



## U.S. Department of the Interior Bureau of Land Management

Anchorage Field Office

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Anchorage, Alaska 99507

<http://www.blm.gov/ak/st/en/fo/ado.html>

### Environmental Assessment: DOI-BLM-AK-010-2009-0007-EA Reindeer Grazing Permits on the Seward Peninsula

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Applicant: John A. Walker  
Applicant: Clifford Weyiouanna

Case File No.: F-035186  
Case File No.: F-030183  
Case File No.: FF-024210  
Case File No.: FF-085605  
Case File No.: F-030387  
Case File No.: F-030432  
Case File No.: F-030165  
Case File No.: FF-085288  
Case File No.: FF-019442  
Case File No.: FF-011729  
Case File No.: FF-000898  
Case File No.: FF-000839  
Case File No.: FF-085604  
Case File No.: FF-087313  
Case File No.: FF-011516



Location: Bureau of Land Management lands on the Seward Peninsula  
Prepared By: BLM, Anchorage Field Office, Resources Branch  
December 2008



**DECISION RECORD**  
**and**  
**FINDING OF NO SIGNIFICANT IMPACT**

I. Decision:

It is my decision to issue ten-year grazing permits on Bureau of Land Management lands to reindeer herders on the Seward and Baldwin peninsulas, Alaska. The permits shall be subject to the terms and conditions set forth in Alternative B of the attached Reindeer Grazing Programmatic Environmental Assessment.

II. Rationale for the Decision:

The Reindeer Industry Act of 1937, 500 Stat. 900, authorizes the Secretary's regulation of reindeer grazing on Federal public lands on the peninsulas. Title 43 of the Code of Federal Regulations Section 4300.40 allows for the issuance of ten-year, grazing permits. In recognition of the importance of reindeer grazing to Native Alaskan culture and tradition, authorizing up to ten-year permits allows herders more time for building herds and infrastructure, thereby giving a longer-term investment opportunity.

The Federal Land Policy and Management Act, Section 202(f), provides that the Secretary shall allow an opportunity for public comment and participation in the formulation of plans and programs relating to the management of the public lands. The Act also provides that the Secretary shall take any action necessary to prevent unnecessary or undue degradation of the lands. By identifying land health standards specific to reindeer grazing on the Seward and Baldwin Peninsulas, BLM seeks to maintain a balance between range health and a sustainable and economically viable reindeer industry.

I have selected Alternative B because it provides a framework for managing the range on the peninsulas; acknowledges the difficulty of maintaining a viable reindeer herd in the face of herd emigration with the Western Arctic Caribou Herd; and recognizes the habitat requirements of subsistence resources on the peninsulas. Grazed Class 5 utilization threshold, a salient feature of Alternative B, is a conservation measure intended to prevent unnecessary or undue degradation of the range while maintaining environmental and ecosystem integrity.

III. Finding of No Significant Impact:

The proposed action is consistent with existing national environmental policies and objectives as set forth in Section 101 (a) of the National Environmental Policy Act of 1969 (NEPA). Further and based on the analysis of potential environmental impacts contained in the attached environmental assessment, it is my determination that the proposed action does not constitute a major Federal action significantly affecting the quality of the human environment and that an environmental impact statement is not required.

IV. ANILCA Section 810 Compliance:

The proposed action will not significantly restrict Federal subsistence uses, decrease the abundance of federal subsistence resources, alter the distribution of federal subsistence resources, or limit qualified Federal subsistence user access.

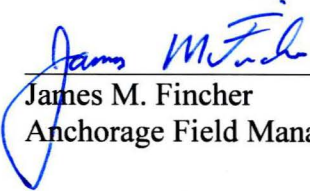
Moreover reindeer herding in Alaska was intended to be a supplemental subsistence resource, Reindeer Industry Act of 1937, 500 Stat. 900.

V. Adverse Energy Impact Compliance:

The action will not have an adverse impact on energy development, production, supply or distribution. The preparation of a Statement of Adverse Energy Impact is not required.

VI. Compliance and Monitoring Plan:

The mitigation measures found in the attached programmatic environmental assessment are incorporated herein as if fully set forth.

  
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James M. Fincher  
Anchorage Field Manager

12/30/2008  
Date

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## Chapter 1

### 1.0 INTRODUCTION

Reindeer were first brought into Alaska on September 21, 1891 at Unalaska Island in the Aleutians. The next year, 171 animals were introduced to the Seward Peninsula at Port Clarence later known as “Teller Reindeer Station” so named in honor of H.M. Teller, the Senator from Colorado who sponsored a bill to allocate six thousand dollars for the purchase of reindeer from Russia for importation to Alaska.<sup>1</sup> Today, reindeer herding remains an avocation and a tradition of Alaska Natives on the Seward and adjacent Baldwin peninsulas where there are fifteen reindeer grazing areas under permit.<sup>2</sup>

Table 1.1 lists the number of reindeer currently authorized within each herder’s range area.

**Table 1.1 – Number of reindeer authorized**

<b>Herder</b>	<b># Reindeer Authorized<sup>3</sup></b>
Davis	2,000
Goodhope*	1,000
Gray	1,000
Hadley*	1,000
Henry	1,000
Karmun*	3,000
Lee	3,000
Menadelook*	1,200
Noyakuk	1,000
Olanna	1,000
Ongtawasruk	1,000
Sagoonick*	2,000
Sheldon*	2,000
Walker*	300
Weyiouanna	1,000
Total:	21,500

\* Based on reports from reindeer herders and Kawerak Reindeer Herders Association, many ranges currently have no actively managed reindeer herds.

<sup>1</sup> Sheldon Jackson, *Fifth Annual Report on introduction of reindeer into Alaska*, 54<sup>th</sup> Cong., 1<sup>st</sup> Sess., Sen. Exec. Doc. No. 111 Washington, DC, 1896, 11-3.

<sup>2</sup> Schneider 2005

<sup>3</sup> The number of reindeer authorized is the total for each herder’s area, not just on BLM lands.

The reindeer loss is due to them being swept away with migrating caribou.<sup>4</sup>

## **1.1 Land Status**

When reindeer were introduced on the peninsulas, all the land was under federal management. Today the land is owned and/or managed by the State of Alaska, Native Corporations, private parties, and agencies of the United States Department of the Interior.

As a consequence of changes in land ownership and management responsibilities, the Bureau of Land Management, the State of Alaska's Department of Natural Resources, and the National Park Service entered into a Memorandum of Understanding (MOU 2002)<sup>5</sup> which allows for cooperative permitting and management of reindeer grazing on public lands, Federal and State. Under the agreement, allocation of permit administration is based on predominate land ownership or management responsibility within each area boundary. By the terms of the agreement, the Bureau of Land Management is the Lead Agency responsible for administering the permitting process for the Gray, Henry, Menadelook, Noyakuk, Sagoonick and Walker grazing areas; the State of Alaska's Department of Natural Resources is the Lead Agency responsible for administering the permitting process for the Davis, Hadley, Olanna, Lee, and Sheldon grazing areas; and the National Park Service is the Lead Agency responsible for administering the permitting process for the Goodhope, Karmun, Ongtawasruk and Weyiouanna grazing areas. The 2002 Memorandum of Understanding is due for revision to adjust to the changes in land ownership and management priorities and management direction in the 2008 Kobuk-Seward Peninsula Approved Management Plan.<sup>6</sup>

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<sup>4</sup> Personal communication, Kawerak RHA and individual herders.

<sup>5</sup> MOU, AK 025 2003 05, dated October 9, 2002.

<sup>6</sup> BLM 2008 Kobuk-Seward Peninsula Approved Management Plan



Table 1.2 – Land Status, identifies the land ownership acreage. The Bureau of Land Management currently manages 4,192,989 acres in this environmental analysis planning area.

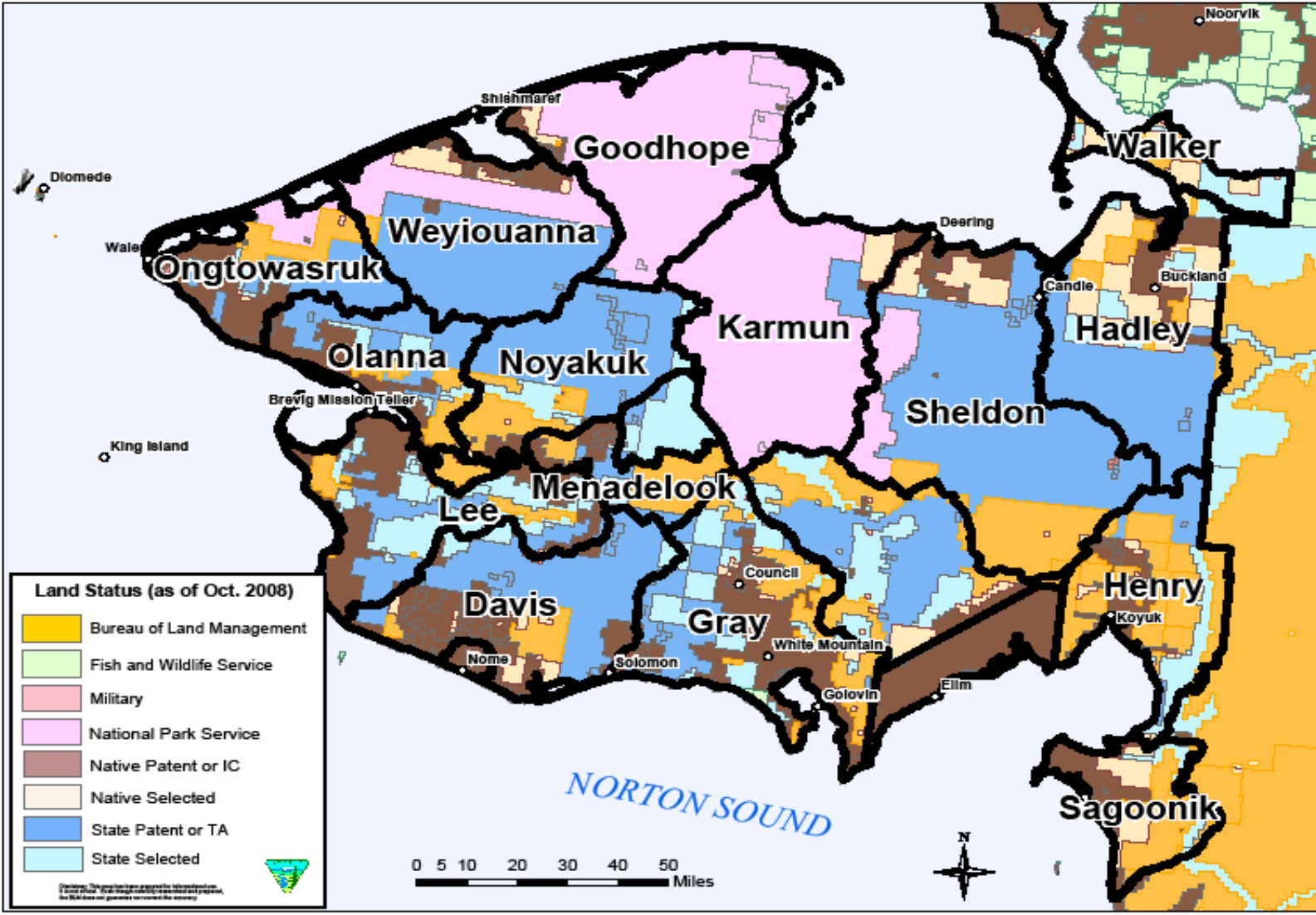
**Table 1.2 – Land Status**

<b>Seward &amp; Baldwin Peninsulas Land Ownership 2008</b>	<b>Acres</b>	<b>Percent</b>
BLM Unencumbered <sup>7</sup>	1,892,444	13%
State Selected	1,486,314	11%
Native Corporation Selected	814,231	6%
Fish and Wildlife Service	13,182	<1%
Military	9,549	<1%
National Park Service	2,699,467	19%
Native Patent or IC	2,596,392	18%
Private	1,576	<1%
State Patent or TA	4,565,912	32%
<b>Total</b>	<b>14,079,068</b>	<b>100%</b>
BLM Managed Total	4,192,989	30%

Bureau of Land Management lands addressed in this analysis include BLM unencumbered, State Selected, and Native Corporation Selected land. Concurrence is required from the State of Alaska on proposals to use State selected lands (ANILCA 906(k)(1)(B)), and consultation with ANCSA Native Corporations on proposals to use Native selected lands (43 CFR §2650.1(a)(2)(i)).

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<sup>7</sup> Bureau of Land Management *unencumbered* lands are lands of the Federal public domain that have not been set aside for conservation under the Alaska National Interest Lands Conservation Act, Public Law 96-487, 94 Stat. 2371, December 2, 1980, or for conveyance to either the State of Alaska or the Native community.



## **1.2 Relationship to Statutes, Regulations, Policies, Plans or Other Environmental Analyses**

### **1.2.1 Statutory and Regulatory Authority**

The Federal Land Policy and Management Act directs the Secretary of the Interior to manage Federal public lands under principles of multiple use and sustained yield while preventing unnecessary or undue degradation of the lands, 43 U.S.C. §1732(b). The Reindeer Industry Act authorizes the Secretary's regulation of reindeer grazing on Federal public lands on the peninsulas, 25 U.S.C. §500m and 43 CFR Part 4300.

### **1.2.2 Policy**

The purpose statement of the Reindeer Industry Act of 1937 provides:

A necessity for providing *means of subsistence* for the Eskimos and other natives of Alaska is hereby declared to exist. It is also declared to be the policy of Congress, and the purpose of this subchapter, to establish and maintain for the said natives of Alaska a self-sustaining economy by acquiring and organizing for and on behalf of said natives a reindeer industry or business, by encouraging and developing native activity and responsibility in all branches of the said industry or business, and by preserving the native character of the said industry or business thus established.

[Emphasis added. 25 U.S.C. §500]

### **1.2.3 Plans**

The grazing areas all fall within the boundary of the Kobuk-Seward Peninsula Record of Decision and Approved Management Plan, September 2008. This plan provides the basis for considering the propriety of permitting reindeer grazing on Bureau of Land Management lands within the Kobuk-Seward Peninsula Approved Management Plan's planning area.

### **1.2.4 Environmental Analyses**

The National Environmental Policy Act of 1969 requires that the Bureau of Land Management analyze the environmental effects of activities it authorizes on the public lands to determine whether they will have a significant affect on the quality of the human environment, 42 U.S.C. §4332. In managing the environment, the Bureau of Land Management is required to "... prevent unnecessary or undue degradation of the land[s]," 43 U.S.C. §1732(b). Further, and in recognition of the need for the "... continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives, on the public lands

and by Alaska Natives on Native lands is essential to Native physical, economic, traditional, and cultural existence,” “... utilization of the public lands in Alaska is to cause the least adverse impact possible on rural residents who depend upon subsistence uses of the resources of such lands. ...”, Title VIII of the Alaska National Interest Lands Conservation Act, Public Law 96-487, December 2, 1980, 94 Stat. 2371, 16 U.S.C. §§3111 and 3112.

The effects on the land, rural residents and the resources upon which they rely and the affect on the human environment associated with reindeer grazing have been analyzed with respect to each area every five years since 1992. These effects were also analyzed in the Bureau of Land Management Alaska’s Kobuk-Seward Peninsula Final Environmental Impact Statement.

The Affected Environment and Environmental Consequences Chapters of this document tier<sup>8</sup> off of the 2008 Kobuk-Seward Peninsula Resource Management Plan, Environmental Impact Statement. The issues identified and discussed in the 2008 Kobuk-Seward Peninsula Approved Resource Management Plan and Environmental Impact Statement relevant to reindeer grazing are incorporated by reference.<sup>9</sup>

### **1.3 Plan Conformance**

#### **1.3.1 2008 Kobuk-Seward Peninsula Approved Management Plan**

This programmatic environmental analysis is in conformance with the 2008 Kobuk-Seward Peninsula Approved Management Plan (KSPRMP). After approval, the Anchorage Field Office will take appropriate measures to bring all permitted grazing operations and activities on Bureau of Land Management land in alignment with the new land health standards and grazing permit stipulations developed as an outcome of this analysis.

The Goals of the Kobuk-Seward Peninsula Approved Management Plan, Environmental Impact Statement are:

1. Resolve conflicts between livestock grazing, wildlife, and subsistence.
2. Maintain and improve the quality of the range conditions.
3. Manage for a sustainable level of livestock grazing with deference given to maintaining habitat needed to support desired populations of wildlife.
4. Determine appropriateness of grazing of livestock for species other than reindeer.

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<sup>8</sup> 40 CFR §1502.20

<sup>9</sup> 40 CFR §1502.21

The Kobuk-Seward Peninsula Approved Management Plan allows reindeer grazing only in the following areas: Sheldon, Karmun, Goodhope, Buckland River, Mt. Wick, Weyiouanna, Davis, Kakaruk, Kougarok, Koyuk, Ongtowasruk, Olanna, Shaktoolik, Baldwin Peninsula, and Mt. Bend. The remainder of the planning area, including McCarthy's Marsh and the upper Kuzitrin River is closed to grazing.

The Kobuk-Seward Peninsula Approved Management Plan requires that applications for grazing permits be considered on a case-by-case basis, considering conflicts with wildlife and subsistence. The Kobuk-Seward Peninsula Approved Management Plan also determined that reindeer are the only type of livestock permitted under a grazing permit.

The Kobuk-Seward Peninsula Approved Management Plan also requires the development of grazing management plans for open and actively used allotments that include grazing systems and fire management. All authorized activities and uses of Bureau of Land Management lands are subject to the Statewide Land Health Standards. Section 1.3.1.1 (below) discusses the Statewide Land Health Standards that are relevant to reindeer grazing in the planning area.

#### **1.3.1.1 Kobuk-Seward Peninsula Approved Management Plan Statewide Land Health Standards**

The national Bureau of Land Management grazing program regulations do not apply to Alaska. Unlike the Bureau of Land Management in the contiguous 48 States, where Standards and Guidelines are being implemented under regulations contained in 43 CFR 4180, the Bureau of Land Management and the Resource Advisory Council for Alaska cooperatively developed standards and guidelines for Alaska. These Alaska Land Health Standards and Guidelines<sup>10</sup> (Appendix D of the 2008 Kobuk-Seward Peninsula Approved Management Plan) describe the desired ecological conditions and goals that the Bureau of Land Management intends to maintain, or attain, in managing lands throughout Alaska.

These statewide land health standards are criteria for land use planning decisions:

- Watershed Function-Uplands
- Watershed Function-Riparian, wetland, aquatic areas
- Ecological processes
- Water quality and yield
- Threatened, endangered, native, and locally important species

While these land health standards are good guidelines for overall resource management issues, they do not give land health measures specific for reindeer

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<sup>10</sup> Kobuk-Seward Peninsula Resource Management Plan, Appendix D: BLM Alaska Land Health Standards, page 2.

grazing. The Bureau of Land Management must identify more specific land health standards with measurable indicators of range health appropriate to reindeer grazing in Alaska.

### **1.3.1.2 Kobuk-Seward Peninsula Approved Management Plan Required Operating Procedures**

Grazing permits are subject to the Required Operating Procedures (ROPS) listed below.<sup>11</sup> ROP Objective Veg-2 requires that Bureau of Land Management permitted activities “minimize disturbance to vegetative resources.” These Required Operating Procedures in the Kobuk-Seward Plan were developed to ensure that the Alaska Land Health Standards (Section 1.3.1.1 above, page 9) are met in carrying out permitted activities and management practices. These Required Operating Procedures give us the foundation upon which we will develop more specific land health standards and ecological measures appropriate to reindeer grazing in this environmental analysis.

The Required Operating Procedures identified in the Kobuk-Seward Peninsula Approved Management Plan relative to reindeer grazing state:

**ROP Veg-2i** Permitted livestock grazing will be conducted in a manner that maintains long term productivity of vegetation. Animals will not be picketed in riparian areas. In areas of low grass production, operators will pack in weed-free hay or concentrated feed.

**ROP Veg-2j** Require Special Recreation Permit holders, reindeer herders, dog mushers, and other Bureau of Land Management permit holders to use certified weed-free products on Bureau of Land Management lands.

The Bureau of Land Management will use these requirements to develop appropriate reindeer grazing permit stipulations which herders will be required to comply with. Furthermore, to determine the success of these required operating procedures, we have established measures, or indicators of change, that would prompt the need for mitigation of impacts from permitted reindeer grazing. Specific measures of rangeland health appropriate to reindeer grazing have been developed and are considered in this environmental analysis.

## **1.4 Background of Reindeer Industry**

### **1.4.1 Reindeer**

Reindeer are the domestic or semidomestic form of the animal *Rangifer tarandus*

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<sup>11</sup> Kobuk-Seward Peninsula Resource Management Plan, Approved RMP page 24.

spp. In North America, reindeer in the wild are usually called caribou.<sup>12</sup> Well adapted to winter conditions, they are native species to the circumpolar tundra and boreal forest regions. When the indigenous peoples of Europe began herding reindeer, five to seven thousand years ago, they mimicked the animals' natural migration patterns and moved them between winter and summer ranges. The same is true today. When Sheldon Jackson imported reindeer to Alaska in the 1890s, he also brought with him Sami reindeer herders, indigenous peoples of Europe, to teach Alaska Natives reindeer herding techniques.<sup>13</sup>

The imported reindeer population in Alaska grew to well over 600,000. By 1933, these populations began their decline, and by 1950, only 25,000 reindeer remained. Population declines were attributed to inadequate herding, wolf predation, poor facilities, herder/owner conflicts and low profit margins caused by the economic depression. Winter forage was destroyed by overgrazing, trampling and fire. There was poor planning of range use and insufficient knowledge of range management.<sup>14</sup>

## 1.4.2 Herding



In the non-winter months reindeer feed on grasses, sedges, shrubs, forbs, flowering plants, fungi, horsetails and the leaves of willows, which allow them to buildup winter fat stores. They have prehensile lips and are selective grazers, choosing the most nutritionally dense plants and plant parts.

