

**Dichotomous Field Key to Ecological Systems
of Map Zones 67, 68, 69 & 72
Alaska Arctic, United States**

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TABLE OF CONTENTS

Introduction	2
Land Use, Unvegetated, Semi-natural and Altered Vegetation	4
Key to Arctic Alaska Ecological Systems and Existing Vegetation Types	6
General Key.....	7
Shrubland and Tussock Tundra Ecological Systems.....	7
Herbaceous Ecological Systems.....	8
Process-Driven Ecological Systems.....	9
Floodplain (includes outwash) Ecological Systems and Existing vegetation types.....	9
Polygonal Ground (including Strangmoor) Ecological Systems.....	10
Tidal Ecological Systems and Existing Vegetation Types.....	11

Introduction

The following keys to NatureServe ecological systems cover the areas found in Arctic Alaska, within NLCD map zones 67, 68, 69, and 72 (Figure 1). Three other documents contain field keys to the ecological systems of the Boreal, Aleutian and Maritime regions of Alaska. The field keys were written for LANDFIRE by ecology staff of the Alaska Natural Heritage Program (<http://aknhp.uaa.alaska.edu/>), which is housed with the University of Alaska Anchorage. Descriptions for each ecological system can be found on NatureServe’s public website, NatureServe Explorer (<http://www.natureserve.org/explorer/servlet/NatureServe?init=Ecol>).

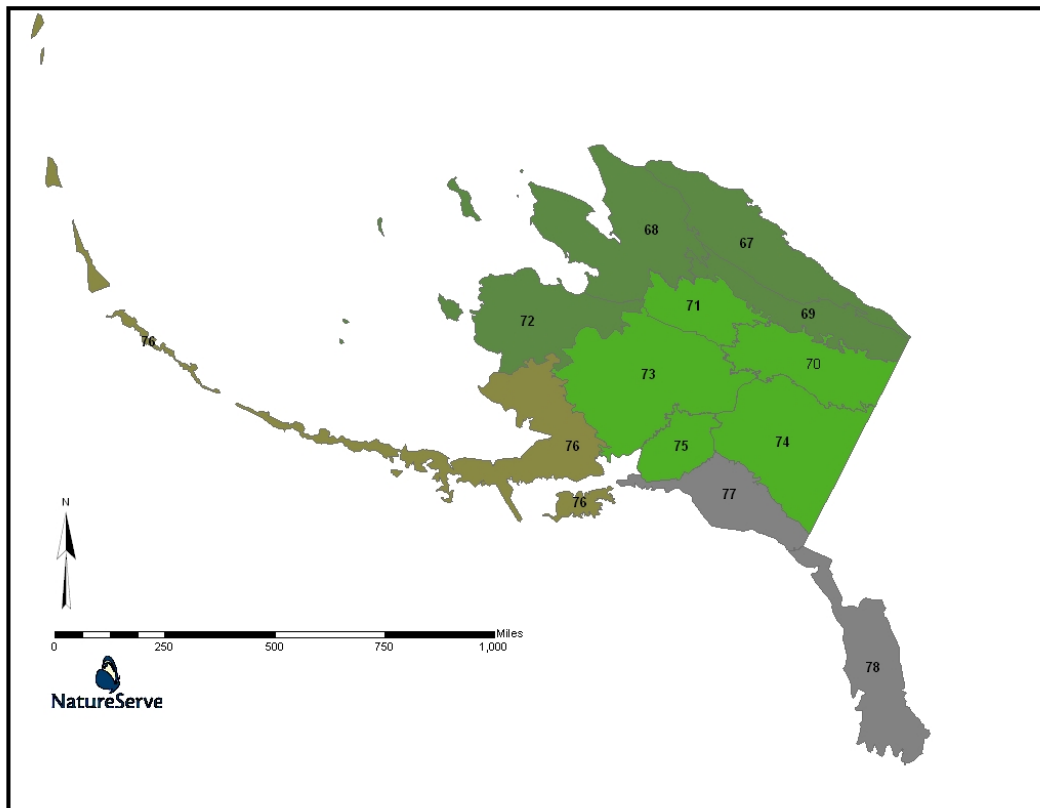


Figure 1. LANDFIRE map zones for Alaska. Keys in this document cover zones 67, 68, 69, & 72.

