Ecological Site Description ID:	R236XY131AK—Western Alaska Maritime Tussock Loamy Slopes, Frozen

Ecological Dynamics of the Site:

This western Alaska maritime ecological site is located on upland plains and hills in undulating areas on or surrounded by peat mounds. These areas are typically found at elevations between sea level and 1,450 feet with slopes of 1 to 12 percent. Slope aspect does not appear to influence the plant community dynamics of this site as it is found on all aspects.

This ecological site is correlated to D36-Western maritime scrub organic peat mounds; D36-Western maritime tussock scrub organic depressions; and Kumla soils. Soil characteristics that are likely to influence plant community dynamics include a gelic soil temperature regime, an udic or aquic moisture regime with rapid or moderate permeability to a depth of 10 inches, and strongly to extremely acidic soils (pH 5.5 to 4.0). A restricting layer of permafrost is commonly found between depths of 24 and 56 inches. Organic material content in the surface layer can range from 2 to 100 percent. Annual precipitation is usually between 21 and 57 inches, and the annual frost-free period ranges from 85 to 140 days. Parent material can consist of organic material over coarse-silty loess, mossy organic material over coarse-loamy cryoturbate over coarse-loamy eolian deposits, or mossy organic material over coarse-silty cryoturbate over coarse-silty loess.

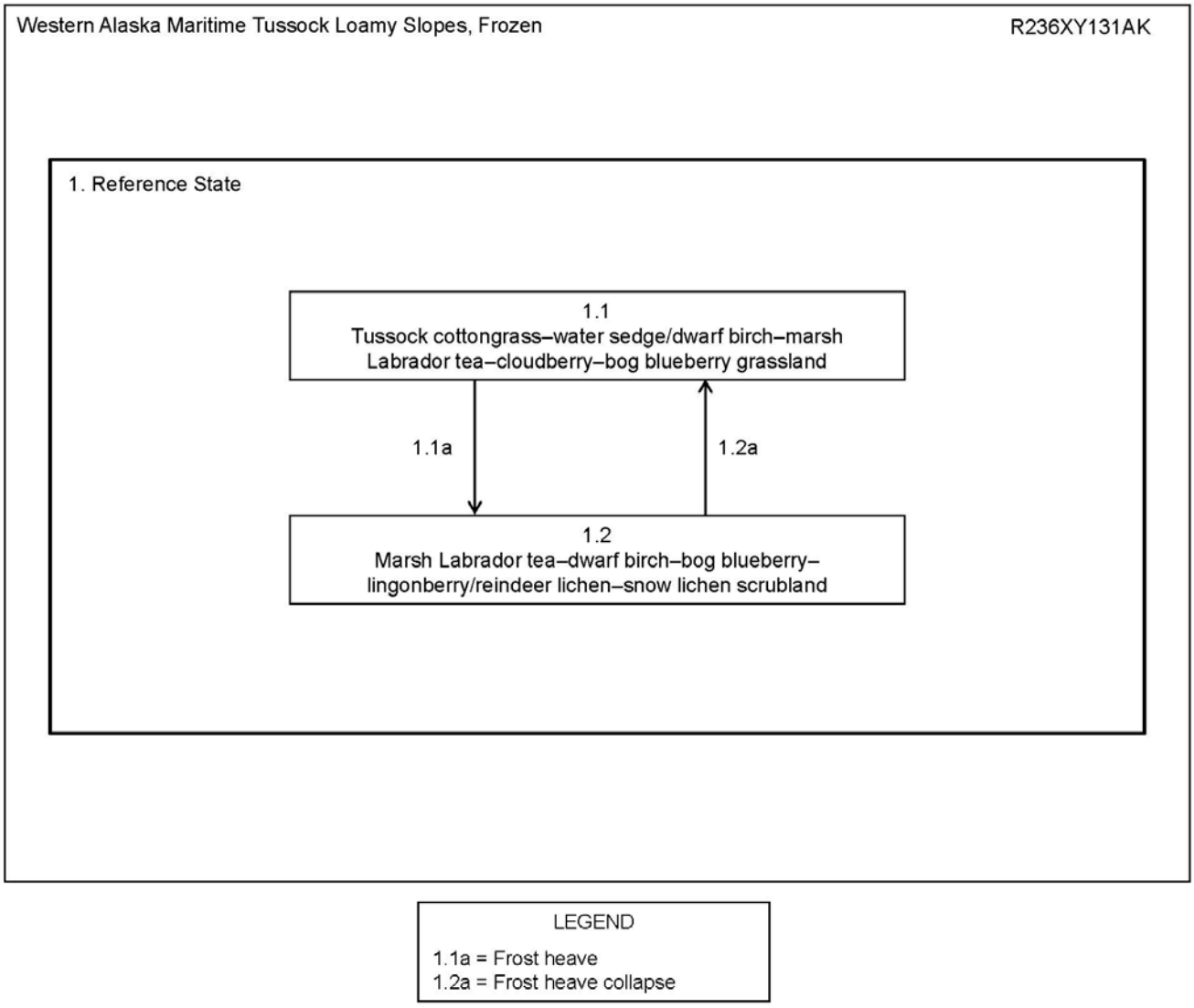
The reference community phase is typified by tussock grassland consisting of hydrophilic graminoids, low and dwarf shrubs, and mosses. When compared to other ecological sites that occur on upland, undulating areas in the survey area, this ecological site is easily differentiated by being on or by peat mounds. This ecological site can also be distinguished from nearly all other ecological sites by the presence of permafrost throughout. Permafrost influences the presence and absence of plants (Billings and Mooney, 1968) and the disturbance regime. Ecological site R236XY130AK (Western Alaska Maritime Dwarf Scrub Loamy Slopes, Moist) also has areas of permafrost, though it is not nearly as prevalent and that ecological site does not support a disturbance regime.