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<sup>12</sup> University of Alaska, December 1980, Eskimos, Reindeer and Land

<sup>13</sup> International Sami Journal, The Sami/Inupiaq/Yup'ik Reindeer in Alaska & Canada Story, Nathan Muus

<sup>14</sup> Swanson, Barker, 1992, Rangifer



Summer grazing range areas for reindeer include ecosystem types that contain cottongrass and other nutritious grazing resources important for cow and calf growth and weight gain.



During winter months, reindeer must dig through deep, crusty snow to feed on various lichens and shrubs. Because of long winters, quality, quantity, and availability of winter forage can influence population levels. The Natural Resource Conservation Service assists herders in range management.





Today, helicopters are sometimes used to drive reindeer. In addition, herders push their deer on foot, or with 4-wheelers or snowmobiles.





Corralling of reindeer occurs once or twice a year for husbandry purposes. It also occurs during times of predation and to avoid emigration of reindeer with the Western Arctic Caribou herd. This corral is outside of Nome, accessible by road.



Noyakuk corral and line-cabin, Imuruk Basin. Corralling facilitates the accurate marking of stock and the making of counts and ownership records.



Noyakuk corral chute, Imuruk Basin.



Noyakuk cabin, Imuruk Basin. Reindeer herding occurs on large acreages, in a country of sparse settlement and poor transportation facilities with travel over the range, often under adverse conditions, consequently there is a need for shelters or cabins throughout some of the ranges.



The University of Alaska Fairbanks Reindeer Research Program assists herders with reindeer husbandry. Here, blood samples are drawn to monitor the incidence of brucellosis and other diseases.



In conjunction with the University of Alaska Fairbanks, at least two herders with reindeer are experimenting with small scale feed-lot operations to assess the prospects of alternate operations that may avoid emigration of reindeer with the Western Arctic Caribou Herd.

## **1.5 Bureau of Land Management Measures of Range Health**

The Bureau of Land Management monitors grazing range health by measuring lichen utilization and cover, a process called the Alaska Grazed Class Method. Details of this methodology are described in Chapter 2 – Bureau of Land Management Monitoring, Mitigations Common to All Alternatives.

Access to monitoring transect sites is primarily by helicopter due to the remote nature of the range. The helicopter and logistical support cost of these annual range assessments is approximately \$35,000, involving one helicopter, one helicopter manager, and two range managers to conduct the transect monitoring.

This lichen cover and utilization data is useful for range condition assessments in the specific transect area(s). The Bureau of Land Management monitoring is limited to just BLM lands. Due to the patchwork of land ownership, effective landscape-level assessment within each range area is best achieved through collaborative monitoring across jurisdictional boundaries.

## **1.6 Purpose and Need for the Proposed Action**

The decision to promote the Reindeer Industry and to allocate federal public land for reindeer grazing was made by Congress with passage of the Reindeer Industry Act of 1937. Legislation since the Reindeer Industry Act, including the Alaska Native Claims Settlement Act and Title VIII of the Alaska National Interest Lands Conservation Act, forms a continuous pattern of Congressional efforts to promote Native Alaskan cultural and economic well-being.

The foregoing coupled with the multiple use and sustained yield provisions of the Federal Land Policy and Management Act limits the scope to the prevention of unnecessary or undue degradation of the public lands, 43 U.S.C. 1732(b).

The purpose and need for this environmental analysis is to identify land health standards appropriate to reindeer grazing on the Seward and Baldwin peninsulas and to maintain a balance between range health and a sustainable and economically viable reindeer industry. By identifying ecological measures of the grazing impacts, we can determine how much and where reindeer grazing can be permitted, and what mitigations are necessary. We will establish thresholds of allowable impacts to Alaska's unique tundra grazing range while maintaining the diversity and ecological health on Bureau of Land Management land. Because the Kobuk-Seward Peninsula Approved Management Plan requires the development of grazing management plans for permitted livestock grazing and compliance with the Required Operating Procedures, best management practices need to be established to give administrators appropriate measures, utilization thresholds and mitigations to use when considering approval of the proposed reindeer grazing activities.

## **Chapter 2**

### **2.0 PROPOSED ACTION AND ALTERNATIVES**

#### **2.1 Introduction**

The National Environmental Policy Act (NEPA) requires consideration of alternatives to the Preferred Alternative that address important issues identified in the scoping process. This chapter describes the scoping process and issues that were revealed, the Preferred Alternative and three other project alternatives, including the No Action Alternative.

#### **2.2 Scoping and Issue Identification**

##### **2.2.1 Scoping Meetings**

Public scoping helps managers identify significant issues that drive the development of our Proposed Action and alternatives for consideration and comparative analysis. Beginning in November 2007, the Bureau of Land Management met with parties involved with the reindeer industry on the Seward and Baldwin peninsulas. The public and the following entities were invited to participate in meetings to develop issues and share their role in how the industry is being managed and generate ideas of how it can be better managed:

- Alaska Department of Fish and Game (ADFG)
- Alaska Department of Natural Resources (DNR)
- Bering Straits Native Corporation (BSNC)
- Bureau of Indian Affairs (BIA)
- Bureau of Land Management Fairbanks District Office (BLM-FDO)
- Kawerak Reindeer Herders Association (RHA)
- Natural Resource Conservation Service (NRCS)
- National Park Service (NPS)
- University of Alaska Fairbanks Reindeer Research Program (UAF RRP)

Scoping meetings were held in Nome, Koyuk, Shishmaref, Wales, Fairbanks, and Anchorage.

##### **2.2.2 Issues Identified During Scoping**

Issues help managers identify coordination needs with other agencies, promote constructive dialogue and relations, generate information, refine issues, and identify new issues and possible alternatives. The following issues were raised during the scoping process:

### **2.2.2.1 Issues of Public Concern**

#### **2.2.2.1.a *Socioeconomics and Cultural Tradition Values***

Reindeer herding is important socially and culturally to the residents in many communities on the Seward and Baldwin peninsulas. Reindeer herding is valued as a cultural tradition for Alaska Natives. In its prime, the reindeer industry on the Seward & Baldwin peninsulas was strong enough to sustain communities with meat, bartering resources and local employment. Traditions are passed along to family members for generations. Reindeer meat is often shared with families and residents in communities with active reindeer herds.

A number of factors have diminished the industry. The attractiveness of lucrative opportunities in bigger communities like Fairbanks and Anchorage has lured younger members of reindeer herding families away, contributing to loss of traditions being passed along.

The caribou migrations over the past ten +/- years has swept away many of the herders' reindeer, leaving very few or no reindeer at all in some of the reindeer range areas. This loss of property, potential income, reliable meat source, and cultural activity in the communities has diminished the enthusiasm for reindeer herding on the Seward and Baldwin peninsulas.

The lack of adequate slaughtering and processing infrastructure to help herders get their meat products to market has undermined the sustainability of the reindeer industry on the Seward and Baldwin peninsulas.

### **2.2.2.2 Issues of Management Concern**

#### **2.2.2.2.a *Proprietary Information regarding reindeer herd location(s)***

Reindeer herders cooperate with the University of Alaska Reindeer Research Program and many have received assistance from the Natural Resource Conservation Service through the Environmental Quality Improvement Program (EQIP). Educational Assistance funds have been used to purchase and install Global Positioning Satellite (GPS) tracking collars. The Alaska Department of Fish and Game has installed GPS tracking collars on caribou, and the data is available to interested parties. Herders can access "real time" location data for both caribou and reindeer herds. The herd location data helps herders maintain their reindeer herds from emigration with migrating caribou. It also helps herders to more efficiently apply range management practices such as seasonal herd rotation throughout the permitted range area. The reindeer location data on Bureau of Land Management lands would be useful to Bureau range managers for assessing range conditions and developing monitoring strategies. However, the reindeer location data has been considered proprietary and not available to this

Agency in previous years.

**2.2.2.2.b**     ***Natural Resource Conservation Service monitoring data***

The Natural Resource Conservation Service conducts range assessments throughout the grazing areas regardless of land ownership to determine the overall health of the reindeer ranges. The Natural Resource Conservation Service makes management recommendations to the reindeer herders, specific to strategic herd movement and grazing management plans. Sometimes there are areas of heavy grazing in a range area that needs to be rested from grazing in order to maintain ecological health of the range. The Natural Resource Conservation Service works with the herder to develop a prescribed grazing plan to balance ecological health with herders' needs.

Although the range utilization and condition data that the Natural Resource Conservation Service gathers on non-Bureau of Land Management land (as well as BLM land) is federally funded, Natural Resource Conservation Service considers it proprietary and therefore the BLM and other land management agencies have not been provided this data to support landscape level range condition assessment.

The Bureau of Land Management uses the same lichen cover and utilization assessment methodology as the Natural Resource Conservation Service, the Alaska Grazed Class Method, and the two agencies often share logistics and support for monitoring activities on Bureau of Land Management lands. The Bureau of Land Management currently does not participate in monitoring activities on non-BLM managed lands.

**2.2.2.2.c**     ***Subsistence Resources***

Reindeer and herding activities could affect subsistence resources including the Western Arctic Caribou Herd, fur bearing animals, and other species relied upon for subsistence purposes. Not all communities have been able to maintain reindeer herding for subsistence purposes. Some residents prefer caribou.

**2.2.2.3**       **Issues of Environmental Concern**

**2.2.2.3.a**     ***Range Health***

Failure to rotate herds to alternate grazing areas could lead to overgrazing and ecosystem degradation.

**2.2.2.3.b**     ***Wildlife***

Continued emigration of reindeer with the Western Arctic Caribou Herd may



result in the eventual demise of reindeer husbandry on the peninsulas. Additionally, reindeer compete with caribou in forage habitat.

**2.2.2.3.c**     *Disease*

The interaction of domesticated reindeer with wild caribou could adversely affect either population by the exchange of disease.

**2.2.2.3.d**     *Invasive plants*

Introduction of non-native invasive plants are an environmental concern with supplemental feeding.

**2.2.2.4**       **Issues raised during scoping, but outside of the scope of this analysis**

**2.2.2.4.a**     *Use of Native Corporation Lands*

Native Corporation representatives expressed a desire to receive payment for herding on corporation lands. It is the responsibility of any reindeer herder to obtain permission and comply with any and all landowner requirements. The Bureau of Land Management has no jurisdiction over non-BLM managed lands.

**2.2.2.4.b**     *Reindeer husbandry*

At least one individual expressed concern with reindeer husbandry and herding practices. Reindeer husbandry is taught by the University of Alaska Reindeer Research Program, and herders are encouraged to cooperate with recommended husbandry practices.

**2.2.2.4.c**     *Price of reindeer meat*

Several individuals expressed concern about the high price of reindeer meat in the local grocery.

**2.3**           **Alternative A - No Action**

**Issue permits for up to five-year terms, no change from existing management and administration**

Under the No Action Alternative, the Bureau of Land Management would continue to issue grazing permits, for up to five-year terms, with the concurrence from the National Park Service and Alaska Department of Natural Resources. Bureau of Land Management lands within the following fifteen range areas would remain open to reindeer herding:

1. Davis
2. Goodhope
3. Gray (Mt. Wick)
4. Hadley (Buckland River)
5. Henry
6. Karmun
7. Lee (Kakaruk)
8. Menadelook
9. Noyakuk
10. Olanna
11. Ongtawasruk
12. Sagoonick
13. Sheldon
14. Walker (Baldwin Peninsula.)
15. Weyiouanna

The number of reindeer permitted under the No Action Alternative would stay the same as currently authorized on each grazing area.

Currently there are no reindeer in many range areas due to them being swept away with migrating caribou. In open range areas where there are no reindeer (Goodhope, Hadley, Karmun, Menadelook, Sagoonick, Sheldon, and Walker), the Bureau of Land Management would allow these herders to re-apply and hold reindeer grazing permits. Permits would be renewed to support herder's efforts to re-establish and maintain a viable reindeer herd when caribou migration patterns change and reduce the conflict between the two. This is responsive to the socioeconomic importance of the reindeer industry to the Alaska Native culture and tradition.

This No Action Alternative would not require an amendment to the Kobuk-Seward Peninsula Approved Management Plan.

### **2.3.1 Alternative A - Monitoring and Land Health Standards**

The Bureau of Land Management would continue to monitor and assess range health conditions using the Alaska Grazed Class Method.<sup>15</sup>

Land health standards and Required Operating Procedures identified in the Kobuk-Seward Peninsula Approved Management Plan would apply.<sup>16</sup> There would be no grazing utilization threshold (Grazed Class Utilization – discussed further in this analysis) established that would require mitigations to be

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<sup>15</sup> Natural Resource Conservation Service, 2001, A Procedure for Evaluating Lichen Utilization on Reindeer Ranges.

<sup>16</sup> Kobuk-Seward Peninsula Resource Management Plan 2008, Appendix A, A-10

implemented.

Based on the annual monitoring findings, the Bureau of Land Management would make recommendations to herders, (not require) periods of rest and recovery for BLM lands. These monitoring findings and recommendations would be presented to the herders at the annual Reindeer Herders Association meeting in Nome.

### **2.3.2 Alternative A - Reindeer Grazing Permit Stipulations - Annual Report Requirements**

The requirement for herders to submit a report of grazing operations would remain the same as in the past (See Exhibit A). These reports are due by April 1, annually. The information required by the Bureau of Land Management would be:

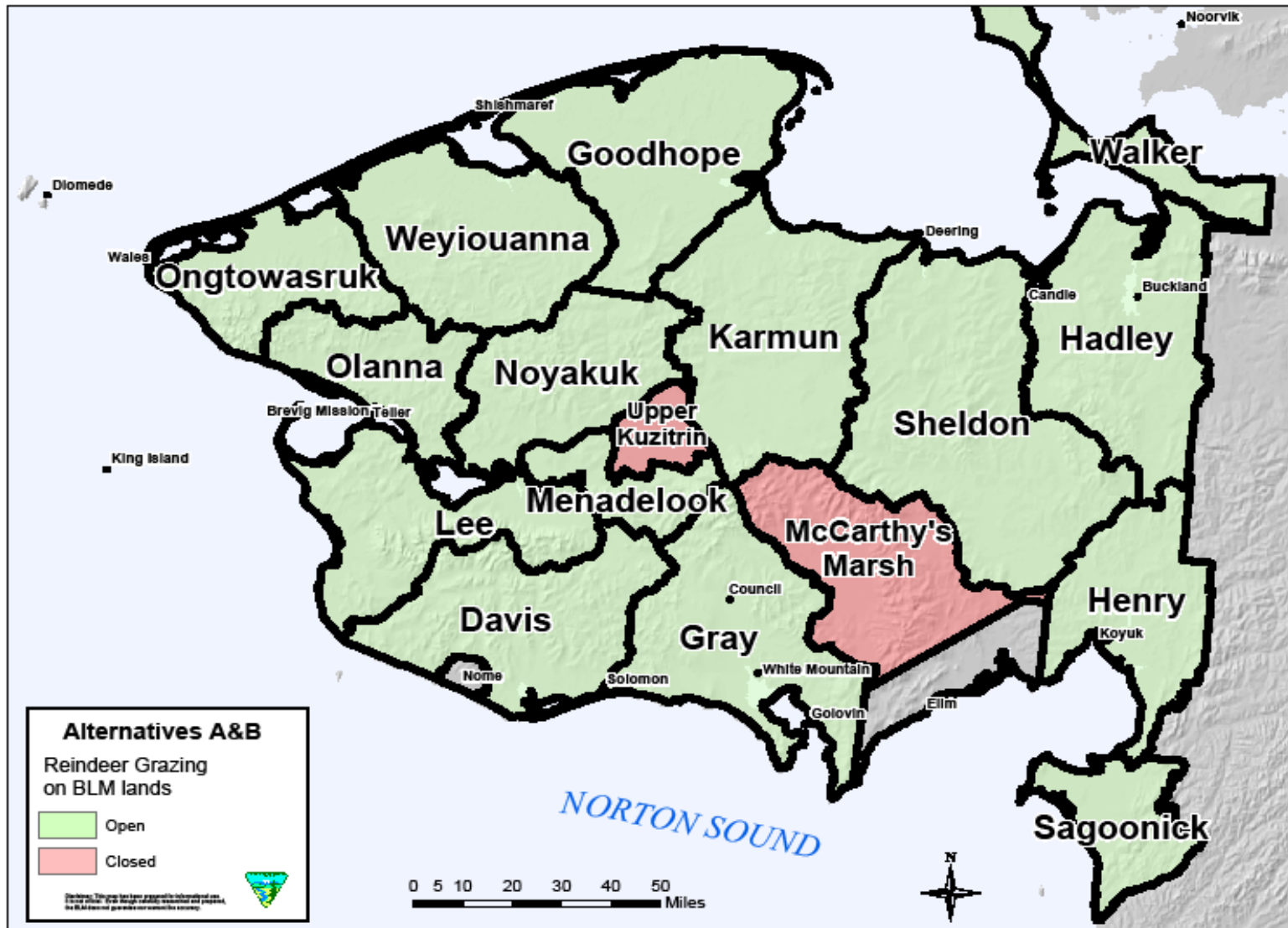
1. Forage preference, including time of year.
2. Any indications of changes in the vegetation composition.
3. Maps indicating the locations of the herd at different times of the year.
4. Presence of competitors and/or predators.
5. Presence of burned areas.
6. Presence of deep or crusted snow areas.
7. Number of reindeer on the range and summary of corralling and slaughtering activities.

### **2.3.3 Alternative A - Reindeer Grazing Permit Stipulations – Grazing Management Plans**

The Kobuk-Seward Peninsula Resource Management Plan identifies the development of grazing area management plans for open and actively used range areas.<sup>17</sup> Bureau of Land Management would work with herders to develop grazing management plans.

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<sup>17</sup> Kobuk-Seward Peninsula Resource Management Plan 2008, Approved RMP-24



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## 2.4

### **Alternative B – Preferred Alternative**

This Bureau of Land Management Preferred Alternative would provide the greatest opportunity for responsible reindeer grazing without an amendment to the 2008 Kobuk-Seward Peninsula Approved Management Plan. The Bureau of Land Management would work collaboratively with the Natural Resource Conservation Service and reindeer herders to develop grazing management plans that minimize overgrazing of rangelands and maximize the long-term grazing potential of each grazing area. The grazing management plans would balance permitted reindeer grazing in each area with responsible resource conservation.

The Bureau of Land Management would issue grazing permits for up to ten-year terms on Bureau of Land Management lands with the concurrence from the National Park Service and Alaska Department of Natural Resources. This minimizes the number of times a herder has to submit permit renewal applications to the Bureau of Land Management and allows herders more time for building herds and infrastructure, thereby giving a longer-term investment opportunity.

The following fifteen range areas would remain open to reindeer herding:

1. Davis
2. Goodhope
3. Gray (Mt. Wick)
4. Hadley (Buckland River)
5. Henry
6. Karmun
7. Lee (Kakaruk)
8. Menadelook
9. Noyakuk
10. Olanna
11. Ongtawasruk
12. Sagoonick
13. Sheldon
14. Walker (Baldwin Peninsula)
15. Weyiouanna

Initially, the number of reindeer permitted would stay the same as currently authorized on each grazing range area. Increases in the number of reindeer allowed would be considered based upon range management recommendations from the herders, University of Alaska Reindeer Research Program, Natural Resource Conservation Service, State of Alaska Department of Natural Resources, National Park Service, and Bureau of Land Management monitoring data.

Currently there are no reindeer in many range areas due to them being swept away

with migrating caribou. In open range areas where there are no reindeer (Goodhope, Hadley, Karmun, Menadelook, Sagoonick, Sheldon, and Walker), the Bureau of Land Management would allow these herders to re-apply and hold reindeer grazing permits. Permits would be renewed to support herder's efforts to re-establish and maintain a viable reindeer herd when caribou migration patterns change and reduce the conflict between the two. This is responsive to the socioeconomic importance of the reindeer industry to the Native Alaska culture and tradition.

If an existing permit is cancelled (Bureau of Land Management action) or relinquished (herder action), new applicants will be considered on a case-by-case basis in those reindeer range areas.

This Preferred Alternative establishes grazing utilization thresholds to meet land health standards identified in the Kobuk-Seward Approved Management Plan, and it would not require an amendment to the Plan.

New Bureau of Land Management permit stipulations would require herders to submit an annual report of grazing operations (See Exhibit B). Annual reports would be due by April 1, for operations the preceding year. The information required by the Bureau of Land Management would involve herd location(s) and range use throughout the year, location of corrals, cabins, and slaughtering facilities, and herd management activities on Bureau of Land Management lands to assist permit administrators in developing strategic monitoring plans. Herder Annual Report forms (See Exhibit G) and detailed range area maps would be provided to the herders to assist them with the reporting requirements. In lieu of using the maps provided, herders could provide the Bureau with the Global Positioning Satellite collar data for reindeer locations on Bureau of Land Management lands.

The Bureau of Land Management would work in cooperation with herders and the Natural Resource Conservation Service to develop the grazing management plans for Bureau of Land Management lands. The Bureau of Land Management would require updated grazing management plans to be submitted every five years.

#### **2.4.1 Alternative B - Monitoring and Land Health Standards**

The Bureau of Land Management would continue to monitor and assess range health conditions using the Alaska Grazed Class Method<sup>18</sup>. This methodology measures the percent of lichen disturbance and lichen cover as part of range condition assessments. Table 3.1 - Lichen Utilization Classes describes the physical characteristics and recommended rest periods for the range of Lichen

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<sup>18</sup> Natural Resource Conservation Service, 2001, A Procedure for Evaluating Lichen Utilization on Reindeer Ranges.

