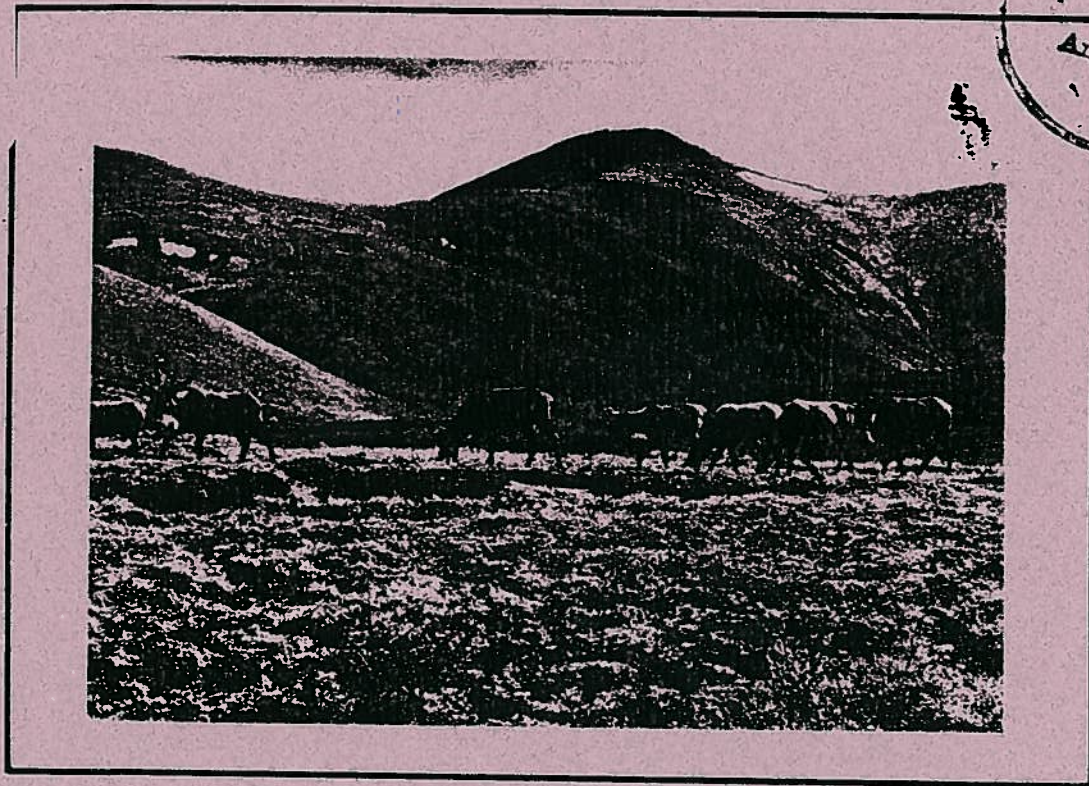


Range Survey of the Seward Peninsula Reindeer Ranges, Alaska

US FISH & WILDLIFE SERVICE--ALASKA
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Prepared by
United States Department of Agriculture
Soil Conservation Service

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Range Survey of the Seward Peninsula Reindeer Ranges, Alaska



Prepared by

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In cooperation with:

the

Reindeer Herders Association

the

United States Department of the Interior,

Bureau of Land Management

National Park Service

Bureau of Indian Affairs

the

State of Alaska

University of Alaska, Agricultural and Forestry Experiment Station, Palmer

Division of Agriculture

Division of Land & Water Management Graphics Section

and the

Alaska Soil and Water Conservation District

PREFACE

In 1976, the Northwest Alaska Native Association (NANA) and the Reindeer Herders Association (RHA) asked the Alaska Soil and Water Conservation District and the United States Department of Agriculture, Soil Conservation Service (SCS) for assistance in developing and applying range management plans for reindeer. In response, the SCS designed and initiated a 15 million-acre survey of 19 reindeer-grazing permit areas on the Seward Peninsula. The survey was designed to provide information useful for land resource management, with special emphasis on reindeer range planning and management. Survey objectives were to: 1) identify, map, and describe "ecological sites"; 2) describe plant community characteristics of each ecological site; 3) quantify plant communities in terms of species composition and annual productivity; and 4) collect other information for resource planning on Seward Peninsula rangelands.

In 1976, Landsat data was used to classify and map ecological sites in the northeastern areas of the Seward and Baldwin Peninsulas. Starting in 1979 photo-interpretation of high altitude infrared color photography was used and continued to be used for classifying ecological sites during the 1981, 1982, and 1983 survey seasons. The 1976 area was remapped using the color infrared aerial photography in 1983.

The survey was coordinated by the Reindeer Herders Association and conducted by the Soil Conservation Service; with cooperation from the Bureau of Land Management and the University of Alaska, Geophysical Institute; and the Agricultural and Forestry Experiment Station at Palmer. Funding was provided by the Alaska Department of Natural Resources, Division of Agriculture; the Bureau of Indian Affairs and the SCS. Throughout the survey, assistance and support were also provided by individual reindeer herders; the Cooperative Extension Service; the National Park Service; Alaska Soil and Water Conservation District; NANA Regional Corporation; Bering Straits Regional Corporation; associated Village Corporations; and individuals from villages throughout the survey area.

ACKNOWLEDGEMENTS

During the years of this survey, our survey team had the fortunate opportunity of meeting and working with a great number of individuals throughout Alaska, who were directly or indirectly involved with resource management. During these years we listened and learned much about the people; the past history; the future; the reindeer; and the natural resources of the Seward and Baldwin Peninsulas.

By using available information and field experience, we learned as we proceeded with the inventory. We developed techniques and procedures to accomplish the objectives of the survey. A strong supporting feature of this survey has been the interaction with various contributing resource specialists.

We wish to thank John Schaeffer for initiating interest in the survey and assisting with obtaining funding; legislative support from Representative Jack Fuller; Dr. Robert Pegau for technical assistance; Danny Karmun and Virgil Severns for field assistance and coordination; Matt Robus and David O. Scott, Jr. (then BLM) for technical assistance; Thomas George for remote sensing expertise; Calvin Steele, Mark P. Kinney, Julie Sharp, Devony Lehner Welch, Douglas J. Van Patten and Steven J. Gregory for the help with all phases of the survey; Dr. Les Viereck for classification of ecological sites; Ruth Fields, who cooked for us and provided a happy camp environment; the Reindeer Herders Association Coordinators, Henry Ahgupuk and Vernon Kuzgruk; Reindeer Herders Association Executive Board of Directors; President Lawrence Davis for their assistance and support; and Susan Peck of the Division of Land and Water Management Graphics Section, Department of Natural Resources for the graphics, design and layout of this book.

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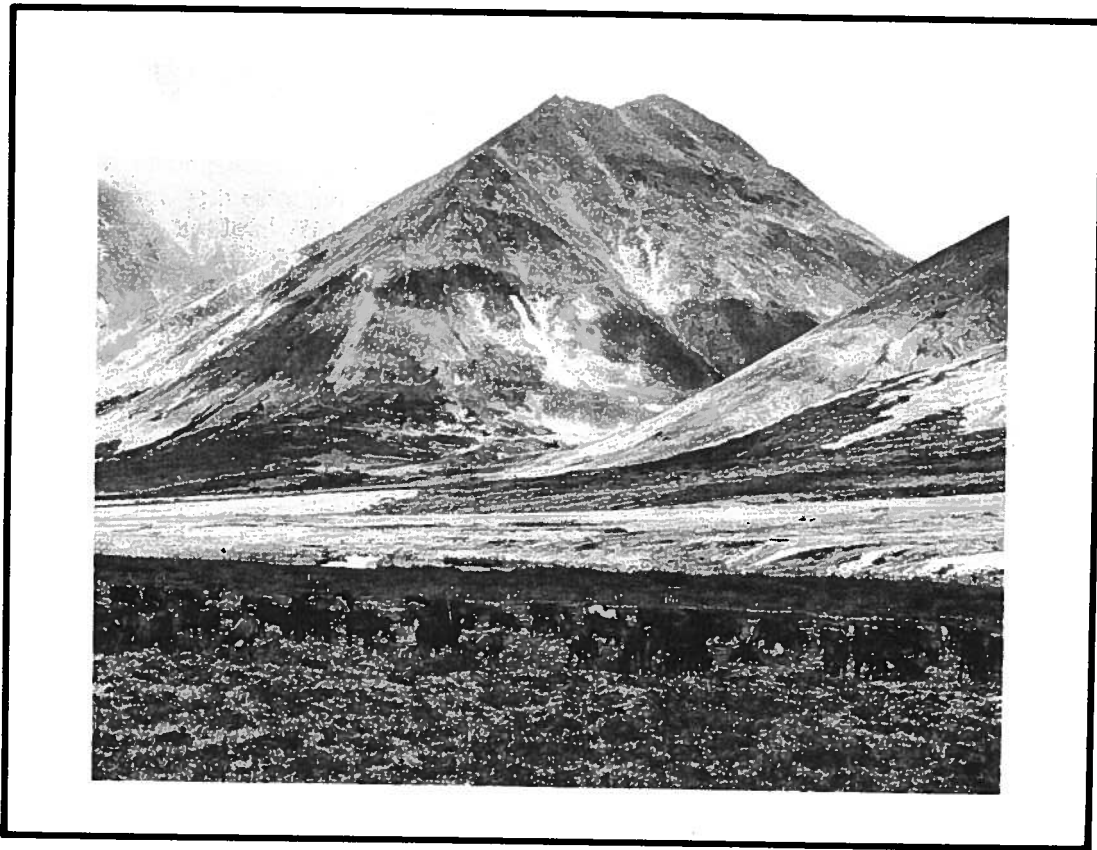
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PHOTO AND NARRATIVE INDEX OF ECOLOGICAL SITES

Code Number	Name	Narrative & Photo Page
10	Mixed Forest (Floodplain)	25
11	Black Spruce	26
12	White Spruce (Upland)	27
13	Spruce-Lichen (Upland)	28
14	Paper Birch (Upland)	29
15	Spruce-Lichen (Palsa)	30
20	Tall Shrub (Floodplain)	31
21	Tall Shrub (Drainageway)	32
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35A	Shrub-Birch (Hillside)	36
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41	Shrub Meadow (Mountain)	38
42A	Low Shrub-Water Sedge (Tussock Tundra)	39
42B	Low Shrub-Cottongrass (Tussock Tundra)	40
43A	Low Shrub-Sedge Meadow (Alpine)	41
43B	Low Shrub-Lichen Meadow (Alpine)	42
44	Shrub-Lichen (Upland)	43
45	Water Sedge-Muskeg (Bog-Fen)	44
50	Dunes (Beach)	45
51	Marsh (Tidal)	46
52	Sedge (Wet Meadow)	47
54	Sedge (Drainageway)	48
55	Cottongrass-Water Sedge (Low Center Polygons)	49
56A	Grass (Breached Lake Bed)	50
56B	Sedge (Breached Lake Bed)	51
57	Sedge (Wet Lake Bed)	52
60	Lichen (Tussock Tundra)	53
61	Lichen Meadow (Mountain)	54
63	Lichen-Sedge (Costal Tundra)	55
64	Lichen-Sedge Meadow	56
65	Lichen Slope (Upland)	57
66	Lichen Mat (Lowland)	58
70	Lichen Granitic Slope (Alpine)	59
71	Dryas Limestone Slope	60
72	Bald Limestone Slope	61
74	Dryas-Lichen (Ridges)	62
82	Riverwash	63



REINDEER GRAZING IN GRAND CENTRAL CANYON VALLEY

Part I INTRODUCTION

The Survey Area

The Seward Peninsula, located in northwestern Alaska is bordered to the north by Kotzebue Sound, and to the south by Norton Sound (see location map, Fig. 1). Including the Baldwin Peninsula, a small peninsula attached at its northeastern corner, the Seward Peninsula comprises approximately 15 million acres. The main mass of the peninsula lies between 161° and 168° west longitude, and 64 north latitude and the Arctic Circle (66° 30'N).

The Seward Peninsula encompasses a diversity of land features and climatic zones, with elevations ranging from sea level to 7,500 feet above sea level. Variety in elevation and topography create an array of environments and vegetation types ranging from high elevation alpine meadows to tidal-influenced marshlands.

Climate

The climate of the Seward Peninsula is continental, characterized by long severe winters with temperatures averaging -5° F to -20° F with extremes to -60° F. Summers are cool, windy and often wet along the coast. Inland is usually somewhat hotter and drier. Average summer temperatures range from 33° F to 61° F with extremes to 90° F.

Because of the northern latitudes of the Seward Peninsula, the change in amount of daylight from summer to winter is spectacular. At the Arctic Circle the "Midnight Sun" is seen on June 21 – summer solstice. However, at winter solstice – December 21, the sun does not rise above the horizon.

The mean annual precipitation varies from about 10 inches in the north to almost 20 inches in the south. The higher mountains receive over 40 inches. Over 60 percent of the precipitation falls as rain during three months of summer (June 15 to September 15). Average annual snowfall is from 40 inches on the northern parts of the peninsula to almost 60 inches in the south. Higher mountains receive in excess of 100 inches annually.

Winds are moderate to strong yearlong. Calm conditions occur only 5 to 15 percent of the time. Winter winds are stronger, with occasional fall winds up to 80 to 90 knots which cause coastal flooding, such as the storm that hit Nome on November 22, 1974. The winter winds also increase the chill factor close to -100° F at times (Scott 1982).

Location Map

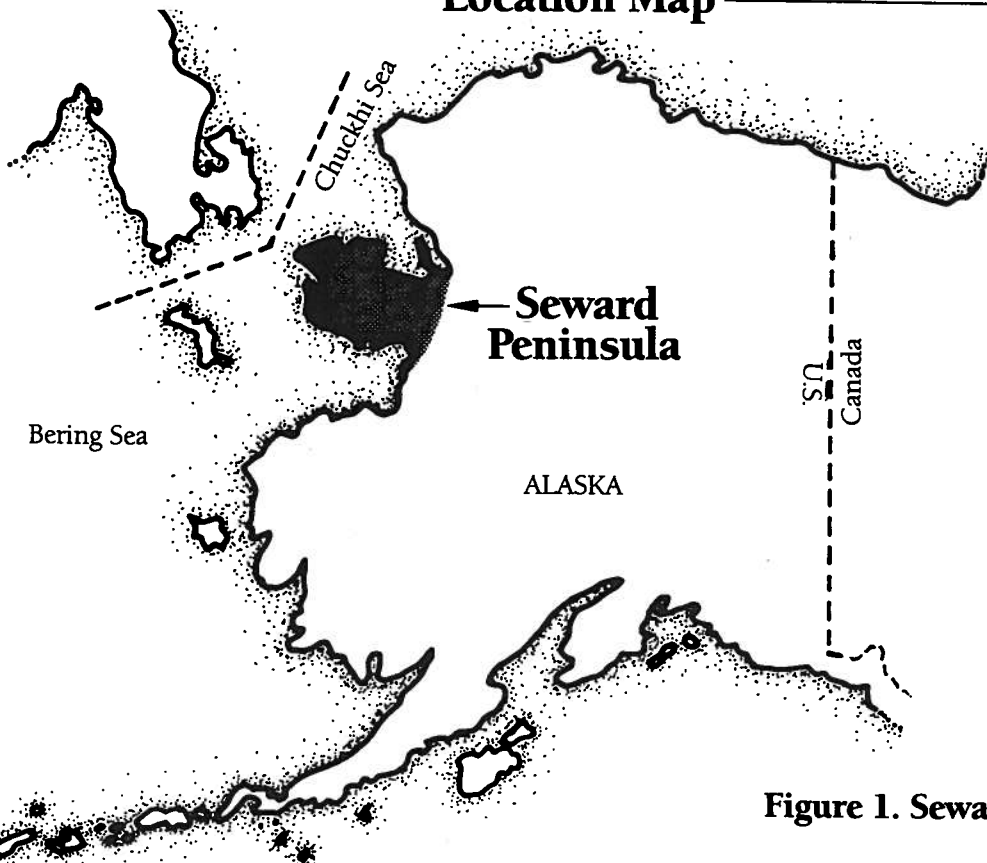


Figure 1. Seward Peninsula

Purpose

The purpose of this guide is to familiarize users with "ecological sites" on the Seward Peninsula. The guide can provide several kinds of information at various levels of detail. For example, the guide can provide:

1. general familiarity with the "typical" appearance of individual ecological sites. Photographs illustrate vegetation and landforms characteristic of each site. Where complexes of or transition zones between sites are shown on photographs, arrows indicate individual ecological sites represented.
2. non-technical narrative descriptions of ecological sites. These identify: landforms on which particular potential plant communities usually occur; plant species and annual productivity characteristic of each ecological site; and the value of the ecological site for reindeer grazing. Also included is: a list of plant species recognized in the ecological site; the composition, by weight, that each species represents; percent cover provided by forbs, shrubs, trees, lichens, water, rocks, etc.; and annual plant productivity.
3. maps showing location and distribution of ecological sites. (Refer to Appendix E, Index to map sheets.)
4. general correlations of specific ecological sites with particular soils. For more detailed soils information, refer to the Soil Survey of Seward Peninsula Area, Alaska; USDA-SCS (in publication).

An understanding of range terminology and survey procedures will help in using data presented here. For this reason, the following background discussions are provided.



**MATT ROBUS CHECKING CARIBOU GRAZING USE IN
THE SELEWIK HILLS.**

Part 2

RANGE TERMINOLOGY AND BACKGROUND

Ecological Sites and Successional Sequences

A main objective of the Seward Range Survey was to map and describe "ecological sites" in the study area. An "ecological site" is a distinctive kind of land that differs from other kinds of land in its ability to produce a characteristic potential plant community. Ecological sites are inclusive of range sites, woodland sites and riparian sites. Ecological sites are unique, mapable divisions on the landscape which are used for resource management. An ecological site is generally characterized by specific soils, topography, precipitation, temperatures, and other physical conditions. The combination of physical conditions, typical of the site, results in the potential to support particular plant and animal communities. For example, on the Seward Peninsula, white spruce forests typically develop on relatively warm well-drained soils on level or south-facing terrain below 2,500 feet in elevation; so lands with such conditions would be mapped as one kind of forested "ecological site."

When an ecological site is cleared, for example by fire, plant and associated animal communities reappear in "successional" sequence; that is, one "seral" community after another develops on the site in a predictable orderly pattern that eventually produces the potential natural community typical of that site. In reality, succession is neither as predictable nor orderly as often believed, but the concept is nonetheless invaluable in assessing the possible consequences of various management activities or disturbances, such as fire or over-grazing on particular sites. Figures 2 and 3 display several possible successional sequences found on the Seward Peninsula after fire in the taiga (forest) and tundra.

The "natural potential" community produced by succession represents a combination of plants and animals well adapted to long-term, self-perpetuating survival and reproduction on the site. Climax communities, however, are not static; they change in response to the physical conditions that affect them. One year, for example, the growing season may provide optimum sunlight, and seed productivity in a community may be high. Both plant productivity and plant abundance will be affected. In another year, excessive rainfall may depress seed production, alter plant species abundance, lower availability of animal foods, and reduce animal populations.

Despite natural fluctuations, potential (and seral) communities can be recognized by characteristic community structures, associations of species and thus they can be

mapped. Likewise, lands physically capable of producing particular communities, that is ecological sites, can be recognized and mapped. Ecological sites represent differences in potential; that is, differences in their capabilities to respond to management and to support plants and habitats for animals. Knowing the kinds and locations of ecological sites in an area is invaluable in land-use planning.

Figure 2 shows some of the many paths of revegetation that have been observed following fire in interior Alaska. The original preburn forest type is shown on the bottom row of boxes. The thickness of the line is related to how commonly each of the revegetation sequences occurs. Thus, black spruce is usually replaced directly by other stands of black spruce but occasionally is replaced by aspen or birch. Aspen stands, usually on warm dry sites, are most often replaced by other aspen stands but occasionally are revegetated by birch or a grass meadow after fire. Eventually, with a long period without fire, the aspen stands are invaded by white spruce or occasionally black spruce. The climax vegetation on well-drained sites is white spruce and on cold wet sites black spruce, often with an alternating bog cycle. (Viereck and Schandelmeier 1980).

Most of the plant communities mapped during this inventory are "natural potential" or "climax" communities. A few of the mapped communities, however, such as Forest (burned) and Tundra (burned), are seral stages. Seral communities are mapped instead of the natural potential community where it is anticipated that 20 or more years will be required for significant changes to occur in terms of the plant community present.

An ecological site has several components, such as soils, climate and vegetation. Although these can be examined individually, each influences and is influenced by all others. Because components are interrelated, a change in one, either natural or manmade, generally causes changes in others. All major components making up ecological sites were examined during the survey: soils, vegetation, animals, climate, and physiography. As noted above, many of these are discussed in this report. Information on components not included here, i.e. wildlife and climate, can be obtained from Range Conservationists at the Anchorage office of the SCS. In addition, SCS personnel can provide more detailed information on components that are discussed, and can help in interpreting and applying survey data.