Frost heave is the major disturbance regime for this ecological site, and it is considered a natural event that is typically unmanaged. Frost heave in the reference community phase can create elevated areas that dry out. This can lead to a plant community with fewer hydrophilic species and more low shrubs and lichens. Frost heave collapse typically coincides with frequent, very long periods of ponding. Ponding commonly inhibits access of oxygen to susceptible plants (Hook and Crawford, 1978; Jackson *et al.*, 1991). Hypoxic or anoxic conditions are a major abiotic stress that helps to determine the presence or absence of vascular plants (Vartapetian and Jackson, 1996). The effects of ponding typically depend on yearly and monthly variations in rainfall, snowmelt, and seepage.

Slight browsing by moose on willows and by caribou on lichens can occur on this ecological site, but it does not appear to affect the ecological processes significantly enough to alter the plant communities.

Peat mounds that are higher than a few meters commonly result in the surrounding area being much wetter, which may remove the *in situ* permafrost. These wet, non-permafrost areas are best represented by ecological site R236XY127AK (Western Alaska Maritime Graminoid Peat Slopes).

State and Transition Diagram:



State ID Number:	1	State Name:	Reference State
State Narrative:	The reference state supports two community phases, grouped by structure and dominance of the vegetation (e.g., graminoids, shrubs, and lichens) and their ecological function and stability. The reference community phase is represented by tussock grassland consisting of hydrophilic graminoids, various low and dwarf shrubs, and mosses. The presence of these community phases is temporally and spatially dictated by the influences of frost heave and collapse. No alternative states have been observed. This report provides baseline vegetation inventory data for this ecological site. Future data collection is needed to provide further information about existing plant communities and the disturbance regimes that would result in transitions from one community to another.		