Utilization Grazed Classes. The Lichen Utilization Classes table is an integral component of the Alaska Grazed Class Methodology.

A grazing utilization threshold of Grazed Class 5 utilization (heavy) would be the land health standard established in Alternative B, the Preferred Alternative. Grazed Class 5 utilization threshold addresses the statewide land health standards established in the Kobuk-Seward Peninsula Approved Management Plan:

- Watershed Function-Uplands
- Watershed Function-Riparian, wetland, aquatic areas
- Ecological processes
- Water quality and yield
- Threatened, endangered, native, and locally important species

Grazed Class 5 (heavy) is characterized by:

- 76% - 100% of the lichen has been disturbed or dislodged.
- Adequate lichen remains in the utilized section of the plot for regeneration. Craters extend only to the top of the organic horizon and not into mineral soil exposed rock. Severely trampled sites should be placed in this class. Recover period may be: 15 years for upland, and 12 years for lowland.

This utilization threshold was selected to achieve management objectives of maintaining long term productivity of vegetation, and to preserve the biological and ecological integrity on the Seward and Baldwin peninsulas.

If monitoring reveals a Grazed Class 5 (heavy) or greater utilization on the range, the Bureau of Land Management would consult with Natural Resource Conservation Service and the herders to develop a grazing management prescription to rest or defer grazing until live-lichen biomass is stable and accumulating faster than dead lichen biomass. Range condition trend shall also be moving towards management objectives.<sup>19</sup> The management objective is to “maintain long term productivity of vegetation”, as described in the Required Operating Procedure (ROP) identified in the Kobuk-Seward Peninsula Approved Management Plan, Section 1.3.1.2., ROP Veg-2i.

Monitoring findings and recommendations would be presented to the herders in an annual monitoring report at the annual herders meeting in Nome, and the recommendations must be addressed in the herders grazing management plans.

If monitoring data indicates Grazed Class 5 or greater utilization, stipulations tied

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<sup>19</sup> NRCS, Alaska, August 1999, 528A-7

to reindeer grazing permits would be required to mitigate the impacts.

Mitigations required if monitoring shows Grazed Class 5 or greater may involve:

1) Required rest of the heavily grazed area.

Rest or deferment of an area can be implemented through prescribed grazing.<sup>20</sup> Depending on the extent of Grazed Class 5 utilization observed, the Bureau of Land Management, in consultation with the herders, the Natural Resource Conservation Service, and the University of Alaska Reindeer Research Program, would identify on the range map the specific area required to be rested.<sup>21</sup>

It is conceivable that the presence of caribou could lead to Grazed Class 5 or greater utilization impacts. Regardless of whether reindeer or caribou cause the grazing impacts, reindeer herders would be required to rest or defer areas with Grazed Class 5 or greater, in accordance with the recommendations from the Bureau of Land Management.

2) Option for supplemental feeding.

Supplemental feeding option proposals on Bureau of Land Management land would undergo a site specific environmental analysis. The following elements would be considered in the analysis:

- a. The Bureau of Land Management would require the supplemental feed to be treated (or have no non-native invasive plant components) to prevent the propagation of non-native/invasive plants.
- b. Structures and/or associated facilities proposed.
- c. Proximity of supplemental feeding areas to riparian areas or other land features that could be affected.
- d. Size of the area proposed for use, the time period, duration and number of reindeer that would be using it.

3) Reduced number of reindeer in permit authorization:

The Bureau of Land Management may reduce the number of reindeer authorized on BLM land if range conditions adversely change, for example, by natural causes, overgrazing, or fire.<sup>22</sup>

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<sup>20</sup> NRCS, Alaska, August 1999

<sup>21</sup> CFR 43, 4300.41 (b)

<sup>22</sup> CFR 43, 4300.41(a)



These range management principles and guidelines would help the Bureau of Land Management determine if grazing management plans are being implemented effectively by verifying range conditions relative to observed grazing utilization data.

#### **2.4.2 Alternative B - Reindeer Grazing Permit Stipulations - Annual Report Requirements**

Permittee will submit a completed report of grazing operations and reindeer location information to the Bureau of Land Management by April 1 of each year. The Bureau of Land Management will provide the herders with a Herder Annual Report Form and a range area map to assist the herder in showing where and when the grazing and herding activities took place on BLM land (BLM unencumbered, State Selected, Native Corporation Selected). These stipulations apply only to Bureau of Land Management land.

Reindeer location data considered proprietary by herders will be maintained by the Bureau of Land Management as proprietary and used for permit administration, not available for public disclosure.

Herders should report range health conditions for Bureau of Land Management lands to assist administrators in developing strategic monitoring plans.

#### **2.4.3 Alternative B - Reindeer Grazing Permit Stipulations - Grazing Management Plans**

Herders with reindeer would be required to develop and provide an updated grazing management plan to the Bureau of Land Management within the first year of a permit term, and every five years thereafter. This would be a new stipulation for grazing permits as required by the Kobuk-Seward Peninsula Approved Management Plan.<sup>23</sup> Grazing management plans should be developed in collaboration with the Natural Resource Conservation Service and should include:

1. Range resources in the area (winter/summer habitat, safe areas, etc.) shown on a map.
2. Range health condition information for Bureau of Land Management managed land, if known, shown on a map. (Maps will be provided by the BLM for herders convenience).
3. Major Issues (predator problems, access and weather events).
4. Methods of herding reindeer (i.e. helicopter, airplane, rollagon/nodwell, ATV, snow machine).

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<sup>23</sup> Kobuk-Seward Peninsula Resource Management Plan, Approved RMP-24.

*\*Reindeer location data considered proprietary by herders will be maintained by the Bureau of Land Management as proprietary and used for permit administration, not available for public disclosure.*

## **2.5 Alternative C – Issue ten-year grazing permits to herders with reindeer, and five year permits to herders with no reindeer.**

This alternative is more conservative than the other Alternatives developed for this programmatic environmental analysis. Supplemental feeding on Bureau of Land Management land will not be authorized to provide a higher standard to prevent the introduction of invasive plants.

This alternative puts more stringent requirements on the herders to provide the Bureau with reindeer Global Positioning Satellite collar data and Natural Resource Conservation Service range condition data (if available) to the Bureau of Land Management.

The following fifteen range areas would remain open to reindeer herding.

1. Davis
2. Goodhope\*
3. Gray (Mt. Wick)
4. Hadley (Buckland River)\*
5. Henry
6. Karmun\*
7. Lee (Kakaruk)
8. Menadelook\*
9. Noyakuk
10. Olanna
11. Ongtawasruk
12. Sagoonick\*
13. Sheldon\*
14. Walker (Baldwin Peninsula)\*
15. Weyiouanna

\* Based on reports from reindeer herders and Kawerak Reindeer Herders Association, these ranges currently have no actively managed reindeer herds.<sup>24</sup>

Herders with no actively managed reindeer herds would be issued five-year permits. Herders would be required to notify the Bureau of Land Management upon placement of reindeer on the range area, and within one year of reindeer placement submit a grazing management plan with a proposal of how they would develop and maintain reindeer grazing operations. If no reindeer are placed on

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<sup>24</sup> Personal communication, Kawerak RHA and individual herders.

range area within five years for reasons other than those associated with caribou migration patterns, permittee would be allowed to re-apply, but other applicants would also be given consideration on a case-by-case basis.

Herders who currently have reindeer would be issued new permits for up to ten years. These herders would have to submit a grazing management plan within the first year of the ten-year permit term, and submit an updated plan every five years.

The maximum number of reindeer permitted would stay the same as currently authorized until a determination of stocking rate using a method described in Bureau of Land Management/AK/OF-83/08<sup>25</sup>, or other accepted methodology, is established. The Bureau of Land Management would collaborate with Natural Resource Conservation Service and University of Alaska Reindeer Research Program to determine accepted stocking rate methodology.

If an existing permit is cancelled (Bureau of Land Management action) or relinquished (herder action), new applicants will be considered on a case-by-case basis in any open areas where there are no reindeer grazing operations being maintained.

### **2.5.1 Alternative C - Monitoring and Land Health Standards**

Monitoring and Land Health Standards for Alternative C would be the same as in Alternative B, the Proposed Action with the exception that supplemental feeding would not be an option. See Section 2.4.1, Alternative B - Monitoring and Land Health Standards.

### **2.5.2 Alternative C - Reindeer Grazing Permit Stipulations - Annual Report Requirements**

Permittee would be required to submit an annual report to the Bureau of Land Management by April 1 for the preceding year. The Bureau of Land Management will provide the herders with a Herder Annual Report Form and a range area map to assist the herder in showing where and when the grazing and herding activities took place on Bureau of Land Management managed land (BLM unencumbered, State Selected, Native Corporation Selected).

Reporting requirements for Alternative C are similar to Alternative B, but require herders to provide reindeer Global Positioning Satellite collar data and Natural Resource Conservation Service range monitoring data (if available) to the Bureau of Land Management to assist permit administrators in developing strategic monitoring plans. These stipulations apply only to Bureau of Land Management land.

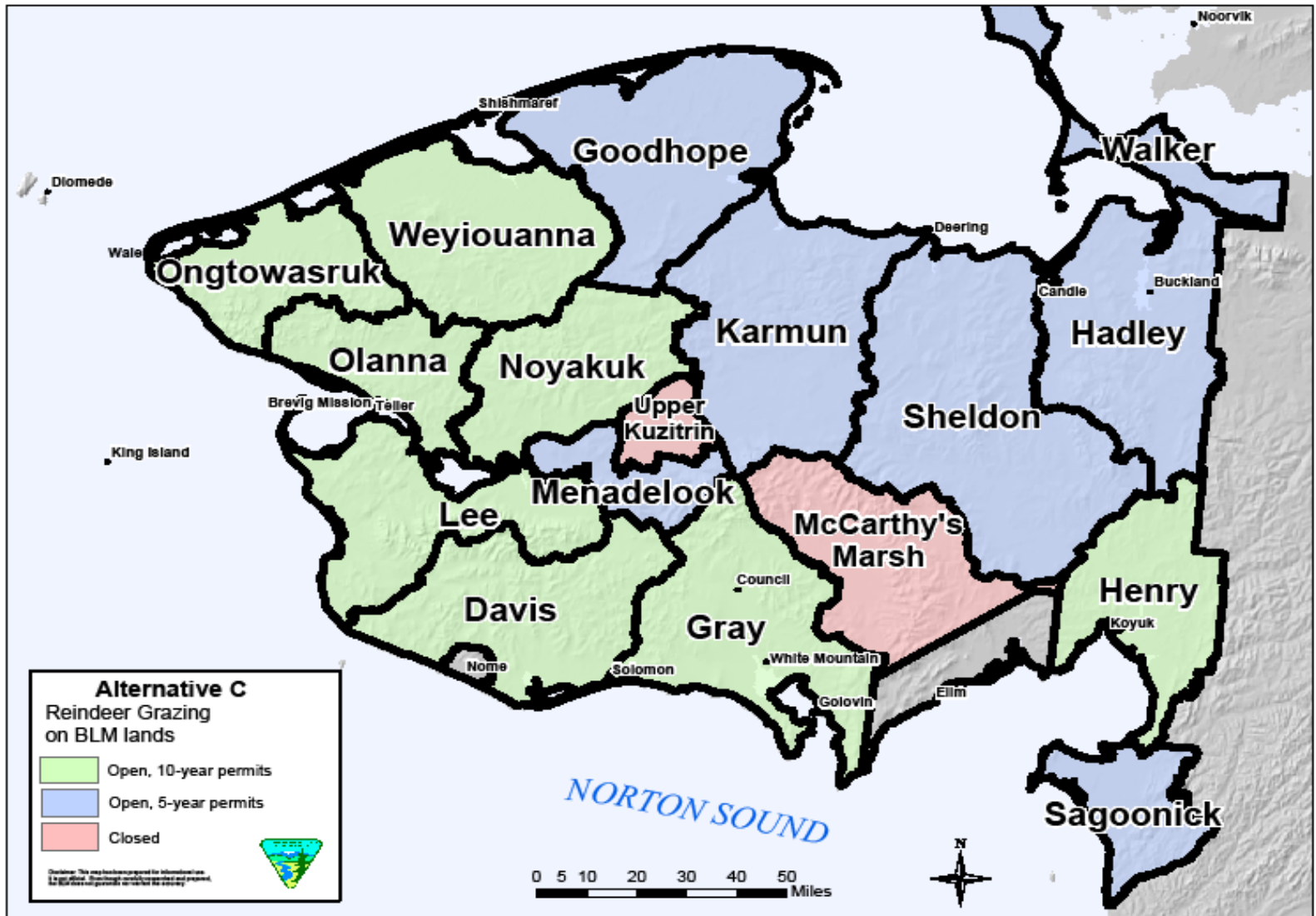
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<sup>25</sup> Adams, Connery June 1983

Otherwise, annual reporting requirements are the same as Alternative B. See Section 2.4.2, Alternative B – Reindeer Grazing permit Stipulations – Annual Report Requirements.

**2.5.3 Alternative C - Reindeer Grazing Permit Stipulations - Grazing Management Plans**

The grazing management plan requirements would be the same as in Alternative B. See Section 2.4.3, Alternative B - Reindeer Grazing Permit Stipulations - Grazing Management Plans.



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## **2.6 Alternative D – Allow Reindeer Grazing on all Bureau of Land Management managed lands on the Seward and Baldwin peninsulas**

This alternative promotes reindeer grazing industry development to the greatest degree in all areas of the Seward and Baldwin peninsulas. This alternative allows for the possibility of grazing reindeer in areas that have been closed to reindeer grazing since the issuance of the 2008 Kobuk-Seward Peninsula Approved Management Plan.

Under this alternative, the Upper Kuzitrin and McCarthy’s Marsh areas would be open for reindeer grazing application and permit issuance. This alternative would require an amendment to the 2008 Kobuk-Seward Peninsula Approved Management Plan, which closed two formerly open grazing areas from permitted reindeer grazing.

Under this alternative, permits would be issued for up to ten years. The permits would be cancelled after five years on ranges without any reindeer and active herd management, if non-use is for reasons other than caribou migration patterns. The Bureau of Land Management would seek assistance from Kawerak Reindeer Herders Association to find another herder interested in establishing a reindeer herd in that range area.

### **2.6.1 Alternative D - Monitoring and Land Health Standards**

Monitoring and land health standards are the same as in Alternative B, with the following exceptions:

1. Upper Kuzitrin and McCarthy’s Marsh areas would be open to reindeer grazing. The number of reindeer authorized would be determined by recommendations from the herders, University of Alaska Reindeer Research Program, Natural Resource Conservation Service, and Bureau of Land Management monitoring data.
2. The grazing utilization threshold would be Grazed Class 6 – (severely heavy).

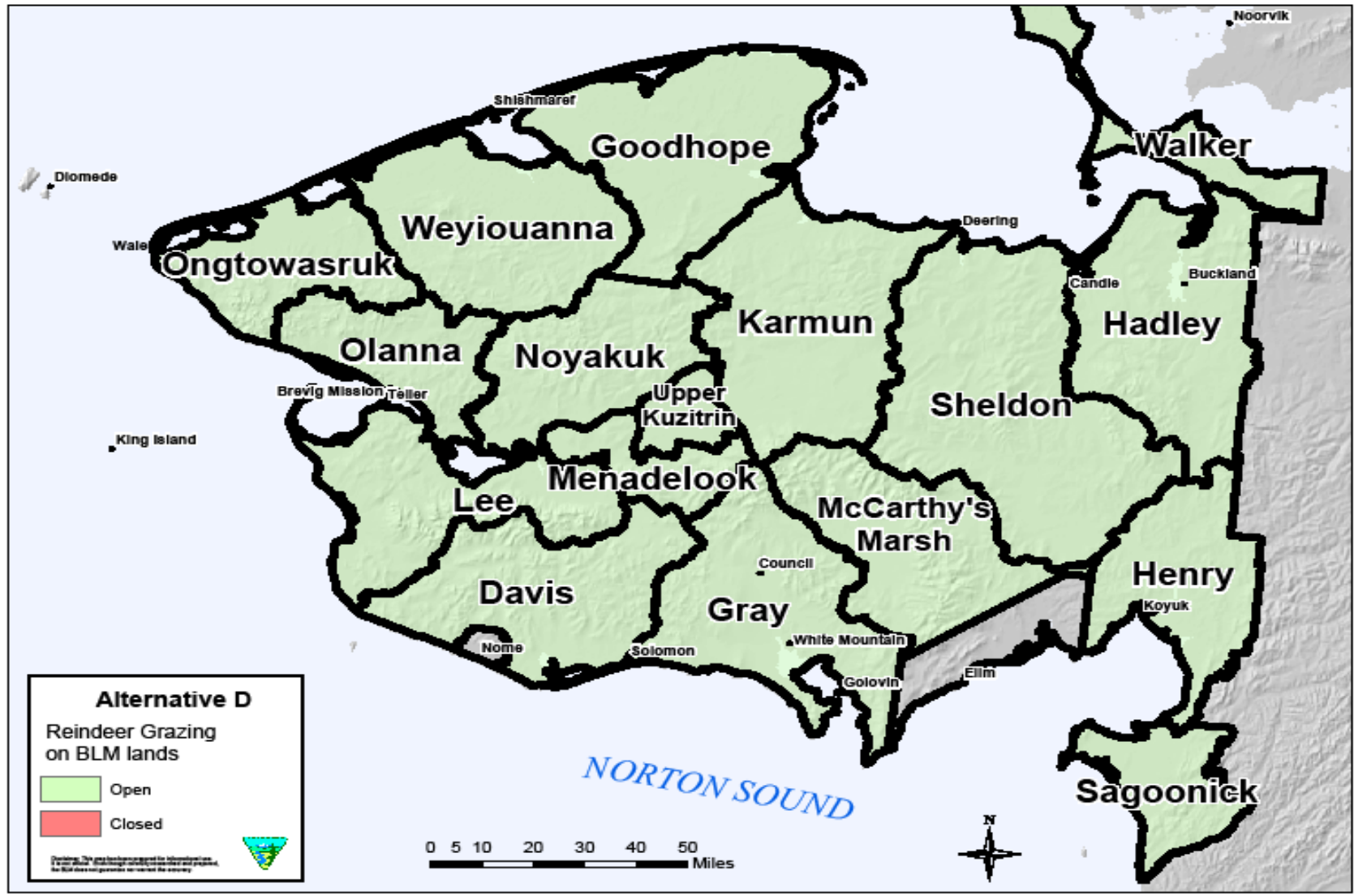
### **2.6.2 Alternative D - Reindeer Grazing Permit Stipulations - Annual Report Requirements**

The reporting requirements for the herders would be the same as in Alternative B.

### **2.6.3 Alternative D - Reindeer Grazing Permit Stipulations - Grazing Management Plans**

The 2008 Kobuk-Seward Peninsula Approved Management Plan management

decision for livestock grazing identifies the need for the development of grazing area management plans for open and actively used range areas. Herders would be required to submit an updated grazing management plan to the Bureau of Land Management every five years.



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## **2.7 Mitigations Common to All Alternatives**

The following Required Operating Procedures, Monitoring Protocol, and Permit Administration terms would be the same for all Alternatives addressed in this environmental analysis.

### **2.7.1 Required Operating Procedures**

Required Operating Procedures (ROPS) in the Kobuk-Seward Plan were developed to ensure that the Alaska Land Health Standards are met in carrying out permitted activities and management practices. ROP Objective Veg-2 requires permitted activities minimize disturbance to vegetative resources. Permitted grazing will be conducted in a manner that maintains long term productivity of vegetation.

### **2.7.2 Monitoring Protocol**

Permit administrators will continue to monitor permitted grazing operations on Bureau of Land Management lands annually, as funding allows utilizing the Alaska Grazed Class Methodology.<sup>26</sup>

Climate change, unstable economic conditions and scrutinized land manager decisions make optimizing the reindeer industry challenging. The Bureau of Land Management will work through cooperative management to strengthen landscape level management and assessment efforts to support both an ecological and economic self-sustaining reindeer grazing industry to minimize impacts to the resources while maximizing grazing opportunities. A balanced monitoring strategy will be developed with herders, partners, and resource managers for long-term, landscape level approach to grazing range management for the most efficient and cost effective plan. By incorporating the traditional knowledge of herders with science-based research and technology, this strategy will best serve the reindeer industry by sharing our ways of working, ways of knowing, and ways of managing.

### **2.7.3 Bureau of Land Management Permit Administration**

The Bureau of Land Management will allow only one reindeer grazing permit in each area during any specified time period.

In addition to the standard terms and conditions contained in the Bureau of Land Management Reindeer Grazing Permit (Form 4132-2), additional terms and

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<sup>26</sup> USDA Natural Resource Conservation Service, 2001, A Procedure for Evaluating Lichen Utilization on Reindeer Ranges.

conditions are added to Section 9 of the permit *Additional conditions or stipulations* for grazing operations on Bureau of Land Management lands.<sup>27</sup> Each Alternative addressed in this analysis has different additional mitigations and Stipulations for Section 9 of the grazing permit. These stipulations discuss grazing permit conditions relative to the number of reindeer permitted, associated facilities, required operating procedures, annual reports, grazing management plans, resource protection, waste and hazardous material and land use. See Exhibits A, B, C & D – Bureau of Land Management Reindeer Grazing Permit Stipulations.

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<sup>27</sup> Exhibit F: Grazing Permit Form 4132-2.