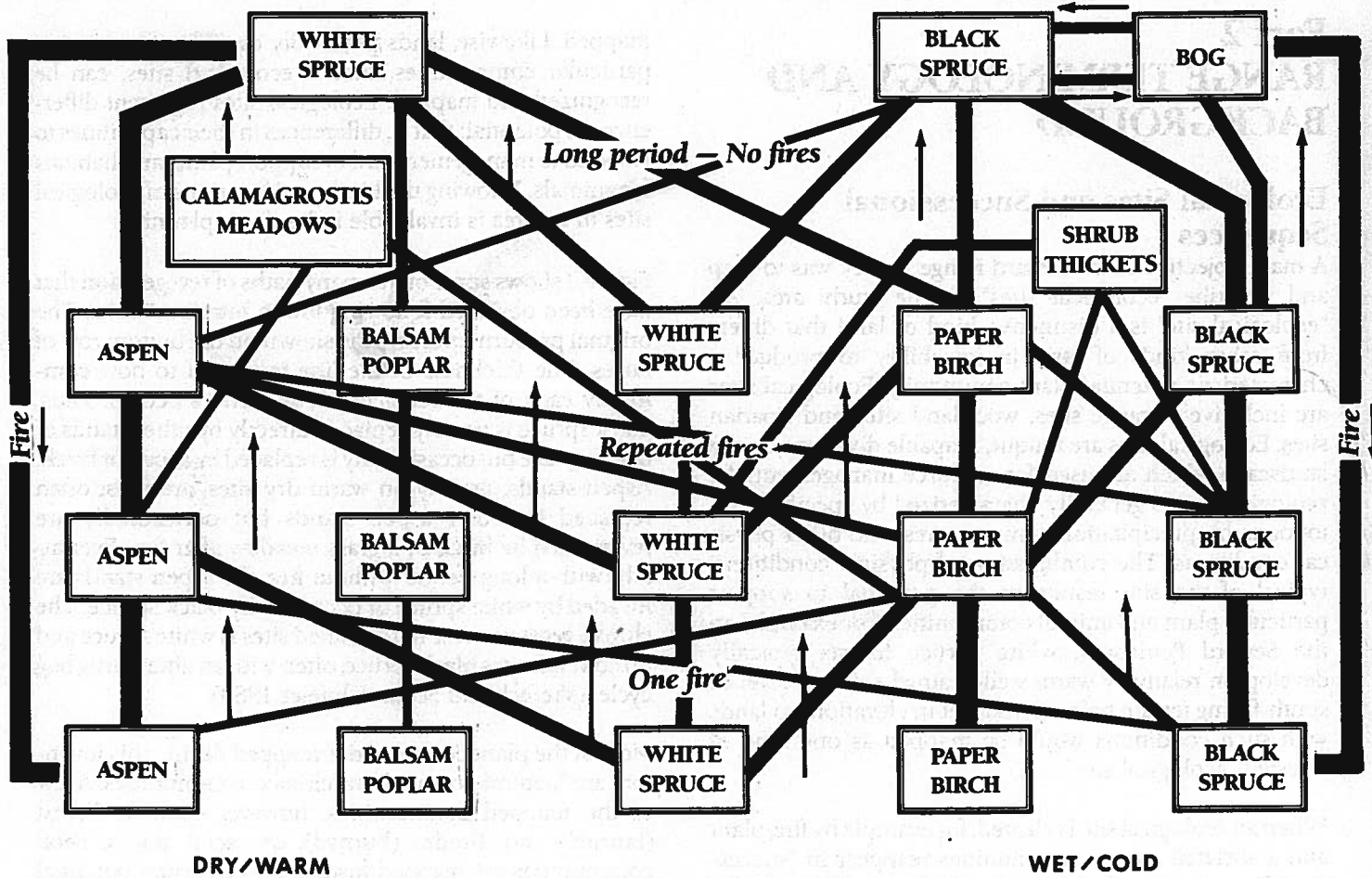


Fig. 2
Patterns of forest succession after fire

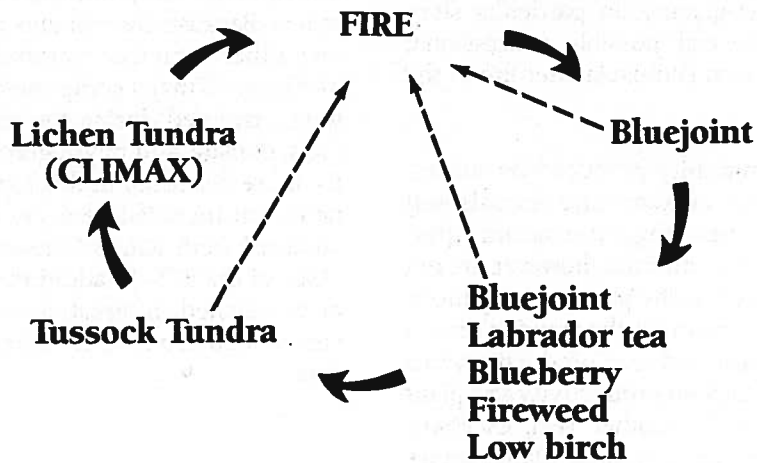


Fig. 3
Patterns of tundra succession following fire in Alaska (Vioreck and Schandelmeier 1980).



**SCS RANGE CONSERVATIONISTS MARK KINNEY
AND CALVIN STEELE COLLECTING VASCULAR
PLANT ANNUAL HERBAGE PRODUCTION DATA
ON ECOLOGICAL SITE NO. 41, SHRUB MEADOW
MOUNTAIN.**

Part 3

IMPORTANCE OF LICHENS

Lichens In Range Management

Approximately 15% of the earth's land surface is covered by tundra; broad treeless areas dominated by prostrate shrubs, short-stemmed herbaceous perennials, lichens, and mosses (Billings 1973).

The lichens are extremely important in upland portions of tundra systems, where they form extensive mats utilized by reindeer and caribou as winter food. In winter, when little deciduous browse can be found, lichens represent virtually the only high energy forage available on arctic ranges, and may constitute as much as 60-80% percent of reindeer or caribou diet (Pegau 1968).

The reindeer lichens (*Cladina spp.*) are the most important of the lichens because of their high palatability and abundance. The iceland lichens (*Cladonia and Cetraria spp.*) are also very palatable, but are not as abundant. Also of importance for winter food are the arboreal lichens in the forested areas. Arboreal lichens, such as the *Usneae* and *Alectoriae*, may make substantial contributions to the winter diet of reindeer and barren-ground caribou, particularly under severe weather conditions (Edwards 1960).

Reindeer have the extraordinary ability to locate and excavate lichens even where these food sources are buried under a snow cover of two feet or more. However, reindeer do not thrive under these conditions—actually the very low protein (2-3% dry matter), ash (2% dry matter), and fat (1-5% dry matter) content and the high crude fiber (45% dry matter) of the lichens cause reindeer to lose considerable body substance, although not necessarily body weight, during prolonged winter grazing on lichens (Luick 1977).

Competition for grazing on winter lichen ranges is very low, but environmental hazards may limit lichen availability. Massive caribou die-offs have resulted when early spring rains have frozen and formed an impenetrable crust of ice on top of the snow, making lichens totally unavailable (Luick 1977).

Lichen Adaptations

The arctic tundra, a heat-limiting ecosystem with cold, long winters and cool, short summers, contains fewer plant species than other terrestrial ecosystems. The uniqueness of arctic vegetation lies in the fact that these plants are physiologically adapted to metabolize, grow, and reproduce under relatively low temperatures (Billings & Mooney 1968). Furthermore, arctic vegetation is exposed to lengthy periods of darkness, frost, and snow cover, and the abrasive influence of winds characteristic of arctic regions (Kappen 1973).

Lichens are an important primary producer inhabiting arctic tundra. The abundance of lichens in harsh arctic environments is partly due to their opportunistic adaptations, permitting them to take advantage of temporary, favorable conditions for nutrient assimilation (Bliss 1971). Crustose lichens can be found growing on rock outcrops on which only a trace of mineral soil has accumulated, although growth is very slow and sporadic. Lichens can also endure prolonged desiccation even to the point of becoming brittle. Shortly after rainfall begins, however, enough water is imbibed to permit photosynthesis; and even high relative humidity can reactivate desiccated thalli. Furthermore, lichens have a high resistance to freezing and are able to survive long periods of inactivity while frozen (Kappen 1973). In addition, lichens are long-lived perennials (Beschel 1961), and the scarcity of vascular plant competitors allows the slow-growing lichens to persist for long periods of time if undisturbed (Kappen 1973).

Lichen Succession

In many arctic environments, lichen-rich plant communities represent the end-product of undisturbed succession. Because of their very slow growth rates, lichen species are highly sensitive to disturbance. Disturbances such as fire, overgrazing, or trampling can severely damage or destroy lichens. The time required for lichens to re-establish after a disturbance varies widely and depends on climate, severity and type of disturbance, original vegetation present, soil conditions, etc. In general, however, re-establishment of lichens takes many years.

Many lichens are particularly sensitive to fires. In the arctic, good lichen growth is often dependent on the presence of a thick organic mat on the soil surface; and the most palatable lichen species are generally found growing on such mats. Because of their ability to assimilate nutrients stored in this organic layer, these lichens can compete successfully with vascular plants where such an organic layer develops. Vascular plants, unlike lichens, generally grow better rooted in mineral soils. On many arctic rangelands, permafrost prevents root penetration into the mineral soil layer and confines root growth to the organic material on the surface; this produces conditions more favorable to lichens than to vascular plants. If the organic layer is burned or otherwise destroyed, lichens can no longer survive. After fire, lichens on some sites require over 50 years to become as abundant and productive as they were before being burned (Vioreck and Schandelmeier 1980). Figure 4 indicates years required for selected lichen species to recover after fire.

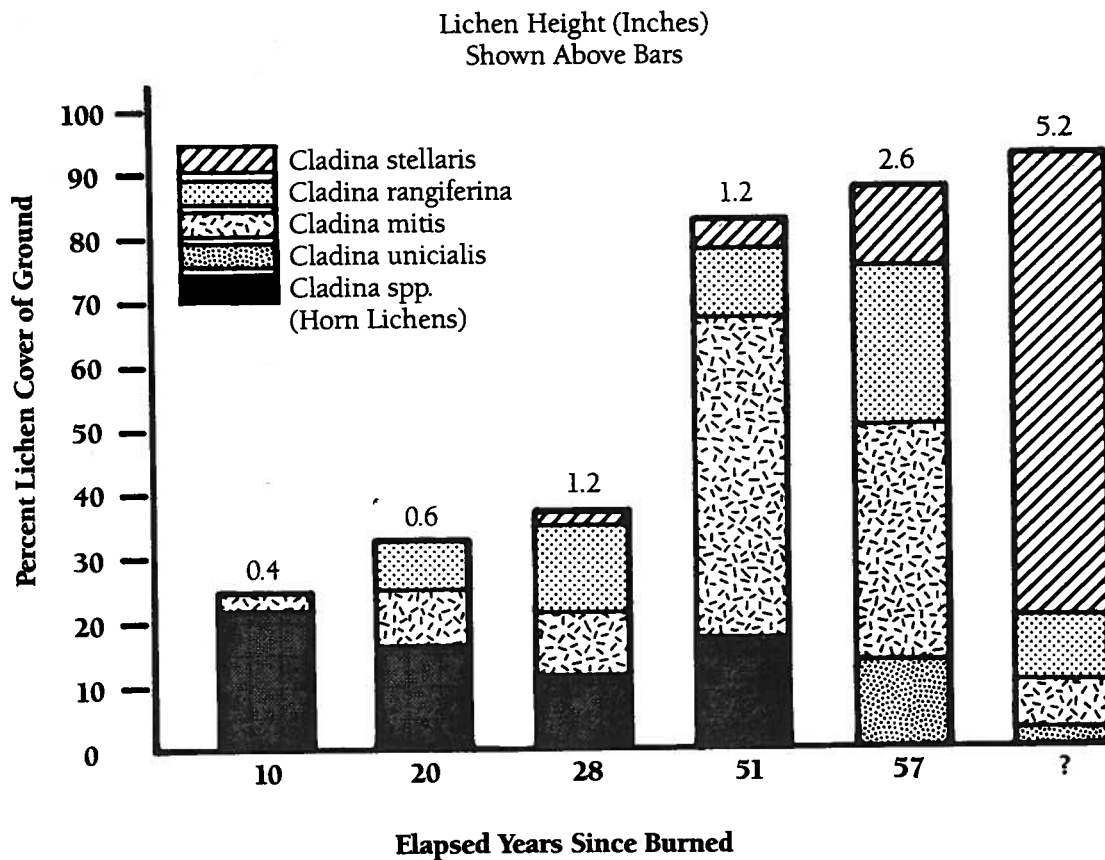


Figure 4
Succession of Reindeer Lichen
on Lichen Woodland Sites Following
Destruction by Fire.



RANGE SNOW SURVEY SPRING CAMP

Part 4

RANGELAND INVENTORY IN THE ARCTIC

Survey Procedures

Few comprehensive studies have been made of plant communities or succession on the entire Seward Peninsula. This survey constitutes the most detailed effort to date to measure and map plant communities and ecological sites in the area. The survey was designed to: 1) describe and map ecological sites; 2) collect vegetation information useful in estimating initial reindeer stocking rates; and 3) provide other specific baseline information useful for developing comprehensive range management programs.

Inventory procedures were developed for a remote and relatively inaccessible region of Alaska. To do this, a 4-person crew tested various inventory and mapping techniques at the start of the survey, and selected those which seemed most appropriate, considering survey objectives and working conditions. Once inventory activities were initiated, a 4-person crew surveyed 2-3 million acres each summer during the 6-8 week field season. Survey procedures were refined during the 5 years of field work. Procedures used during the study are described in more detail (Swanson, et al 1983).

The Seward Peninsula Range Survey was conducted in five phases:

1. **Planning.** Using 1:250,000-scale topographic maps, the crew divided the survey area into physiographic units following procedures outlined in George and Scorup (1981). False-color infrared aerial photography, at a scale of 1:60,000, was then used to identify plots for reconnaissance and field identification of ecological site categories.

2. **Reconnaissance.** In the field, crew members examined plots considered representative of each kind of ecological site. They recorded visual estimates of plant community composition and production, range condition, fire history, and grazing intensity.

3. **Mapping.** From the information obtained from field reconnaissance, the crew delineated ecological sites on the 1:60,000-scale color-infrared aerial photography covered with transparent overlays. The minimum area delineated during mapping was 160 acres. Areas smaller than 160 acres were combined with larger map units and recorded as inclusions. Where two ecological sites can be identified and delineated separately but their use and management are similar, they are combined and mapped as a undifferentiated map unit. Undifferentiated map units consist of two or three major ecological sites that are combined because their use and management are the same or very

similar for common uses. The undifferentiated map unit is used to help the map user by reducing the number of map units with the same interpretations in the survey. The major ecological sites are generally large enough to be separated at the scale of mapping used and they have no regular pattern.

Complexes, however, are map units that consist of areas of two or three ecological sites, that are in a *regularly repeating pattern*, so intricate that the components cannot be delineated separately at mapping scales of 1:60,000. The proportions and patterns of the major ecological sites are relatively consistent in most delineations of the map unit.

4. **Inventory.** From among those delineations, mapped as representing a particular ecological site, production plots were randomly selected for field sampling. The number selected depended on the number of acres of a particular ecological site found in the survey area, time, and statistical error acceptable. Field measurements were made of plant species composition and cover; annual plant productivity¹; lichen biomass, live lichen biomass, and height; moss biomass; and tree species diameter, height, and cover. In addition, a soil scientist collected soils data and mapped the soils of the Seward Peninsula.

5. **Verification.** The crew traversed pre-established transects to determine the accuracy of the ecological site map within the area flown. Estimates were then made of overall mapping accuracy.

Statistical Analysis

The intensity for sampling herbage production was designed for the key vegetation component of each ecological site. Sampling was designed to provide estimates of production at predetermined levels of reliability.

The herbage production, mean, standard error of the mean, and the confidence limits have been calculated for each site.

Ecological sites, producing more than 150 lbs/ac (air dry) of live lichen biomass, were considered to have significant quantities of lichens for use by reindeer during the winter grazing season. Lichens were designated as the key component, regardless of the vascular plant composition and production. For any particular ecological site, we can say that the total herbage production mean will fall within the range with 70 percent reliability.

¹Annual growth of vascular plants is measured and production estimates are calculated using a double sampling method (refer to Range Survey Procedures Manual 1983). Annual growth of lichens is not measured due to lack of information on lichen growth; therefore lichen production and composition are separated from vascular plant production and composition.

There is no statistical reliability for moss biomass data, due to the limited number of samples obtained. Moss biomass sampling procedures were not completely developed and implemented until 1980. The Moss Biomass data is presented to provide users with a very general concept of moss species, composition, and total biomass (average and range) of data collected from plots that were sampled. Moss cover data, however, was collected consistently throughout the survey and should provide adequate information for various ecological interpretations.



BUCKLAND VILLAGE CHILDREN

Part 5

ECOLOGICAL SITE DESCRIPTIONS

ison of the ecological site name, with the 1982 revision of preliminary classification for vegetation of Alaska, are referred to Appendix C.

Site Description

Thirty-nine ecological sites have been recognized on the Seward Peninsula. The site descriptions list the potential vegetation by species, their percent by average annual production, and the total average annual production. Each site description represents relatively undisturbed pristine vegetation. Users may encounter minor variations of the typical site description when on the land, working with, or observing ecological sites. It will be necessary for users to recognize the cause of the variation. Variations may occur from such factors as fire, grazing and off-road traffic; or the variation may be a result of environmental factors, such as minute changes in soils or micro-environment. When making ecological interpretations, it is important to recognize the source of the variation to the ecological site description.

Reindeer Grazing Interpretations

Each ecological site description has a brief interpretation value for reindeer grazing. The interpretation identifies the best season of use and provides general grazing information for each site. Suitability for season of use was determined quantitatively. By assigning values of high, moderate and low preferred reindeer forage plants; multiplying these values by the appropriate species annual herbage production; an index value has been developed.

Using Ecological Site Descriptions

The following section provides information on 39 ecological sites identified and mapped on the Seward Peninsula. The schematic represents geographical relationships of the ecological sites as they occur on the landscape (Fig. 5).

Mapping Units

In this survey the mapping units represent the present and potential vegetation in all mapping units except 90 and 91. Mapping units 90 and 91 are seral plant communities. Disturbance by fire has caused the vegetation to be different than it was in the potential. Many years of plant succession will be required for the plant community to again reach potential.

How To Use The Legend

Table 1 identifies the mapping unit code number and the ecological code number and name. Each standardized code number and name will appear consistently throughout the report when referring to any particular mapping unit or ecological site. Mapping units 90 and 91 are the only seral plant communities mapped. Users needing a compar-