Phase 1.1			
Community Phase Number:	1.1	Community Phase Name:	Tussock cottongrass-water sedge/dwarf birch-marsh Labrador tea-cloudberry-bog blueberry grassland
Community Phase Narrative:			
The reference community phase is characterized by grassland consisting of hydrophilic graminoids with shrubs that are high in species richness. Annual plant production is visually estimated to be slightly higher among graminoids than shrubs. Typically, this community consists of tussock cottongrass (*Eriophorum vaginatum*), water sedge (*Carex aquatilis*), and red cottongrass (*Eriophorum russeolum*) and a rich mix of shrubs, including dwarf birch (*Betula nana*), marsh Labrador tea (*Ledum palustre* ssp*. decumbens*), cloudberry (*Rubus chamaemorus*), and bog blueberry (*Vaccinium uliginosum*). Other facultative to obligate wetland species include bog rosemary (*Andromeda polifolia*), bog cranberry (*Vaccinium oxycoccos*), and roundleaf sundew (*Drosera rotundifolia*). Sporadic, rare individual regenerative or medium-sized white spruce (*Picea glauca*) trees also are present. Mosses are prevalent (total mean cover ~34 percent), mainly species of sphagnum moss (*Sphagnum spp.*). The ground cover may also include lichens (~23 percent), herbaceous litter (~56 percent) and woody litter (~1 percent). About 1 percent of the surface is covered with water. About 1 percent is bare soil.			

Community Phase Canopy Cover

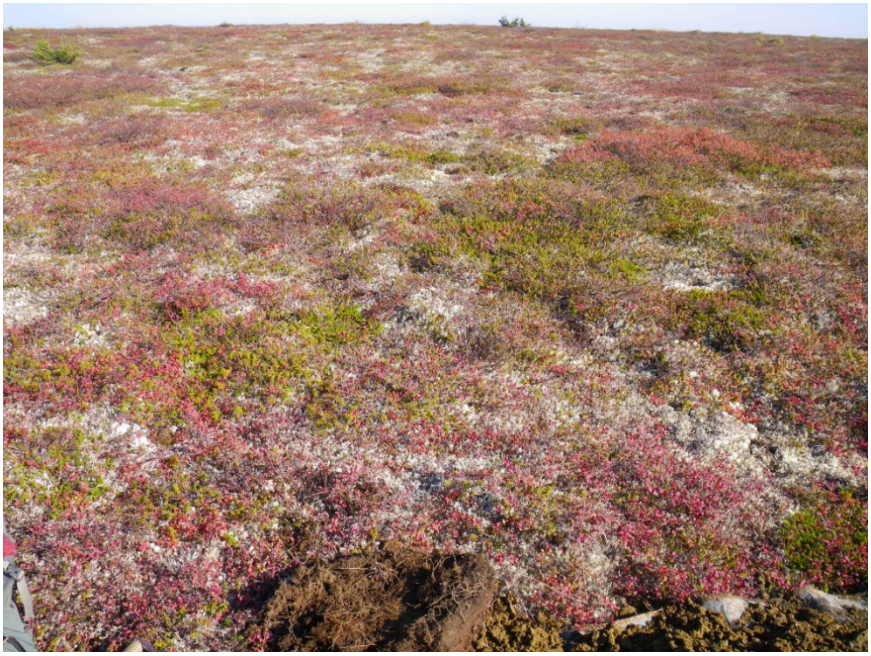
(Vegetation data in the table are provided as constancy (percent) and average canopy cover (percent) of the most dominant and ecologically relevant species for this community phase.)

Plant group	Common name	Scientific name	USDA plant code	Constancy (percent)	Average canopy cover (percent)
S	Dwarf birch	*Betula nana*	BENA	100.0	10.3
S	Marsh Labrador tea	*Ledum palustre* ssp. *decumbens*	LEPAD	98.1	14.5
S	Cloudberry	*Rubus chamaemorus*	RUCH	88.7	5.6
S	Bog blueberry	*Vaccinium uliginosum*	VAUL	84.9	8.2
S	Bog rosemary	*Andromeda polifolia*	ANPO	77.4	2.3
S	Bog cranberry	*Vaccinium oxycoccos*	VAOX	56.6	Trace
G	Tussock cottongrass	*Eriophorum vaginatum*	ERVA4	84.9	27.9
G	Water sedge	*Carex aquatilis*	CAAQ	54.7	4.8
G	Red cottongrass	*Eriophorum russeolum*	ERRU2	37.7	19.0
F	Roundleaf sundew	*Drosera rotundifolia*	DRRO	34.0	Trace
M	Sphagnum moss	*Sphagnum spp.*	SPHAG2^	52.8	38.2

^ Sphagnum mosses are identified to the genus level.