2.8 Table 2.1 - Alternatives Comparison Table

Variable	Alternative A No Action	Alternative B Proposed Action	Alternative C	Alternative D
<b>Permit term</b>	Up to 5 years	Up to 10 years	Up to 5 years for herders with no reindeer*; Up to 10 years for herders with reindeer.	Up to 10 years
<p><b>Areas open for grazing</b></p> <p><i>BLM managed lands in the specified range areas include:</i></p> <p><i>BLM unencumbered, State Selected and Native Corporation Selected lands. All stipulations in this environmental analysis are applicable to only these BLM managed lands. These lands are shown on page 7- Land Status Map, as well as on detail maps and legal descriptions to be provided with the herders' permits.</i></p>	<p>Same as now, 15 areas open for reindeer grazing:</p> <ol style="list-style-type: none"> <li>1. Davis</li> <li>2. Goodhope*</li> <li>3. Gray (Mt. Wick)</li> <li>4. Hadley (Buckland R.)*</li> <li>5. Henry</li> <li>6. Karmun*</li> <li>7. Lee (Kakaruk)</li> <li>8. Menadelook*</li> <li>9. Noyakuk</li> <li>10. Olanna</li> <li>11. Ongtowasruk</li> <li>12. Sagoonick*</li> <li>13. Sheldon*</li> <li>14. Walker (Baldwin P.)*</li> <li>15. Weyiouanna</li> </ol> <p>*These range areas currently have no actively managed reindeer herd(s).</p>	<p>Same as now, 15 areas open for reindeer grazing:</p> <ol style="list-style-type: none"> <li>1. Davis</li> <li>2. Goodhope*</li> <li>3. Gray (Mt. Wick)</li> <li>4. Hadley (Buckland R.)*</li> <li>5. Henry</li> <li>6. Karmun*</li> <li>7. Lee (Kakaruk)</li> <li>8. Menadelook*</li> <li>9. Noyakuk</li> <li>10. Olanna</li> <li>11. Ongtowasruk</li> <li>12. Sagoonick*</li> <li>13. Sheldon*</li> <li>14. Walker (Baldwin P.)*</li> <li>15. Weyiouanna</li> </ol> <p>*These range areas currently have no actively managed reindeer herd(s).</p>	<p>Same as now, 15 areas open for reindeer grazing:</p> <ol style="list-style-type: none"> <li>1. Davis</li> <li>2. Goodhope*</li> <li>3. Gray (Mt. Wick)</li> <li>4. Hadley (Buckland R.)*</li> <li>5. Henry</li> <li>6. Karmun*</li> <li>7. Lee (Kakaruk)</li> <li>8. Menadelook*</li> <li>9. Noyakuk</li> <li>10. Olanna</li> <li>11. Ongtowasruk</li> <li>12. Sagoonick*</li> <li>13. Sheldon*</li> <li>14. Walker (Baldwin P.)*</li> <li>15. Weyiouanna</li> </ol> <p>*These range areas currently have no actively managed reindeer herd(s).</p>	<p>Increased, 17 areas open for reindeer grazing:</p> <ol style="list-style-type: none"> <li>1. Davis</li> <li>2. Goodhope*</li> <li>3. Gray(Mt. Wick)</li> <li>4. Hadley (Buckland R.)*</li> <li>5. Henry</li> <li>6. Karmun*</li> <li>7. Lee (Kakaruk)</li> <li>8. McCarthy's Marsh*</li> <li>9. Menadelook*</li> <li>10. Noyakuk</li> <li>11. Olanna</li> <li>12. Ongtowasruk</li> <li>13. Sagoonick*</li> <li>14. Sheldon*</li> <li>15. Upper Kuzitrin*</li> <li>1. Walker (Baldwin P.)*</li> <li>2. Weyiouanna</li> </ol> <p>*These range areas currently have no actively managed reindeer herd(s).</p>

<b>Variable</b>	<b>Alternative A No Action</b>	<b>Alternative B Proposed Action</b>	<b>Alternative C</b>	<b>Alternative D</b>
<b>Number of Reindeer Permitted</b>	Maximum number as currently authorized on existing permits.	Maximum number as currently authorized on existing permits. Increases or decreases would be considered based upon range management recommendations from UAF RRP, reindeer herders, and NRCS.	Increases in current number would be based upon a determination of range stocking rate using a method described in BLM/AK/OF-83/08 (Adams, Connery June 1983) or other accepted methodology.	Increases or decreases in number as currently authorized would be allowed until monitoring shows Grazed Class 6 or greater.  Number of reindeer permitted in Upper Kuzitrin and McCarthy's Marsh would be based on BLM monitoring data and recommendations from the UAF RRP, NRCS, ADNR, and the reindeer herders.
<b>Allow new grazing operations in open ranges without reindeer</b>  <i>At the discretion of the authorized officer.</i>	Existing permits on ranges without deer would be renewed whether or not herder has developed and maintained grazing operations.	If existing permit is cancelled (BLM action) <sup>28</sup> or relinquished (herder action), new applicants will be considered on a case-by-case basis.	If existing permit is cancelled (BLM action) or relinquished (herder action), new applicants will be considered on a case-by-case basis.	If existing permit is cancelled (BLM action) or relinquished (herder action), new applicants will be considered on a case-by-case basis.  Promote and solicit new grazing operations in all open areas in conjunction with Kawerak RHA.

<sup>28</sup> Exhibit F - Grazing Permit Form 4132-2, Section 5.

Variable	Alternative A No Action	Alternative B Proposed Action	Alternative C	Alternative D
<b>Amendment to Kobuk-Seward RMP needed</b>	No	No	No	Yes –the Kobuk-Seward RMP closed McCarthy’s Marsh and Upper Kuzitrin to reindeer grazing.
<p><b>Herders Annual Report requirements</b></p> <p><i>Due to BLM by April 1 of each year.</i></p> <p><i>All information required in herders annual reports considered proprietary by herders and/or NRCS would be held as proprietary information by the BLM and would not be available for public disclosure.</i></p>	<p>Herders would be required to submit a report of grazing operations as in the past.</p>	<p>Herders would be required to submit a report of grazing and herding operations, reindeer locations, and range condition information on BLM land to BLM permit administrators.</p> <p>Report forms and maps would be provided by BLM to assist herders with reporting requirements.</p> <p>Annual reports must include data on where and when reindeer were grazing on BLM managed lands over the previous calendar year.</p> <p>GPS reindeer collar data can be provided in lieu of providing a map of reindeer locations to the BLM.</p>	<p>Herders would be required to submit a report of grazing and herding operations, reindeer locations, and range condition information on BLM land to BLM permit administrators.</p> <p>Report forms and maps would be provided by BLM to assist herders with reporting requirements.</p> <p>Annual reports must include GPS reindeer collar location data and NRCS range condition data for BLM lands.</p>	<p>Herders would be required to submit a report of grazing and herding operations, reindeer locations, and range condition information on BLM land to BLM permit administrators.</p> <p>Report forms and maps would be provided by BLM to assist herders with reporting requirements.</p> <p>Annual reports must include data on where and when reindeer were grazing on BLM managed lands over the previous calendar year.</p> <p>GPS reindeer collar data can be provided in lieu of providing a map of reindeer locations to the BLM.</p>

Variable	Alternative A No Action	Alternative B Proposed Action	Alternative C	Alternative D
<p><b>Grazing Management Plans</b></p> <p><i>The Kobuk – Seward RMP2008 requires the development of grazing management plans.</i></p>	<p>Herders would be required to submit a grazing management plan to the BLM every five years.</p> <p>Supplemental feeding would be allowed on BLM managed lands. Site specific analysis would be required prior to approval.</p>	<p>Grazing Management Plans would be required by BLM within the first year of a permit term, and updated every five years thereafter.</p> <p>Herders would be required to incorporate grazing rest and rotation schedules according to Alaska Grazed Class Method: <u><i>A Procedure for Evaluating Lichen Utilization on Reindeer Range</i></u> into grazing management plans.</p> <p>Reindeer location data and range condition data required to be incorporated into grazing management plans.</p>	<p>Grazing Management Plans would be required by BLM within the first year of permit term, and updated every five years thereafter.</p> <p>Herders would be required to incorporate grazing rest and rotation schedules according to Alaska Grazed Class Method: <u><i>A Procedure for Evaluating Lichen Utilization on Reindeer Range</i></u> into grazing management plans.</p> <p>Reindeer GPS reindeer collar location data and NRCS range condition data would be required to be incorporated into grazing management plans.</p>	<p>Herders would be required to submit a grazing management plan to the BLM every five years.</p> <p>Herders would be required to incorporate grazing rest and rotation schedules according to Alaska Grazed Class Method: <u><i>A Procedure for Evaluating Lichen Utilization on Reindeer Range</i></u> into grazing management plans.</p>

<b>Variable</b>	<b>Alternative A No Action</b>	<b>Alternative B Proposed Action</b>	<b>Alternative C</b>	<b>Alternative D</b>
<b>Monitoring, Land Health Standards, &amp; Mitigations</b>	<p>The Alaska Grazed Class Method would be used by BLM to assess range health conditions and make range management recommendations to herders.</p>	<p>The Alaska Grazed Class Method would be used by BLM to assess range health conditions. If range monitoring shows Grazed Class 5 utilization (heavy) or greater, rest of overgrazed area would be required.</p> <p>Supplemental feeding would be allowed on BLM managed lands. Site specific analysis would be required prior to approval.</p> <p>A balanced monitoring strategy would be developed with herders, partners and resource managers for long-term, landscape level approach to grazing range management. This strategy would incorporate the traditional knowledge of herders with science-based research and technology for the most efficient and cost effective approach.</p>	<p>The Alaska Grazed Class Method would be used by BLM to assess range health conditions. If range monitoring shows Grazed Class 5 utilization (heavy) or greater, reduced numbers of reindeer and/or closure of overgrazed area would be required.</p> <p>Supplemental feeding would not be authorized on BLM managed land.</p> <p>A balanced monitoring strategy would be developed with herders, partners and resource managers for long-term, landscape level approach to grazing range management. This strategy would incorporate the traditional knowledge of herders with science-based research and technology for the most efficient and cost effective approach.</p>	<p>The Alaska Grazed Class Method would be used by BLM to assess range health conditions. If range monitoring shows Grazed Class 6 utilization (severely heavy) or greater, reduced numbers of reindeer and/or closure of overgrazed area would be required.</p> <p>Supplemental feeding would be allowed on BLM managed lands. Site specific analysis would be required prior to approval.</p> <p>A balanced monitoring strategy would be developed with herders, partners and resource managers for long-term, landscape level approach to grazing range management. This strategy would incorporate the traditional knowledge of herders with science-based research and technology for the most efficient and cost effective approach.</p>

## **2.9 Alternatives Eliminated from Detailed Study**

Alternatives E and F were dismissed from detailed analysis.

### **2.9.1 Alternative E**

**Bureau of Land Management would require fencing and supplemental feeding of all herds to prevent interaction with Western Arctic Caribou Herd.**

This alternative is not practical due to the vastness of the range area. The impacts of the fencing would be too significant an impact to the open range and indigenous species, including the Western Arctic Caribou Herd.

### **2.9.2 Alternative F**

**Bureau of Land Management would not issue permits for reindeer grazing on BLM managed lands.**

This alternative does not meet the fiduciary responsibility of the Bureau of Land Management under the intent and purpose of the Reindeer Industry Act of 1937.



## **Chapter 3**

### **3.0 AFFECTED ENVIRONMENT**

This section tiers off of and incorporates the analyses and discussions presented in the Kobuk-Seward Peninsula Resource Management Plan and Environmental Impact Statement.

The following elements have been analyzed with the assumptions that:

1. There is no environmental or substantial difference between caribou and reindeer;
2. Both are native or appropriate species for introduction to tundra and boreal forest environments;
3. The reindeer herding traditions of the indigenous peoples of Europe were assimilated by the Native peoples of Alaska;
4. After 117 years of their presence on the peninsulas, the environmental effects of reindeer' presence have stabilized with the result being that the only effects for analysis are those brought about by human domestication of reindeer. Herding to different areas of an open range and occasional corralling are both necessary consequences of traditional reindeer husbandry and promotion of the reindeer industry under the Reindeer Industry Act.

### **3.1 Socioeconomics**

The reindeer herding industry is a vital part of the social and economic environment on the Seward and Baldwin peninsulas. It has become an integral part of the contemporary lifestyle, integrated into the social organization, culture, values and seasonal subsistence activities of most people in the region.

Reindeer herding provides meat, reindeer by-products, income and employment to the people of the area. The industry provides private sector employment in a region where public sector employment is the norm. There are no known alternative industries or activities shown to be as economically and socially compatible or acceptable to the people of the region as herding. It provides employment in an otherwise limited employment situation. Villages have become dependent on their local herds. Current herding practices are rational within this current socio-cultural context and economic system of northwestern Alaska. The price received for meat has increased along with personal income levels, consumer preference for reindeer meat over imported meats, and the prices to be paid for such import substitutes. Rising production costs for labor, fuel and equipment tend to restrain small herd operations at marginal levels.

The reindeer industry provides a source of high-quality red meat protein as an

alternative to imported meats and to local wildlife that has increasingly come under more government regulations. The former natural, subsistence foods have been replaced by junk food (soda pop, chips, candy, high carbohydrate foods) as they have become more readily available over time. Health organizations work to educate rural residents on healthy eating, and the importance of minimizing the consumption of junk food. Thus, sustaining the reindeer industry is in the best interest for the overall health and welfare of rural residents on the Seward peninsula.

While most Natives participate in subsistence activities and in the cash/wage economy to some degree, herding provides a primary means of income.

### 3.2 Vegetation

#### Ecosystem Provinces<sup>29</sup>



**Alaska's Ecosystem Provinces**

Two of the above Ecosystem Provinces are found on the peninsulas.

Vegetation in the Seward Peninsula Tundra-Meadow exists in moist and wet tundra communities at lower elevations and alpine tundra communities in the high mountains. Vegetation is primarily composed of sedge tussocks interspersed with scattered willows and birches, with isolated spruce-hardwood forests.

Vegetation in the Bering Tundra (Northern) along the wet coastal areas is chiefly sedge and cottongrass; woody plants grow on higher sites. Birch-willow-alder

<sup>29</sup> Source: [http://www.fs.fed.us/colorimagemap/ecoreg1\\_akprovinces.html](http://www.fs.fed.us/colorimagemap/ecoreg1_akprovinces.html)

thickets are extensive in transition zones between beach and forest.

These vegetation types both can have significant lichen components, critical winter forage for reindeer and caribou. *The Range Survey of the Seward Peninsula Reindeer Ranges, Alaska*, prepared by the USDA Soil Conservation Service (now the Natural Resource Conservation Service) in July 1985, identifies, maps, and describes more detailed ecological sites and describes the plant composition and annual productivity of the climax ecosystems. This document is herein referred to as the *Range Survey*, and is a key resource for Bureau of Land Management monitoring and grazing range management on the Seward Peninsula.

## **Lichens**

Lichens are spore-bearing rather than seed-bearing plants. They exist as a cooperative packet of fungal and algal components. Lichens regenerate both vegetatively (by fragments, and by microscopic units of fungi and algae called isidia and soredia), and by sexual reproduction (spores). The lichens most often selected by reindeer and caribou (the “reindeer lichens”) are in the genus *Cladina*. For Alaska these species are: *Cladina rangiferina*, *C. stygia*, *C. arbuscula*, *C. mitis* and *C. stellaris*. These *Cladina* species grow very slowly even under favorable conditions, approximately 5 mm per year. Lichens are opportunistic, going dormant when dry or frozen, and recovering quickly when moistened and above freezing, able to resume photosynthesis. Lichens in general are more productive in a coastal climate, compared to an interior climate, due to higher relative humidity and precipitation levels.

### **3.2.1 Bureau of Land Management Reindeer Range Monitoring**

Because of long winters, the quality, quantity, and availability of winter forage is a critical limiting factor for reindeer populations. Monitoring, or utilization checks, are important for the development of grazing management plans and maintaining sustained forage production systems for reindeer.

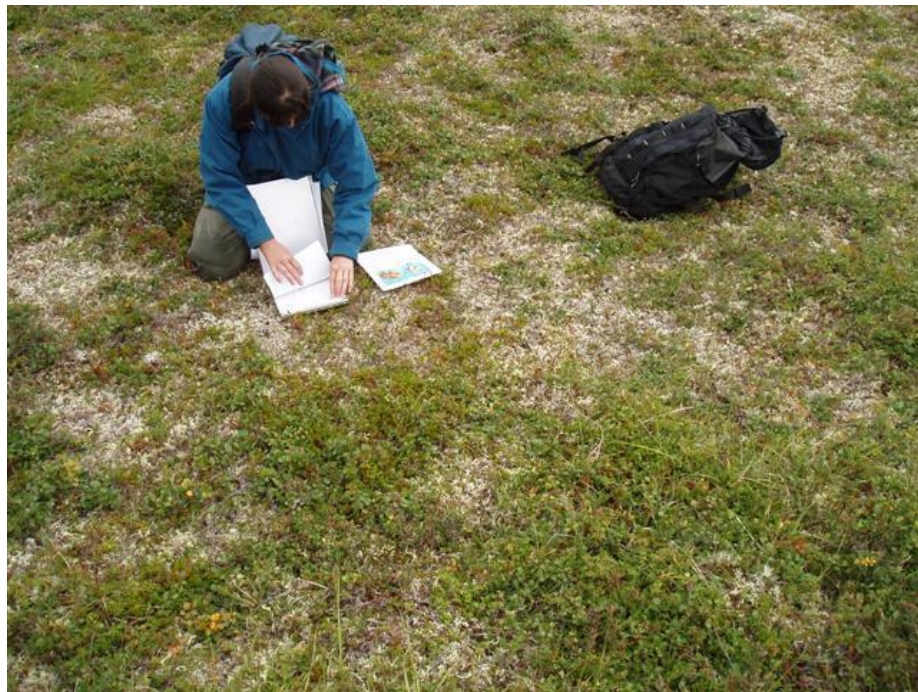
Permit administrators select monitoring transects on Bureau of Land Management lands in areas containing likely winter habitat for reindeer - ecological site types with high lichen biomass. These sites are selected using the mapped ecological site types in the *Range Survey*. The Bureau of Land Management uses the monitoring protocol found in *A Procedure for Evaluating Lichen Utilization on Reindeer Range June 1990*, Swanson, USDA Soil Conservation Service, for annual monitoring activities. This procedure (or methodology) is called the Alaska Grazed Class Method.<sup>30</sup>

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<sup>30</sup> USDA NRCS, 2001, A Procedure for Evaluating Lichen Utilization on Reindeer Ranges, Section 200.4(a).

Lichen utilization and cover monitoring is conducted by range managers via ocular observation and is recorded on field data forms (Exhibit E)<sup>31</sup>. Lichen monitoring transects involve twenty separate linear ocular observation points, each approximately six feet apart.

Lichen cover is measured in terms of percent lichen cover, ranging from Lichen Absent, to Class 5: 76-100% lichen cover. Lichen cover data helps range managers determine the value of the area as winter forage habitat for reindeer. Winter lichen ranges usually have a lichen cover greater than 20%.<sup>35</sup>



Lichen cover (versus lichen utilization) is measured by the percent of the transect area that is covered by lichens. Lichen cover, expressed as Cover Class, is evaluated by range managers to help determine habitat suitability for winter forage.

Lichen utilization is measured by the amount of disturbance to the lichen cover, either from forage or trampling. Lichen Utilization Grazed Class measure is used to evaluate the amount of foliage material that is removed from forage plants by grazing herbivores.<sup>32</sup>

The Grazed Class ranges from Class 0 – None, 0% disturbed, to Class 8 –

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<sup>31</sup> USDI BLM Field Data Form 4132-3.

<sup>32</sup> SCS, 1976.

Extreme, 100% of the lichen cover has been disturbed. The Lichen Utilization Class descriptions used from the Alaska Grazed Class Methodology is displayed in Table 3.1 - Lichen Utilization Classes.



Reindeer lichens become brittle and break easily when dry. When moist, lichens are very pliable and more easily measured.

**Table 3.1**

**Lichen Utilization Classes**

	Recovery (yrs)	
	Upland	Lowland
CLASS 0 – None (N)	0	0
CLASS 1 – Trace (T) Trace to 5% of the lichen cover is disturbed. There is no apparent trampling or forage use. To determine utilization, a careful examination of the podetia of <i>Cladonia spp.</i> or thalli of <i>Cetraria spp.</i> will be required. No recovery period necessary.	0	0
CLASS 2 – Slight (S) 5% - 25% of the lichen cover is disturbed or dislodged. There is no appreciable disturbance to the lichen cover. Discreet observations have to be made to detect utilization. Craters are not apparent; a few individual bites are noted. Recovery may be:	4	2
CLASS 3 – Moderate (M) 26% - 50% of the lichen cover is disturbed or dislodged. Evidence of slight grazing or trampling is apparent. “Top cropping” may be placed in this class, even if it occurs on all lichen in the plot. Small, shallow craters may occur, but usually use has occurred on less than 1/3 of the top portion of the thallus. Recovery period may be:	8	4
CLASS 4 – Moderately Heavy (MH) 51% - 75% of the lichen cover has been removed or dislodged. Use of the lichen is apparent and includes heavy top cropping to use some or the entire live portion of the lichen thallus plant. Craters and/or bites may be obvious when viewed from a distance of 20 feet. Scattered bunches and fragments of lichens are distributed around the plot on the utilized areas; a few small bites may penetrate to the organic mat. Recovery period may be:	12	8
CLASS 5 – Heavy (H) 76% - 100% of the lichen has been disturbed or dislodged. Adequate lichen remains in the utilized section of the plot for regeneration. Craters extend only to the top of the organic horizon and not into mineral soil exposed rock. Severely trampled sites should be placed in this class. Recover period may be:	15	12
<i>(Utilization in Cover Classes 6-8 involve exposed mineral soil)</i>		

**Table 3.1 (continued)**

**Lichen Utilization Classes (continued)**

Recovery (yrs)  
Upland/Lowland

**\*CLASS 6 – Severely Heavy (SH)\***

Most of the lichen cover has been disturbed or dislodged. Craters extend through the organic mat. Less than 25% of the plot has mineral soil and/or rock and/or organic material exposed from grazing or cratering. There should be sparse fragments of lichen remaining to initiate regeneration, but regeneration will be slower.