Figure 5

General Ecological Site Sequence on the Seward Peninsula

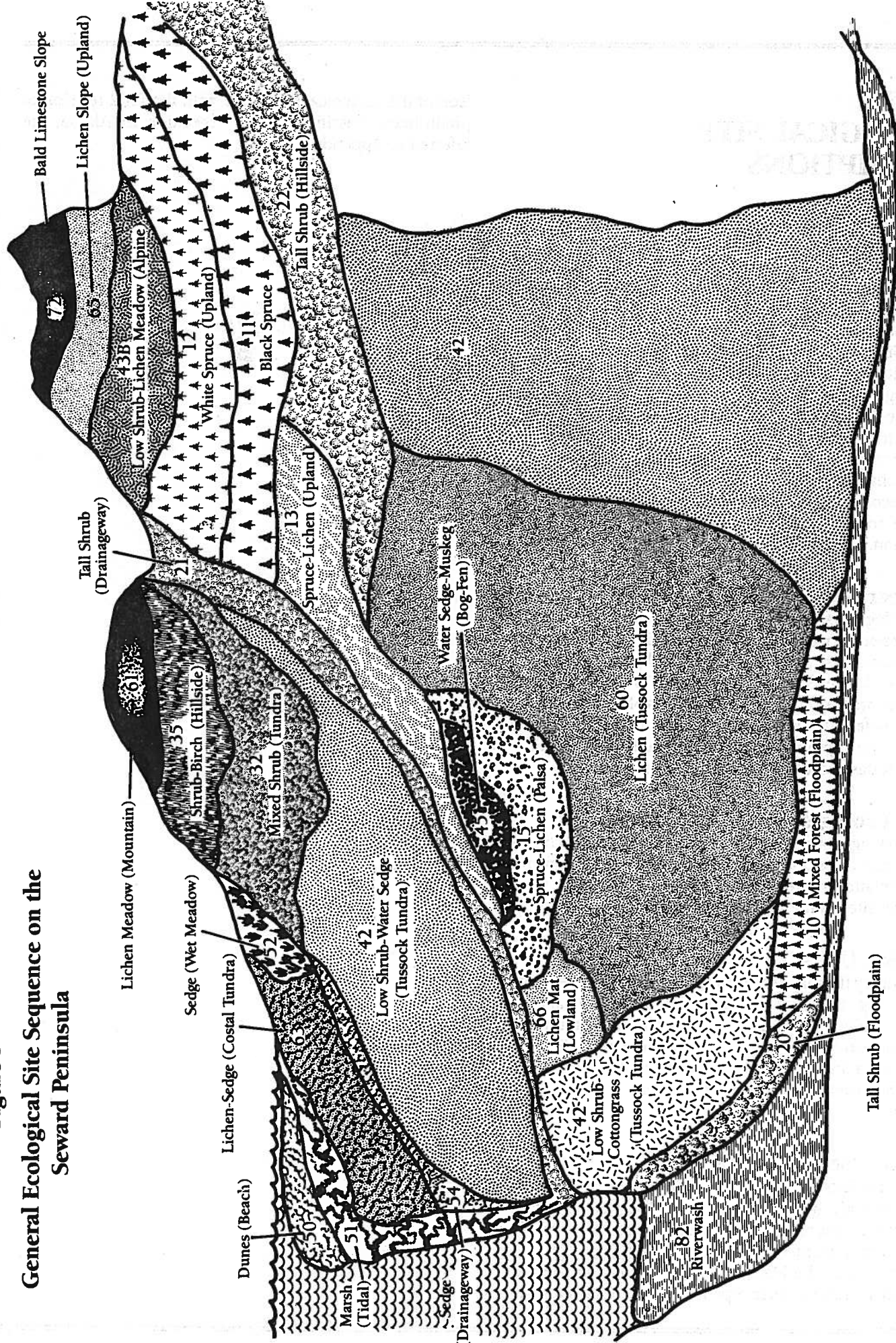


TABLE 1

Mapping Units and Ecological Site Legend

Physiognomy	Mapping Unit		Ecological Site	
	Code Number	Name	Code Number	Name
Water	4	Lagoon ¹		
	5	Ocean ¹		
Trees	10	Mixed Forest (Floodplain)	10	Mixed Forest (Floodplain)
	11	Black Spruce	11	Black Spruce
	12	White Spruce (Upland)	12	White Spruce (Upland)
	13	Spruce-Lichen (Upland)	13	Spruce-Lichen (Upland)
	14	Paper Birch (Upland)	14	Paper Birch (Upland)
Tall Shrub	15	Spruce-Lichen (Palsa)	15	Spruce-Lichen (Palsa)
	20	Tall Shrub (Floodplain)	20	Tall Shrub (Floodplain)
	21	Tall Shrub (Drainageway)	21	Tall Shrub (Drainageway)
Low Shrub	22	Tall Shrub (Hillside)	22	Tall Shrub (Hillside)
	32	Mixed Shrub (Tundra)	32	Mixed Shrub (Tundra)
	34	Low Shrub (Floodplain)	34	Low Shrub (Floodplain)
	35	Low Shrub (Hillside) (Undifferentiated) (35A and/or 35B)	35A 35B	Shrub-Birch (Hillside) Shrub-Willow (Hillside)
Low Shrub/ Herbaceous	41	Shrub Meadow (Mountain)	41	Shrub Meadow (Mountain)
	42	Tussock Tundra (Undifferentiated) (42A and/or 42B)	42A	Low Shrub-Water Sedge (Tussock Tundra)
			42B	Low Shrub-Cottongrass (Tussock Tundra)
	43	Alpine Mountain Meadow (Complex)	43A	Low Shrub-Sedge Meadow (Alpine)
			43B	Low Shrub-Lichen Meadow (Alpine)
	44	Shrub-Lichen (Upland)	44	Shrub-Lichen (Upland)
	45	Water Sedge-Muskeg (Bog-Fen)	45	Water Sedge-Muskeg (Bog-Fen)
Herbaceous	50	Dunes (Beach)	50	Dunes (Beach)
	51	Marsh (Tidal)	51	Marsh (Tidal)
	52	Sedge (Wet Meadow)	52	Sedge (Wet Meadow)
	54	Sedge (Drainageway)	54	Sedge (Drainageway)
	55	Cottongrass-Water Sedge (Low Center Polygons)	55	Cottongrass-Water Sedge (Low Center Polygons)
			56A 56B	Grass (Breached Lake Bed) Sedge (Breached Lake Bed)
	56	Breached Lake Bed (Undifferentiated) (56A and/or 56B)	56A 56B	Grass (Breached Lake Bed) Sedge (Breached Lake Bed)
57	Sedge (Wet Lake Bed)	57	Sedge (Wet Lake Bed)	

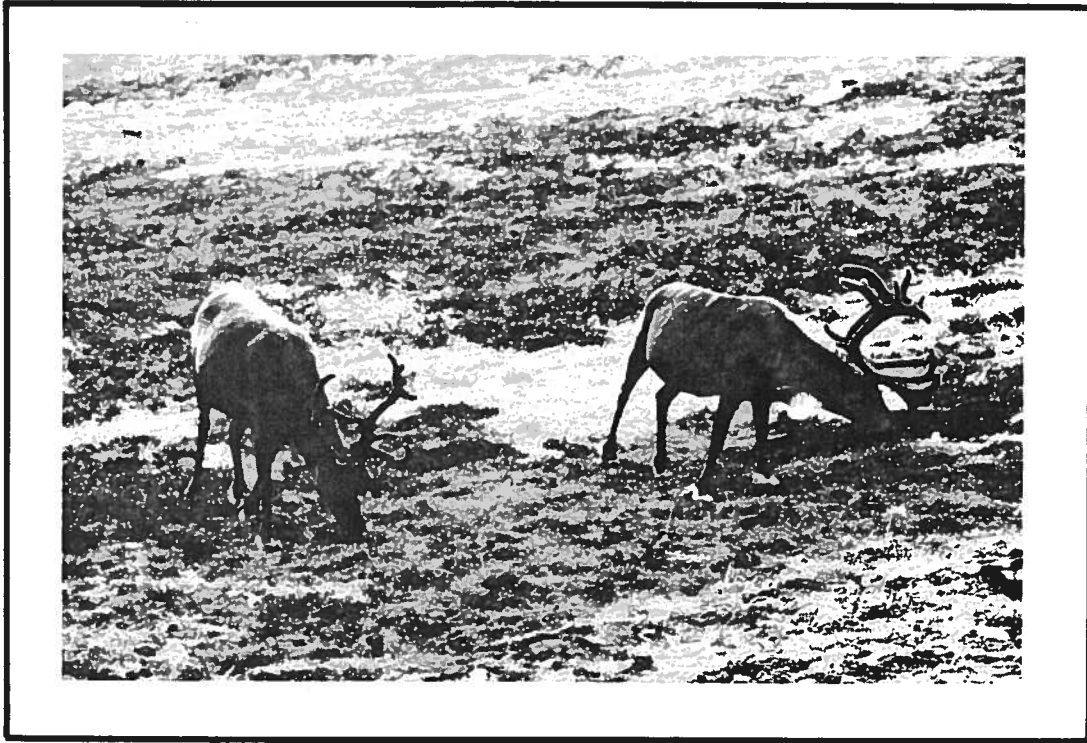
¹Not an ecological site; refer to miscellaneous mapping descriptions p.64.

²Seral communities of ecological sites.

Physiognomy	Mapping Unit		Ecological Site	
	Code Number	Name	Code Number	Name
Herbaceous (Mat)	60	Lichen (Tussock Tundra)	60	Lichen (Tussock Tundra)
	61	Lichen Meadow (Mountain)	61	Lichen Meadow (Mountain)
	63	Lichen-Sedge (Coastal Tundra)	63	Lichen-Sedge (Coastal Tundra)
	64	Lichen-Sedge Meadow (Upland)	64	Lichen-Sedge Meadow (Upland)
	65	Lichen Slope (Upland)	65	Lichen Slope (Upland)
	66	Lichen Mat (Lowland Tundra)	66	Lichen Mat (Lowland Tundra)
Mat and Cushion	70	Lichen Granitic Slope (Alpine)	70	Lichen Granitic Slope (Alpine)
	71	Dryas Limestone Slope	71	Dryas Limestone Slope
	72	Bald Limestone Slope	72	Bald Limestone Slope
	74	Dryas-Lichen (Ridges)	74	Dryas-Lichen (Ridges)
Miscellaneous	80	Lava Bed ¹		
	81	Barren ²		
	82	Riverwash	82	Riverwash
	90	Burned Forest ²		
	91	Burned Tundra ²		

¹Not an ecological site; refer to miscellaneous mapping descriptions p. 64.
²Seral communities of ecological sites.

ECOLOGICAL SITES



ECOLOGICAL SITE NO. 10
NAME: MIXED FOREST (FLOODPLAIN)

Physical Characteristics

FEATURES – This site occurs on alluvial river bottoms, broad vegetated floodplains, and valleys on old river meanders.

VEGETATION – The overstory is dominated by white spruce (*Picea glauca*), with scattered stands of balsam poplar (*Populus balsamifera*). The understory is mainly littletree and diamondleaf willows (*Salix spp.*), bluejoint (*Calamagrostis canadensis*), and field horsetail (*Equisetum arvense*).

VEGETATION PRODUCTION (Air Dry) – White spruce average 10 inches d.b.h., about 40 feet in height, and 140 years old. Trees suitable for house logs may be found in some areas. Grasses and grasslikes comprise 20 percent, forbs 25 percent, and shrubs 55 percent of the vegetative production. Annual vascular plant production is 875 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for summer range. Main forage plants are willows, succulent forbs, and grasses. Herding would be a problem because of dense brush cover and large numbers of insects.



Shrubs/Woody (55%)	Percent
Alnus crispa . . . . .	.2
Betula glandulosa . . . . .	.5
Empetrum nigrum . . . . .	.3
Rosa acicularis . . . . .	.3
Salix alaxensis . . . . .	.3
Salix arbusculoides . . . . .	.19
Salix planifolia . . . . .	.9
Vaccinium uliginosum . . . . .	.6
Others . . . . .	.5

Live Lichen Biomass (0%) **Percent**

Moss/Clubmoss Biomass (100%)	Percent
Dicranum spp	T
Hylocomnium spp . . . . .	.86
Hypnum spp	T
Pleurozium spp	T
Polytrichum spp . . . . .	.14

Average Cover (percent)

Tree	6-12	Moss	12-25
Shrub	12-25	Litter	25-50
Forb	6-12	Bare Ground	0-6
Grass/grasslikes	12-25	Rock	0-6
Lichen	0-6	Water	0-6

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 630-1120
 - Average 875
- b. Live Lichen Biomass
 - 0
 - 0
- c. Moss/Clubmoss Biomass*
 - Range 1730-2590
 - Average 2160

Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (20%)	Percent
Calamagrostis canadensis . . . . .	.16
Others . . . . .	.4

Forbs/Miscellaneous (25%)	Percent
Equisetum arvense . . . . .	.13
Galium boreale . . . . .	.3
Rubus arcticus . . . . .	.2
Others . . . . .	.7

*Represents the range of data collected.

ECOLOGICAL SITE NO. 11

NAME: BLACK SPRUCE

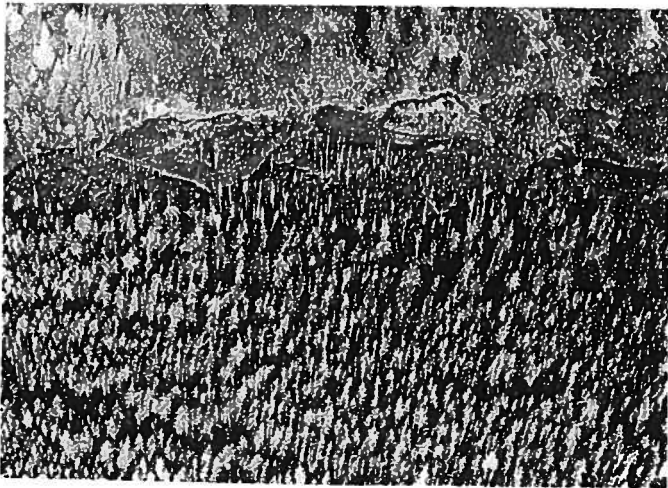
Physical Characteristics

FEATURES – This site occurs on the lower portion of hills and mountains, as well as in valleys, in forested regions.

VEGETATION – The overstory is dominated by a sparse stand of black spruce (*Picea mariana*) with an understory of bog blueberry (*Vaccinium uliginosum*), blackberry (*Empetrum nigrum*), and salmonberry (*Rubus chamaemorus*). Sedges (*Carex spp.*) and some lichens (*Cladina spp.*) are also quite common on this site.

VEGETATION PRODUCTION (Air Dry) – Black spruce, average 5 inches d.b.h., 27 feet in height and 90 years old. The understory is predominantly grasses and shrubs. Grasses and grasslikes comprise 25 percent, forbs 20 percent, and shrubs 55 percent of the vegetative production. Annual vascular plant production is 460 lb/ac. Live lichen biomass is 435 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range and should be used during early winter before deep snow accumulates. Lichens become very brittle during drier periods and can be damaged by trampling. Herding is difficult because of lodged black spruce throughout the site.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (25%)	Percent
<i>Calamagrostis canadensis</i> . . . . .	.1
<i>Carex spp.</i> . . . . .	.24

Forbs/Miscellaneous (20%)	Percent
<i>Equisetum arvense</i> . . . . .	.2
<i>Petasites frigidus</i> . . . . .	.2
<i>Rubus chamaemorus</i> . . . . .	.16

Shrubs/Woody (55%)	Percent
<i>Betula nana</i> . . . . .	.4
<i>Empetrum nigrum</i> . . . . .	.12
<i>Ledum decumbens</i> . . . . .	.8
<i>Salix planifolia</i> . . . . .	.8
<i>Vaccinium uliginosum</i> . . . . .	.20
<i>Vaccinium vitis-idaea</i> . . . . .	.2
Others . . . . .	.1

Live Lichen Biomass (100%)	Percent
<i>Cetraria islandica</i> . . . . .	.16
<i>Cladina arbuscula</i> . . . . .	.8
<i>Cladina rangiferina</i> . . . . .	.27
<i>Cladina stellaris</i> . . . . .	.15
<i>Cladonia elongata</i> . . . . .	.30
<i>Cladonia spp.</i> . . . . .	.3
Others . . . . .	.1

Moss/Clubmoss Biomass (100%)	Percent
<i>Hylocomnium spp.</i> . . . . .	.51
<i>Pleurozium spp.</i> . . . . .	.7
<i>Sphagnum spp.</i> . . . . .	.42

Average Cover (percent)			
Tree	12-25	Moss	25-50
Shrub	25-50	Litter	6-12
Forb	6-12	Bare Ground	0-6
Grass/grasslikes	12-25	Rock	0-6
Lichen	6-12	Water	0-6

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	410-510
Average	460
b. Live Lichen Biomass	
	60-810
	435
c. Moss/Clubmoss Biomass*	
Range	670-3920
Average	1930

*Represents the range of data collected.

ECOLOGICAL SITE NO. 12
NAME: WHITE SPRUCE (UPLAND)

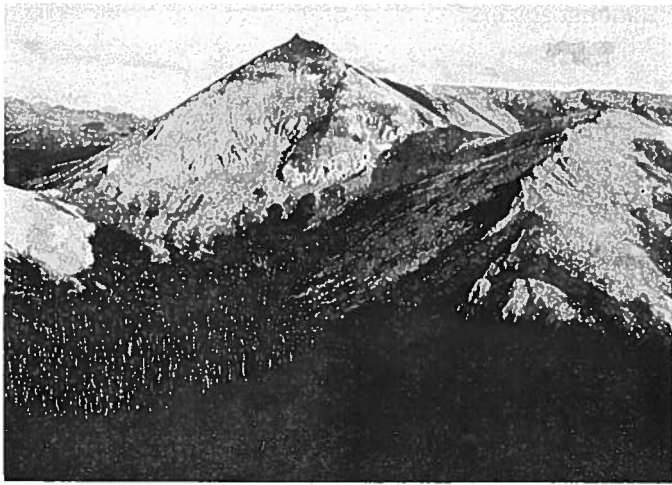
Physical Characteristics

FEATURES – This site occurs on mountainsides, and in the upper elevations of mountain valleys.

VEGETATION – Dense stands of white spruce (*Picea glauca*) dominate the overstory. The understory consists primarily of green alder (*Alnus crispa*), and diamondleaf willow (*Salix planifolia*).

VEGETATION PRODUCTION (Air Dry) – White spruce average 8 inches d.b.h., about 33 feet in height and 142 years old. Trees suitable for house logs may be found in some areas. Grasses and grasslikes comprise 10 percent, forbs 15 percent, and shrubs 75 percent of the vegetative production. Annual vascular plant production is 1070 lb/ac.; over 50 percent of the annual production is composed of alder (*Alnus spp.*) and willows (*Salix spp.*). Live lichen biomass yields 135 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for summer range. The most important forages are willows and forbs. A dense brush understory and lodged white spruce throughout the site makes herding very difficult.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (10%)	Percent
Calamagrostis canadensis . . . . .	.5
Carex bigelowii . . . . .	.2
Carex podocarpa . . . . .	.2
Others . . . . .	.1

Forbs/Miscellaneous (15%)	Percent
Equisetum arvense . . . . .	.4
Equisetum sylvaticum . . . . .	.2
Rubus arcticus . . . . .	.2
Others . . . . .	.7

Shrubs/Woody (75%)	Percent
Alnus crispa . . . . .	.29
Cassiope tetragona . . . . .	.2
Dryas integrifolia . . . . .	.5
Empetrum nigrum . . . . .	.6
Salix planifolia . . . . .	.19
Vaccinium uliginosum . . . . .	.5
Others . . . . .	.9

Live Lichen Biomass (100%)	Percent
Cetraria cucullata . . . . .	.9
Cetraria islandica . . . . .	.26
Cladina mitis . . . . .	.5
Cladina stellaris . . . . .	.2
Cladonia gracilis . . . . .	.6
Cladonia spp . . . . .	.41
Thamnolia subuliformis . . . . .	.2
Others . . . . .	.9

Moss/Clubmoss Biomass (100%)	Percent
Dicranum spp . . . . .	.2
Hylocomnium spp . . . . .	.37
Hypnum spp . . . . .	.10
Lycopodium spp . . . . .	.24
Pleurozium spp . . . . .	.6
Polytrichum spp . . . . .	.5
Others . . . . .	.16

Average Cover (percent)			
Tree	12-25	Moss	25-50
Shrub	25-50	Litter	25-50
Forb	6-12	Bare Ground	0-6
Grass/grasslikes	6-12	Rock	0-6
Lichen	6-12	Water	0-6

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 910-1230
 - Average 1070
- b. Live Lichen Biomass
 - 60-210
 - 135
- c. Moss/Clubmoss Biomass*
 - Range 200-1510
 - Average 740

*Represents the range of data collected.

ECOLOGICAL SITE NO. 13

NAME: SPRUCE-LICHEN (UPLAND)

Physical Characteristics

FEATURES – This site occurs on the lower portions of mountains and alluvial fans, and on floodplains.

VEGETATION – Scattered stands of white spruce (*Picea glauca*) dominate the overstory canopy. An understory composed of bog blueberry (*Vaccinium uliginosum*), blackberry (*Empetrum nigrum*), and a dense, highly productive mat of reindeer lichen (*Cladina arbuscula*, *C. rangiferina*, and *C. stellaris*) dominate the vegetation.

VEGETATION PRODUCTION (Air Dry) – White spruce average 8 inches d.b.h., 30 feet in height, and 140 years old. Small stands of black spruce (*Picea mariana*) may be found in some locations. The understory is composed mainly of shrubs and lichens. Grasses and grasslikes comprise 5 percent, forbs 5 percent, and shrubs 90 percent of the vegetative production. Annual vascular plant production is 325 lb/ac. Live lichen biomass is 2445 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range because of the abundant high quality lichen forage it produces. Lichens become very brittle during drier periods of the year and can be quickly depleted by trampling. This site is good winter range providing snow conditions do not restrict grazing. It provides good reindeer feed, water, and materials for corrals, fences, and cabins. There is adequate fire wood on this site. Trees and scattered shrubs provide cover for reindeer; however, predators typically are a problem for reindeer grazing this site during the winter months. An additional 300 lb/ac (air/dry) of aboreal lichens (*Alectoria* and *Usnea spp.*) occur in the lower 10 feet of the tree and are available for winter feed if necessary.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (5%)	Percent
Carex bigelowii . . . . .	.1
Festuca altaica . . . . .	.4

Forbs/Miscellaneous (5%)	Percent
Rubus chamaemorus . . . . .	.3
Others . . . . .	.2

Shrubs/Woody (90%)	Percent
Alnus crispa . . . . .	.2
Betula nana . . . . .	.6
Empetrum nigrum . . . . .	.22
Ledum decumbens . . . . .	.7
Salix arbusculoides . . . . .	.5
Vaccinium uliginosum . . . . .	.37
Vaccinium vitis-idaea . . . . .	.3
Others . . . . .	.8

Live Lichen Biomass (100%)	Percent
Cetraria islandica . . . . .	.5
Cladina arbuscula . . . . .	.17
Cladina mitis . . . . .	.4
Cladina rangiferina . . . . .	.39
Cladina stellaris . . . . .	.29
Cladonia gracilis . . . . .	.2
Others . . . . .	.4

Moss/Clubmoss Biomass (100%)	Percent
Hylocomnium spp . . . . .	.6
Lycopodium spp . . . . .	.13
Sphagnum spp . . . . .	.81

Average Cover (percent)			
Tree	12-25	Moss	6-12
Shrub	25-50	Litter	0-6
Forb	0-6	Bare Ground	6-12
Grass/grasslikes	0-6	Rock	0-6
Lichen	25-50	Water	0-6

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 250-400
 - Average 325
- b. Live Lichen Biomass
 - 1880-3010
 - 2445
- c. Moss/Clubmoss Biomass*
 - Range 320-2090
 - Average 850

*Represents the range of data collected.

**These are ground lichens; tree lichen average biomass is 300 lb/ac making a total of 2745 lb/ac.

ECOLOGICAL SITE NO. 14

NAME: PAPER BIRCH (UPLAND)

Physical Characteristics

FEATURES – This site occurs in the mountains, typically on east-facing slopes; the site is not extensive.

VEGETATION – This site is dominated by a dense stand of paper birch (*Betula papyrifera*), with an understory composed of bog blueberry (*Vaccinium uliginosum*), bluejoint (*Calamagrostis canadensis*), and reindeer lichens (*Cladina arbuscula*, *C. rangiferina*, *C. stellaris*).