The systems and existing vegetation types included in these keys are intended to represent the legend that LANDFIRE will be striving to map for existing vegetation. Existing vegetation types are successional plant communities that are encompassed in the concept of an ecological system. Some types are in the keys that characteristically occur at small spatial scales (generally <2 ha in size) and hence may not be mappable by the LANDFIRE project. However, we have chosen to be inclusive in the keys, so that the user will have information on these system types for comparison purposes. In some cases they may be important for modeling fire condition class and, given their relative distinctiveness on the landscape, they may indeed be mappable.

Plant names are almost always in Latin and follow the nomenclature of Kartesz (1999). In limited cases, we have included synonyms for some taxa. In some cases a common name is used, particularly for choices where a large number of species within a genus would need to be listed. For example, couplets may say “sedge cover >25%”, where any combination of *Carex* or *Eriophorum* species could meet the criteria specified in the couplet. Some of the common names used (and Genera for those) include sedge (*Carex*), alder (*Alnus*), and willow (*Salix*).

The keys are “dichotomous”, which means the user follows the order of the ‘couplets’ and makes a choice between the 2 options represented in the couplet. The ordering of the couplets in each key does matter, and the user should choose the option in each couplet that best fits the data or field situation. A choice leads the user to the next couplet to be utilized in the keying process, via a number at the far right, or else leads to a final result (an ecological system type or an existing vegetation type).

If the choice the user makes leads to a “result”, then either an Ecological System is named or an Existing Vegetation Type is named. The existing vegetation types are generally grouped together in a separate section of the keys from the ecological systems, and they have “existing vegetation type” in their names. Once an ecological system is reached in the key, it is always useful to read the description of the system to ascertain if the result fits what is described for the system.

Systems do not include Latin species names in them, and always start with a Biogeographic region (e.g. Alaska Arctic Acidic Sparse Tundra), and are in bold. Keys are generally based on dominance within vegetation strata, with tree cover generally considered first, then that of shrubs, then the herbaceous component. Codominant species within a given strata are important as well, in some cases a system type will have 2 or more codominant species, which may or may not be present in all stands. Many ecological systems will have a variable physiognomy; where appropriate these variable systems have been placed into the keys in several places (i.e. some grassland systems have a “shrub-steppe” physiognomy and hence will be in the key both as shrub-steppe and herbaceous). Environmental context parameters are also used in the keys, such as for distinguishing coastal or wetland systems from upland and non-coastal systems.

Some terminology is commonly employed throughout the keys that distinguish general spatial characteristics of the vegetation or environmental setting. For example ‘matrix’ types of vegetation are dominant across the majority of a given landscape, while ‘large patch’ types tend to occur as distinctive patches within the larger ‘matrix.’ Elevation-based life zones are commonly employed, with reference to ‘alpine,’ ‘subalpine,’ ‘montane,’ or ‘foothill’ zones.

These zones vary in actual elevational thresholds across multiple map zones, and within individual map zones. More precise definition of these elevation breaks by map zone could be accomplished with additional research.

In the next section of the document we have provided a table showing the LANDFIRE legend units for the U.S. that represent non-natural vegetation, and a short description for each of them. They are not formally incorporated into the keys, since they are typically recognizable without the use of a key, or else their floristic composition is so variable as to be not useful in a field key. Our primary purpose was to provide keys for the natural and near-natural vegetation of these zones. Most of these non-natural land cover types will not be mapped in the arctic of Alaska.