Recovery period may be: 40 20

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\*Classes 6 – 8 must meet utilization criteria class 4 or 5.

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**\*CLASS 7 – Severe (S)**

All of the lichen cover has been disturbed or dislodged. Less than 50% of the plot has mineral soil and/or rock exposed from grazing or cratering. Inadequate fragments of lichens remain to initiate regeneration at a normal recovery rate. Micro-environment has been altered. Most shrubs have been browsed heavily and bark may be removed.

Recovery period may be: 60 40

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**\*Class 8 – Extreme (E)**

All of the lichen cover has been disturbed or dislodged. 50% - 100% of the plot has mineral soil and/or rock exposed from grazing or cratering. There is not adequate lichen for regeneration. This class of utilization occurs only in the most severe circumstances. Recovery period may be 50 – 100 years or more, depending on the soil's potential to produce lichen. Vegetation on soil damage may be irreversible, resulting in altered potential plant composition.

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NOTE: In some areas, utilization intensity will not fit into a utilization class because of unusual circumstances. In this instance, a subjective evaluation will have to be made to estimate the appropriate class. One such possible approach is to estimate the years of full lichen recovery and select the appropriate class of utilization.

Monitoring transect site data is summarized in an annual monitoring report and is used to determine the range health in the monitoring transect area.

Based on the Alaska Grazed Class Method, annual monitoring reports are provided to the reindeer herders with recommended grazing rest and recovery periods for the specific monitoring transect areas, and those Bureau of Land Management lands in areas of the range with symptomatic conditions of the transect areas. This methodology for range assessment provides range managers and herders an indication of the range health conditions on the Bureau of Land Management managed lands permitted for grazing reindeer.

### **3.2.2 Natural Resource Conservation Service Collaboration**

The Natural Resources Conservation Service offers an Environmental Quality Incentives Program (EQIP) that works with herders to gather information regarding sensitive areas that may need protection. Together they use a process to determine sampling locations, take lichen measurements, estimate biomass, and look at adjacent sites to confirm findings. This information is mapped to indicate similarity index, apparent trend, rangeland health and utilization. The Natural Resources Conservation Service then meets with the herder to finalize a contract. The Environmental Quality Incentives Program is a cost share program that provides incentive payments to herders. Eight herders on the Seward Peninsula currently participate.

The Natural Resource Conservation Service develops grazing management plans for some reindeer grazing areas. It is not known if all herders participate in this program. These plans take into account many different factors described below, with rest and rotation schedules for annual shifting of the reindeer herds. Adaptive management strategies are taken when weather or other environmental events influence where the herds are rotated.

The following Section, A. through I., describes the methodology used by the Natural Resource Conservation Service in the development of grazing management plans. (NRCS, Steele, November 2008)

#### **A. Overall Summary**

The Natural Resource Conservation Service began inventorying range resources on the Seward Peninsula in 1976 and published the *Range Survey*. The purpose of the inventory was to map and describe the Ecological Sites to be used in developing and monitoring grazing management plans to be implemented by the reindeer herders and cooperating agencies.



Ecological Sites are defined as a distinctive kind of land with characteristic soils, topography or landscape position, climate, hydrology and physical characteristics, with the ability to produce a distinctive kind and amount of vegetation in dynamic equilibrium with its environment. This is called the Historic Climax Plant Community (HCPC). Variability is apparent in productivity and occurrence of individual species within ecological sites. However, spatial boundaries can be recognized by characteristic patterns of soils, physical characteristics, species composition, associations and plant community structure.

## **B. How Natural Resource Conservation Service Grazing Management Plans are Designed to Minimize Impacts**

The Natural Resource Conservation Service assists individual reindeer herders to develop and follow a Range Management Plan that will meet quality criteria to sustain the resources and meet their management objectives.

The objective of the Natural Resource Conservation Service planning is to assist clients to:

- Understand the basic ecological principles associated with managing the resources and how their decisions may influence ecological change.
- Realize their responsibilities for protecting and maintaining their resources for sustainable use in the future.
- Develop a plan that meets the needs of their management objectives and protects the soil, water, air, plant and animal resources.

Typically the following steps were followed in the Natural Resource Conservation Service development of range management plans. These steps may occur concurrently, in a different sequence and may be repeated during the planning process to present alternatives to consider or to modify a plan.

- 1) Inventory resources: Seward Peninsula Range Survey completed in 1985.
- 2) Analyze resource data: Develop initial stocking rates based on availability of lichen for winter range.
- 3) Identify problems: Lack of or accessibility problems to winter range.
- 4) Determine client objectives: Maximize production while not overgrazing lichen sites; Protect reindeer herds from migrating caribou herds.

- 5) Formulate alternative solutions: Develop rotational grazing strategies for herding.
- 6) Evaluate alternative solutions: Present alternatives to the herders for their consideration.
- 7) Make decisions: Herders decide which of the alternatives would work best for their management abilities.
- 8) Implement plan: Herders begin to follow the grazing plan, Documentation of herd locations; Monitoring of the range resources.
- 9) Evaluation of results: Analyze the results of the grazing system for utilization, similarity index, trend, and range health and make adjustments and modifications as needed.

### **C. Techniques for monitoring**

The Natural Resource Conservation Service and Bureau of Land Management have agreed nationally that the common management description for forage resources will be the Ecological Site Description (described in the *Range Survey*). These are based on a description of the Historic Climax Plant Community (HCPC) and the soils on which they occur. Presently there are 28 Ecological Sites described and mapped on the Seward Peninsula.

### **D. Monitoring**

Monitoring is used to quantify effects of management or environmental variation at a location, through time. Monitoring provides data on three key attributes of landscape and ecosystem sustainability: soil and site stability, hydrologic function and biotic integrity. These data provide the foundation for assessing and evaluating the degree to which goals or values are being met by current management. They also provide the basis for management options that meet specific goals.

### **E. Utilization**

Utilization is short-term monitoring data of how much of the plants current year's growth has been removed by the grazing animal. This is generally used to make short-term or annual management changes. It includes not only the amount consumed, but also damage to plants from trampling and hoof action as well. This is an ocular estimation made by an experienced range professional familiar with the plants being evaluated. On the Seward Peninsula, the Natural Resource Conservation Service is primarily monitoring utilization of the lichen resources as

an indicator to evaluate the effectiveness of rotational herding techniques and to make recommendations for changes in the herd's winter grazing locations in the near future.

#### **F. Apparent Trend/Measured Trend**

Apparent trend is a qualitative assessment of the current status in relation to the site potential. It looks at the entire site as a whole and compares it to the ungrazed site, or the desired plant community. Plant decadence, soil condition, species composition of the plant community, and vigor of the plants are all considered. A rating of plus (+) is assigned for a site moving toward the desired plant community, minus (-) is assigned for a site moving away from the desired plant community or a zero (0) for a trend which is not discernable.

Measured trend is a quantitative assessment of the current status in relation to the status at some previous time when the same indicators were evaluated.

#### **G. Rangeland Health**

Rangeland health is the degree to which the integrity of the soil, vegetation, water, and air, as well as the ecological processes of the rangeland ecosystem are balanced and sustained. It is not a monitoring tool in and of itself, but is used to indicate sites that need more detailed monitoring programs. It is an attempt to look at how the ecological processes on a site are functioning.

The Natural Resource Conservation Service is currently using a modified version of "Interpreting Indicators of Rangeland Health" (IIRH) on the Seward Peninsula. (Pellant et al, 2000). This protocol was selected because it emphasizes the capacity of the system to function relative to its potential. It reflects the current status of the three fundamental ecosystem attributes: soil and site stability, hydrologic function and biotic integrity. This process uses 17 qualitative indicators to generate assessments of the three attributes. A standard or reference is established for each ecological site and summarized in a "Reference Sheet"

Each indicator is placed into one of five categories based on its relative departure from its reference. Specific combinations of the 17 indicators are then used to evaluate each of the three attributes.

The 17 indicators which are rated are:

Bare ground	Plant production	Pedestals
Soil surface	Plant composition	Litter movement
Rill	Plant mortality	Litter amount
Gullies	Structural groups	Water flow pattern
Soil Loss	Invasive plants	Wind scoured area
Compaction	Reproductive capacity	

## **H. Similarity Index**

Similarity index is expressed as the percentage of a vegetative plant community that is presently on the site. When determining a similarity index the plant community it is being compared to must be identified as the reference community. The reference community is most often the Historic Climax Plant Community (HCPC). It provides a measurement of change that has taken place on a site. The purpose for determining similarity index is to provide a basis for describing the extent and direction of changes that have taken place and predicting those that can take place because of a specific management action. Collecting plant production data to determine similarity index is time consuming and is not usually done for monitoring purposes. It is generally an inventory process.

## **I. Adaptive Management**

When range managers change management or decide to continue with the same management, we are making a prediction. Predictions are more likely to be explicit when management requires a significant financial investment or is believed to increase risk. Frequently the predictions are implicit, because most management decisions are assumed to lead to improvements in the health of the land, or the quantity and quality of resources provided by the land. These predictions are similar to scientific hypotheses. Monitoring data allow us to test our predictions. We may not be able to collect as much data as we would like and certainly not as much as researchers would, but the data are useful for adjusting management because they reflect the unique characteristics of the land range managers are trying to manage.

In the long term, the data collected and interpreted on each type of monitoring unit or ecological site can help to refine ecological models and how rangelands are managed. But it is of limited value to learn only that a particular management strategy resulted in loss of forage or soil. Both short-term and long-term quantitative monitoring data should be used, together with qualitative observations, to evaluate hypotheses frequently, especially if environmental conditions vary. If it begins to look like a management strategy does not conform

to expectations, the strategy can be adjusted. Successful feedback between monitoring and management helps make land use more sustainable.

### **3.2.3 Effects of vegetation on reindeer health**

Much research has been conducted on range condition effects on reindeer and caribou health and productivity. Body size in reindeer is determined primarily by grazing conditions during the summer (Reimers, *Rangifer*, 1997). The quality of the winter pastures has a minor effect on the body size in areas where the summer conditions allow the animals to grow at their maximum rate. In areas where maximum growth rates for various reasons are counteracted, severely overgrazed winter pastures will contribute to reduced body size (Reimers, *Rangifer*, 1983).

Reindeer and caribou depend heavily on lichens during the winter. During the spring, summer and fall they forage on a variety of plants, including sedges and grasses, terrestrial forbs, aquatic plants, shrub birch and willow twigs, and even mushrooms. In a site that has not been grazed for many years, reindeer lichens will create deep mats, and the dead portion of the lichen strand is usually longer than the live portion. With light grazing some of the live portions can be cropped off and lichens lightly “scrambled.” With heavy grazing comes trampling and cratering. Lichen biomass is removed, and some lichen biomass is fragmented. Fragmented lichen can easily blow away and desiccate too severely to recover.

Reindeer are very selective eaters and tend to pick only the plants or plant parts that are the most nutritious. The University of Alaska Fairbanks Reindeer Research Program is currently investigating the seasonal shifting of diet composition and habitat selection of free-ranging reindeer on the Seward Peninsula in relation to the seasonal changes in species composition and plant characteristics between habitats<sup>33</sup>.

## **3.3 Subsistence<sup>34</sup>**

For the most part, the resources that were utilized by the residents of the Seward Peninsula in the past are still utilized by the residents of today, albeit harvested with modern technology. The primary sea mammal resources of the area consist of bowhead whale, beluga, bearded seal, ringed seal, harbor seal, and walrus. Migratory waterfowl are still the primary fresh meat of the spring, and fishing occurs year-round. Caribou, and lately, moose and musk-oxen comprise the primary large land mammals actively hunted in the area. Additionally, small mammals such as ground squirrel, Arctic hare, snowshoe hare, and muskrat are used both for their meat or fur. Other animals presently harvested from the area

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<sup>33</sup> ([http://reindeer.salrm.uaf.edu/range\\_and\\_nutrition](http://reindeer.salrm.uaf.edu/range_and_nutrition))

<sup>34</sup> This section tiers off Kobuk-Seward Peninsula Resource Management Plan and Environmental Impact Statement and references are listed in Volume 3 of the Plan.

include porcupine, marten, red fox, white fox, wolverine, weasel, mink, river otter, wolf, lynx, marmot, ground squirrel, hare, and grizzly bear.

Although most residents of the area live a sedentary life in organized communities, hunters and fishers still travel great distances to subsist. The incorporation of new technologies such as snow mobiles, ATVs, and gas-powered boats allow hunters access to larger areas of land with less time and effort. In this way, it is possible to work within a wage-based economy, while still practicing a subsistence lifestyle. Likewise, it is still customary for most communities to relocate to seasonal camps for specific activities, such as the putting up of bearded seal meat or fish, even if these seasonal camps are only located a short distance from the permanent village. Additionally, as part of the land claims settlement of ANCSA, many of the residents of the area have allotments, or small tracts of private land located in their traditional harvest areas within their region. Travel to, and extended stays at family allotments is still a yearly occurrence throughout the area.

The area has within its borders more than 12 federally qualified subsistence communities, and encompasses wholly or in part two State Game Management Units (GMU) Each management unit or subunit has multiple species, multiple populations, allocation claims by commercial, sport and subsistence user groups, and inter and intra community competition for subsistence resources, and multi-cultural user groups.

Title VIII of ANILCA establishes both a conservation mandate (conserve healthy populations), and an allocation mandate (priority for non-wasteful subsistence uses by rural residents) for subsistence on public lands in Alaska. ANILCA Title VIII also ensures reasonable access by rural residents to subsistence resources on public lands, and mandates a priority for subsistence use over the taking of fish and wildlife for other purposes (such as commercial or recreational use). The Reindeer Act acknowledges the need to supplement subsistence resources for the Eskimos and other Alaska Natives.

The Bureau of Land Management is responsible for administering the Federal Subsistence Program on BLM public lands in the area, including data collection and analysis, and implementing and enforcing regulations. The overall objective is to provide for rural subsistence use, while maintaining healthy populations of subsistence resources within the bounds of recognized fish and wildlife management principles.

## 3.4

### Wildlife<sup>35</sup>

Given the physiographical extent of the Seward and Baldwin peninsulas, habitats are quite varied and support a diversity of wildlife. These habitats and the wildlife species that rely on them extend across administrative boundaries to other federal, state, and private lands both within and outside the area. Public land ownership is scattered with intermingled private and state lands, though large blocks of public land are present in some areas. Habitats within the area have been subjected to limited disturbance in the past and are considered to be in a mostly natural and nearly pristine condition given the roadless nature of the area, difficulty in accessing the area, and the low number of permitted activities occurring on Bureau of Land Management lands. The area includes the all of State GMU 22, and portions of GMU 23.

Only those wildlife species considered important as a subsistence resource, economically important to the region, or otherwise requiring management emphasis will be addressed in this chapter.

#### *(1) Muskoxen*

Muskoxen are indigenous to northwestern Alaska but disappeared before or during the nineteenth century. Muskoxen were reintroduced to northwestern Alaska in 1970 on both the Seward Peninsula and near Cape Thompson. Since that time, the Seward Peninsula population has grown rapidly and extended its range to occupy suitable habitat throughout the peninsula.

The Seward Peninsula population is currently expanding further east into the Nulato Hills and the Selawik and Yukon River drainages. The 2005 population was estimated at 2,387 animals. Population density is highest on the western Seward Peninsula (Persons 2003a).

Favored habitat includes windblown ridges during the winter and riparian areas during the summer. When snow depth is greater than 12 inches, muskoxen move to areas where snow cover is minimal such as exposed ridges. Vegetation in these areas is typically sparse. During the winter muskoxen survive on body-fat reserves and minimize movement to conserve energy. In the summer forage is plentiful and muskoxen build fat reserves.

Muskoxen are not valued by many residents of the Seward Peninsula, including reindeer herders, for several reasons. The decision to reintroduce muskoxen to this region was made without public participation. Herders and other local residents felt ignored and resent these transplants before they knew anything

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<sup>35</sup> This section tiers off Kobuk-Seward Peninsula Resource Management Plan and Environmental Impact Statement and references are listed in Volume 3 of the Plan.

about the animals. Many subsistence users feel threatened by muskoxen when picking berries or gathering greens (Dau 2000).

### **(2) *Moose***

Moose are an important subsistence resource and are widely distributed throughout the area in suitable habitats. Moose are most abundant in areas that contain willow and birch shrubs, and along large rivers. In general, their distribution is determined by requirements for food and cover and by seasonal snow depths.

Moose were first documented in the eastern part of the planning area in the 1920s. By the 1960s they occupied most areas of suitable habitat within the area. Currently, moose populations are low or declining in GMU's 22A, 22B, 22D, and possibly 22E. Other surveys indicate either very low recruitment rates or low population levels in other parts of the unit, indicating that the population is well below Alaska Department of Fish and Game (ADF&G) management goals.

Moose winter habitat condition in the area is not known to be a limiting factor to moose populations. However, monitoring of browse has been very limited. Moose habitat quality limits distribution and numbers of moose within the area. Some parts of the area are marginal moose habitat and will never support high numbers of moose.

### **(3) *Caribou***

The Western Arctic Caribou Herd (WACH) ranges throughout the area, calving in the National Petroleum Reserve-Alaska just east of the northern portion of the area, and wintering in the Nulato Hills and central/eastern Seward Peninsula on the south. This herd, the only caribou herd found in the area, ranges over about 140,000 square miles in northwestern Alaska.

In the early 1970s, the Western Arctic Caribou Herd population was estimated at 243,000 animals. By 1976, the population had declined to an estimated 75,000 animals. From 1976 to the present, the herd has grown substantially. Census data from 1996 and 1999 resulted in population estimates of 463,000 and 430,000 caribou, respectively (Dau 2003b). A census completed in 2007 resulted in the current estimated population size of 377,000 caribou (Dau 2007).

Caribou migrate seasonally between their calving areas and summer and winter ranges to take advantage of seasonally available forage. In general, the winter diet of caribou consists predominantly of lichens, with a shift to vascular plants during the spring (Thompson and McCourt 1981).

Calving ground locations may shift gradually over years or change abruptly due to environmental conditions. Since the mid-1970s, the Western Arctic Caribou Herd



has calved primary north and east of the Seward Peninsula (Dau 2003b). Typically, most pregnant cows reach the calving grounds by late May.

The winter range of the Western Arctic Caribou Herd has changed over time and varies from year to year. Before the mid-1970s, a substantial portion of the Western Arctic Caribou Herd wintered north of the Brooks Range or near Wiseman and Anaktuvuk Pass. Since the mid-1970s, the primary winter range of the Western Arctic Caribou Herd has been south of the Brooks Range along the northern fringe of the boreal forest. Between the mid-1980s and mid-1990s, a large portion of the Western Arctic Caribou Herd consistently wintered in the Nulato Hills. Beginning in 1996, the Western Arctic Caribou Herd began shifting its winter range west from the Nulato Hills to the Seward Peninsula. While most of the herd migrates south of the Brooks Range, some caribou winter on the Arctic coastal plain most years (Dau 2003b, BLM 2003b).

The current quality of caribou habitat within the planning area is mostly unknown, with the exception of the Buckland River Valley and the northern Nulato Hills, where the Bureau of Land Management has been monitoring caribou winter range since 1981. The last time these habitat transects were monitored, they showed a 14 percent decline in the percent cover of lichen (Jandt et al, 2003). However, this apparent decline is based on only 20 transects within the 140,000 square mile range of the herd. Given the remoteness of the area and lack of development and other resource uses within the range of the herd, habitat is thought to be in a natural condition in most areas. The large size of the Western Arctic Caribou Herd has reduced the availability of lichen in some areas.

#### **(4) *Brown Bear***

Population densities vary depending on the productivity of the environment. An aspect of bear habitat is the availability of prey species. Low or declining moose and fish stocks in the area may adversely affect bear populations. The current condition of brown bear habitat in the planning area has not been quantified. For the most part, the habitat is in a natural condition. Most of the Bureau of Land Management managed lands in the area are roadless and are far from villages. The Bureau of Land Management has not permitted many activities within the area that would have resulted in surface disturbance or changes to the habitat. No threats to the quality of habitat are known.

Habitat suitability varies within the area, though bear densities are generally higher on the southern Seward Peninsula than in other areas. According to ADF&G, bear densities in GMU 22 have increased since 1991 and are currently higher than the densities found during a study in the early 1990s (Persons 2003b). The only brown bear census in GMU 23 occurred in 1987 near the Red Dog Mine Road. This study resulted in a density estimate of one adult bear per 27.5 square miles (Ballard et al, 1991). There is no other quantitative data to estimate

population trend. Local residents believe that brown bear populations have increased since the 1940s and 1950s (Dau 2003).

#### **(5) *Gray Wolf***

In general, wolves are found throughout the area wherever adequate numbers of prey species are found. In most of Alaska, moose and/or caribou are their primary food. During summer, small mammals including voles, lemmings, ground squirrels, snowshoe hares, beavers, and occasionally birds and fish supplement their diet (ADF&G 1994b).

Research has never been conducted in GMU 22 to assess wolf distribution and population trend. Estimates of wolf distribution, population trend, harvest, and human use data are obtained from sealing certificates and observations by staff, reindeer herders, and other local residents (Gorn 2003). Wolf abundance in the Nulato Hills and Seward Peninsula is dependent upon the presence of caribou, with abundance increasing from October to May when caribou are present. As caribou have extended their winter range west, wolf numbers have also increased (Gorn 2003). Reports from local residents, statewide trapper surveys, and observations by ADF&G staff indicate that wolf numbers have increased on the Seward Peninsula west of and including the Buckland River drainage (Gorn 2003, Dau 2003c).