VEGETATION PRODUCTION (Air Dry) – Paper birch average 5 inches d.b.h., 30 feet in height, and 90 years old. They form a dense canopy allowing very little sunlight to reach the understory. Grasses and grasslikes comprise 15 percent, forbs 5 percent, and shrubs 80 percent of the vegetative production. Annual vascular plant production is 350 lb/ac. Live lichen biomass is 1000 lb/ac. Total moss biomass (*Hylocomium spp.*, and *Polytrichum spp.*) is over 4000 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range. Lichens grow in scattered colonies throughout the area. Deep snows accumulate on this site and restrict reindeer foraging during mid-winter.

Shrubs/Woody (80%)

Percent

Empetrum nigrum . . . . .	.63
Ledum decumbens. . . . .	.9
Vaccinium uliginosum . . . . .	.3
Vaccinium vitis-idaea . . . . .	.3
Others . . . . .	.2

Live Lichen Biomass (100%)

Percent

Cetraria cucullata . . . . .	.2
Cetraria islandica . . . . .	.9
Cladina arbuscula . . . . .	.72
Cladina rangiferina . . . . .	.7
Cladonia elongata . . . . .	.10

Moss/Clubmoss Biomass (100%)

Percent

Hylocomium spp. . . . .	.83
Polytrichum spp. . . . .	.17

Average Cover (percent)

Tree	50-75	Moss	50-75
Shrub	12-25	Litter	6-12
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	12-25	Rock	0-6
Lichen	6-12	Water	0-6

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	300-400
Average	350
b. Live Lichen Biomass	
	900-1100
	1000
c. Moss/Clubmoss Biomass*	
Range	3000-6000
Average	4500



Relative Percentage of Total Plant Community by Weight

Grass/Grasslikes (15%)

Percent

Calamagrostis canadensis.12
Festuca altaica3

Forbs/Miscellaneous (5%)

Percent

Linnaea borealis.5
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*Represents the range of data collected.

ECOLOGICAL SITE NO. 15

NAME: SPRUCE-LICHEN (PALSA)

Physical Characteristics

FEATURES – This site occurs on hummocks and mounds at lower elevations of forested areas, and is frequently associated with muskegs.

VEGETATION – Scattered stands of black spruce (*Picea mariana*) dominate the site. The understory is composed of northern labrador tea (*Ledum decumbens*), blackberry (*Empetrum nigrum*), salmonberry (*Rubus chamaemorus*), and a dense mat of reindeer lichen (*Cladina arbuscula*, *C. rangiferina*, *C. stellaris*).

VEGETATION PRODUCTION (Air Dry) – Black spruce average 4 inches d.b.h., 20 feet in height, and 90 years old. Grasses and grasslikes comprise a trace, forbs 15 percent and shrubs 85 percent of the vegetative production. Annual vascular plant production is 545 lb/ac. Live lichen biomass is 3015 lb/ac. Mosses (*Hylocomium spp.*, *Pleurozium spp.*, *Polytrichum spp.*, and *Mnium spp.*) occur as dense mats in the understory and average 5350 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range. This site supports excellent winter forage of energy-rich lichens, so should only be used as winter range. Lichens become very brittle during drier periods of the year, and when trampled can be depleted very quickly. Sedges are also available along the border of the site when it is associated with muskeg. During fall, hummocks make herding difficult by causing topographic variation and roughness. Small quantities of aboreal lichens (*Alectoria* and *Usnea spp.*) also grow on this site and, if necessary, may be used for winter forage.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (T)	Percent
Eriophorum vaginatum T	

Forbs/Miscellaneous (15%)	Percent
Rubus chamaemorus . . . . .	.15

Shrubs/Woody (85%)	Percent
Betula nana . . . . .	.3
Empetrum nigrum . . . . .	.10
Ledum decumbens . . . . .	.60
Vaccinium uliginosum . . . . .	.8
Vaccinium vitis-idaea . . . . .	.2
Others . . . . .	.2

Live Lichen Biomass (100%)	Percent
Cetraria islandica . . . . .	.3
Cladina arbuscula . . . . .	.38
Cladina rangiferina . . . . .	.33
Cladina stellaris . . . . .	.24
Others . . . . .	.2

Moss/Clubmoss Biomass (100%)	Percent
Unidentified	100

Average Cover (percent)			
Tree	6-12	Moss	12-25
Shrub	12-25	Litter	0-6
Forb	6-12	Bare Ground	0-6
Grass/grasslikes	0-6	Rock	0-6
Lichen	50-75	Water	0-6

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 310-780
 - Average 545
- b. Live Lichen Biomass
 - 1990-4040
 - 3015
- c. Moss/Clubmoss Biomass*
 - Range 5330-5380
 - Average 5350

*Represents the range of data collected.

ECOLOGICAL SITE NO. 20

NAME: TALL SHRUB (FLOODPLAIN)

Physical Characteristics

FEATURES – This site occurs along river floodplains and lowlands where soils are deep, moisture is readily available, and growing conditions are favorable to produce tall shrubs.

VEGETATION – The overstory vegetation is dominated by dense stands of tall green alders (*Alnus crispa*) and willows (*Salix spp.*). The understory is composed of low quantities of bluejoint (*Calamagrostis canadensis*) and field horsetail (*Equisetum arvense*).

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 5 percent, forbs 5 percent, and shrubs 90 percent of the vegetative production. Total annual vascular plant production is 2775 lb/ac. Live lichen biomass yields 5 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for summer and fall range. When this site is associated with windswept gravel bars and beaches, it can provide some relief from insects to grazing reindeer. Willows provide high quality forage during summer months, however, dense shrub cover makes herding difficult during this time.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (5%)	Percent
Calamagrostis canadensis . . . . .	.4
Others . . . . .	.1

Forbs/Miscellaneous (5%)	Percent
Equisetum arvense . . . . .	.2
Others . . . . .	.3

Shrubs/Woody (90%)	Percent
Alnus crispa . . . . .	.13
Salix alaxensis . . . . .	.23
Salix glauca . . . . .	.9
Salix lanata . . . . .	.11
Salix planifolia . . . . .	.24
Vaccinium uliginosum . . . . .	.5
Others . . . . .	.5

Live Lichen Biomass (100%)	Percent
Cetraria spp . . . . .	.100

Moss/Clubmoss Biomass (100%)	Percent
Hypnum spp . . . . .	.24
Mnium spp . . . . .	.7
Pleurozium spp . . . . .	.31
Others . . . . .	.38

Average Cover (percent)			
Shrub	25-50	Litter	50-75
Forb	12-25	Bare Ground	0-6
Grass/grasslikes	6-12	Rock	0-6
Lichen	0-6	Water	0-6
Moss	12-25		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	2290-3260
Average	2775
b. Live Lichen Biomass	
	0-10
	5
c. Moss/Clubmoss Biomass*	
Range	1400-1665
Average	1490

*Represents the range of data collected.

ECOLOGICAL SITE NO. 21
NAME: TALL SHRUB (DRAINAGEWAY)

Physical Characteristics

FEATURES – This site occurs along upland drainages and streams where moisture collects.

VEGETATION – A dense cover of shrubs, consisting mainly of diamondleaf willow (*Salix planifolia*), dominate the overstory. Bigelow sedge (*Carex bigelowii*), bluejoint (*Calamagrostis canadensis*), and an abundance of different forbs such as arctic sweet coltsfoot (*Petasites frigidus*), field horsetail (*Equisetum arvense*), buttercup (*Ranunculus spp.*), and salmonberry (*Rubus chamaemorus*) are found in small quantities in the understory.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 15 percent, forbs 20 percent, and shrubs 65 percent of the vegetative production. Total annual vascular plant production is 1850 lb/ac. Live lichen biomass yields 15 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for summer and fall range. Insects during the summer months can make this an unfavorable habitat for grazing; due to the sites' wind-free location, mosquito harassment can be intolerable.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (15%)	Percent
<i>Calamagrostis canadensis</i> . . . . .	.5
<i>Carex bigelowii</i> . . . . .	.7
Others . . . . .	.3

Forbs/Miscellaneous (20%)	Percent
<i>Equisetum arvense</i> . . . . .	.6
<i>Petasites frigidus</i> . . . . .	.7
Others . . . . .	.7

Shrubs/Woody (65%)	Percent
<i>Alnus crispa</i> . . . . .	.7
<i>Betula nana</i> . . . . .	.3
<i>Salix fuscescens</i> . . . . .	.3
<i>Salix glauca</i> . . . . .	.2
<i>Salix planifolia</i> . . . . .	.40
<i>Salix reticulata</i> . . . . .	.3
<i>Vaccinium uliginosum</i> . . . . .	.2
Others . . . . .	.5

Live Lichen Biomass (100%)	Percent
<i>Cladonia gracilis</i> . . . . .	.94
<i>Cladonia spp</i> . . . . .	.6

Moss/Clubmoss Biomass (100%)	Percent
<i>Hylocomnium spp</i> . . . . .	.58
<i>Sphagnum spp</i> . . . . .	.42

Average Cover (percent)			
Shrub	12-25	Litter	25-50
Forb	25-50	Bare Ground	0-6
Grass/grasslikes	12-25	Rock	0-6
Lichen	0-6	Water	0-6
Moss	25-50		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 1410-2280
 - Average 1850
- b. Live Lichen Biomass
 - 0-30
 - 15
- c. Moss/Clubmoss Biomass*
 - Range 1008-2000
 - Average 1580

*Represents the range of data collected.

ECOLOGICAL SITE NO. 22

NAME: TALL SHRUB (HILLSIDE)

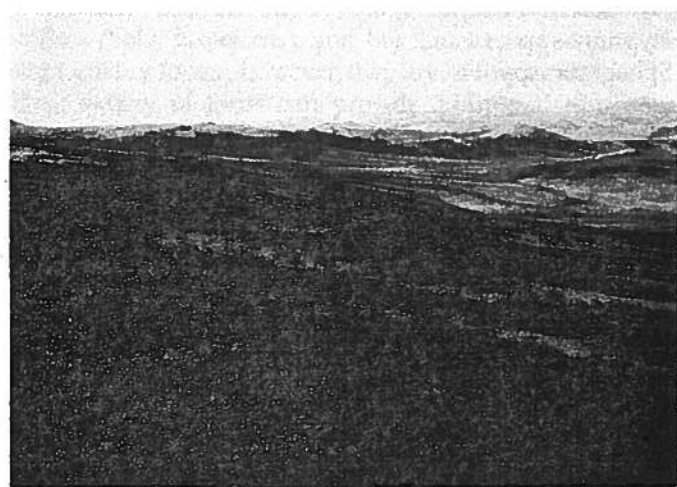
Physical Characteristics

FEATURES – This site occurs on hillsides and mountainsides.

VEGETATION – This site is dominated by a dense canopy of green alder (*Alnus crispa*) and a few willows (*Salix spp.*), with a sparse understory of bluejoint (*Calamagrostis canadensis*) and forbs. Lichens occur in very small quantities.

VEGETATION PRODUCTION (Air Dry) – Green alder make up 70 percent of the annual plant production, other shrubs 20 percent; 5 percent forbs, and 5 percent grasses and grasslikes. Total annual vascular plant production is 3360 lb/ac. Live lichen biomass is 30 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for summer and fall range. Low production of desirable forage species makes this a low value grazing site. Also, dense alder thickets make herding impossible, and provide cover for predators.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (5%)	Percent
Calamagrostis canadensis . . . . .	.5

Forbs/Miscellaneous (5%)	Percent
Equisetum arvense . . . . .	.1
Others . . . . .	.4

Shrubs/Woody (90%)	Percent
Alnus crispa . . . . .	.70
Salix glauca . . . . .	.3
Salix planifolia . . . . .	.10
Others . . . . .	.7

Live Lichen Biomass (100%)	Percent
Cladina arbuscula . . . . .	.14
Cladina rangiferina . . . . .	.14
Cladonia gracilis . . . . .	.9
Others . . . . .	.63

Moss/Clubmoss Biomass (100%)	Percent
Hylocomnium spp. . . . .	.92
Lycopodium spp . . . . .	.5
Polytrichum spp. . . . .	.3

Average Cover (percent)			
Shrub	25-50	Litter	50-75
Forb	12-25	Bare Ground	0-6
Grass/grasslikes	6-12	Rock	0-6
Lichen	0-6	Water	0-6
Moss	12-25		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants

Range	2810-3910
Average	3360
- b. Live Lichen Biomass

10-50
30
- c. Moss/Clubmoss Biomass*

Range	450-1420
Average	900

*Represents the range of data collected.

ECOLOGICAL SITE NO. 32

NAME: MIXED SHRUB (TUNDRA)

Physical Characteristics

FEATURES – This site occurs on nearly level to moderately sloping rolling valleys, and along foot slopes of low hills.

VEGETATION – A mixture of low shrubs, dwarf arctic birch (*Betula nana*), northern labrador tea (*Ledum decumbens*), lingonberry (*Vaccinium vitis-idaea*), and blueberry (*Vaccinium uliginosum*) dominate the vegetation on this site. A dense cover of tussock cottongrass (*Eriophorum vaginatum*) and Bigelow sedge (*Carex bigelowii*) occur throughout the site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 25 percent, forbs 5 percent, and shrubs 70 percent of the vegetative production. Total annual vascular plant production is 1075 lb/ac. Live lichen biomass is 45 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for summer range. Lichen production is low, so this would be very poor winter range. This site is also fair spring range because it is among the first sites to “green-up” in spring and can then provide nutritious spring forage.



Relative Percentage of Total Plant Community by Weight

Grass/Grasslikes (25%)	Percent
<i>Carex bigelowii</i>	15
<i>Eriophorum vaginatum</i>	9
Others	1

Forbs/Miscellaneous (5%)	Percent
<i>Rubus chamaemorus</i>	2
Others	3

Shrubs/Woody (70%)	Percent
<i>Alnus crispa</i>	11
<i>Betula nana</i>	14
<i>Ledum decumbens</i>	15
<i>Salix planifolia</i>	9
<i>Vaccinium uliginosum</i>	13
<i>Vaccinium vitis-idaea</i>	6
Others	2

Live Lichen Biomass (100%)	Percent
<i>Cetraria cucullata</i>	21
<i>Cetraria islandica</i>	8
<i>Cladina arbuscula</i>	11
<i>Cladina mitis</i>	9
<i>Cladina rangiferina</i>	17
<i>Cladonia amaurocraea</i>	4
<i>Cladonia gracilis</i>	8
<i>Cladonia spp</i>	18
Others	4

Moss/Clubmoss Biomass (100%)	Percent
<i>Hylocomnium spp</i>	20
<i>Hypnum spp</i>	5
<i>Sphagnum spp</i>	75

Average Cover (percent)			
Shrub	50-75	Litter	25-50
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	12-25	Rock	0-6
Lichen	6-12	Water	0-6
Moss	12-25		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	980-1170
Average	1075
b. Live Lichen Biomass	
	30-60
	45
c. Moss/Clubmoss Biomass*	
Range	2500-8500
Average	8180

*Represents the range of data collected.

ECOLOGICAL SITE NO. 34
NAME: LOW SHRUB (FLOODPLAIN)

Physical Characteristics

FEATURES – This site occurs along river floodplains and lowlands, particularly on rich alluvial material deposited by river water.

VEGETATION – Diamondleaf willow (*Salix planifolia*) and feltleaf willow (*Salix alaxensis*), along with other shrubs such as dwarf arctic birch (*Betula nana*), resin birch (*Betula glandulosa*), and bog blueberry (*Vaccinium uliginosum*), dominate the vegetation on this site. Bigelow sedge (*Carex bigelowii*) and numerous forbs are also present. Iceland lichen (*Cetraria islandica*) is the most common lichen species found on the site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 20 percent, forbs 10 percent, and shrubs 70 percent of the vegetative production. Total annual vascular plant production is 970 lb/ac. Live lichen biomass is 100 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for summer and fall range. Dwarf arctic birch, Alaska bog willow (*Salix fuscescens*), and bog blueberry can provide high quality forage, however, they are of low quantity. The large variety of forbs can provide additional nutritious forage during the growing season. Associated windswept barren gravel bars provide insect relief.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (20%)	Percent
Calamagrostis canadensis . . . . .	.3
Carex aquatilis . . . . .	.1
Carex bigelowii . . . . .	.6
Carex spp. . . . .	.6
Others . . . . .	.4

Forbs/Miscellaneous (10%)	Percent
Equisetum arvense . . . . .	.3
Others . . . . .	.7

Shrubs/Woody (70%)	Percent
Betula glandulosa . . . . .	.3
Betula nana . . . . .	.4
Empetrum nigrum . . . . .	.4
Salix spp . . . . .	.8
Salix alaxensis . . . . .	.7
Salix planifolia . . . . .	.30
Salix reticulata . . . . .	.2
Vaccinium uliginosum . . . . .	.7
Others . . . . .	.5

Live Lichen Biomass (100%)	Percent
Cetraria cucullata . . . . .	.3
Cetraria islandica . . . . .	.57
Cladina arbuscula . . . . .	.17
Cladina rangiferina . . . . .	.13
Cladonia gracilis . . . . .	.6
Others . . . . .	.4

Moss/Clubmoss Biomass (100%)	Percent
Hylocomnium spp . . . . .	.100

Average Cover (percent)			
Shrub	12-25	Litter	12-25
Forb	6-12	Bare Ground	0-6
Grass/grasslikes	12-25	Rock	0-6
Lichen	0-6	Water	0-6
Moss	12-25		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 660-1280
 - Average 970
- b. Live Lichen Biomass
 - 40-160
 - 100
- c. Moss/Clubmoss Biomass*
 - Range 2210-3250
 - Average 2830

*Represents the range of data collected.

ECOLOGICAL SITE NO. 35A

NAME: SHRUB-BIRCH (HILLSIDE)

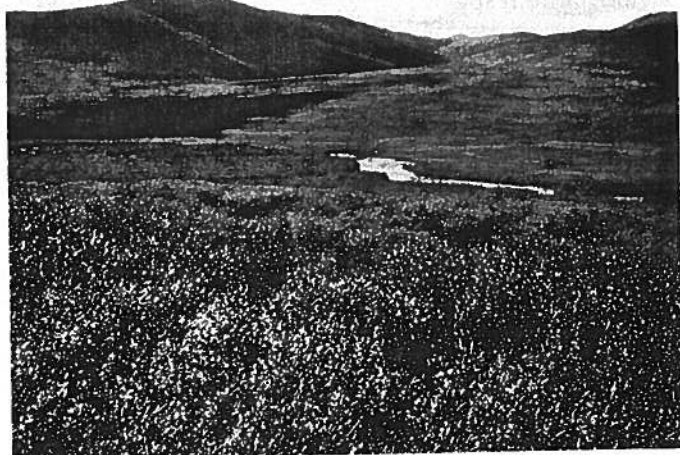
Physical Characteristics

FEATURES – This site occurs on mountainsides and hillsides. This site can occur over extensive areas or in linear strips running parallel to drainageways.

VEGETATION – The overstory is dominated by dwarf arctic birch (*Betula nana*), resin birch (*Betula glandulosa*), and bog blueberry (*Vaccinium uliginosum*). Bigelow sedge (*Carex bigelowii*) and bluejoint (*Calamagrostis canadensis*) dominate the understory.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 10 percent, forbs 5 percent, and shrubs 85 percent of the vegetative production. Total annual vascular plant production is 860 lb/ac. Live lichen biomass is 20 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for summer range. Dwarf arctic birch and various willows (*Salix spp.*) can provide high value forage during these seasons.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (10%)	Percent
<i>Calamagrostis canadensis</i> . . . . .	.2
<i>Carex bigelowii</i> . . . . .	.7
Others . . . . .	.1

Forbs/Miscellaneous (5%)	Percent
<i>Artemisia arctica</i> . . . . .	.2
Others . . . . .	.3

Shrubs/Woody (85%)	Percent
<i>Betula glandulosa</i> . . . . .	.20
<i>Betula nana</i> . . . . .	.20
<i>Empetrum nigrum</i> . . . . .	.3
<i>Ledum decumbens</i> . . . . .	.1
<i>Salix glauca</i> . . . . .	.2
<i>Salix planifolia</i> . . . . .	.10
<i>Vaccinium uliginosum</i> . . . . .	.20
<i>Vaccinium vitis-idaea</i> . . . . .	.2
Others . . . . .	.7

Live Lichen Biomass (100%)	Percent
<i>Cetraria cucullata</i> . . . . .	.20
<i>Cetraria islandica</i> . . . . .	.28
<i>Cladina arbuscula</i> . . . . .	.16
<i>Cladina rangiferina</i> . . . . .	.18
<i>Cladonia gracilis</i> . . . . .	.8
<i>Dactylina arctica</i> . . . . .	.4
Others . . . . .	.6

Moss/Clubmoss Biomass (100%)	Percent
<i>Hylocomnium spp.</i> . . . . .	.88
<i>Polytrichum spp.</i> . . . . .	.12

Average Cover (percent)			
Shrub	50-75	Litter	25-50
Forb	6-12	Bare Ground	0-6
Grass/grasslikes	6-12	Rock	0-6
Lichen	0-6	Water	0-6
Moss	25-50		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 720-1000
 - Average 860
- b. Live Lichen Biomass
 - 10-30
 - 20
- c. Moss/Clubmoss Biomass*
 - Range 280-7410
 - Average 2890

*Represents the range of data collected.