Community Pathways

Pathway Number	Pathway Name & Description
1.1a	Frost heave. Upheaval of land from the surrounding area can create drier areas that may lead to a shift in the vegetative community. Although many species are extant in both communities, marked differences in abundance between areas of frost heave and collapse make use of two separate communities necessary. The time required for this transition to occur depends on factors such as the height of frost heave and how quickly the upheaved area drains and dries.

Phase 1.2			
Community Phase Number:	1.2	Community Phase Name:	Marsh Labrador tea-dwarf birch-bog blueberry-lingonberry/reindeer lichen-snow lichen scrubland
Community Phase Narrative:			
This frost heave community phase is characterized by scrubland consisting of low and dwarf shrubs with lichens interspersed throughout. Annual plant productivity is visually estimated to be highest among shrubs. Overall productivity is hypothesized to be lower in this phase than in the reference community phase due to reduced richness and abundance of graminoids. Typically, this community consists of marsh Labrador tea (*Ledum palustre* ssp*. decumbens*), dwarf birch (*Betula nana*), bog blueberry (*Vaccinium uliginosum*), and tussock cottongrass (*Eriophorum vaginatum*). Other species extant in this community include lingonberry (*Vaccinium vitis-idaea*), cloudberry (*Rubus chamaemorus*), bog rosemary (*Andromeda polifolia*), and red cottongrass (*Eriophorum russeolum*). Lichens are common in the ground cover (total mean cover ~42 percent), and reindeer lichens (*Cladina spp.*) and cup lichens (*Cladonia spp.*) typically are the most abundant. Other ground cover commonly includes mosses (~21 percent), herbaceous litter (~36 percent), and woody litter (~1 percent). About 1 percent is bare soil.			

Community Phase Canopy Cover

(Vegetation data in the table are provided as constancy (percent) and average canopy cover (percent) of the most dominant and ecologically relevant species for this community phase.)

Plant group	Common name	Scientific name	USDA plant code	Constancy (percent)	Average canopy cover (percent)
S	Marsh Labrador tea	*Ledum palustre* ssp. *decumbens*	LEPAD	100.0	17.0
S	Dwarf birch	*Betula nana*	BENA	100.0	11.9
S	Bog blueberry	*Vaccinium uliginosum*	VAUL	82.1	6.1
S	Lingonberry	*Vaccinium vitis-idaea*	VAVI	78.6	2.9
S	Cloudberry	*Rubus chamaemorus*	RUCH	75.0	6.7
S	Black crowberry	*Empetrum nigrum*	EMNI	64.3	7.7
G	Tussock cottongrass	*Eriophorum vaginatum*	ERVA4	67.9	19.0
L	Reindeer lichens	*Cladina spp.*	CLADI3^	60.7	35.9
L	Cup lichens	*Cladonia spp.*	CLADO3*	35.7	10.6

^ This does not include reindeer lichens (*Cladina spp.*) that were identified to the species level, including *Cladina arbuscula, Cladina rangiferina*, *Cladina stellaris,* and *Cladina stygia*.

* This does not include cup lichens (*Cladonia spp.*) that were identified to the species level, including *Cladonia uncialis* and *Cladonia alaskana.*

Community Pathways

Pathway Number	Pathway Name & Description
1.2a	Frost heave collapse. Frequent, very long periods of ponding occur in the collapsed areas, which can lead to shrub stress and a decrease in the population of susceptible plants. Because they are free from competition for space and light and the growing conditions are ideal, facultative to obligate wetland species may colonize. There is no known time period over which frost heave collapse will occur, though it likely depends on various factors, including albedo and soil temperature.

Bibliography

Billings, W.D., and H.A. Mooney. 1968. The ecology of arctic and alpine plants. Biological Reviews. Volume 43(4): 481-529.

Hook, D., and R. M. M. Crawford. 1978. Plant life in anaerobic environments. Ann Arbor Science Publishers, Inc.

Jackson M.B., D.D. Davies, and H. Lambers, editors. 1991**.** Plant life under oxygen deprivation: Ecology, physiology, and biochemistry. The Hague: SPB Academic.

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This report is interim and subject to change.