#### **(6) *Migratory Birds***

There are two threatened species, Steller's eider and spectacled eider, in the area. There is no designated critical habitat within the area, although there are two designated marine habitats off the coast of the Seward Peninsula. Steller's eider probably occurs within the area only as a migrant or rare summer visitor. The primary breeding areas for the spectacled eider are located outside of the Seward Peninsula. Per the Endangered Species Act, a federal recovery plan has been developed for these eider species within Alaska. Limited distribution of eiders within the Seward Peninsula and the limited amount of BLM-managed land on the Peninsula, make recovery actions involving the BLM lands unlikely.

Numerous species of raptors inhabit the area including golden eagle, peregrine falcon, osprey, gyrfalcon, northern harrier, American kestrel, Merlin, sharp-shinned hawk, northern goshawk, rough-legged hawk, great horned owl, great gray owl, snowy owl, northern hawk owl, short-eared owl, and boreal owl. Many of these species are uncommon to rare due to a lack of suitable habitat. Those species dependent upon forested habitats are generally most common in the eastern portions of the planning area.

Wetland habitat within the area is used by populations of waterfowl, including ducks, geese, swans, loons, grebes, cormorants, and shorebirds. These species occupy a wide variety of habitats including coastal wetlands, ponds and lakes, and

inland streams.

The Boreal Partners in Flight Working Group (1999) has identified the following priority species for western and northern Alaska: gyrfalcon, snowy owl, gray-cheeked thrush, varied thrush, blackpoll warbler, golden-crowned sparrow, Smith's longspur, McKay's bunting, rusty blackbird, and hoary redpoll. Many priority species depend upon shrub habitats, which is likely the most important land bird habitat in western Alaska (BPIF 1999). The Boreal Working Group developed a Landbird Conservation Plan for Alaska Biogeographic Regions in 1999.

The overall goal of the Landbird Conservation Plan is to keep land birds well distributed across the landscape in Alaska. The primary conservation action recommended within the planning area is broad scale monitoring of priority species. No imminent threats have been identified for these species.

Because migratory birds occupy a wide variety of habitats, it is difficult to generalize on habitat condition. However, most of the Bureau of Land Management land is in a natural state, permitted activities are minimal, and no specific threats to the quality of the habitat are known.

### **3.5 Areas of Critical Environmental Concern**

The Kobuk-Seward RMP identifies one new area of critical environmental concern within the planning area, Mount Osborn.<sup>36</sup> This area was designated to protect genetically unique Kigluaik Arctic char. This ACEC is within the boundaries of the Kakaruk/Lee grazing range area.

### **3.6 University of Alaska Reindeer Research Program<sup>37</sup>**

#### **Research**

The University of Alaska Reindeer Research Program (UAF RRP) is dedicated to the development and promotion of the reindeer industry on the Seward Peninsula and throughout Alaska. They work closely with producers to develop and conduct research projects that can be applied directly to their operations. Outreach is a significant part of their program and they have strong ties to communities and schools across Alaska.

The reindeer herders of Western Alaska face many production challenges. In addition to the special challenges that the remoteness and ruggedness of the

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<sup>36</sup> Kobuk-Seward Peninsula Approved RMP-10

<sup>37</sup> <http://reindeer.salrm.uaf.edu>

landscape present, they are faced with the questions that all livestock producers must attempt to answer: What is the most cost effective way to feed animals? How to prevent overgrazing of their range? What diseases should they worry about and what can they do to keep their herd healthy? What factors affect the quality of the meat from their animals? Because University of Alaska Reindeer Research Program research is driven by the concerns of the producer, and because these questions are not isolated from one another, they have a variety of overlapping research interests.

One of the main areas of study is range management and nutrition, which addresses some of the feeding challenges faced by those producers who use range as the exclusive nutritional resource, as well as those who rely on supplemental feed. University of Alaska Reindeer Research Program also addresses various animal health issues, including parasites and established and emerging diseases. Various conditions in either of these areas (and more) can affect the quality of the meat product. In response, the University of Alaska Reindeer Research Program has addressed several meat quality questions.

Monitoring reindeer on the vast open ranges can be challenging, even impossible at certain times of year. One of the tools used to keep track of the deer, as well as to gather data for various research projects, is radio and satellite telemetry. These technologies are fundamental to the reindeer research activities.

In addition to conducting research, the University of Alaska Reindeer Research Program is involved in outreach to the community. This includes working closely with the producers to help find solutions to their production issues, as well as educating school children and the general public about reindeer related issues.

### **Meat Production**

Most reindeer producers in Alaska use an extensive management system where animals are allowed to free-range over large designated grazing ranges on the Seward Peninsula, St Lawrence and Nunivak Islands and the Aleutian Chain. These ranges are large and remote with no or limited availability of slaughtering, processing and transportation infrastructure. Some reindeer producers want to shift the management and location of their operations to more intensively managed farms in Interior Alaska to utilize cereal grain and forage production, slaughtering facilities, and transportation and distribution networks. Currently voluntary state inspection is utilized for reindeer field-slaughter but a federal inspection program is in the process of being initiated.

A mobile meat processing lab is scheduled to arrive at the UAF Northwest Campus in Nome in July 2009. This will add an important element to the high latitude range management certificate program. The USDA-funded equipment

will support the meat production courses offered at the Northwest Campus. The self-contained lab, which will be able to move from one remote community to another, will make possible on-site USDA inspections of reindeer meat for the first time. Such labs are used in various locations across the Lower 48, and this one will be winterized to prepare it for the extreme climate.

### **Radio and Satellite Telemetry**

Radio telemetry is a valuable tool for tracking animal movements and studying habitat selection and use. Since the 1980s, the Reindeer Research Program has been using radio collars to study the grazing habits of reindeer to aid in the development of sound range management practices. When the presence of caribou on the Seward Peninsula became a threat to reindeer herds in the late 1990s, they incorporated satellite collars into the telemetry program, allowing continuous data acquisition without many of the constraints of a conventional VHF telemetry system. This satellite telemetry, computer mapping and the Internet help herders keep existing reindeer away from migrating caribou and assists herders in locating and recovering lost animals.

### **Range Management and Nutrition**

Management of nutritional resources is perhaps the most important activity in any animal production system. An appropriate plan for nutrition is the key factor in the productivity of a herd, affecting reproduction, growth, production (meat, milk, antler, etc.) and health. However, economic feasibility is also a major consideration when choosing feeding strategies. For operations utilizing an intensive management system, feed is the single largest expense. For operations that rely on pastures for grazing, range resources are frequently the limiting factor. Understanding nutritional needs and optimal feeding strategies is essential for a productive herd. Greg Finstad, University of Alaska Reindeer Research Program leader, continues extensive research in range management and nutrition on the Seward Peninsula.

### **Range Management**

Most of the reindeer in Alaska are grown under an extensive management system, that is, they are allowed to graze freely over large ranges instead of being kept in small pastures where supplemental feed is provided. Though the ranges are vast by most standards, care is required to keep these ranges healthy. The objective of current range management studies is to evaluate the effect of species, maturity, season, and environment on fiber and mineral concentrations in plants found in ecological sites used significantly by foraging reindeer on the Seward Peninsula.

## **Forage Selection**

The University of Alaska Reindeer Research Program is also interested in the ways that reindeer select forages throughout the growing season. They are very selective eaters and tend to pick only the plants or plant parts that are the most nutritious. During the summer, reindeer graze on grasses, sedges, forbs, and shrubs. During the fall, however, they transition to a winter diet that is made up almost entirely of lichen. Scientists are currently investigating the seasonal shifting of diet composition and habitat selection of free-ranging reindeer on the Seward Peninsula in relation to the seasonal changes in species composition and plant characteristics between habitats.

## **Ration Development**

The goal of the reindeer industry is to provide a stable meat supply and an enhanced economic base for the people of Alaska. Currently, most Alaskan reindeer production is found on the Seward Peninsula, where reindeer are allowed to range freely over large grazing areas. However, further expansion and development of the industry in other areas of the state is possible if a low cost feed is available for intensively managed herds within fenced areas or for supplemental feeding of free-range reindeer. One of the objectives of the Reindeer Research Program is to determine which locally grown feed ingredients and pasture grasses (and in what proportions) can be used in reindeer diets in a nutritious and economic manner.

## **Animal Health**

Animal health is critical to the success of any production operation. University of Alaska Reindeer Research Program has a variety of past and on-going projects addressing this. These projects address reproductive health, parasite control, and present and emerging diseases including Brucellosis, Chronic Wasting Disease, and West Nile Virus.

## **Unique Production Topics**

In addition to the typical challenges facing herders and ranchers, the reindeer herders of the Seward Peninsula face a unique set of issues. These range from the presence of caribou on winter pasture, to the exacerbated effects of climate change at high latitudes, to the logistical difficulty of herding and corralling in remote locations over rugged terrain. Invasive species present a serious threat to ecosystems worldwide and are typically most effectively managed through prevention rather than eradication. Though Alaskan ecosystems are relatively pristine compared to those at more moderate latitudes, introduction and range expansion of nonindigenous plants in Alaska is expected to occur. In response to

the recent and dramatic range expansion of the Western Arctic Caribou Herd (WACH) onto the Seward Peninsula, some herders have begun to use geographically isolated refugia or fenced enclosures to protect herds during times when caribou are present. Provision of supplemental feed to animals held in these areas may help to increase control of animals and mitigate localized overuse of the range. Feedstuffs can contain viable weed seeds and dispersal through fecal matter and spilled feed is one mechanism by which nonindigenous plant species could be introduced. The objective of this study is to determine whether supplemental feeding of reindeer in a tundra grazing system is likely to result in the introduction of nonindigenous plant species to the Seward Peninsula.

### **3.7 Kawerak Reindeer Herders Association<sup>38</sup>**

The purpose of the Kawerak Reindeer Herders Association is to provide assistance to its twenty-one members in the development of a viable reindeer industry, to enhance the economic base for rural Alaska, and to improve the management of the herds.

Kawerak Reindeer Herders Association provides assistance to its members who are reindeer herd owners and managers. The program offers administrative, logistical, advocacy and field support toward the development of a self-sustaining reindeer industry.

### **3.8 Climate Change**

There are at least fifteen climate change models world-wide, and five for Alaska. Generally, predicted trends involve increasing temperatures, increased precipitation in the summer and winter, and a longer frost free season. Lichens grow best in a moist environment, and drier conditions adversely affect their growth. Lichen range is expected to move towards the North Pole, and will decrease in size.<sup>39</sup> One particular model predicts that there will be longer frost free season (summer) and higher temperatures. However, with higher temperatures and a longer frost free season, surface water is predicted to more readily evaporate causing water availability to decrease. Wendy Loya of The Wilderness Society predicts that the Western Arctic Caribou range is expected to be 40% drier by year 2099<sup>40</sup>.

Lichens constitute critical winter forage for barren ground caribou (Klein 1991) and consequently, reindeer. Climate warming has been implicated as a factor that may reduce lichen abundance in the tundra ecosystem (Chapin et al, 1995). In fact, experimental warming of research plots in arctic tundra communities by just

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<sup>38</sup> <http://www.kawerak.org/servicedivisions/nrd/rha/index.html>

<sup>39</sup> Arctic Climate Impact Assessment 2005

<sup>40</sup> “A1B Model” discussed at the Western Arctic Caribou Working Group Meeting, December 2008.

1-3° C produced substantial vegetation changes in a single year (Walker et al, 2006). Shrubs and graminoids increased in height and density, resulting in decreased cover of shade-intolerant lichens and bryophytes (Walker et al, 2006).

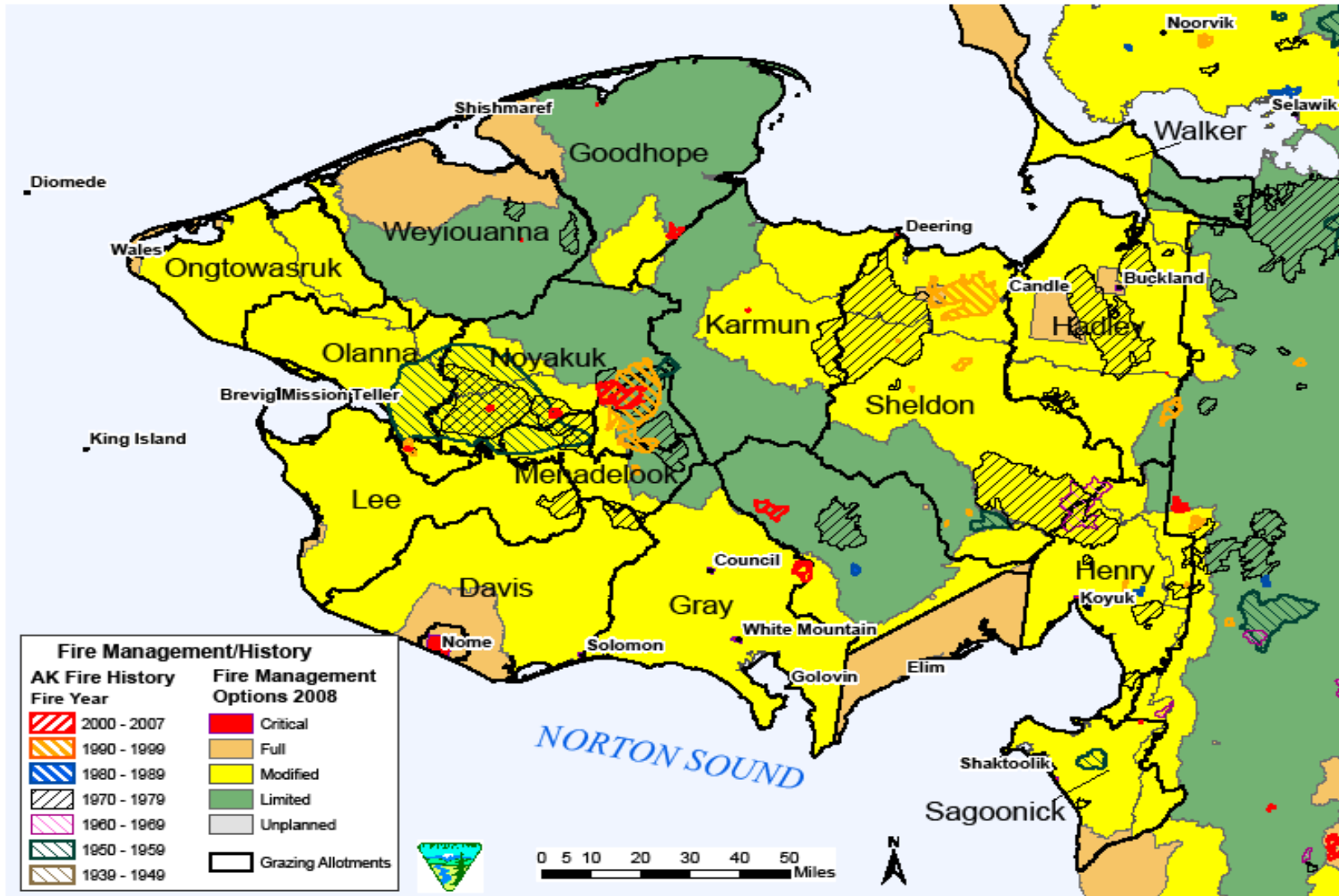
Fire can also play an important role in the recovery and or productivity of winter lichen area. Changes in the vegetation structure in the caribou winter range on the Seward Peninsula and vicinity indicates slower lichen regeneration and increased shrub cover in burned area compared to unburned areas. The actual recovery of forage lichens after fire on study sites is slower than predictions based on ideal growth potential (Jandt, et al, 2008). Lichen regeneration after controlled burns requires a longer period of time, but still much less than after severe wild fire (Scotter, 1965).

Reduction in lichen cover cannot be attributed just to wildfire and caribou grazing. Researchers have found that lichen cover declined on some unburned transects as well as transects with low caribou use (Joly, et al.). Analyses of the implications of global climate change on tundra ecosystems as well as experimental warming studies predict that lichens will be negatively affected. Grasses and shrubs are predicted to increase under global warming scenarios, and shrub expansion has already been observed in arctic and subarctic Alaska, as well as in northwestern Alaska. Vascular species compete with lichens for sunlight and nutrients, providing another mechanism to facilitate declining lichen cover in the Arctic tundra ecosystem. These vascular taxa not only directly compete with lichens, but they also alter snow melt patterns with could lead to even greater shrub cover. Wildfire, disturbance by caribou, global climate change and shrub expansion all independently act to reduce lichen cover in Arctic tundra ecosystems, however, they also are interactive. Climate warming is predicted to lead to more wildfires (Wein 1976; McCoy and Burn 2005), which could accelerate decline and potential disappearance of old-growth lichen tussock tundra communities in northwest Alaska (Rupp et al, 2000), further degrading caribou winter range (Rupp et al, 2006).

Research on forage quality as it relates to reindeer productivity has indicated that early snowmelt has accelerated reproductive phenology of tussock cottongrass, resulting in higher floral digestibility both early and late during inflorescence development. Changes in climate that lead to changes in snow cover can alter both the timing of flowering and chemistry of tussock cottongrass, and consequently, its value as reindeer and caribou forage. Model output shows that reindeer foraging on tussock cottongrass inflorescences may increase digestible dry matter intake twofold by selectively foraging on early-emergent inflorescences. The multiplicative effects of forage quality and food intake result in a near doubling in the rate of weight gain during this critical early spring period. Such increases in body weight gain have potentially great consequences for reindeer at both the individual and population levels. The effects of early



availability of high-quality forage on reindeer may be more pronounced if the current trend toward earlier green-up in the Arctic continues (Cebrian, et al 2008).



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Lichen cover has declined on the Seward Peninsula and these changes in vegetative community are in step with climate change predictions. The decline in lichen abundance on the winter range of the Western Arctic Caribou Herd over 24 years is an index of caribou habitat condition. The observed changes in vegetation cover can be attributed to caribou grazing, fire, and possibly global climate change. Continued declines in lichen cover could lead to population declines within the herd, range shifts, or both (Joly, et al, 2007).

Lichens respond differently than vascular plants to climate warming. After being heavily overgrazed by reindeer, lichens on St. Mathew Island in the Bering Sea are recovering slower than expected. Climate warming in recent decades in the northern Bering Sea and associated summer drying have been primary factors responsible for greatly reducing favorability for lichen growth on St. Matthew Island and slowing recovery of lichens from the overgrazing in the past by reindeer. The pronounced warming in much of the Arctic and Sub-arctic in recent decades has favored growth of many vascular plant species in tundra plant communities. It is now evident, however, that lichens, a unique symbiotic relationship of fungal and algal components, are responding differently than vascular plants to climate warming. A similar pattern of removal of lichens as major components of plant communities has occurred following introductions of reindeer to other islands at high latitudes and has been documented in association with climate warming in recent decades in the wintering grounds of the Western Arctic Caribou Herd (Klein, Shulski, 2008).

Research in Norway has shown that recolonisation of trampled lichen pastures in the High Arctic is dependent on the regrowth from small fragments of lichen thalli (the body of the lichen). Intact lichen have been shown to grow most rapidly during periods of sustained moisture caused by rainfall or cloudy days. Damaged lichen thalli grow at slower rates than intact thalli, but these small fragments have potential to recolonize trampled and grazed areas. Climate change models for arctic areas predict wetter summers, milder winters and greater stochastic variability. The predicted increase in summer precipitation is expected to increase the growth rates of lichen fragments and may help to ameliorate the damage done to the lichen thalli by reindeer trampling and grazing in this region (Cooper, 2002).

## **Chapter 4**

### **4.0 ENVIRONMENTAL CONSEQUENCES**

#### **4.1 Socioeconomics**

##### **Alternatives A, B**

Continuance of prior authorizations in the fifteen open grazing areas would facilitate the availability of an alternate subsistence resource, support the local economy and encourage the continued development of traditional reindeer husbandry on the peninsulas, 25 U.S.C. §500.

##### **Alternative C**

Herders with no actively managed reindeer herds would be issued five-year permits. If no reindeer are placed on range area within five years due to reasons other than caribou migration patterns, permittee would be allowed to re-apply, but other applicants would also be given consideration on a case-by-case basis. This would allow new interested parties the opportunity to apply for and potentially become a permitted reindeer herder on the Seward Peninsula.

##### **Alternative D**

Alternative D opens up two more areas to reindeer grazing: McCarthy's Marsh and Upper Kuzitrin, therefore increasing opportunities for continuing historic traditions of reindeer herding and economic development on the Seward Peninsula. As with Alternative C, if within five years a herder has not been successful in developing and maintaining a reindeer grazing due to reasons other than caribou migration patterns, the range area(s) would be available for new interested parties to apply for a grazing permit.

#### **4.2 Vegetation**

##### **Impacts Common to all Alternatives**

The impacts to vegetation by permitted reindeer grazing varies by the location of grazing activities, the quantity of animals grazing, and grazing management practices.

It is reasonable to assume that range health could be adversely impacted through inappropriate grazing practices; however, herders are counseled in range management and reindeer husbandry by the Natural Resource Conservation Service and the University of Alaska, Fairbanks Reindeer Research Program.

Moreover, the herders have been engaged in reindeer herding on the peninsulas for more than one hundred years with passage of the tradition from generation to generation. There is no reason to believe that the range is being mismanaged. Furthermore, one of the purposes of this environmental assessment is to establish land health standards which reflect the best management practices appropriate to reindeer grazing.

#### **4.2.1 Effects of reindeer grazing on vegetation**

Much research has been conducted on the effects of reindeer grazing on vegetation both locally and in the international northern arctic climates.