ECOLOGICAL SITE NO. 35B

NAME: SHRUB-WILLOW (HILLSIDE)

Physical Characteristics

FEATURES – This site occurs on hillsides and mountainsides, particularly on moist north-facing slopes.

VEGETATION – Diamondleaf willow (*Salix planifolia*), northern labrador tea (*Ledum decumbens*), dwarf arctic birch (*Betula nana*), bog blueberry (*Vaccinium uliginosum*), lingonberry (*Vaccinium vitis-idaea*), Bigelow sedge (*Carex bigelowii*), and tussock cottongrass (*Eriophorum vaginatum*) are the most common plants on this site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 15 percent, forbs 15 percent, and shrubs 70 percent of the vegetative production. Annual vascular plant production yields 945 lb/ac. Live lichen biomass is 165 lb/ac.

VALUE FOR GRAZING – This site is best suited for summer and fall range. Willows (*Salix spp.*), bog blueberry, and sedges can provide high value forage during these seasons. The 165 lb/ac of live lichen biomass is also an important forage for reindeer during fall.

Average Cover (percent)

Shrub	50-75	Litter	12-25
Forb	6-12	Bare Ground	0-6
Grass/grasslikes	6-12	Rock	0-6
Lichen	0-6	Water	0-6
Moss	25-50		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	780-1110
Average	945
b. Live Lichen Biomass	
	30-300
	165
c. Moss/Clubmoss Biomass*	
Range	500-3000
Average	1340

Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (15%)	Percent
Calamagrostis canadensis . . . . .	.2
Carex bigelowii . . . . .	.5
Eriophorum vaginatum . . . . .	.5
Others . . . . .	.3

Forbs/Miscellaneous (15%)	Percent
Artemisia arctica . . . . .	.5
Others . . . . .	.10

Shrubs/Woody (70%)	Percent
Betula nana . . . . .	.13
Ledum decumbens . . . . .	.16
Salix planifolia . . . . .	.17
Vaccinium uliginosum . . . . .	.9
Vaccinium vitis-idaea . . . . .	.12
Others . . . . .	.3

Live Lichen Biomass (100%)	Percent
Cladina arbuscula . . . . .	.2
Cladina rangiferina . . . . .	.2
Cladonia spp . . . . .	.23
Others . . . . .	.73

Moss/Clubmoss Biomass (100%)	Percent
Hylocomnium spp . . . . .	.100

*Represents the range of data collected.

ECOLOGICAL SITE NO. 41

NAME: SHRUB MEADOW (MOUNTAIN)

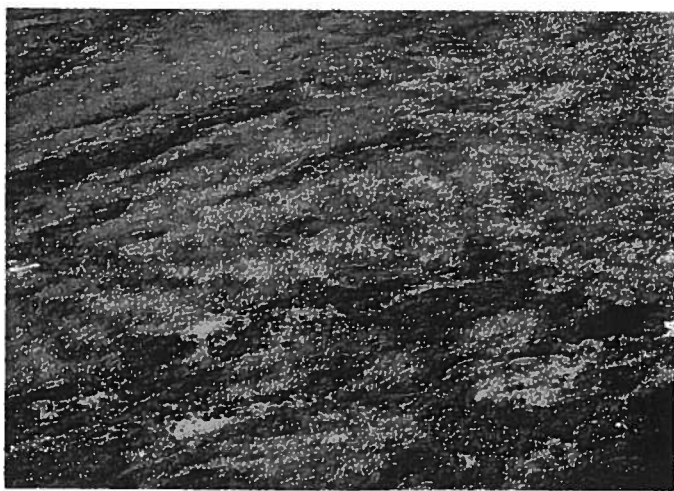
Physical Characteristics

FEATURES – This site occurs on mountainsides and ridges.

VEGETATION – Low shrubs, primarily bog blueberry (*Vaccinium uliginosum*), dwarf arctic birch (*Betula nana*), willows (*Salix spp.*), and entire-leaf mountain-avens (*Dryas integrifolia*), dominate the aspect of this site; however, Bigelow sedge (*Carex bigelowii*) is the most abundant plant species. Forbs and lichens constitute the remainder of the vegetation.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 35 percent, forbs 10 percent, and shrubs 55 percent of the vegetative production. Vascular plant production yields 615 lb/ac and live lichen biomass yields 150 lb/ac for this site.

VALUE FOR GRAZING – This site is best suited for summer and fall range. Willows, dwarf arctic birch, and sedge can provide high value forage during these seasons. The 150 lb/ac of live lichen biomass can be an important reindeer forage during the fall season.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (35%)	Percent
Carex aquatilis . . . . .	.6
Carex bigelowii . . . . .	.25
Others . . . . .	.4

Forbs/Miscellaneous (10%)	Percent
Rubus chamaemorus . . . . .	.5
Others . . . . .	.5

Shrubs/Woody (55%)	Percent
Betula nana . . . . .	.9
Dryas integrifolia . . . . .	.8
Empetrum nigrum . . . . .	.3
Ledum decumbens . . . . .	.3
Loiseleuria procumbens . . . . .	.2
Salix fuscescens . . . . .	.3
Salix planifolia . . . . .	.6
Salix reticulata . . . . .	.6
Vaccinium uliginosum . . . . .	.9
Vaccinium vitis-idaea . . . . .	.2
Others . . . . .	.4

Live Lichen Biomass (100%)	Percent
Cetraria cucullata . . . . .	.39
Cetraria islandica . . . . .	.30
Cladina arbuscula . . . . .	.9
Cladina rangiferina . . . . .	.14
Cladonia gracilis . . . . .	.3
Cladonia spp . . . . .	.3
Others . . . . .	.2

Moss/Clubmoss Biomass (100%)	Percent
Hylocomnium spp . . . . .	.50
Polytrichum spp . . . . .	.50

Average Cover (percent)			
Shrub	25-50	Litter	12-25
Forb	6-12	Bare Ground	0-6
Grass/grasslikes	12-25	Rock	0-6
Lichen	12-25	Water	0-6
Moss	25-50		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 570-660
 - Average 615
- b. Live Lichen Biomass
 - 100-200
 - 150
- c. Moss/Clubmoss Biomass*
 - Range 800-4000
 - Average 2040

*Represents the range of data collected.

ECOLOGICAL SITE NO. 42A
NAME: LOW SHRUB-WATER SEDGE
(TUSSOCK TUNDRA)

Physical Characteristics

FEATURES – This site occurs in combination with other wet sites on broad depressions and coastal plains.

VEGETATION – Bigelow sedge (*Carex bigelowii*), water sedge (*C. aquatilis*), northern labrador tea (*Ledum decumbens*), and dwarf arctic birch (*Betula nana*) are the dominant vegetation on this site. Lichens and succulent forbs can also be found hidden throughout the understory.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 45 percent, forbs 5 percent, and shrubs 50 percent of the vegetative production. Annual vascular plant production yields 790 lb/ac and live lichen biomass yields 150 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for summer and fall range. Water sedge, grasses, and new deciduous growth provide high levels of digestible protein. Some lichens occur on this site, but this site is not recommended for use as winter range. The lichens, however, can be an important supplemental reindeer forage in the fall.

Moss/Clubmoss Biomass (100%)		Percent
Hylocomnium spp . . . . .		.13
Sphagnum spp . . . . .		.87

Average Cover (percent)			
Shrub	25-50	Litter	25-50
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	25-50	Rock	0-6
Lichen	6-12	Water	0-6
Moss	12-25		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	660-920
Average	790
b. Live Lichen Biomass	
	90-210
	150
c. Moss/Clubmoss Biomass*	
Range	650-1440
Average	1040

Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (45%)	Percent
Calamagrostis canadensis . . . . .	.7
Carex aquatilis . . . . .	.13
Carex bigelowii . . . . .	.15
Eriophorum vaginatum . . . . .	.9
Others . . . . .	.1

Forbs/Miscellaneous (5%)	Percent
Rubus chamaemorus . . . . .	.5

Shrubs/Woody (50%)	Percent
Betula nana . . . . .	.12
Ledum decumbens . . . . .	.25
Vaccinium uliginosum . . . . .	.5
Vaccinium vitis-idaea . . . . .	.7
Others . . . . .	.1

Live Lichen Biomass (100%)	Percent
Cetraria cucullata . . . . .	.23
Cetraria islandica . . . . .	.6
Cladina arbuscula . . . . .	.21
Cladina rangiferina . . . . .	.22
Cladonia gracilis . . . . .	.5
Cladonia spp . . . . .	.20
Thamnolia subuliformis . . . . .	.3

*Represents the range of data collected.

ECOLOGICAL SITE NO. 42B
NAME: LOW SHRUB-COTTONGRASS
(TUSSOCK TUNDRA)

Physical Characteristics

FEATURES – This site occurs on foot slopes, rolling hills, and broad depressions.

VEGETATION – Tussock cottongrass (*Eriophorum vaginatum*), Bigelow sedge (*Carex bigelowii*), northern labrador tea (*Ledum decumbens*), and lingonberry (*Vaccinium vitis-idaea*) dominate the vegetation of this site. Lichens and salmonberry (*Rubus chamaemorus*) can be found hidden throughout the understory.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 40 percent, forbs 10 percent, and shrubs 50 percent of the vegetative production. Annual vascular plant production yields 695 lb/ac and live lichen biomass yields 110 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for spring and summer range. Sedges and grasses provide high levels of digestible protein during the growing season.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (40%)	Percent
Carex bigelowii . . . . .	.10
Eriophorum vaginatum . . . . .	.25
Others . . . . .	.5

Forbs/Miscellaneous (10%)	Percent
Rubus chamaemorus . . . . .	.10

Shrubs/Woody (50%)	Percent
Betula nana . . . . .	.8
Empetrum nigrum . . . . .	.2
Ledum decumbens . . . . .	.20
Vaccinium uliginosum . . . . .	.6
Vaccinium vitis-idaea . . . . .	.12
Others . . . . .	.2

Live Lichen Biomass (100%)	Percent
Cetraria cucullata . . . . .	.24
Cetraria islandica . . . . .	.11
Cladina arbuscula . . . . .	.18
Cladina rangiferina . . . . .	.24
Cladonia gracilis . . . . .	.3
Cladonia spp . . . . .	.18
Thamnolia subuliformis . . . . .	.2

Moss/Clubmoss Biomass (100%)	Percent
Polytrichum spp . . . . .	.61
Sphagnum spp . . . . .	.39

Average Cover (percent)			
Shrub	25-50	Litter	25-50
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	25-50	Rock	0-6
Lichen	6-12	Water	0-6
Moss	12-25		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 640-750
 - Average 695
- b. Live Lichen Biomass
 - 80-140
 - 110
- c. Moss/Clubmoss Biomass*
 - Range 1000-3000
 - Average 1420

*Represents the range of data collected.

ECOLOGICAL SITE NO. 43A
NAME: LOW SHRUB-SEDGE MEADOW
(ALPINE)

Physical Characteristics

FEATURES – This site occurs on broad ridges, and frequently, on north-facing mountainsides. Solifluction lobes and patterned ground characterize this site.

VEGETATION – Bigelow sedge (*Carex bigelowii*), mountain-avens (*Dryas spp.*), and netleaf willow (*Salix reticulata*) are the major plants on this site. Bog blueberry (*Vaccinium uliginosum*) is also quite common.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 25 percent, forbs 20 percent, and shrubs 55 percent of the vegetative production. Annual vascular plant production yields 830 lb/ac and live lichen biomass 340 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range. Due to the presence of lichens, this site should not be used at any other season; lichens can become very brittle during drier periods of the year, and when trampled, can be damaged. Sedges and grasses can provide fair value forage during early winter.



Shrubs/Woody (55%)	Percent
Betula nana . . . . .	.5
Dryas integrifolia . . . . .	.7
Dryas octopetala . . . . .	.12
Empetrum nigrum . . . . .	.5
Salix fuscescens . . . . .	.2
Salix reticulata . . . . .	.10
Salix spp . . . . .	.2
Vaccinium uliginosum . . . . .	.7
Others . . . . .	.5

Live Lichen Biomass (100%)	Percent
Cetraria cucullata . . . . .	.14
Cetraria islandica . . . . .	.19
Cladina arbuscula . . . . .	.11
Cladina rangiferina . . . . .	.42
Cladonia gracilis . . . . .	.6
Thamnolia subuliformis . . . . .	.3
Others . . . . .	.5

Moss/Clubmoss Biomass (100%)	Percent
Hylocomnium spp . . . . .	.100

Average Cover (percent)			
Shrub	25-50	Litter	25-50
Forb	25-50	Bare Ground	0-6
Grass/grasslikes	12-25	Rock	0-6
Lichen	0-6	Water	0-6
Moss	25-50		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 720-940
 - Average 830
- b. Live Lichen Biomass
 - 65-610
 - 340
- c. Moss/Clubmoss Biomass*
 - Range 940-3020
 - Average 2030

Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (25%)	Percent
Arctagrostis latifolia . . . . .	.2
Calamagrostis canadensis . . . . .	.3
Carex bigelowii . . . . .	.14
Others . . . . .	.6

Forbs/Miscellaneous (20%)	Percent
Artemisia arctica . . . . .	.4
Equisetum arvense . . . . .	.4
Others . . . . .	.12

*Represents the range of data collected.

ECOLOGICAL SITE NO. 43B
NAME: LOW SHRUB-LICHEN MEADOW
(ALPINE)

Physical Characteristics

FEATURES – This site occurs on broad ridges and mountainsides. Solifluction lobes and patterned ground characterize this site.

VEGETATION – Bigelow sedge (*Carex bigelowii*), white mountain-avens (*Dryas octopetala*), four-angled heather (*Cassiope tetragona*), bog blueberry (*Vaccinium uliginosum*), and lichens are the most common vegetation.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslike comprise 15 percent, forbs 10 percent, and shrubs 75 percent of the vegetative production. Annual vascular plant production yields 580 lb/ac and live lichen biomass yields 450 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range and, due to the presence of lichens, should only be used for this season. Trampling damage can occur on this site during dry periods when lichens are susceptible to breakage, causing a depletion of winter forage. Also, in wet areas associated with slow-melting snow, compaction is another harmful result of trampling. Sedges and grasses can provide fair value forage during the early part of winter.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (15%)	Percent
<i>Carex bigelowii</i> . . . . .	.12
<i>Festuca altaica</i> . . . . .	.2
Others . . . . .	.1

Forbs/Miscellaneous (10%)	Percent
<i>Equisetum arvense</i> . . . . .	.3
Others . . . . .	.7

Shrubs/Woody (75%)	Percent
<i>Arctostaphylos alpina</i> . . . . .	.2
<i>Arctostaphylos rubra</i> . . . . .	.2
<i>Betula nana</i> . . . . .	.5
<i>Cassiope tetragona</i> . . . . .	.12
<i>Dryas octopetala</i> . . . . .	.20
<i>Empetrum nigrum</i> . . . . .	.5
<i>Ledum decumbens</i> . . . . .	.3
<i>Salix reticulata</i> . . . . .	.6
<i>Vaccinium uliginosum</i> . . . . .	.11
<i>Vaccinium vitis-idaea</i> . . . . .	.3
Others . . . . .	.6

Live Lichen Biomass (100%)	Percent
<i>Cetraria cucullata</i> . . . . .	.7
<i>Cetraria islandica</i> . . . . .	.39
<i>Cladina arbuscula</i> . . . . .	.24
<i>Cladina rangiferina</i> . . . . .	.14
<i>Cladonia gracilis</i> . . . . .	.9
<i>Dactylina arctica</i> . . . . .	.2
Others . . . . .	.5

Moss/Clubmoss Biomass (100%)	Percent
<i>Ptilium</i> spp. . . . .	.100

Average Cover (percent)			
Shrub	50-75	Litter	6-12
Forb	6-12	Bare Ground	0-6
Grass/grasslikes	0-6	Rock	0-6
Lichen	12-25	Water	0-6
Moss	25-50		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 510-650
 - Average 580
- b. Live Lichen Biomass
 - 315-580
 - 450
- c. Moss/Clubmoss Biomass*
 - Range 2640-9385
 - Average 5030

*Represents the range of data collected.

ECOLOGICAL SITE NO. 44

NAME: SHRUB-LICHEN (UPLAND)

Physical Characteristics

FEATURES – This site occurs on mountainsides, hillsides, and ridge crests.

VEGETATION – Dwarf arctic birch (*Betula nana*), bog blueberry (*Vaccinium uliginosum*), northern labrador tea (*Ledum decumbens*), Bigelow sedge (*Carex bigelowii*), and lichens are the most common vegetation.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 15 percent, forbs a trace, and shrubs 85 percent of the vegetative production. Annual vascular plant production yields 780 lb/ac, live lichen biomass yields 3190 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range. Dwarf arctic birch and northern labrador tea can provide fair value forage during the early part of the season, and lichens provide excellent forage throughout winter.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (15%)	Percent
<i>Carex bigelowii</i>	13
Others	2

Forbs/Miscellaneous (T)	Percent
<i>Rubus chamaemorus</i>	T

Shrubs/Woody (85%)	Percent
<i>Alnus crispa</i>	2
<i>Betula nana</i>	31
<i>Empetrum nigrum</i>	6
<i>Ledum decumbens</i>	10
<i>Loiseleuria procumbens</i>	2
<i>Salix fuscescens</i>	3
<i>Salix planifolia</i>	6
<i>Vaccinium uliginosum</i>	19
<i>Vaccinium vitis-idaea</i>	4
Others	2

Live Lichen Biomass (100%)	Percent
<i>Cetraria cucullata</i>	8
<i>Cetraria islandica</i>	9
<i>Cladina arbuscula</i>	18
<i>Cladina mitis</i>	10
<i>Cladina rangiferina</i>	34
<i>Cladina stellaris</i>	18
Others	3

Moss/Clubmoss Biomass (100%)	Percent
<i>Hylocomnium</i> spp.	49
<i>Polytrichum</i> spp.	18
Others	33

Average Cover (percent)			
Shrub	25-50	Litter	0-6
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	12-25	Rock	0-6
Lichen	25-50	Water	0-6
Moss	0-6		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 560-1000
 - Average 780
- b. Live Lichen Biomass
 - 2430-3950
 - 3190
- c. Moss/Clubmoss Biomass*
 - Range 255-3070
 - Average 1430

*Represents the range of data collected.

ECOLOGICAL SITE NO. 45

NAME: WATER SEDGE-MUSKEG (BOG-FEN)

Physical Characteristics

FEATURES – This site occurs in depressional areas where free water and organic matter accumulate. This site is frequently associated with the Spruce-Lichen (Palsa)-(15) ecological site.

VEGETATION – Water sedge (*Carex aquatilis*), rushes, and forbs are the most common plants and constitute 85 percent of the vegetative production. Willows (*Salix spp.*) occur in some areas, especially on better drained portions of the site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 75 percent, forbs 10 percent, and shrubs 15 percent of the vegetative production. Annual vascular plant production yields 665 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for spring and summer range. Growing grasses and sedges provide high levels of digestible protein. Water sedge, the dominant sedge on this site, is a high quality summer food. Willows found on the fringes of this site can also supply good forage during the latter part of the growing season. Mosquitoes may limit grazing use on this site during windless days in midsummer.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (75%)	Percent
<i>Carex aquatilis</i> .....	.68
<i>Juncus spp.</i> .....	.6
Others .....	.1

Forbs/Miscellaneous (10%)	Percent
<i>Equisetum hiemale californicum</i> .....	.5
Others .....	.5

Shrubs/Woody (15%)	Percent
<i>Potentilla fruticosa</i> .....	.5
<i>Salix fuscescens</i> .....	.5
Others .....	.5

Live Lichen Biomass (0%)

Moss/Clubmoss Biomass (100%)	Percent
<i>Hypnum spp.</i> .....	.26
<i>Sphagnum spp.</i> .....	.59
Others .....	.15

Average Cover (percent)

Shrub	6-12	Litter	6-12
Forb	12-25	Bare Ground	0-6
Grass/grasslikes	50-75	Rock	0-6
Lichen	0-6	Water	0-6
Moss	75-94		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	410-920
Average	665
b. Live Lichen Biomass	
	0
	0
c. Moss/Clubmoss Biomass*	
Range	5110-12,545
Average	8090

*Represents the range of data collected.

ECOLOGICAL SITE NO. 50

NAME: DUNES (BEACH)

Physical Characteristics

FEATURES – This site occurs on narrow sandy beaches and gravelly beach ridges along the coast.

VEGETATION – Dunegrass (*Elymus mollis*), sea peavine (*Lathyrus maritimus*), and large-flower spargrass (*Poa eminens*) are the most common plants. Some shrubs and other forbs are scattered throughout the site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 70 percent, forbs 25 percent, and shrubs 5 percent of the vegetative production. Annual vascular plant production yields 940 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for spring range. The most desirable reindeer forage on this site is dunegrass; especially in early stages of growth.

Average Cover (percent)

Shrub	0-6	Litter	25-50
Forb	12-25	Bare Ground	25-50
Grass/grasslikes	25-50	Rock	0-6
Lichen	0-6	Water	0-6
Moss	0-6		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	800-1080
Average	940
b. Live Lichen Biomass	
	0
	0
c. Moss/Clubmoss Biomass*	
Range	400-1200
Average	1120



Relative Percentage of Total Community by Weight

Grasses/Grasslikes (70%)		Percent
Elymus mollis	.....	.64
Poa eminens	.....	.4
Others	.....	.2
Forbs/Miscellaneous (25%)		Percent
Epilobium angustifolium	.....	.3
Lathyrus maritimus	.....	.15
Others	.....	.7
Shrubs/Woody (5%)		Percent
Empetrum nigrum	.....	.5
Live Lichen Biomass (0%)		Percent
Moss/Clubmoss Biomass (100%)		Percent
Others	.....	.100

*Represents the range of data collected.