Land Use, Unvegetated, Semi-natural and Altered Vegetation

LAND USE OR UNVEGETATED SURFACES	
Open Water	Open water
Developed	Generally developed lands.
Developed, Open Space	Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Impervious surfaces account for less than 20% of total cover. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses.
Developed, Low Intensity	Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-50% of total cover. These areas most commonly include single-family housing units.
Developed, Medium Intensity	Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-80% of the total cover. These areas most commonly include single-family housing units
Developed, High Intensity	Includes highly developed areas where people reside in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to 100% of the total cover.
Agriculture	Generally developed for agricultural uses.
Pasture/Hay	These agriculture lands typically have perennial herbaceous cover (e.g. regularly-shaped plantings) used for livestock grazing or the production of hay. There are obvious signs of management such as irrigation and haying that distinguish it from natural grasslands. Identified CRP lands are included in this land cover type.
Cultivated Crops and Irrigated Agriculture	These areas used for the production of crops, such as corn, soybeans, small grains, sunflowers, vegetables, and cotton, typically on an annual cycle. Agricultural plant cover is variable depending on season and type of farming. Other areas include more stable land cover of orchards and vineyards.
Perennial Ice/Snow	
SEMI-NATURAL / ALTERED VEGETATION	
Ruderal Vegetation	Vegetation resulting from succession following significant anthropogenic disturbance of an area. It is generally characterized by unnatural combinations of species (primarily native species, though they often contain slight or substantial numbers and amounts of species alien to the region as well)
Ruderal Upland - Old Field	
Ruderal Upland - Abandoned Tree Plantation	
Ruderal Wetland	
Introduced Vegetation	Vegetation dominated by introduced species. These are spontaneous, self-perpetuating, and not (immediately) the result of planting, cultivation, or human maintenance. Land occupied by introduced vegetation is generally permanently altered (converted) unless restoration efforts are undertaken.
Introduced Upland Vegetation - Treed	Land cover is significantly altered/disturbed by introduced tree species.

Introduced Upland Vegetation - Shrub	Land cover is significantly altered/disturbed by introduced woody and/or herbaceous vegetation.
Introduced Upland Vegetation - Annual and Biennial Forbland	Land cover is significantly altered/disturbed by introduced annual and biennial forbs. Natural vegetation types are no longer recognizable. Typical species that dominate these areas are <i>Acroptilon repens</i> , <i>Leucanthemum vulgare</i> , <i>Cirsium arvense</i> , <i>C. vulgare</i> , <i>Euphorbia esula</i> , <i>Lepidium latifolium</i> , <i>Carduus nutans</i> , <i>Centaurea</i> spp. (<i>diffusa</i> , <i>solstitialis</i>), <i>Salsola kali</i> , <i>Bassia scoparia</i> , <i>Halogeton glomeratus</i> , <i>Melilotus officinalis</i> , and <i>Cardaria</i> spp.
Introduced Upland Vegetation – Annual Grassland	Land cover is significantly altered/disturbed by introduced annual grasses. Natural vegetation types are no longer recognizable. Typical species include <i>Bromus japonicus</i> , <i>B. rigidus</i> , <i>B. rubens</i> , <i>B. tectorum</i> , <i>Taeniatherum caput-medusae</i> , and/or <i>Schismus barbatus</i> .
Introduced Upland Vegetation - Perennial Grassland and Forbland	Land cover is significantly altered/disturbed by introduced, non-native perennial grasses and forbs. Natural vegetation types are no longer recognizable. Grass species include <i>Agropyron cristatum</i> , <i>Poa bulbosa</i> , <i>Bromus inermis</i> , <i>Phleum pratense</i> , and <i>Poa pratensis</i> . Forbs may include: <i>Centaurea</i> spp., <i>Cirsium arvense</i> , <i>Euphorbia esula</i> , <i>Lepidium</i> spp., <i>Melilotus</i> spp.
Introduced Riparian Vegetation	Land cover is altered/disturbed and dominated by introduced woody vegetation (woodlands and shrublands). Typical riparian trees and shrubs include <i>Elaeagnus angustifolia</i> , <i>Tamarix</i> spp., <i>Triadica sebifera</i> , etc.
Introduced Wetland Vegetation	Land cover is altered/disturbed and dominated by introduced wetland vegetation. Species may include <i>Lythrum salicaria</i> , <i>Phalaris arundinacea</i> , <i>Phragmites australis</i> , etc.
Modified/Managed Vegetation	Vegetation resulting from management or modification of natural/near natural; vegetation, but producing a structural and floristic combination not clearly known to have a natural analogue. Modified vegetation may be easily restorable by either management, restoration of ecological processes, and/or succession.
Modified/Managed Upland Vegetation	Land cover is apparently managed/modified and dominated by trees and/or shrubs. Vegetation is a mixture of herbaceous, shrub, and tree species.
Recently Burned Forest and Woodland	Land cover is apparently modified by recent fires which have burned forest and woodland vegetation. Vegetation is a mixture of herbaceous, shrub, and tree species.
Recently Burned Shrubland	Land cover is apparently modified by recent fires which have shrubland vegetation. Vegetation is a mixture of herbaceous and shrub species.
Recently Burned Grassland	Land cover is apparently modified by recent fires which have burned grassland vegetation. Vegetation is a mixture of herbaceous and shrub species.
Managed Tree Plantation	Land cover is apparently modified and appears as a managed tree plantation.
Recently Logged Timberland	Land cover is apparently modified and appears as logged timberland.
Modified/Managed Wetland Vegetation	These areas include created and obviously managed wetlands of varying size resulting from water diversion. Artificial Wetlands will be mapped where obvious built structures may be distinguished from imagery.