Monitoring of reindeer grazing areas on the Seward Peninsula by the Bureau of Land Management and the Natural Resource Conservation Service from the late 1980s through 2008 has documented locations with moderate to severe impacts on vegetation from reindeer. This damage includes trampled and fragmented lichens, cratering to organics or mineral soil, and heavily browsed willows and dwarf Arctic birch (Meyers 1995, 1996, 1997a). However, given sufficient years of rest from grazing those areas will recover fully (Swanson, et al, 1985). An improvement in condition is apparent at some of these sites (Meyers 2003b, Meyers 2004d) due to the steady drops in size or complete absence (on some grazing areas) of Seward Peninsula reindeer herds (Finstad, et al, 2005, Meyers 1997b). This type of range assessment has led to the determination of annual reporting, grazing management plans, and land health standards discussed in the range of alternatives.

Research in the northern climates of Sweden and Norway has concluded that grazing and trampling by semi-domesticated reindeer are important factors in controlling vegetation in northern Fennoscandia. Studies have suggested that reindeer grazing increases richness and diversity of vegetation in most cases, but this influence depends on the site type and grazing intensity. The enriching effect seems to be strongest at moderate grazing intensity (Suominen, et al, 2000). The structure of vegetation in *Calluna-Cladina* heaths was studied in northwestern Finnish Lapland in relation to grazing pressure of semi-domestic reindeer. The highest species richness was found in moderately grazed areas. The relative abundance of reindeer lichens increased with decreasing grazing pressure and *Cladonia stellaris* inhibited the growth of dwarf shrubs. *C. stellaris*, the dominant species of climax communities, cannot withstand hard grazing pressure; it is more effectively grazed than the other *Cladina* species because of its compact structure. Only small-bodied moss and horn lichen species, which are also resistant to reindeer trampling, can survive under the heaviest grazing pressure. They have apparently effective dispersal mechanisms and are thus capable of occupying recently disturbed patches (Helle, et al, 1982).

Research in Sweden has indicated that intensive grazing can promote a transition of moss-rich heath tundra into productive, graminoids-dominated steppe-like tundra vegetation. Moreover the results suggest that intermittent intensive reindeer grazing can enhance productivity of summer ranges (Olfsson, et al, 2001).

Other international studies on the tundra heath vegetation in northern Norway have investigated the effect of summer grazing by reindeer on the composition of vegetation, productivity and nitrogen cycling. The results were inconsistent with the view that the highest productivity is found at intermediate grazing pressure. These results rather support the hypothesis that intensive grazing can promote a transition of moss-rich heath tundra into productive, graminoids-dominated steppe-like tundra vegetation. Moreover, the results suggest that intermittent intensive reindeer grazing can enhance productivity of summer ranges (Olofsson, et al, 2001).

Although lichen abundance and availability has been found to be the critical factor for winter survival of reindeer and caribou, some scientists promote the opinion that the animal health (reindeer calf weight) is most greatly influenced by the health of summer habitat (Reimers 1997). The quality of the winter pastures has a minor effect on the body size in areas where the summer conditions allow the animals to grow at their maximum rate. In areas where maximum growth rates for various reasons are counteracted, severely overgrazed winter pastures will contribute to reduced body size (Reimers 1983).

Peter Neitlich, lichenologist with the National Park Service, Bering Land Bridge National Preserve (BELA), has analyzed grazing resources in the northern portion of the Seward Peninsula. Studies have revealed lightly grazed areas had taller lichens and greater total lichen cover than heavily grazed sites. Minor yet statistically significant changes in community structure were also observed between heavily and lightly grazed sites. However, lichen species richness did not differ by grazing status. This research advocates that overall, average lichen height appears to be the best indication of grazing intensity on the Seward Peninsula. Neitlich studies purport that the location of Bering Land Bridge National Preserve, regardless of disturbance history (grazing, fire, etc.), is more favorable to vascular plants and *Sphagnum*, and lichens grow taller in response, compared to areas on the Seward Peninsula further south. In addition, lower (lichen) cover in the Preserve may be attributed to site or climatic differences rather than grazing (Holt, et al, 2008).

Since 1987, reindeer numbers on the Seward Peninsula have decreased by 75% (Finstad, et al, 2005) due to mixing with caribou herds, leaving their usual grazing ranges and often dying partly due to animal and human predation (Fitzgerald 2002). Over 16,000 reindeer have emigrated with the Western Arctic Caribou

Herd since 1987, with some herders losing 45-85% of their animals. Six herders have lost all of their reindeer (Fitzgerald 2002). As a consequence, reindeer ranges on the Seward Peninsula have been lightly grazed or ungrazed *by reindeer* during the last 10-15 years. Substantially fewer caribou have wintered on the Seward Peninsula during the winters of 2003-2004 through 2006-07 compared to 1996-97 through 2002-03.

The Natural Resources Conservation Service works closely with the reindeer herders to develop range management plans based on range utilization, available lichen resources and biomass, and seasonal movements of the reindeer herds. Consideration is given to the seasonal movements of the Western Arctic Caribou Herd and the fact that they, and indigenous wild species, are free roaming and often cause heavy impacts to available lichen resources.

According to interviews with reindeer herders, they have historically herded their reindeer to various locations throughout their grazing areas on seasonal and annual rotations. These strategic herding activities are designed to maximize the opportunities for adequate forage, range recovery after grazing, and protection from migrating caribou. The herders have been practicing these herding strategies on the peninsulas for more than 100 years. While appearing self-regulating these activities do occur on federal public land and thus need to be permitted in order to ensure the goals and objectives set forth in the Kobuk-Seward Peninsula Approved Management Plan are met.

The Bureau of Land Management collaborates with the Natural Resources Conservation Service to do range monitoring, pool resources, and contribute funding. These monitoring reports identify the percent lichen cover and utilization. The monitoring reports identify some areas experiencing heavy grazing and utilization, while other areas are showing little to no grazing use. The monitoring reports make recommendations for “resting” the heavily grazed areas. The 2000-2008 monitoring conducted by the Bureau of Land Management identified areas of heavy grazing utilization and lichen cover, as well as little to no grazing utilization or lichen cover (BLM monitoring reports, 2000-2008).

All Alternatives considered in this analysis involve grazing management plans to some extent. Bureau of Land Management monitoring in reindeer herd winter habitat vicinities has indicated primarily Grazed Class 0 – Class 5 lichen utilization results over the past decade, with very little Grazed Class 6 or greater observed. There have been grazing impacts from migrating caribou that exceed Grazed Class 5 in the caribou winter habitat vicinities.

Grazing management systems on the Seward Peninsula involving rotational use of the reindeer winter grazing area(s) on a three to five year rotation period on moderate to high lichen biomass areas that are in good condition should be

sufficient to maintain ecological condition (Swanson, Barker, *Rangifer* 1992). By requiring grazing management plans which incorporate similar rotation and grazing strategies, the Bureau of Land Management is able to meet the requirements of best management practices outlined in the Kobuk-Seward Peninsula Approved Management Plan.

#### **4.2.1.1 Safe Areas**

In some situations, there are environmental and logistical influences that force herders to keep reindeer in a specific area (out of prescription with their grazing management plan) to protect them from migrating caribou and/or predators, which can lead to overgrazed conditions. These areas are often referred to as “safe areas.” Other factors can cause a divergence from grazing management plans such as significant weather events which might preclude herders from accessing their reindeer during a given time period or location. Monitoring results indicating occasional Grazed Class 5 utilization is deemed acceptable in some situations, considering the need for safe areas and other significant events that could lead to the Grazed Class 5 impacts. However, consistent findings of Grazed Class 5 or greater utilization would prompt the Bureau of Land Management to employ required mitigations to prevent more serious degradation of the ecosystem from higher than Grazed Class 5 impacts. At the consistently found Grazed Class 5 utilization scenario, the Bureau of Land Management would seek advice from the herders, the Natural Resource Conservation Service and the University of Alaska Reindeer Research Program to develop a strategy to effectively and efficiently mitigate the impacts on overgrazed areas.

#### **4.2.1.2 Invasive Plants**

Supplemental feed products can contain plant species propagules that could change the ecological processes in the arctic tundra environment. Required Operating Procedures in the Kobuk-Seward Peninsula Resource Management Plan (ROP Veg-2i and 2j) require reindeer herders to use “certified weed-free” products on Bureau of Land Management lands.

Supplemental feeding proposals on Bureau of Land Management land would undergo a site specific environmental analysis. The following elements would be considered in the analysis:

- a. The Bureau of Land Management would require the supplemental feed to be treated (or have no non-native invasive plant components) to prevent the propagation of non-native/invasive plants.
- b. Structures and/or associated facilities proposed.
- c. Proximity of supplemental feeding areas to riparian areas or other land features that could be affected.



- d. Size of the area proposed for use, the time period, duration and number of reindeer that would be using it.

The likeliness of supplemental feeding leading to invasive non-native plant infestations therefore is minimal on Bureau of Land Management lands.

There is potential, however, for non-native plant infestation by activities occurring on adjacent lands. Reindeer can roam freely across many land ownership boundaries. Invasive plant infestations can spread by natural growth of the area occupied, or by propagules transported in reindeer waste, wind, or hydrologic systems. If adjacent land owners allow supplemental feeding with non-certified weed free products, there is potential for invasive/non-native plant infestations on Bureau of Land Management managed lands. As land and resource managers work collaboratively to establish and maintain best management practices on a landscape level, the likelihood of invasive plant infestation is reduced.

#### **4.2.2.1 Alternative A – No Action**

This No Action Alternative does not identify any additional land health standards for reindeer grazing, therefore there would be no management actions, or requirements imposed on the herders, taken by the Bureau of Land Management other than recommendations based on guidance in the Alaska Grazed Class Methodology, and those provided for in the Kobuk Seward Resource Management Plan. There is no threshold level of grazing utilization established that calls for required mitigating measures to insure ecological processes are being maintained. Without requirements linked to the grazing permit stipulations, it is conceivable that grazing impacts in some areas could become so overly grazed that significant ecological damage could occur. The Bureau of Land Management can adjust the number and described area in which it feels is usable and adequate for reindeer grazing needs<sup>41</sup>, however.

Supplemental feed products can contain non-native invasive plant species propagules. Because the Bureau of Land Management has no jurisdiction over non-BLM managed lands, there is potential for invasive plant infestation from supplemental feeding of reindeer in any range area, if allowed by other land owners without employing best management practices for the prevention of invasive species. Invasive plant infestations can spread by natural growth and dispersal, or by propagules in reindeer waste. Supplemental feeding on Bureau of Land Management lands would require site specific environmental analysis prior to authorization. The Required Operating Procedures in the Kobuk-Seward Peninsula Approved Resource Management Plan require reindeer herders to use

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<sup>41</sup> 43 CFR §4300.41 (a), (b).

certified weed-free projects on Bureau of Land Management land, therefore the likelihood of permitted reindeer grazing leading to invasive plant infestations is minimal.

#### **4.2.2.2 Alternative B – Preferred Alternative**

Alternative B, the Bureau of Land Management Preferred Alternative, best integrates the traditional knowledge of the herders and the skill and expertise of range management guidance from Natural Resource Conservation Service with BLM grazing permit administration responsibility.

This alternative identifies a grazing utilization threshold of Grazed Class 5 – Heavy. If and when Grazed Class 5 utilization is observed, the Bureau of Land Management would require a rest and rotation of these areas, and consider the option for supplemental feeding. The specified period of rest as defined in the Alaska Grazed Class Methodology for Grazed Class 5 utilization is 15 - 20 years. Grazing management plans typically incorporate rest and seasonal rotation schedules to provide adequate time for heavily grazed areas to recover towards a positive trend. The Grazed Class 5 threshold is characterized by heavy grazing, with 76-100% of the lichen being disturbed. Adequate lichen remains in the utilized area for regeneration and cratering extends only to the top of the organic horizon and not into the mineral soil. Therefore, the risk of erosion leading to permafrost melt is very low.

The Bureau of Land Management would validate permit compliance with grazing management plans by evaluating the information provided in annual grazing reports from the herder(s) along with monitoring data. Permit stipulations require herders to report where they have kept their reindeer throughout the year, as well as range conditions, if known. By comparing the reindeer locations with range condition information, the Bureau of Land Management can validate that the herders are following the rest and rotation schedule guidance in their grazing management plans.

Considering the effectiveness of herd management and oversight by the Natural Resource Conservation Service, this management approach has the best combination of mitigations and utilization thresholds to support the reindeer industry. It allows for significant industry growth, while establishing a reasonable and responsible grazing utilization threshold to protect heavily grazed resources. Alternative B also incorporates adaptive management tools for dealing with the logistical challenges of the Arctic environment. Overall, the effects of this alternative to the vegetation resources are not significant, as they do not cause any undue or unnecessary degradation of the environment, or irretrievable commitment of resources.

#### **4.2.2.3 Alternative C**

This alternative takes the most conservative approach to the location and number of reindeer grazing permits. Like Alternative B, the land health standard threshold of Grazed Class 5 – heavy grazing utilization is identified to prompt required mitigations tied to the grazing permit. If Bureau of Land Management monitoring shows Grazed Class 5 or greater, the BLM may reduce the number of reindeer permitted in the specific area, and/or require rest and rotation the area of Grazed Class 5 or greater utilization. This would give herders the responsibility to ensure that heavily overgrazed areas have adequate recovery time.

Supplemental feeding would not be allowed, therefore the option of reduced numbers of reindeer and/or area closure would be required mitigation tools to prevent overgrazing any area to a Grazed Class 6 utilization condition. This maintains a maximum of Grazed Class 5 utilization for Bureau of Land Management managed lands.

The Bureau of Land Management would validate compliance with these requirements through the annual grazing report from the herder(s). These reports require herders show on a map where they have kept their reindeer throughout the year.

This alternative does not allow supplemental feeding on Bureau of Land Management managed lands, therefore the chance of invasive plant invasion on BLM managed lands is reduced to a greater degree than any other Alternatives considered.

#### **4.2.2.4 Alternative D**

The impacts to the vegetation resources under this Alternative have potential to be greater than those under other Alternatives considered. The grazing utilization threshold of Grazed Class 6 would allow for more severe impacts to vegetation and soils, as described in Section 3.2.1, Table 3.1, Lichen Utilization Classes.

Additionally, Upper Kuzitrin and McCarthy's Marsh – would be open for reindeer grazing. These two areas, which are now heavily used by the Western Arctic Caribou Herd during the winter migration<sup>42</sup>, could experience greater grazing impacts by allowing reindeer to utilize the resources. It is probable that the number of reindeer permitted would be very low because the Western Arctic Caribou Herd have occupied and heavily grazed these two areas in the past several winters.

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<sup>42</sup> Caribou Collar Locations Maps, Western Arctic Caribou Herd, ADF&G.

It would be difficult to maintain a reindeer herd(s) in the Upper Kuzitrin and McCarthy's Marsh areas during the caribou winter migration. Grazed Class 6 utilization would likely be observed consistently and therefore the range managers would recommend that the herder(s) reduce their number of reindeer, and rest specified areas showing Grazed Class 6 or higher. Required rest of specified areas would be 20-40 years or longer.

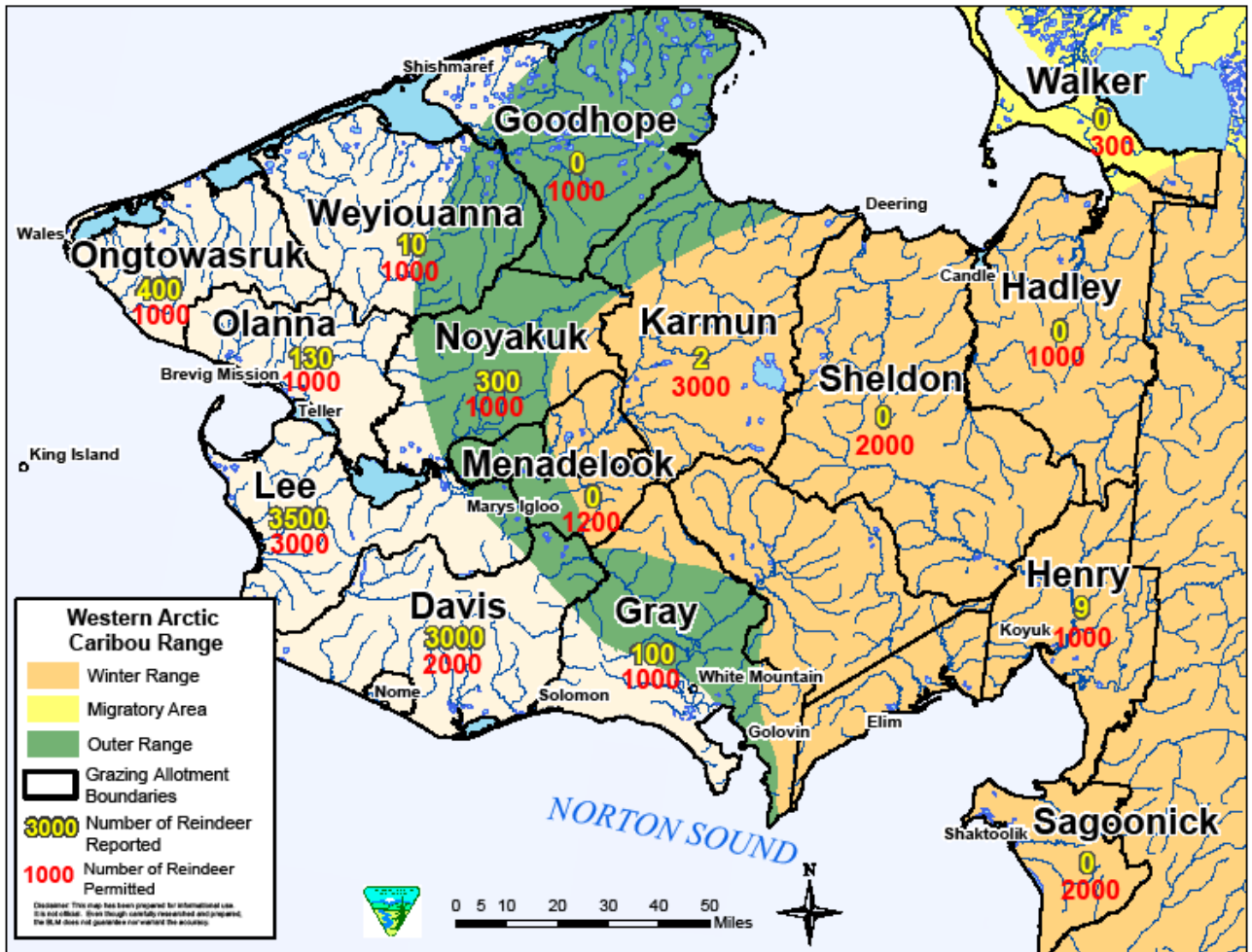
The Grazed Class 6 utilization threshold and supplemental feeding option would mitigate the reindeer grazing impacts to the vegetation resources, but there would be greater potential for ecological damage due to exposed mineral soil under the Grazed Class 6 utilization threshold. The exposed mineral soil could lead to increased ground thawing, permafrost melt, and soil erosion.

Additionally, exposed mineral soils are more conducive to invasive species infestations, increasing the potential of altering species composition and the ecological environment.

### 4.3 Wildlife and Subsistence

Impacts to wildlife would be the same as impacts to subsistence and will not be addressed separately.

#### Impacts Common to All Alternatives



The Western Arctic Caribou Range map above shows why the reindeer ranges within the caribou migratory areas on the Seward Peninsula have little or no reindeer present. Reindeer may continue to emigrate with caribou in the Western Arctic Caribou Herd's annual migrations.

In 2002 the Arctic Council surveyed the state of reindeer husbandry across the circumpolar north. Their findings found similar problems on both the Eurasian and North American continents: domestic herds were being overwhelmed by

wild herds.

During the winters of 2001-2002 and 2002-2003 substantial numbers of reindeer were lost from the Davis herd when they joined the Western Arctic Caribou Herd. Only the Davis, Lee (Kakaruk), and Ongtowsruk herds were commercially viable in the spring of 2007 (Dau 2007).

Peninsula herders have already come up with some innovative methods to save their domestic stock. Satellite collars on both the Western Arctic Caribou Herd and the domestic reindeer are used to track the movements of the two groups. Herders can monitor the information in real time on a website.

Because reindeer remain in the same area yearlong, they may overuse lichen in localized areas. This can be a problem due to incursions by caribou into reindeer ranges. Reindeer herders may be forced to keep their animals in the same area, year after year in order to keep them separate from caribou. This may result in reduction of lichen biomass in some areas. BLM would seek advice from the herder, University of Alaska Fairbanks, and Natural Resource Conservation Service to minimize ecological damage and implement grazing prescriptions (see Safe Areas 4.2.1.1).

Caribou currently have the greatest impact on the Seward Peninsula reindeer industry than any other wildlife. Grazing by reindeer can indirectly impact caribou, by degrading habitat or reducing the availability of the preferred forage species; by the transference of diseases between reindeer and caribou; by reindeer herders attempting to separate their reindeer from caribou, or by disturbing wintering moose and musk ox by reindeer herding activities, resulting in increased stress on these animals. All of these potential impacts are present at low and acceptable levels at this time, as the permits are not active or are far below the permitted numbers of reindeer, however impacts and/or herd numbers could increase in the future. The framework of Federal and State management agencies, the Western Arctic Caribou Herd Working Group and the Musk ox Working Group are in place to address these issues as they emerge.

The Western Arctic Caribou Herd utilize the same forage resources and habitat as the reindeer, however, they are present on the Seward Peninsula primarily only during the winter months, and generally only in the eastern portion of the Peninsula. The Western Arctic Caribou Herd has only recently pushed its winter use area into the central portion of the Seward Peninsula. According to Dau (2007) substantially fewer caribou have wintered on the Seward Peninsula during the winters of 2003-2004 through 2006-2007 compared to 1996-1997 through 2002-2003. The timing and use of the Seward Peninsula has substantially reduced competition, mixing, and potential for disease transference.