ECOLOGICAL SITE NO. 51

NAME: TIDAL MARSH

Physical Characteristics

FEATURES – This site occurs on tidal flats, generally at the mouths of large rivers.

VEGETATION – Salt-tolerant plant species are found on this site. Creeping alkaligrass (*Puccinellia phryganodes*), Ramens sedge (*Carex ramenskii*), dunegrass (*Elymus mollis*), and water sedge (*Carex aquatilis*) are the most common plants. A few scattered forbs and shrubs are an inconspicuous component of this site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 75 percent, forbs 10 percent, and shrubs 15 percent of the vegetative production. Annual vascular plant production yields 1005 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for spring and summer range. Grasses and sedges provide high quality protein, especially in the early stages of growth. Mosquito harassment may limit grazing during summer, even though forage may be available; on windy days, however, this site can provide good to excellent forage and water for reindeer. Also, the availability of salt on estuarine flats is a very important component of this site. Because of the openness of this site, herding is easy and predators create little problem.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (75%)	Percent
Agrostis borealis . . . . .	.2
Calamagrostis canadensis . . . . .	.3
Carex aquatilis . . . . .	.5
Carex ramenskii . . . . .	.15
Carex spp. . . . .	.4
Elymus mollis . . . . .	.8
Poa eminens . . . . .	.3
Puccinellia phryganodes . . . . .	.30
Others . . . . .	.5

Forbs/Miscellaneous (10%)	Percent
Chrysanthemum arcticum . . . . .	.3
Potentilla egedii . . . . .	.4
Others . . . . .	.3

Shrubs/Woody (15%)	Percent
Salix fuscescens . . . . .	.7
Salix ovalifolia . . . . .	.5
Others . . . . .	.3

Live Lichen Biomass (0%)	Percent
	0

Moss/Clubmoss Biomass (0%)	Percent
	0

Average Cover (percent)			
Shrub	12-25	Litter	25-50
Forb	6-12	Bare Ground	0-6
Grass/grasslikes	50-75	Rock	0-6
Lichen	0-6	Water	0-6
Moss	0-6		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 900-1110
 - Average 1005
- b. Live Lichen Biomass
 - 0
 - 0
- c. Moss/Clubmoss Biomass*
 - Range 0
 - Average 0

*Represents the range of data collected.

ECOLOGICAL SITE NO. 52

NAME: SEDGE (WET MEADOW)

Physical Characteristics

FEATURES – This site occurs along coastal plains immediately inland of beach dunes, and on nearly level areas in the uplands.

VEGETATION – Water sedge (*Carex aquatilis*), Bigelow sedge (*Carex bigelowii*), Alaska bog willow (*Salix fuscescens*), and white cottongrass (*Eriophorum scheuchzeri*) are the most common plants on this site. Forbs, other shrubs, and lichens are a minor component of this site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 60 percent, forbs 5 percent, and shrubs 35 percent of the vegetative production. Annual vascular plant production yields 570 lb/ac. Live lichen biomass yields 145 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for summer range. Growing grasses and sedges provide high levels of digestible protein. Browse species, as well as available lichen biomass, provide forage during fall and early winter. Mosquitoes may limit grazing during summer even though forage is plentiful. Because of the openness of this site, herding is easy and predators create little problem.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (60%)	Percent
<i>Carex aquatilis</i> . . . . .	.36
<i>Carex bigelowii</i> . . . . .	.13
<i>Eriophorum scheuchzeri</i> . . . . .	.7
Others . . . . .	.4

Forbs/Miscellaneous (5%)	Percent
<i>Equisetum arvense</i> . . . . .	.2
Others . . . . .	.3

Shrubs/Woody (35%)	Percent
<i>Betula nana</i> . . . . .	.3
<i>Dryas integrifolia</i> . . . . .	.3
<i>Dryas octopetala</i> . . . . .	.3
<i>Salix fuscescens</i> . . . . .	.10
<i>Salix reticulata</i> . . . . .	.5
<i>Vaccinium uliginosum</i> . . . . .	.3
Others . . . . .	.8

Live Lichen Biomass (100%)	Percent
<i>Cetraria cucullata</i> . . . . .	.21
<i>Cetraria islandica</i> . . . . .	.26
<i>Cladina arbuscula</i> . . . . .	.17
<i>Cladina rangiferina</i> . . . . .	.24
<i>Cladonia gracilis</i> . . . . .	.3
<i>Thamnolia subuliformis</i> . . . . .	.4
Others . . . . .	.5

Moss/Clubmoss Biomass (100%)	Percent
<i>Hylocomnium</i> spp . . . . .	.9
<i>Hypnum</i> spp . . . . .	.10
<i>Sphagnum</i> spp . . . . .	.11
Others . . . . .	.70

Average Cover (percent)			
Shrub	12-25	Litter	25-50
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	25-50	Rock	0-6
Lichen	12-25	Water	0-6
Moss	12-25		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	530-610
Average	570
b. Live Lichen Biomass	
	90-200
	145
c. Moss/Clubmoss Biomass*	
Range	210-1850
Average	885

*Represents the range of data collected.

ECOLOGICAL SITE NO. 54
NAME: SEDGE (DRAINAGEWAY)

Physical Characteristics

FEATURES – This site occurs in upland drainageways, and within shallow lake systems.

VEGETATION – Water sedge (*Carex aquatilis*), white cottongrass (*Eriophorum scheuchzeri*), dwarf arctic birch (*Betula nana*), and Alaska bog willow (*Salix fuscescens*) are the most common plants on this site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 85 percent, forbs a trace, and shrubs 15 percent of the vegetative production. Annual vascular plant production yields 660 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for spring and summer range. Some sedges can be grazed during winter, and can provide one of the few sources of high quality green feed at that time, while lichens are available from nearby sites. Mosquitoes may be a limiting factor in late spring and early summer.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (85%)	Percent
<i>Carex aquatilis</i> . . . . .	.65
<i>Eriophorum scheuchzeri</i> . . . . .	.18
Others . . . . .	.2

Forbs/Miscellaneous (T)	Percent
<i>Rubus chamaemorus</i>	T
Others	T

Shrubs/Woody (15%)	Percent
<i>Betula nana</i> . . . . .	.7
<i>Salix fuscescens</i> . . . . .	.5
Others . . . . .	.3

Live Lichen Biomass (0%) **Percent**

Moss/Clubmoss Biomass (100%) **Percent**

<i>Hylocomnium</i> spp . . . . .	.10
<i>Hypnum</i> spp . . . . .	.14
<i>Sphagnum</i> spp . . . . .	.74
Others . . . . .	.2

Average Cover (percent)

Shrub	6-12	Litter	12-25
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	25-50	Rock	0-6
Lichen	0-6	Water	12-25
Moss	12-25		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	540-780
Average	660

b. Live Lichen Biomass	
0	
0	

c. Moss/Clubmoss Biomass*	
Range	610-1760
Average	1180

*Represents the range of data collected.

ECOLOGICAL SITE NO. 55
NAME: COTTONGRASS-WATER SEDGE
(LOW CENTER POLYGONS)

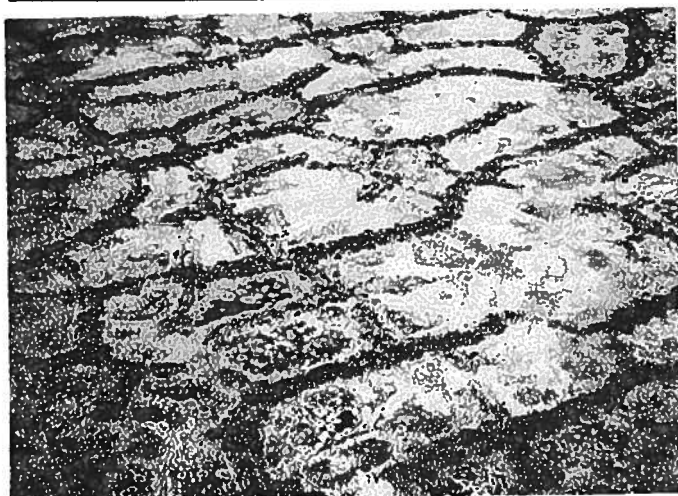
Physical Characteristics

FEATURES – This site occurs adjacent to breached lake beds on the coastal plain, and in lake systems.

VEGETATION – Water sedge (*Carex aquatilis*), white cottongrass (*Eriophorum scheuchzeri*), and northern labrador tea (*Ledum decumbens*) are the most common plants on this site. Other grasses and grasslikes, forbs, and low growing shrubs constitute minor components of the vegetation.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes constitute 60 percent, forbs a trace, and shrubs 40 percent of the vegetative production. Annual vascular plant production yields 715 lb/ac. Live lichen biomass yields 75 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for spring and summer range. Vegetation quality on this site in summer is high. Grasses and sedges provide high levels of digestible protein. Shrubs provide good to excellent forage, both in spring, as new growth, and in fall. In summer, mosquitoes may limit grazing on windfree days.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (60%)	Percent
Carex aquatilis . . . . .	.33
Carex rotundata . . . . .	.5
Eriophorum angustifolium . . . . .	.5
Eriophorum scheuchzeri . . . . .	.11
Eriophorum vaginatum . . . . .	.5
Others . . . . .	.1

Forbs/Miscellaneous (T)	Percent
Rubus chamaemorus	T

Shrubs/Woody (40%)	Percent
Betula nana . . . . .	.7
Ledum decumbens . . . . .	.20
Vaccinium uliginosum . . . . .	.4
Vaccinium vitis-idaea . . . . .	.5
Others . . . . .	.4

Live Lichen Biomass (100%)	Percent
Cetraria cucullata . . . . .	.13
Cetraria islandica . . . . .	.8
Cladina arbuscula . . . . .	.26
Cladina rangiferina . . . . .	.22
Cladonia gracilis . . . . .	.3
Cladonia spp . . . . .	.28

Moss/Clubmoss Biomass (100%)	Percent
Hypnum spp . . . . .	.20
Polytrichum spp . . . . .	.10
Sphagnum spp . . . . .	.70

Average Cover (percent)			
Shrub	12-25	Litter	12-25
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	12-25	Rock	0-6
Lichen	0-6	Water	0-6
Moss	25-50		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	600-830
Average	715
b. Live Lichen Biomass	
	20-130
	75
c. Moss/Clubmoss Biomass*	
Range	1500-5000
Average	3000

*Represents the range of data collected.

ECOLOGICAL SITE NO. 56A
NAME: GRASS (BREACHED LAKE BED)

Physical Characteristics

FEATURES – This site occurs on breached lake beds, oxbows, and lake borders on coastal and alluvial plains. Distinct shorelines of old lakes characterize this site.

VEGETATION – Bluejoint (*Calamagrostis canadensis*), water sedge (*Carex aquatilis*), and dwarf arctic birch (*Betula nana*) are the most common plants on this site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 80 percent, forbs 5 percent, and shrubs 15 percent of the vegetative production. Annual vascular plant production yields 805 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for spring and summer range. During spring and early summer grasses and sedges provide high levels of digestible protein. Dwarf arctic birch, especially its new growth, can provide good quality forage from spring through fall. Limiting factors on this site during summer include mosquitoes, and also the relative scarcity of shrubs.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (80%)	Percent
Calamagrostis canadensis . . . . .	.65
Carex aquatilis . . . . .	.13
Others . . . . .	.2

Forbs/Miscellaneous (5%)	Percent
Polemonium acutiflorum . . . . .	.2
Others . . . . .	.3

Shrubs/Woody (15%)	Percent
Betula nana . . . . .	.12
Others . . . . .	.3

Live Lichen Biomass (0%) **Percent**

Moss/Clubmoss Biomass (100%) **Percent**
 Hylocomnium spp.98
 Sphagnum spp.2

Average Cover (percent)			
Shrub	12-25	Litter	50-75
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	25-50	Rock	0-6
Lichen	0-6	Water	0-6
Moss	12-25		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 640-970
 - Average 805
- b. Live Lichen Biomass
 - 0
 - 0
- c. Moss/Clubmoss Biomass*
 - Range 170-5700
 - Average 2120

*Represents the range of data collected.

ECOLOGICAL SITE NO. 56B
NAME: SEDGE (BREACHED LAKE BED)

Physical Characteristics

FEATURES – This site occurs on breached lake beds, oxbows, and lake borders on coastal and alluvial plains.

VEGETATION – Water sedge (*Carex aquatilis*), bluejoint (*Calamagrostis canadensis*), and diamondleaf willow (*Salix planifolia*) are the most common plants.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 60 percent, forbs 5 percent, and shrubs 35 percent of the vegetative production. Annual vascular plant production yields 645 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for summer range. Grasses and grasslikes provide high quality digestible protein. Willows (*Salix spp.*), especially new growth, can provide forage into fall and possibly early winter. During summer, mosquitoes may limit grazing on this site on windless days.

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	490-880
Average	645
b. Live Lichen Biomass	
	0
	0
c. Moss/Clubmoss Biomass*	
Range	100-800
Average	300

Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (60%)	Percent
Calamagrostis canadensis . . . . .	.25
Carex aquatilis . . . . .	.27
Others . . . . .	.8

Forbs/Miscellaneous (5%)	Percent
Polemonium acutiflorum . . . . .	.1
Others . . . . .	.4

Shrubs/Woody (35%)	Percent
Betula nana . . . . .	.2
Empetrum nigrum . . . . .	.1
Salix fuscescens . . . . .	.2
Salix lanata . . . . .	.10
Salix planifolia . . . . .	.20

Live Lichen Biomass (0%)	Percent
---------------------------------	----------------

Moss/Clubmoss Biomass (100%)	Percent
Sphagnum spp . . . . .	.100

Average Cover (percent)			
Shrub	12-25	Litter	50-75
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	25-50	Rock	0-6
Lichen	0-6	Water	0-6
Moss	6-12		

*Represents the range of data collected.

ECOLOGICAL SITE NO. 57

NAME: SEDGE (WET LAKE BED)

Physical Characteristics

FEATURES – This site occurs on wet lake beds, oxbows, and lake borders on coastal and alluvial plains. It is frequently adjacent to small lakes, ponds, and breached lakebeds.

VEGETATION – Water sedge (*Carex aquatilis*), round sedge (*Carex rotundata*), and white cottongrass (*Eriophorum scheuchzeri*) are common plants on this site. Due to extreme wetness, forbs and shrubs are sparse.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 90 percent, forbs 5 percent, and shrubs 5 percent of the vegetative production. Annual vascular plant production yields 795 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for spring and summer range. Growing grasses and sedges provide high levels of digestible protein early in the season, but nutritional values decline as plants mature. Some sedges can be grazed during winter, and can provide one of the few sources of high quality green feed at that time, while lichens are available from nearby sites. Mosquitoes may limit grazing use of this area during summer. Accessibility to water is no problem on this site.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (90%)	Percent
Carex aquatilis	70
Carex rotundata	6
Eriophorum scheuchzeri	6
Others	8

Forbs/Miscellaneous (5%)	Percent
Potentilla palustris	5

Shrubs/Woody (5%)	Percent
Betula nana	2
Others	3

Live Lichen Biomass (0%)	Percent
	0

Moss/Clubmoss Biomass (100%)	Percent
Hylocomnium spp	100

Average Cover (percent)			
Shrub	0-6	Litter	25-50
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	12-25	Rock	0-6
Lichen	0-6	Water	12-25
Moss	25-50		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants

Range	690-900
Average	795
- b. Live Lichen Biomass

	0
	0
- c. Moss/Clubmoss Biomass*

Range	570-3000
Average	880

*Represents the range of data collected.

ECOLOGICAL SITE NO. 60
NAME: LICHEN (TUSSOCK TUNDRA)

Physical Characteristics

FEATURES – This site occurs on rolling hills, long foot slopes, and broad depressions.

VEGETATION – Tussock cottongrass (*Eriophorum vaginatum*), northern labrador tea (*Ledum decumbens*), lingonberry (*Vaccinium vitis-idaea*), and salmonberry (*Rubus chamaemorus*) are the dominant vegetation on this site. Reindeer lichen (*Cladina spp.*) are the most prevalent lichens found.

VEGETATION PRODUCTION (Air Dry) – Grasslikes comprise 35 percent, forbs 10 percent, and shrubs 55 percent of the vegetative production. Annual vascular plant production yields 565 lb/ac. Live lichen biomass yields 995 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range, and due to its large quantities of lichen, should not be used during any other season. Lichens can become very brittle during drier periods of year, and if trampled, can be destroyed. Grasses, sedges, and new growth on shrubs provide good forage during the early part of the growing season. Water is fairly accessible on this site.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (35%)	Percent
Carex aquatilis	3
Carex bigelowii	7
Eriophorum vaginatum	25

Forbs/Miscellaneous (10%)	Percent
Rubus chamaemorus	10
Others	T

Shrubs/Woody (55%)	Percent
Betula nana	7
Empetrum nigrum	5
Ledum decumbens	20
Vaccinium uliginosum	8
Vaccinium vitis-idaea	10
Others	5

Live Lichen Biomass (100%)	Percent
Cetraria cucullata	19
Cetraria islandica	11
Cladina arbuscula	9
Cladina mitis	12
Cladina rangiferina	32
Cladonia spp	14
Cladonia gracilis	2
Others	1

Moss/Clubmoss Biomass (100%)	Percent
Dicranum spp	10
Sphagnum spp	74
Others	16

Average Cover (percent)			
Shrub	25-50	Litter	12-25
Forb	6-12	Bare Ground	0-6
Grass/grasslikes	12-25	Rock	0-6
Lichen	25-50	Water	0-6
Moss	12-25		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 510-620
 - Average 565
- b. Live Lichen Biomass
 - 850-1140
 - 995
- c. Moss/Clubmoss Biomass*
 - Range 890-5340
 - Average 2485

*Represents the range of data collected.

ECOLOGICAL SITE NO. 61

NAME: LICHEN MEADOW (MOUNTAIN)

Physical Characteristics

FEATURES – This site occurs on broad ridges and mountainsides.

VEGETATION – Bigelow sedge (*Carex bigelowii*), entire-leaf mountain-avens (*Dryas integrifolia*), scattered forbs, low shrubs, and lichens are the most common vegetation on this site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 20 percent, forbs 5 percent, and shrubs 75 percent of the vegetative production. Annual vascular plant production yields 480 lb/ac. Live lichen biomass yields 1640 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range. Due to large amounts of lichen on this site, it should not be used during any other season. Lichens can become very brittle during dry periods of the year, and if trampled, can be depleted rapidly. Sedges and deciduous browse can provide fairly high value forage early in winter.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (20%)	Percent
<i>Carex aquatilis</i> .....	.3
<i>Carex bigelowii</i> .....	.15
Others .....	.2

Forbs/Miscellaneous (5%)	Percent
<i>Potentilla biflora</i> .....	.1
Others .....	.4

Shrubs/Woody (75%)

	Percent
<i>Arctostaphylos alpina</i> .....	.2
<i>Betula nana</i> .....	.8
<i>Dryas integrifolia</i> .....	.15
<i>Dryas octopetala</i> .....	.3
<i>Empetrum nigrum</i> .....	.4
<i>Ledum decumbens</i> .....	.4
<i>Loiseleuria procumbens</i> .....	.6
<i>Salix fuscescens</i> .....	.8
<i>Salix phlebophylla</i> .....	.2
<i>Salix reticulata</i> .....	.5
<i>Vaccinium uliginosum</i> .....	.7
<i>Vaccinium vitis-idaea</i> .....	.3
Others .....	.8

Live Lichen Biomass (100%)

	Percent
<i>Cetraria cucullata</i> .....	.15
<i>Cetraria islandica</i> .....	.12
<i>Cetraria nivalis</i> .....	.2
<i>Cladina arbuscula</i> .....	.23
<i>Cladina mitis</i> .....	.2
<i>Cladina rangiferina</i> .....	.26
<i>Cladonia gracilis</i> .....	.3
<i>Cornicularia divergens</i> .....	.2
<i>Thamnolia subuliformis</i> .....	.4
Others .....	.11

Moss/Clubmoss Biomass (100%)

	Percent
<i>Hypnum</i> spp .....	.14
<i>Lycopodium</i> spp .....	.44
<i>Polytrichum</i> spp .....	.21
<i>Sphagnum</i> spp .....	.21

Average Cover (percent)

Shrub	25-50	Litter	6-12
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	6-12	Rock	0-6
Lichen	25-50	Water	0-6
Moss	6-12		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	450-510
Average	480
b. Live Lichen Biomass	
	1350-1930
	1640
c. Moss/Clubmoss Biomass*	
Range	80-240
Average	190

*Represents the range of data collected.

ECOLOGICAL SITE NO. 63

NAME: LICHEN-SEDGE (COASTAL TUNDRA)

Physical Characteristics

FEATURES – This site occurs on alluvial fans and toe slopes on coastal plains immediately adjacent to the Bering and Chukchi Seas.