The grazing areas total 14 million acres on the Seward and Baldwin Peninsulas, of this only 13%, or 1.9 million acres are Bureau of Land Management managed lands. Most of the Bureau of Land Management managed lands are primarily located in the eastern portion of the Peninsula. Of the six grazing areas in the eastern portion of the Peninsula, only one permittee actively maintains a reindeer herd (less than 20 reindeer) and this herd is generally corralled when caribou are in the area. At this time the largest active reindeer grazing are in the southwest portion of the Seward Peninsula, primarily GMU 22C and the southern portion of 22D. These areas have a very limited amount of Bureau of Land Management managed lands.

Approval of grazing permits may result in conflicts between wildlife management and reindeer grazing. Reindeer grazing or permitted activities can indirectly impact caribou harvest by influencing changes to regulations to protect incidental harvest of reindeer. Reindeer-caribou conflicts impact ADF&G caribou monitoring programs. These issues have affected the number and type of collars ADF&G deploys on the Western Arctic Caribou Herd. In response to reindeer herders request for real time caribou locations, ADF&G has developed and maintains a Web-based program to provide outreach on caribou migration patterns to prevent mixing with active reindeer herds. The Web-based program also makes caribou location information available to subsistence hunters. According to Dau (2007) substantially fewer caribou have wintered on the Seward Peninsula during the winters of 2003-2004 through 2006-2007 compared to 1996-1997 through 2002-2003.

Herding activities may result in disturbance impacts to wildlife. These impacts would be negative, especially during stressful times such as winter or reproductive periods. Reindeer herders utilize aircraft and motorized vehicles for herding and may attempt to separate their reindeer from caribou, resulting in disturbance impacts to caribou. Disturbance to wintering moose and musk ox by reindeer herding activities may result in increased stress on these animals. Only the Davis, Lee (Kakaruk), and Ongtowsruk herds are still commercially viable as of 2007. Recent data indicates there are fewer caribou wintering on the Seward Peninsula and they are not ranging far enough south and west to be of significant impact to reindeer herders. ADF&G maintains a Web page showing real-time location of satellite-collared Western Arctic Caribou Herd on the Seward Peninsula to help herders avoid conflicts with caribou (ADF&G 2007)

Most reindeer herders and subsistence hunters believe muskox displace *Rangifer* through aggressive behavior, and competing for food (Dau 2000). However Ihl (1999) found that reindeer selected mainly lichens while muskoxen selected more sedge and moss. Despite similar use of late winter feeding sites, competition between muskoxen and reindeer on the Peninsula is not likely, but may occur if severe snow conditions or increasing densities of either species restrict available

winter habitat (Ihl, 1999).

The incidence and potential for disease spreading between reindeer and wild caribou and then to other wildlife and vice versa is always a potential threat. Under current levels of grazing and herd distribution these potential for impacts would be limited due to the small numbers of reindeer remaining. In addition, the Reindeer Research Program has a variety of past and on-going projects addressing reindeer health. These projects address reproductive health, parasite control, and present emerging diseases including Brucellosis, Chronic Wasting Disease, and West Nile Virus. Also, in 2008, ADF&G conducted a health assessment of the Western Arctic Caribou Herd and two southern caribou herds. This assessment concluded that the presence of parasites and viral diseases were declining in the Western Arctic Caribou Herd. The Western Arctic Caribou Herd was determined to be very healthy and may in fact be one of the healthiest herds in the state (Beckmen, 2008).

University of Alaska Reindeer Research Program has a variety of past and on-going projects addressing reindeer health. These projects address reproductive health, parasite control, and present and emerging diseases including Brucellosis, Chronic Wasting Disease, and West Nile Virus.

Authorization of grazing may negatively impact brown bear and wolf populations due to the increased number of these animals harvested by reindeer herders in defense of life and property. Harvest of predators by reindeer herders in some parts of the Seward Peninsula has been substantial in the past (ADF&G 2002). From 1996-98, nine bears were reported harvested in defense of life and property (DLP) in GMU 22. This reported total does not accurately represent the actual number of non-hunting kills due to low compliance with reporting requirements. Nelson (1993) estimated that an additional 10-30 bears were killed annually and not reported in GMU 22. Additionally reindeer herds act as an alternative prey base which may inflate predator numbers by providing an available food resource. Trends indicate that with so few active herds the impacts to bear and wolf populations is minimal.

The presence of reindeer could impact other predator wildlife species. Furbearers, including fox, wolverine, and wolf follow reindeer herds to feed on newborn calves, sick and weak individuals, and carcass waste from reindeer harvests. Reindeer herds act as an alternative prey base which may inflate predator numbers by providing an available food resource. Trends indicate that with so few active herds the impacts to furbearer populations is minimal.

Wetland habitat within the area is used by populations of waterfowl, including ducks, geese, swans, loons, grebes, cormorants, and shorebirds. These species occupy a wide variety of habitats including coastal wetlands, ponds and lakes, and



inland streams. Reindeer and herding activities have the potential to trample and disturb nesting land birds during breeding season. Most of the prime waterfowl habitat is in the area of McCarthy's Marsh and Upper Kuzitrin where active reindeer herding is currently non-existent. A best management practice would be to not authorize reindeer grazing in prime waterfowl habitat during the nesting and brooding season.

The most intensive subsistence activity is believed to be concentrated on lands conveyed or selected by the Native village corporations. Subsistence activities are a key factor in the selection of lands by Native individuals and corporations, and Native allotments are typically claimed based on a family's use of a site for subsistence activities.

These alternatives considered would not significantly alter the distribution, migration or location of harvestable wildlife or subsistence resources. These proposed alternatives will not significantly restrict wildlife or subsistence uses. These potential conflicts are present at low and acceptable levels at this time as the permits are not active or are far below the permitted numbers of reindeer. No reasonably foreseeable and significant decrease in the abundance of harvestable resources or in the distribution of harvestable resources, and no reasonably foreseeable limitations on harvester access have been forecasted to emerge as a function of the actions that are analyzed in this document. The impacts to subsistence resources associated with the reauthorization of grazing permits will be negligible. The framework of Federal and State management agencies, the Western Arctic Caribou Herd Working Group and the Musk ox Working Group are in place to address these issues as they emerge.

#### **4.3.1 Alternative A**

Alternative A would continue present management practices and levels of resource use. The permits would be valid for up to five years for the current fifteen grazing areas.

##### **Impacts to Subsistence from Reindeer**

Reindeer grazing would be managed using the current permits system for the fifteen grazing areas, with the number of reindeer the same as authorized on existing permits. By having up to five years as opposed to ten year permits outlined in Alternatives B and D, a permittee has less incentive for herd and infrastructure development. Lower industry development may result in fewer impacts to caribou. Grazing management plans, though not required, would be encouraged. Grazing management plans help identify locations where herders can avoid caribou migrations and thereby limit competition for forage, potential disease transfer, incidental harvest by hunters, and reindeer running off with

caribou. The Bureau of Land Management would assess range health conditions and make recommendations to herders. Range assessment recommendations would limit habitat degradation and positively impact caribou. Areas recommended for rest could possibly be available for critical winter caribou habitat.

#### **4.3.2 Alternative B – Preferred Alternative**

Under this Preferred Alternative, the Bureau of Land Management would issue grazing permits for up to ten-year terms, with the concurrence from the National Park Service and Alaska Department of Natural Resources. This alternative identifies cooperative efforts between the Bureau of Land Management, Natural Resource Conservation Service, and the herders to develop grazing management plans that would assure responsible management of Bureau of Land Management land and resources.

##### **Impacts to subsistence from Reindeer**

Fifteen grazing areas, regardless whether the permitted herder has reindeer or not, would remain open to reindeer herding. The number of reindeer permitted would stay the same as currently authorized on each grazing range area. Increases in the number of reindeer allowed would be considered based upon range management recommendations from the herders, University of Alaska Reindeer Research Program and the Natural Resource Conservation Service. A ten-year permit with potential increases in the number of reindeer permitted provides incentives for herd and infrastructure development. Further development may result in increased impacts to caribou. The additional required reporting, grazing management plans, and establishing land health standards in Alternative B should mitigate these potential impacts. Range assessment requirements incorporating rest and rotation schedules would limit habitat degradation and positively impact caribou. Areas required for rest could possibly be available for critical winter caribou habitat.

#### **4.3.3 Alternative C**

Under this Alternative, only herders who currently have a permit and reindeer would be issued new permits for up to ten years. Herders with no actively managed reindeer herds would be issued five-year permits. Herders would be required to notify the Bureau of Land Management upon placement of reindeer on the range area, and within one year of reindeer placement submit a grazing management plan with a proposal of how they would develop and maintain reindeer grazing operations. If no reindeer are placed on range area within five years, permittee would be allowed to re-apply, and other applicants would be given consideration on a case-by-case basis.

The number of reindeer permitted on existing active range areas would stay the same as currently authorized until a determination of stocking rate is established.

### **Impacts to subsistence from Reindeer**

Under this alternative, all fifteen grazing areas would be open to reindeer grazing. Fewer initial active ranges could positively impact caribou through less habitat degradation, forage competition, herd mixing, and opportunities for disease transference. By having up to five years as opposed to ten year permits for new herders outlined in Alternatives B and D, a permittee has less incentive for herd and infrastructure development. Lower industry development may result in fewer impacts to caribou. Under this alternative, herders would be required to work closely with the Bureau of Land Management to develop annual grazing management plans that incorporate the Environmental Quality Incentives Program and Natural Resource Conservation Service data. These additional reporting requirements should mitigate impacts to caribou. Range assessment requirements incorporating closures of overgrazed areas and reducing the number of reindeer would further limit habitat degradation and positively impact caribou.

#### **4.3.4**

### **Alternative D**

Alternative D would allow permitting for up to ten years on the fifteen current grazing areas. In addition, the Upper Kuzitrin and McCarthy's Marsh areas would be open for reindeer grazing application and ten-year permit issuance, for a total of seventeen reindeer grazing areas. Under this alternative, permits would be cancelled after five years on ranges without any reindeer if non-use is for reasons other than caribou migration patterns. The Bureau of Land Management would seek assistance from Kawerak RHA to find another herder interested in establishing a reindeer herd in that range area. Increases in the number of reindeer authorized would be allowed until range utilization monitoring shows Grazed Class 6 or greater.

### **Impacts to Subsistence from Reindeer**

Seventeen grazing areas would be open to reindeer herding, and active reindeer herding would be encouraged on ranges without reindeer. Currently Upper Kuzitrin, McCarthy's Marsh, and most of the grazing areas on the northern and eastern portion of the Seward Peninsula have no reindeer. These areas are along fall migratory route and current primary wintering grounds for the Western Arctic Caribou Herd. The increased number of active grazing areas under this alternative has the greatest potential for habitat degradation, forage competition, and opportunity for disease transference.

This alternative establishes a lichen utilization threshold of Graze Class 6. These areas would then require a minimum of 15-20 years of rest for lichen regeneration. Increasing lichen utilization then limits the forage areas available to caribou on critical winter habitat. The required grazing stipulations are less restrictive than Alternatives B and C and provide for minimal mitigation compared to the other alternatives. Grazing management plans would not be required and would limit mitigation for caribou. Range assessment recommendations could limit habitat degradation and positively impact caribou but these assessments recommendations would not be required.

McCarthy's Marsh and the Upper Kuzitrin located on the Seward Peninsula provide important habitat for waterfowl. Although these areas are small, waterfowl production on a per unit basis are comparable to the Koyukuk and Yukon Delta National Wildlife Refuges, both important waterfowl brood areas in Alaska. Reindeer and herding activities have the potential to lower productivity by trampling and disturbing these nesting land birds during the breeding season. A best management practice would be to not authorize reindeer grazing in prime waterfowl habitat during the nesting and brooding season.

#### **4.4 Mount Osborn Area of Critical Environmental Concern**

The Mount Osborn ACEC, designated to protect genetically unique Kigluaik Arctic char is located within the boundaries of the Kakaruk/Lee grazing range area. Continuing to authorize reindeer grazing in this ACEC will not affect the purpose or management objectives of the area, regardless. Reindeer do not congregate around riparian areas like cattle and other grazing animals in the Lower 48 because their preferred forage is not concentrated in the riparian areas (Finstad, Pers. Comm.).

#### **4.5 Cumulative Impacts**

Cumulative impacts result from the incremental impact of human activity when added to other past, present, and reasonably foreseeable future human activity. They can result from individually minor but collectively significant actions taking place over a period of time.

The continued migration of the Western Arctic Caribou Herd onto reindeer ranges may result in less rotation of grazing areas by herders and an increase in range degradation. However, wild reindeer or caribou herds are known to fluctuate in herd size, although there is little comprehension of the nature of the cycles. Should the herd size of the Western Arctic Caribou Herd decrease, reindeer are an appropriate substitute species in tundra and boreal forest environments. As such, cumulative impacts are negligible.

## Chapter 5

### 5.0 Tribes, Individuals, Organizations, or Agencies Consulted

The following entities were invited to participate in meetings to develop issues and share their role(s) how the industry is being managed and generate ideas of how it can be better managed:

- Alaska Department of Fish & Game (ADF&G)  
Tony Gorn, Jim Dau
- Alaska Department of Natural Resources (DNR)  
Stuart Pechek, Jeanne Proulx
- Bering Straits Native Corporation (BSNC)  
Matt Ganley
- Kawerak Reindeer Herders Association, Inc. (RHA)  
Rose Fosdick
- National Park Service (NPS)  
Peter Neitlich
- University of Alaska Fairbanks, Reindeer Research Program (UAF RRP)  
Greg Finstad
- USDA, Natural Resources Conservation Service (NRCS)  
Calvin Steele, Karin Sonnen
- USDOJ Bureau of Indian Affairs (BIA)  
Jacqueline Martin, Warren Eastland
- USDOJ Bureau of Land Management Fairbanks District Office (BLM-FDO)
- Residents and Native Corporation representatives in the following communities:
  - Anchorage
  - Fairbanks
  - Nome
  - Koyuk
  - Shishmaref
  - Wales

## **Chapter 6**

### **6.0 List of Preparers**

Bruce Seppi	Wildlife Biologist, BLM
Geoff Beyersdorf	Subsistence Coordinator, BLM
James Moore	Planning and NEPA Coordinator, BLM
Laurie Thorpe	Natural Resource Specialist, BLM
Thomas Sparks	Natural Resource Specialist, BLM

## References

- ACIA, 2005. Arctic Climate Impact Assessment. Cambridge University Press, 1042p.  
<http://www.acia.uaf.edu>.
- Bureau of Land Management, 2008, Kobuk-Seward Peninsula Record of Decision and Approved Management Plan.
- Bureau of Land Management, MOU dated October 9, 2002, NO. AK 025 2003 05, Memorandum of Understanding among the BLM, ADNR, NPS concerning Management of Reindeer Grazing Permits in Northwestern Alaska.
- Bureau of Land Management, 1976, Environmental Analysis Record, NANA Reindeer Grazing Application in the Kotzebue-Noatak Area.
- Bureau of Land Management, 1983, Adams, Connery, BLM/AK/OF-83/08, Buckland River Reindeer/Caribou Conflict Study Final Report.
- Cebrian, M. R., Kielland, K., Finstad, G., (2006): Forage Quality and Reindeer Productivity: Multiplier Effects Amplified by Climate Change.
- Chapin, F. S., III, (corresponding author) Institute of Arctic Biology, University of Alaska, Fairbanks, AK, 2006: Building Resilience and Adaptation to Manage Arctic Change, *Ambio* Vol. 35, No. 4, June 2006.
- Chapin, F. S., III, Shaver, G. R., Giblin, A. E., Nadelhoffer, K. J., and Laundre, J. A., 1995: Responses of arctic tundra to experimental and observed changes in climate. *Ecology*, 76: 694-711.
- Cooper, E. 2002, Nordic Conference on Reindeer Research, Norway, Climate change effects on forage lichen growth.
- Fitzgerald, D. 2002. Reindeer research: Intensive management may be key. In: *AgroBorealis* Vol. 24, No. 1: 4-7. Agriculture and Forestry Experiment Station, University of Alaska, Fairbanks, Alaska.
- G. R. Suding, K. N., Thompson, C. C., Tolvanen, A., Totland, Ø., Turner, P. L., Tweedie, C. E., Webber, P. J., and Wookey, P. A., 2006: Plant community responses to experimental warming across the tundra biome. *Proceedings of the National Academy of Sciences*, 103(5) 1342-1346.
- Helle, T., Aspi, J., 1983: Effects of winter grazing by reindeer on vegetation, *OIKOS* 40: 337-343. Copenhagen 1983.

Holt, E., McCune, B., Neitlich, P., 2008: Grazing and fire impacts on macrolichen communities of the Seward Peninsula, Alaska, USA, *The Bryologist*, 111(1), pp. 68-83.

International Sami Journal, The Sami/Inupiaq/Yup'ik Reindeer in Alaska & Canada Story, Nathan Muus

Joly, K. and R. R. Jandt. 2007. The unidirectional influences of wildfire, disturbance by caribou, global climate change and shrub expansion on arctic ecosystems. Pages 217-220 in Seventh International Conference on Global Change: Connection to the Arctic (GCCA-7). International Arctic Research Center, University of Alaska Fairbanks, Fairbanks, AK. 312 pp.

Jandt, Joly, Meyers, Racine, 2008, *Arctic, Antarctic, and Alpine Research*, Vol. 40, No. 1, Slow Recovery of Lichen on Burned Caribou Winter Range in Alaska Tundra: Potential Influences of Climate Warming and Other Disturbance Factors.

Joly, Jandt, Meyers, Cole, 2006, Changes in vegetative cover on Western Arctic Herd winter range from 1981 to 2005: potential effects of grazing and climate change.

Klein, D., Shulski, M., 2006, Lichens Respond Differently than Vascular Plants to Climate Warming on a Bering Sea Island.

Klein, D., Shulski, M., 2008, Lichen Recovery Following Heavy Grazing by Reindeer Delayed by Climate Warming.

Klein, D. R., 1991: Limiting factors in caribou population ecology. *Rangifer Special Issue*, 7, 30-35.

Loya, Wendy, The Wilderness Society, Western Arctic Caribou Working Group Meeting, December 2008, "AIB Model".

Natural Resources Conservation Service (NRCS) Conservation Practice Standard, August, 1999, Prescribed Grazing (acre) Code 528A, 528A-1 – 528A-20.

Olofsson, J., Kitti, H., Rautiainen, P., Stark, S., Oksanen, L., 2001: Effects of Summer Grazing by Reindeer on Composition of Vegetation, Productivity, and Nitrogen Cycling.

Reimers, 1983, *Rangifer*, (3) 1, Growth Rate and Body Size Differences in *Rangifer*, A Study of Causes and Effects.

Reimers, 1997, *Rangifer*, Rangifer population ecology: A Scandinavian perspective.

Richter-Menge, J, J. Overland, A. Proshutinsky, V. Romanovsky, L. Bengtsson, L. Brigham, M. Dyurgerov, J.C. Gascard, S., Gerland, R. Graversen, C. Haas, M. Karcher, P. Kuhry, J. Saslanik, H. Melling, W. Maslowski, J. Morison, D. Perovich, R. Przybylak, V. Rachold, I. Rigor, A.



- Shiklomanov, J. Stroeve, D. Walker, and J. Walsh (2006) State of the Arctic Report. NOAA OAR Special Report, NOAA/OAR/PMEL, Seattle, WA, 36 pp.
- Rupp, C. H., et al., 2000: Response of the subarctic vegetation to transient climatic change on the Seward Peninsula in northwest Alaska. *Global Change Biology*, 6, 541-555.
- Rupp, C. H., et al., 2006: Simulating the influences of various fire regimes on caribou winter habitat. *Ecological Applications*, 16, 1730-1743.
- Schneider, Kielland, Finstad, 2005, *Arctic Anthropology*, Vol. 42, No. 2, Factors in the Adaptation of Reindeer Herders to Caribou on the Seward Peninsula, Alaska.
- Scotter, 1965, *Journal of Range Management*, Vol. 18, No. 6, Reindeer Ranching in Fennoscandia.
- Suominen, O., Olofsson, J., 2000: Impacts of semi-domesticated reindeer on structure of tundra and forest communities in Fennoscandia: a review.
- Swanson, J. D., Barker, M. H. W., 1992, *Rangifer*, Vol. 12, No. 1., Assessment of Alaska reindeer populations and range conditions.
- USDA, Soil Conservation Service (SCS), 1985, Range Survey of the Seward Peninsula Reindeer Ranges, Alaska.
- USDA, Soil Conservation Service (SCS), 1976: National Handbook for Native Grazing Lands. Soil Conservation Service, Washington, D.C.
- USDA, Natural Resource Conservation Service (NRCS), 2001, A Procedure for Evaluating Lichen Utilization on Reindeer Ranges.
- USDA, Natural Resources Conservation Service (NRCS), 2000 Environmental Quality Incentives Program, Alaska Summary
- University of Alaska Fairbanks, 2001, *AgroBorealis*, Vol. 33, No. 2: The Annual Report.
- University of Alaska, December 1980, Eskimos, Reindeer and Land.
- Walker, M. D., Wahren, C. H., Hollister, R. D., Henry, G. H. R., Ahlquist, L. E., Alatalo, J. M., Bret-Harte, M. S., Calef, M. P., Callaghan, T. V., Carroll, A. B., Epstein, H. E., Jónsdóttir, I. S., Klein, J. A., Magnússon, B. Molau, U., Oberbauer, S. F., Rewa, S. P., Robinson, C. H., Shaver, Scotter, G. W., 1965: Reindeer Ranching in Fennoscandia.
- Wein, R. W., 1976: Frequency and characteristics of arctic tundra fires. *Arctic*, 29, 213-22.