VEGETATION – Water sedge (*Carex aquatilis*), cotton-grasses (*Eriophorum spp.*), northern labrador tea (*Ledum decumbens*), dwarf arctic birch (*Betula nana*), salmonberry (*Rubus chamaemorus*), and reindeer lichens (*Cladina arbuscula*, *C. rangiferina*, and *C. stellaris*) are the most common vegetation on this site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 50 percent, forbs 10 percent, and shrubs 40 percent of the vegetative production. Annual vascular plant production yields 380 lb/ac. Live lichen biomass yields 2080 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range, and due to the presence of lichens, should not be used during any other season. Lichens can become very brittle during dry periods of the year, and if trampled, can be depleted rapidly. Water sedge, the dominant sedge on this site, was found to be a high-quality winter food by Skuncke (1969). During late fall and throughout winter deciduous browse and lichens can provide excellent forage on this site. Water is very accessible on this site.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (50%)	Percent
Carex aquatilis . . . . .	.25
Carex bigelowii . . . . .	.2
Eriophorum scheuchzeri . . . . .	.5
Eriophorum vaginatum . . . . .	.15
Others . . . . .	.3

Forbs/Miscellaneous (10%)	Percent
Rubus chamaemorus . . . . .	.10

Shrubs/Woody (40%)	Percent
Betula nana . . . . .	.10
Empetrum nigrum . . . . .	.5
Ledum decumbens. . . . .	.12
Vaccinium uliginosum . . . . .	.5
Vaccinium vitis-idaea . . . . .	.5
Others . . . . .	.3

Live Lichen Biomass (100%)	Percent
Cetraria cucullata . . . . .	.6
Cetraria islandica . . . . .	.17
Cladina arbuscula . . . . .	.29
Cladina mitis . . . . .	.5
Cladina rangiferina. . . . .	.37
Others . . . . .	.6

Moss/Clubmoss Biomass (100%)	Percent
Sphagnum spp . . . . .	.100

Average Cover (percent)			
Shrub	6-12	Litter	12-25
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	6-12	Rock	0-6
Lichen	12-25	Water	0-6
Moss	50-75		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 320-440
 - Average 380
- b. Live Lichen Biomass
 - 1630-2530
 - 2080
- c. Moss/Clubmoss Biomass*
 - Range 1625-9520
 - Average 5570

*Represents the range of data collected.

ECOLOGICAL SITE NO. 64
NAME: LICHEN-SEDGE MEADOW
(UPLAND)

Physical Characteristics

FEATURES – This site occurs on mountainsides and broad ridges.

VEGETATION – Bigelow sedge (*Carex bigelowii*), dwarf arctic birch (*Betula nana*) and lichens are the most common vegetation on this site.

VEGETATION PRODUCTION (Air Dry) – Bigelow sedge (*Carex bigelowii*) comprise 30 percent, forbs 5 percent, and shrubs 65 percent of the vegetative production. Annual vascular plant production yields 315 lb/ac. Live lichen biomass yields 3570 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range. Due to the high volume of lichens on this site, it should not be used during any other season. Lichens can become very brittle during dry periods of the year, and if trampled, they can be destroyed. Grasses and sedges provide digestible protein during late fall. Shrubs also provide good quality forage in late fall.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (30%)	Percent
<i>Carex bigelowii</i> .....	.30
Forbs/Miscellaneous (5%)	
<i>Equisetum arvense</i> .....	.3
<i>Rubus chamaemorus</i> .....	.2

Shrubs/Woody (65%)	Percent
<i>Arctostaphylos rubra</i> .....	.8
<i>Betula nana</i> .....	.15
<i>Dryas octopetala</i> .....	.8
<i>Empetrum nigrum</i> .....	.3
<i>Ledum decumbens</i> .....	.3
<i>Salix fuscescens</i> .....	.8
<i>Salix reticulata</i> .....	.7
<i>Vaccinium uliginosum</i> .....	.9
<i>Vaccinium vitis-idaea</i> .....	.3
Others .....	.1

Live Lichen Biomass (100%)	Percent
<i>Cetraria cucullata</i> .....	.17
<i>Cetraria islandica</i> .....	.3
<i>Cladina arbuscula</i> .....	.37
<i>Cladina rangiferina</i> .....	.38
<i>Cladina stellaris</i> .....	.5

Moss/Clubmoss Biomass (100%)	Percent
<i>Hylocomnium</i> spp .....	.56
<i>Sphagnum</i> spp .....	.13
Others .....	.31

Average Cover (percent)			
Shrub	12-25	Litter	0-6
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	6-12	Rock	0-6
Lichen	50-75	Water	0-6
Moss	6-12		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	190-440
Average	315
b. Live Lichen Biomass	
	880-6260
	3570
c. Moss/Clubmoss Biomass*	
Range	2200-10,500
Average	2660

*Represents the range of data collected.

ECOLOGICAL SITE NO. 65

NAME: LICHEN SLOPE (UPLAND)

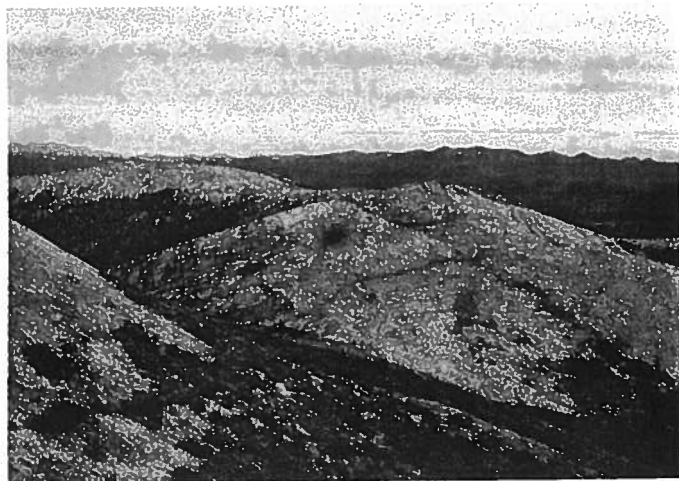
Physical Characteristics

FEATURES – This site occurs on mountainsides, predominantly on the southeastern portion of the Seward Peninsula.

VEGETATION – Alpine azalea (*Loiseleuria procumbens*), dwarf arctic birch (*Betula nana*), Bigelow sedge (*Carex bigelowii*), northern labrador tea (*Ledum decumbens*), blackberry (*Empetrum nigrum*), and reindeer lichens (*Cladina arbuscula*, *C. rangiferina*, *C. stellaris*) are the most common vegetation on this site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 10 percent, forbs a trace, and shrubs 90 percent of the vegetative production. Annual vascular plant production yields 225 lb/ac. Live lichen biomass yields 9740 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range. Overgrazing of herbaceous forage and trampling of lichens could cause a serious problem on this site. This site should not be used during any other season due to its abundant growth of lichens; lichens can become very brittle during dry periods of the year and if trampled, can be depleted rapidly.



Shrubs/Woody (90%)	Percent
Betula glandulosa . . . . .	.4
Betula nana . . . . .	.8
Empetrum nigrum . . . . .	.8
Ledum decumbens . . . . .	.12
Loiseleuria procumbens . . . . .	.50
Vaccinium uliginosum . . . . .	.2
Vaccinium vitis-idaea . . . . .	.5
Others . . . . .	.1

Live Lichen Biomass (100%)	Percent
Cetraria cucullata . . . . .	.3
Cetraria islandica . . . . .	.4
Cladina arbuscula . . . . .	.25
Cladina rangiferina . . . . .	.27
Cladina stellaris . . . . .	.33
Cladonia uncialis . . . . .	.4
Others . . . . .	.4

Moss/Clubmoss Biomass (0%)	Percent
Average Cover (percent)	
Shrub	12-25
Forb	0-6
Grass/grasslikes	0-6
Lichen	75-94
Moss	0-6
Litter	12-25
Bare Ground	0-6
Rock	0-6
Water	0-6

Plant Production – Air Dry (lb/ac)	
a. Vascular Plants	
Range	140-370
Average	255
b. Live Lichen Biomass	
Range	6650-12,830
Average	9740
c. Moss/Clubmoss Biomass*	
Range	0
Average	0

Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (10%)	Percent
Carex bigelowii . . . . .	.7
Others . . . . .	.3

Forbs/Miscellaneous (T)	Percent
Saussurea spp . . . . .	.1

*Represents the range of data collected.

ECOLOGICAL SITE NO. 66

NAME: LICHEN MAT (LOWLAND TUNDRA)

Physical Characteristics

FEATURES – This site occurs in small patches in broad valleys.

VEGETATION – Tussock cottongrass (*Eriophorum vaginatum*), cloudberry (*Rubus chamaemorus*), dwarf arctic birch (*Betula nana*), labrador tea (*Ledum decumbens*), bog blueberry (*Vaccinium uliginosum*), lingonberry (*Vaccinium vitis-idaea*), and lichens are the most common vegetation on this site.

VEGETATION PRODUCTION (Air Dry) – Grasslikes comprise 25 percent, forbs 10 percent, and shrubs 65 percent of the vegetative production. Annual vascular plant production yields 250 lb/ac. Live lichen biomass yields 5805 lb/ac.

VALUE FOR REINDEER GRAZING – This site is best suited for winter range due to its high volume of palatable lichens. Overgrazing and trampling could cause a serious problem on this site, but can be prevented with proper herd management.



Shrubs/Woody (65%)	Percent
<i>Betula nana</i>	10
<i>Empetrum nigrum</i>	7
<i>Ledum decumbens</i>	20
<i>Vaccinium uliginosum</i>	15
<i>Vaccinium vitis-idaea</i>	10
Others	3

Live Lichen Biomass (100%)	Percent
<i>Cetraria cucullata</i>	6
<i>Cetraria islandica</i>	7
<i>Cladina arbuscula</i>	26
<i>Cladina mitis</i>	11
<i>Cladina rangiferina</i>	41
<i>Cladina stellaris</i>	6
Others	3

Moss/Clubmoss Biomass (100%)	Percent
<i>Sphagnum</i> spp	100

Average Cover (percent)

Shrub	12-25	Litter	25-50
Forb	0-6	Bare Ground	0-6
Grass/grasslikes	6-12	Rock	0-6
Lichen	50-75	Water	0-6
Moss	0-6		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	210-290
Average	250
b. Live Lichen Biomass	
	4820-6790
	5805
c. Moss/Clubmoss Biomass*	
Range	4000-10,500
Average	6240

*Represents the range of data collected.

Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (25%)	Percent
<i>Carex aquatilis</i>	7
<i>Carex bigelowii</i>	6
<i>Eriophorum vaginatum</i>	12

Forbs/Miscellaneous (10%)	Percent
<i>Rubus chamaemorus</i>	10

ECOLOGICAL SITE NO. 70
NAME: LICHEN GRANITIC SLOPE
(ALPINE)

Physical Characteristics

FEATURES – This site occurs on granitic ridges and mountainsides.

VEGETATION – White mountain-avens (*Dryas octopetala*), alpine azalea (*Loiseleuria procumbens*), sedges, and lichens are the most common vegetation on this site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 10 percent, forbs 5 percent, and shrubs 85 percent of the vegetative production. Annual vascular plant production yields 290 lb/ac. Live lichen biomass yields 1380 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range. Due to the presence of lichens, this site should not be used during any other season. Lichens can become very brittle during dry periods of the year, and if trampled, can become depleted rapidly. This site is usually exposed to winds and is snow-free during most of the winter.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (10%)	Percent
Carex bigelowii	5
Hierochloe alpina	2
Others	3

Forbs/Miscellaneous (5%)	Percent
Potentilla spp.	1
Others	4

Shrubs/Woody (85%)	Percent
Arctostaphylos alpina	7
Cassiope tetragona	2
Diapensia lapponica	2
Dryas octopetala	35
Empetrum nigrum	2
Ledum decumbens	4
Loiseleuria procumbens	10
Salix phlebophylla	10
Vaccinium uliginosum	3
Vaccinium vitis-idaea	3
Others	7

Live Lichen Biomass (100%)	Percent
Alectoria nigricans	7
Alectoria ochroleuca	7
Cetraria cucullata	5
Cetraria islandica	6
Cetraria nivalis	5
Cladina arbuscula	16
Cladina mitis	2
Cladina rangiferina	12
Cladina stellaris	2
Cladonia gracilis	3
Cladonia spp	3
Cornicularia divergens	12
Stereocaulon lividum	3
Sphaerophorus globosus	3
Thamnolia subuliformis	5
Others	9

Moss/Clubmoss Biomass (0%)	Percent
Average Cover (percent)	
Shrub 25-50	Litter 12-25
Forb 0-6	Bare Ground 6-12
Grass/grasslikes 0-6	Rock 12-25
Lichen 25-50	Water 0-6
Moss 0-6	

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	250-330
Average	290
b. Live Lichen Biomass	
	1150-1610
	1380
c. Moss/Clubmoss Biomass*	
Range	0
Average	0

*Represents the range of data collected.

ECOLOGICAL SITE NO. 71

NAME: DRYAS LIMESTONE SLOPE

Physical Characteristics

FEATURES – This site occurs on limestone hillsides, mountainsides and moraine terraces.

VEGETATION – Mountain-avens (*Dryas spp.*), spike sedge (*Carex nardina*), various forbs, and lichens are the most common vegetation on this site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 10 percent, forbs 10 percent, and shrubs 80 percent of the vegetative production. Annual vascular plant production yields 360 lb/ac. Live lichen biomass yields 270 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range. Although reindeer lichens (*Cladina arbuscula*, *C. rangiferina*, *C. stellaris*) and iceland lichens (*Cetraria spp.*) provide excellent feed for reindeer, lichens are very sparse on this site. This site is usually the last site to be covered with snow in fall and the first to be exposed in spring.



Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (10%)	Percent
Carex bigelowii .....	.4
Carex nardina .....	.5
Others .....	.1

Forbs/Miscellaneous (10%)	Percent
Saxifraga oppositifolia .....	.3
Others .....	.7

Shrubs/Woody (80%)	Percent
Dryas integrifolia .....	.45
Dryas octopetala .....	.20
Loiseleuria procumbens .....	.4
Salix phlebophylla .....	.4
Others .....	.7

Live Lichen Biomass (100%)	Percent
Alectoria ochroleuca .....	.5
Cetraria cucullata .....	.8
Cetraria islandica .....	.6
Cetraria nivalis .....	.24
Cetraria tilesii .....	.5
Cladina arbuscula .....	.3
Cladonia spp .....	.3
Stereocaulon lividum .....	.5
Stereocaulon spp .....	.4
Thamnolia subuliformis .....	.32
Others .....	.5

Moss/Clubmoss Biomass (0%)

Percent

Average Cover (percent)

Shrub	25-50	Litter	12-25
Forb	0-6	Bare Ground	6-12
Grass/grasslikes	0-6	Rock	12-25
Lichen	12-25	Water	0-6
Moss	0-6		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	310-410
Average	360
b. Live Lichen Biomass	
	220-320
	270
c. Moss/Clubmoss Biomass*	
Range	0
Average	0

*Represents the range of data collected.

ECOLOGICAL SITE NO. 72

NAME: BALD LIMESTONE SLOPE

Physical Characteristics

FEATURES – This site occurs on limestone semi-barren mountain tops, and on moraine terraces exposed to high wind.

VEGETATION – Spike sedge (*Carex nardina*), mountain-avens (*Dryas spp.*), purple mountain saxifrage (*Saxifraga oppositifolia*), and lichens are the most common vegetation on this site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 10 percent, forbs 20 percent, and shrubs 70 percent of the vegetative production. Annual vascular plant production yields 105 lb/ac. Live lichen biomass yields 50 lb/ac.

VALUE FOR GRAZING REINDEER – Due to both low vascular plant production and live lichen biomass, this site would be considered poor reindeer range during any season; however, because of exposure to winds, this site provides escape from mosquitoes during summer months.



Shrubs/Woody (70%)	Percent
Dryas drummondii	9
Dryas integrifolia	8
Dryas octopetala	50
Salix phlebophylla	3

Live Lichen Biomass (100%)	Percent
Alectoria nigricans	3
Alectoria ochroleuca	3
Cetraria cucullata	5
Cetraria islandica	4
Cetraria nivalis	8
Cetraria spp	2
Stereocaulon lividum	4
Stereocaulon spp	8
Thamnolia subuliformis	57
Others	6

Moss/Clubmoss Biomass (0%)		Percent
Average Cover (percent)		
Shrub	6-12	Litter 0-6
Forb	0-6	Bare Ground 12-25
Grass/grasslikes	0-6	Rock 50-75
Lichen	0-6	Water 0-6
Moss	0-6	

Plant Production – Air Dry (lb/ac)	
a. Vascular Plants	
Range	90-120
Average	105
b. Live Lichen Biomass	
	30-70
	50
c. Moss/Clubmoss Biomass*	
Range	0
Average	0

Relative Percentage of Total Plant Community

Grasses/Grasslikes (10%)	Percent
Carex nardina	7
Others	3

Forbs/Miscellaneous (20%)	Percent
Minuartia arctica	3
Potentilla elegans	2
Saxifraga oppositifolia	5
Others	10

*Represents the range of data collected.

ECOLOGICAL SITE NO. 74
NAME: DRYAS-LICHEN (RIDGES)

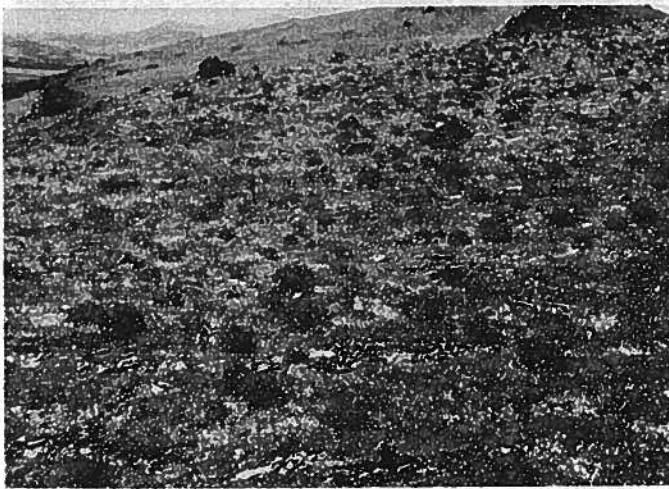
Physical Characteristics

FEATURES – This site occurs on nearly level mountain ridges, summits, and shoulders where soils are shallow and environmental conditions severe.

VEGETATION – White mountain-avens (*Dryas octopetala*), Bigelow sedge (*Carex bigelowii*), arctic lupine (*Lupinus arcticus*), low-growing shrubs, and lichens are the most common vegetation on this site.

VEGETATION PRODUCTION – Grasses and grasslikes comprise 10 percent, forbs 20 percent, and shrubs 70 percent of the vegetative production. Annual vascular plant production yields 380 lb/ac. Live lichen biomass yields 1255 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for winter range. Due to the presence of lichens, this site should not be used during any other season; lichens can become very brittle during dry periods of the year, and if trampled, can be depleted rapidly.



Live Lichen Biomass (100%)	Percent
Alectoria nigricans . . . . .	.3
Alectoria ochroleuca . . . . .	.4
Cetraria cucullata . . . . .	.12
Cetraria islandica . . . . .	.2
Cetraria nivalis . . . . .	.2
Cladina arbuscula . . . . .	.9
Cladina rangiferina . . . . .	.5
Cornicularia divergens . . . . .	.59
Sphaerophorus globosus . . . . .	.2
Others . . . . .	.2

Moss/Clubmoss Biomass (100%)	Percent
Unidentified . . . . .	.100

Average Cover (percent)			
Shrub	12-25	Litter	0-6
Forb	12-25	Bare Ground	6-12
Grass/grasslikes	6-12	Rock	12-25
Lichen	25-50	Water	0-6
Moss	12-25		

Plant Production – Air Dry (lb/ac)

- a. Vascular Plants
 - Range 220-540
 - Average 380
- b. Live Lichen Biomass
 - 790-1720
 - 1255
- c. Moss/Clubmoss Biomass*
 - Range 3000-6500
 - Average 4600

Relative Percentage of Total Plant Community by Weight

Grasses/Grasslikes (10%)	Percent
Carex bigelowii . . . . .	.5
Others . . . . .	.5

Forbs/Miscellaneous (20%)	Percent
Lupinus arcticus . . . . .	.15
Others . . . . .	.5

Shrubs/Woody (70%)	Percent
Dryas octopetala . . . . .	.55
Salix arctica . . . . .	.4
Salix polaris . . . . .	.7
Salix reticulata . . . . .	.4

*Represents the range of data collected.

ECOLOGICAL SITE NO. 82

NAME: RIVERWASH

Physical Characteristics

FEATURES – This site occurs in floodplains and on narrow overflow areas bordering river and stream channels.

VEGETATION – Dwarf fireweed (*Epilobium latifolium*), feltleaf willow (*Salix alaxensis*), Richardson willow (*Salix lanata*), and red fescue (*Festuca rubra*) are the most common plants on this site.

VEGETATION PRODUCTION (Air Dry) – Grasses and grasslikes comprise 10 percent, forbs 40 percent, and shrubs 50 percent of the vegetative production. Annual vascular plant production yields 350 lb/ac. Live lichen biomass yields 65 lb/ac.

VALUE FOR GRAZING REINDEER – This site is best suited for summer and fall range. This site provides good quality but low production reindeer forage. Reindeer may make extensive use of the site during periods of intense insect harassment.



Relative Percentage of Total Plant Community

Grasses/Grasslikes (10%)		Percent
Festuca rubra	.....	.5
Others	.....	.5
Forbs/Miscellaneous (40%)		Percent
Castilleja spp	.....	.3
Epilobium latifolium	.....	.30
Others	.....	.7
Shrubs/Woody (50%)		Percent
Salix alaxensis	.....	.25
Salix lanata	.....	.25
Others	.....	.1

Live Lichen Biomass (100%)		Percent
Cetraria cucullata	.....	.9
Cetraria islandica	.....	.14
Cladina rangiferina	.....	.14
Stereocaulon lividum	.....	.9
Thamnolia subuliformis	.....	.36
Cladonia spp	.....	.18

Moss/Clubmoss Biomass (100%)		Percent
Spagnum spp	.....	.100

Average Cover (percent)			
Shrub	12-25	Litter	12-25
Forb	6-12	Bare Ground	12-25
Grass/grasslikes	0-6	Rock	25-50
Lichen	0-6	Water	0-6
Moss	0-6		

Plant Production – Air Dry (lb/ac)

a. Vascular Plants	
Range	330-370
Average	350
b. Live Lichen Biomass	
	10-120
	65
c. Moss/Clubmoss Biomass*	
Range	1760-2300
Average	2030

*Represents the range of data collected.

MISCELLANEOUS MAPPING UNIT DESCRIPTIONS

The following descriptions are not ecological sites, but have been identified on color-infrared photography and are map units:

Mapping unit no. 4: LAGOON

This mapping unit includes fresh and salt water lagoons which are subjected to tidal influence. Major ecological sites associated with this mapping unit are: Dunes (Beach) (50), and Marsh (Tidal) (51).

Mapping unit no. 5: OCEAN

This mapping unit is either the Chukchi or Bering sea. Major ecological sites associated with this mapping unit are: Dunes (Beach) 50, and Marsh (Tidal) 51.

Mapping unit no. 80: LAVA BED

This mapping unit is an old lava flow. Major ecological sites associated with this mapping unit are: Lichen Mat (Lowland Tundra) (66), and Low Shrub-Cottongrass (Tussock Tundra) (42B).

Mapping unit no. 81: BARREN

This mapping unit includes a number of miscellaneous barren to very sparsely vegetated landforms. Major ecological sites associated with this mapping unit are: Lichen Granitic Slope (Alpine) (70), Dryas Limestone Slope (71), Bald Limestone Slope (72), and Riverwash (82).

Mapping unit no. 90: BURNED FOREST

This burned mapping unit represents many various seral stages of any one of the forested ecological sites, depending upon its vegetative cover prior to burning. Vegetation in this mapping unit is extremely variable because of fire intensity, duration, original site potential, and the rate and direction of plant succession. In most areas, a variety of willows dominate the herbage production in the mapping unit.

Mapping unit no. 91: BURNED TUNDRA

This burned mapping unit represents many various seral stages of any one of the tundra and shrub ecological sites, depending upon its plant cover prior to burning. Vegetation in this mapping unit is extremely variable because of the fire intensity, duration, original site potential, and the rate and direction of plant succession. In most areas, cottongrass and low shrub dominate the herbage production.



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APPENDIX A

GLOSSARY

Arboreal lichen: A lichen that grows on trees.

Acolian deposits: Materials transported and deposited by wind action; generally consists of medium to fine sand and coarse silt.

Alluvial deposits: Material of any particle size that has been deposited by moving water.

Bog: Peat-covered areas or peat-filled depressions with a high water table, strongly acid peat, and a surface layer of mosses.

Breached lake bed: A dried lake bed which at one time contained water, but the water was drained out when frost action or other natural phenomenon weakened the retaining wall and the lake was drained.

Bryophyte: A moss or liverwort.

Caribou: The species of deer inhabiting North America and Greenland, best known of which is *Rangifer tarandus*, the woodland caribou. *Rangifer tarandus* is the only wild subspecies of deer of the genus *Rangifer* occupying Alaska, differing from reindeer who are semi-domesticated.

Climatic climax: A climax community that characterizes normal topography, soils, and shows no dependence for its character upon recurrent disturbance, such as by animals or fire.

Climax community: The final and most stable of a series of communities in a succession, remaining relatively unchanged as long as climatic and physiographic factors remain constant.

Climax vegetation: The stabilized plant community on a particular site. The plant cover reproduces itself and does not change as long as the environment remains the same.

Cover: The proportion of an area covered by the vertical projection of plant crowns or basal area to the ground surface.

Crustose lichen: A lichen growth form with thalli growing in intimate contact with the substrate and lacking a lower cortex and rhizines.

cu ft/ac/yr (cubic foot/acre/year): A volumetric measure of the amount of wood produced per acre per year.

d.b.h. (diameter at breast height): Tree diameter measured at 4.5 feet (1.5m) from the ground.

Dwarf shrub: A shrub or woody plant less than eight inches (20cm) tall.

Ericaceous shrub: A woody plant in the Ericaceae family, e.g. cranberry, blueberry, labrador tea, etc.

Estuary: A water passage where the tide meets a river current; an arm of the sea at the lower end of a river.

Fen: A peatland with slowly moving water above or below the surface, acid to neutral and commonly supporting graminoid vegetation. Low shrubs are often present but sphagnum moss is absent or of low cover.

Floodplain: A plain built up by stream deposition.

Foliose lichen: A leaflike lichen growth form.

Foot slope: A concave surface at the base of a hillside; a transition zone between upslope sites of erosion and downslope sites of deposition.

Forage: All browse and herbaceous food that is grazed or harvested by livestock or available game animals.

Forbs: A general term used to refer to herbaceous non-woody plants other than graminoids, mosses and lichens.

Glacial moraine: Material of any particle size deposited by glaciation.

Herb: A plant with no persistent woody stem above ground.

Hummocks: (1) A rounded knoll or hillock usually of micro-landform character, found in association with tundra and taiga types. (2) Structures built up by *Sphagnum* cushions usually covered by dwarf shrubs. This *Sphagnum* is later partially replaced by other bryophytes or lichens.

Krummholz: (1) Scrubby, stunted trees, often forming a characteristic zone at the limit of tree growth in mountains. (2) The belt of discontinuous scrub or groveland alpine timberlines composed of species which have the genetic potential of the tree lifeform, but in this belt are both strongly dwarfed or misshapen.

Lichen: A thallophytic plant made up of an algae and a fungus growing in symbiotic association.

Low shrub: A woody plant that is approximately eight inches (20cm) to five feet (1.5m).

Muskeg: A wet area usually moss-floored, characterized chiefly by an organic soil. Muskeg most often refers to a black spruce woodland with a thick mat of mosses (*Hypnaeae* and *Sphagnum*) underlain by peat. It can be used to refer to a willow-grown sedge low place, and in loosest terms in any wet lowland such as a slough or bog.

Overstory: The portion of trees or tall shrubs forming the upper crown canopy cover.

Oxbow: A crescent-shaped lake formed in an abandoned river bend which has become separated from the main stream by a change in the course of the river.

Palatability: A measure of the degree of liking of a certain plant.

$$\text{Palatability} = \frac{\text{Relative amount of a species found in a stomach sample}}{\text{Relative amount of a species found on the range}}$$

Palsa: A round or elongated mound, maximum height about 32 feet (10m), composed of a peat layer overlying mineral soil. It has a perennially frozen core which extends from within the peat layer covering downward into or toward the underlying mineral soil.

Parent material: The unconsolidated more or less chemically weathered mineral, or organic matter from which the upper part of the soil profile has developed by pedogenic processes.

Patterned ground: A group term for the more or less symmetrical forms such as circles, polygons, nets, steps and stripes that are characteristic of, but not necessarily confined to the earth's surface and subject to intensive frost action.

Percent slope: The rise or fall per 100 feet.

Perched water table: A water table held above an impermeable bed; underlain by unsaturated rocks of sufficient permeability to allow movement of ground water.

Permafrost: Permanently frozen ground (subsoil); a perennially frozen soil horizon.

Permeability, Soil: The quality of a soil horizon that enables water or air to move through it; may be limited by the presence of one nearby impermeable horizon even though the others are permeable.

Pingo: A low hill or mound forced up by hydrostatic pressure in an area underlain by permafrost.

Plant production: Forage that is produced within a designated period of time in a given area, usually expressed as air-dry weight. It may also be modified as to time of production such as annual, current year's, or seasonal plant production.

Polygons: A type of patterned ground consisting of a closed, roughly equidimensional figure bounded by several sides commonly more or less straight, but some or all of which may be irregularly curved. Polygon low center: A polygon having a center that is lower than its margins. Polygons high center: A polygon having a center that is higher than its margin.

Reindeer: One of the semi-domesticated strains of *Rangifer tarandus*.

Sere: A complete series of successional changes in a community from the initial stage through transitional stages to the climax.

Shoulder: A lateral protrusion or extension of a hill or mountain.

Solifluction: The slow downhill flow or creep of soil and other loose materials that become saturated.

Succession: The orderly process of a changing plant community. It is the process whereby one association of species replaces another. Such a succession is usually gradual and involves a series of changes which follow a more or less regular course. Succession results from a change in habitat and invasion of new species.

Taiga: Subarctic forests or sparse lichen forests.

Tall shrub: A deciduous woody plant approximately five feet (1.5 m) or taller with multiple stems.

Talus: A slope formed by an accumulation of rock debris; rock debris at the base of a cliff.

Thallus (plural, thalli): Plant body of a lichen, usually classified by growth form (crustose, foliose, and fruticose).

Thaw lake: Lakes whose basins have been formed or enlarged by thawing of frozen ground. Some lake basins are entirely the result of thawing, others merely modified by it. They are dynamic features that tend to change their configuration and in places slowly migrate over the tundra.

Thermokarst: The irregular topography from the process of differential thaw settlement or caving of the ground because of melting ground ice.

Toe slope: The downslope site of deposition.

Tundra: The level to undulating treeless areas in northern and western Alaska. The plant association varies but lacks erect trees. Permafrost and patterned ground are also characteristics.

Tussock: A company tuft of grass, moss, or sedge, frequently found in association with low to mid elevation tundra.

Understory: A vegetation canopy under tall shrub or tree canopy.

APPENDIX B

LIST OF COMMON PLANT NAMES AND BOTANICAL NAMES

LATIN NAME	GRASSES/GRASSLIKES	COMMON NAME
<i>Agrostis borealis</i>		grasses: red bentgrass
<i>Arctagrostis latifolia</i>		polargrass
<i>Calamagrostis canadensis</i>		bluejoint
<i>Elymus mollis</i>		dunegrass
<i>Eriophorum angustifolium</i>		tall cottongrass
<i>Eriophorum scheuchzeri</i>		white cottongrass
<i>Eriophorum vaginatum</i>		tussock cottongrass
<i>Festuca altaica</i>		altai fescue
<i>Festuca rubra</i>		red fescue
<i>Hierochloa alpina</i>		alpine holy grass
<i>Poa arctica</i>		arctic bluegrass
<i>Poa eminens</i>		large-flower speargrass
<i>Puccinellia phryganodes</i>		creeping alkaligrass
<i>Carex</i> spp.		sedges:
<i>Carex aquatilis</i>		water sedge
<i>Carex bigelowii</i>		bigelow sedge
<i>Carex nardina</i>		spike sedge
<i>Carex podocarpa</i>		short stalk sedge
<i>Carex rotundata</i>		round sedge
<i>Carex subspathacea</i>		hoppner sedge
<i>Juncus</i> spp.		rushes
<i>Luzula</i> spp.		woodrush
	FORBS/MISCELLANEOUS	
<i>Artemisia arctica</i>		arctic wormwood
<i>Castilleja</i> spp.		indian paintbrush
<i>Chrysanthemum arcticum</i>		arctic daisy
<i>Epilobium angustifolium</i>		common fireweed
<i>Epilobium latifolium</i>		dwarf fireweed
<i>Equisetum arvense</i>		common field horsetail
<i>Equisetum hiemale californicum</i>		horsetail
<i>Equisetum sylvaticum</i>		woodland horsetail
<i>Galium boreale</i>		northern bedstraw
<i>Lathyrus maritimus</i>		sea peavine
<i>Linnaea borealis</i>		twin flower
<i>Lupinus arcticus</i>		arctic lupine
<i>Minuartia arctica</i>		arctic sandwort
<i>Petasites frigidus</i>		arctic sweet coltsfoot
<i>Polemonium acutiflorum</i>		tall jacob's-ladder
<i>Potentilla biflora</i>		two-flower cinquefoil
<i>Potentilla egedii</i>		silverweed
<i>Potentilla elegans</i>		elegant cinquefoil
<i>Potentilla palustris</i>		marsh cinquefoil
<i>Potentilla</i> spp.		cinquefoil
<i>Ranunculus</i> spp.		buttercup
<i>Rubus arcticus</i>		nagoonberry
<i>Rubus chamaemorus</i>		cloudberry
<i>Saussurea</i> spp.		saussura
<i>Saxifraga oppositifolia</i>		purple mountain saxifrage

SHRUBS/TREES

<i>Alnus crispa</i>	american green alder
<i>Arctostaphylos alpina</i>	alpine bearberry
<i>Arctostaphylos rubra</i>	red-fruit bearberry
	birch:
<i>Betula glandulosa</i>	resin
<i>Betula nana</i>	dwarf arctic
<i>Betula papyrifera</i>	paper
<i>Cassiope tetragona</i>	4-angled heather
<i>Diapensia lapponica</i>	diapensia
	mountain-avens:
<i>Dryas drummondii</i>	drummond
<i>Dryas integrifolia</i>	entire-leaf
<i>Dryas octopetala</i>	white
<i>Empetrum nigrum</i>	blackberry (crowberry)
<i>Ledum decumbens</i>	northern labrador tea
<i>Loiseleuria procumbens</i>	alpine azalea
	spruce:
<i>Picea glauca</i>	white
<i>Picea mariana</i>	black
<i>Populus balsamifera</i>	balsam poplar
<i>Potentilla fruticosa</i>	bush cinquefoil
<i>Rosa acicularis</i>	prickly rose
	willow:
<i>Salix alaxensis</i>	feltleaf willow
<i>Salix arbusculoides</i>	littletree willow
<i>Salix arctica</i>	arctic willow
<i>Salix fuscescens</i>	alaska bog willow
<i>Salix glauca</i>	grayleaf willow
<i>Salix lanata</i>	richardson willow
<i>Salix ovalifolia</i>	oval-leaf willow
<i>Salix phlebophylla</i>	skeleton-leaf willow
<i>Salix planifolia</i>	diamondleaf willow
<i>Salix polaris</i>	polar willow
<i>Salix reticulata</i>	netleaf willow
<i>Vaccinium uliginosum</i>	bog blueberry
<i>Vaccinium vitis-idaea</i>	lingonberry (low bush cranberry)

LICHENS

<i>Alectoria nigricans</i>	*
<i>Alectoria ochroleuca</i>	*
<i>Alectoria spp.</i>	*
<i>Usnea spp.</i>	
<i>Cetraria cucullata</i>	*
<i>Cetraria islandica</i>	iceland lichen
<i>Cetraria nivalis</i>	*
<i>Cetraria tilesii</i>	*
<i>Cladonia amaurocraea</i>	*
<i>Cladonia elongata</i>	*
<i>Cladonia gonecha pleurota</i>	*
<i>Cladonia gracilis</i>	*
<i>Cladonia uncialis</i>	*
<i>Cladonia spp.</i>	*

*Common name unknown

— LICHENS —

<i>Cladina arbuscula</i>	*
<i>Cladina mitis</i>	*
<i>Cladina rangiferina</i>	*
<i>Cladina stellaris</i>	reindeer lichen
<i>Cornicularia divergens</i>	other lichens
<i>Dactylina arctica</i>	*
<i>Sphaerophorus globosus</i>	*
<i>Stereocaulon lividum</i>	*
<i>Stereocaulon paschale</i>	*
<i>Thamnolia subuliformis</i>	*

— MOSSES/CLUBMOSES —

<i>Bryum spp.</i>	*
<i>Dicranum spp.</i>	*
<i>Hylocomnium spp.</i>	feather moss
<i>Hypnum spp.</i>	*
<i>Lycopodium spp.</i>	clubmoss
<i>Mnium spp.</i>	*
<i>Pleurozium spp.</i>	*
<i>Polytrichum spp.</i>	*
<i>Ptilium spp.</i>	*
<i>Sphagnum spp.</i>	sphagnum

*Common name unknown

APPENDIX C

COMPARISON OF THE SEWARD PENINSULA ECOLOGICAL SITE NAMES WITH THE 1982 REVISION OF PRELIMINARY CLASSIFICATION

ECOLOGICAL SITE		ALASKA VEGETATION CLASSIFICATION	
CODE NUMBER	NAME	CODE	NAME
10	Mixed Forest	1C(2)d	Open Spruce-Poplar Forest
11	Black Spruce	1A(3)e 1A(2)h	Black Spruce Woodland Open Black Spruce Forest
12	White Spruce (Upland)	1A(2)f	Open White Spruce Forest
13	Spruce-Lichen (Upland)	1A(3)c 1A(2)f	White Spruce Woodland Open White Spruce Forest
14	Paper Birch	1B(2)a 1B(1)d	Open Birch Forest Closed Birch Forest
15	Spruce-Lichen (Palsa)	1A(3)e	Black Spruce-White Spruce Woodland
20	Tall Shrub (Floodplain)	2B(1) 2B(2)	Closed Tall Shrub Scrub Open Tall Shrub Scrub
21	Tall Shrub (Drainageway)	2B(2)d 2B(1)d	Open Alder-Willow Scrub Closed Alder-Willow Scrub
22	Tall Shrub (Hillside)	2B(2)b 2B(1)b	Open Alder Scrub Closed Alder Scrub
32	Mixed Shrub (Tundra)	2C(2)e 2C(2)t	Open Low Alder-Willow Scrub Birch and Ericaceous Shrub Tundra
34	Low Shrub (Floodplain)	2C(2)b	Open Low Willow Scrub
35A	Shrub-Birch (Hillside)	2C(2)a 2C(1)a	Open Low Dwarf Birch Scrub Closed Low Dwarf Birch Scrub
35B	Shrub-Willow (Hillside)	2C(2)b 2C(2)c	Open Low Willow Scrub Open Low Willow-Birch Scrub
41	Shrub Meadow	2C(2)c	Dwarf Birch Willow Scrub
42A	Low Shrub-Water Sedge	2C(2)t	Dwarf Birch-Ericaceous Shrub Tundra
42B	Low Shrub-Cottongrass (Tussock Tundra)	3A(2)d	Tussock Tundra
43A	Low Shrub-Sedge Meadow (Alpine)	2D(2)c	Dryas-Herb Tundra

ECOLOGICAL SITE

ALASKA VEGETATION CLASSIFICATION

CODE NUMBER	NAME	CODE	NAME
43B	Low Shrub-Lichen Meadow (Alpine)	2D(2)b	Dryas-Lichen Tundra
44	Shrub-Lichen (Upland)	2C(2)t	Birch and Ericaceous Shrub Tundra
45	Water Sedge-Muskeg (Bog Fen)	3A(3)a	Wet Sedge Meadow Tundra
50	Dunes (Beach)	3A(1)a	Elymus
51	March (Tidal)	3A(3)j 3A(3)k	Halophytic Grass Wet Meadow Halophytic Sedge Wet Meadow
52	Sedge (Wet Meadow)	3A(3)a	Wet Sedge Meadow Tundra
54	Sedge (Drainageway)	3A(3)a	Wet Sedge Meadow Tundra
55	Cottongrass-Water Sedge	3A(3)a	Wet Sedge Meadow Tundra
56A	Grass (Breached Lake Bed)	3A(2)a	Bluejoint Meadow
56B	Sedge (Breached Lake Bed)	3A(3)a	Wet Sedge Meadow Tundra
57	Sedge (Wet Lake Bed)	3A(3)a	Wet Sedge Meadow Tundra
60	Lichen (Tussock Tundra)	3A(2)d	Tussock Tundra
61	Lichen Meadow	2D(2)b	Dryas-Lichen Tundra
63	Lichen-Sedge (Coastal Tundra)	3A(3)a	Wet Sedge Meadow Tundra
64	Lichen-Sedge Meadow (Upland)	3A(2)i	Sedge-Birch Tundra
65	Lichen Slope (Upland)	3C(2)b	Foliose and Fruticose Lichens
66	Lichen Mat (Lowland Tundra)	3C(2)b	Foliose and Fruticose Lichens
70	Lichen Granitic Slope	2D(2)b	Dryas-Lichen Tundra
71	Dryas Limestone Slope	2D(2)b	Dryas-Lichen Tundra
72	Bald Limestone Slope	2D(2)d	Dryas-Sedge Tundra
74	Dryas-Lichen (Ridges)	2D(2)c	Dryas-herb Tundra
82	Riverwash	2B(2)a	Open Tall Willow Scrub

APPENDIX D

USING THE MAPS WITH THE ECOLOGICAL SITE DESCRIPTIONS

The maps can be interpreted in terms of a variety of land uses when used with the ecological site descriptions. The ecological site descriptions explain what a site is like; the maps show where the site is found.

The steps involved are:

1. Refer to Index to Map Sheets in Appendix E. This index map consists of sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.
2. Identify the sheet number of the Index to Map Sheets which covers the area of interest. Each sheet is at a scale of 1:125,000.
3. Turn to the designated sheet number and locate the area of interest on the sheet.
4. Turn to Table 1. Study the sheet and identify the mapping units of interest and locate them among those listed in the table. The table provides a cross reference between mapping units and ecological sites.
5. Review the mapping units on the left and the appropriate ecological sites on the right. This will tell you what vegetation types occur in each mapping unit.
6. Focusing on a particular ecological site, turn to the Ecological Site Descriptions. An index to each of the ecological site descriptions and photo representations can be found in the front of this report.
7. Turn to the appropriate photo representation of the ecological site you are reviewing.
8. Repeat steps 4 through 7 for each mapping unit and ecological site of interest.