General Key

1. System is tidal, including sites affected by storm surges, a coastal beach or coastal dune, inland active dune, active and inactive floodplain (includes outwash), or polygonal ground and strangmoor Go to **Process-Driven Ecological Systems**
1. System is not tidal, coastal beach or coastal dune, inland active dune, active and inactive floodplain (includes outwash), or polygonal ground and strangmoor 2
2. Total canopy cover of vascular species is <10% 3
2. Total canopy cover of vascular species is >10% 4
3. Open water Lakes or ponds
3. Bare ground Bare ground
4. Total canopy cover of vascular species is <25% 5
4. Total canopy cover of vascular species is >25% (the freshwater aquatic bed and freshwater marsh systems may have 10-25% cover) 7
5. Total canopy cover of vascular species is <25% and lichen cover is >25% **Alaska Arctic Lichen Tundra**
5. Total canopy cover of vascular species is 10-25% and lichen cover is <25% 6
6. Substrate is acidic; does not occur in the Arctic lowlands **Alaska Arctic Acidic Sparse Tundra**
6. Substrate is non-acidic; does not occur in the Arctic lowlands **Alaska Arctic Non-Acidic Sparse Tundra**
7. Total needleleaf or broadleaf tree cover is >10% Use the **Boreal Alaska Key**
7. Total needleleaf or broadleaf tree cover is <10% 8
8. Tussocks with >35% cover 9
8. Tussocks with <35% cover 11

Shrubland and Tussock Tundra Ecological Systems

9. Total shrub cover is >25% **Alaska Arctic Shrub-Tussock Tundra**
9. Total shrub cover is <25% 10
10. Lichen cover is >25% **Alaska Arctic Tussock-Lichen Tundra**
10. Lichen cover is <25% **Alaska Arctic Tussock Tundra**
11. Cover of shrubs is >25% 12
11. Cover of shrubs is <25% Go to **Herbaceous Ecological Systems**
12. Cover of shrubs >20 cm tall is >25% 13
12. Cover of shrubs >20 cm tall is <25%; cover of shrubs <20 cm tall is >25% 14
- 13a. Alder dominates **Alaska Arctic Mesic Alder Shrubland**
- 13b. Willow species dominate **Alaska Arctic Mesic-Wet Willow Shrubland**
- 13c. *Myrica gale* dominates **Alaskan Pacific Maritime Wet Low Shrubland**

13d. Other shrub species dominate the low- and tall-shrub layers	Alaska Arctic Scrub Birch-Ericaceous Shrubland
14. Sedge cover is >25%	15
14. Sedge cover is <25%	18
15. <i>Dryas</i> cover is >10%	Alaska Arctic Mesic Sedge- <i>Dryas</i> Tundra
15. <i>Dryas</i> cover is <10%	16
16. Willow cover is >20%	Alaska Arctic Mesic Sedge-Willow Tundra
16. Willow cover is <20%	17
17. <i>Sphagnum</i> spp. cover is >25%; occurs primarily on level to slightly sloping landscapes of the Yukon-Kuskokwim Delta and the Kotzebue Sound lowlands ecoregions (Nowacki et al. 2001)	Alaska Arctic Dwarf-Shrub-Sphagnum Peatland
17. <i>Sphagnum</i> spp. cover is <25%.....	Alaska Arctic Dwarf-Shrubland
18. <i>Sphagnum</i> spp. cover is >25%; occurs primarily on level to slightly sloping landscapes of the Yukon-Kuskokwim Delta and the Kotzebue Sound lowlands ecoregions (Nowacki et al. 2001)	Alaska Arctic Dwarf-Shrub-Sphagnum Peatland
18. <i>Sphagnum</i> spp. cover is <25%.....	19
19. <i>Dryas</i> dominates or codominates the dwarf-shrub layer.....	20
19. <i>Dryas</i> does not dominate or codominate the dwarf-shrub layer.....	21
20. Substrate is acidic.....	Alaska Arctic Acidic <i>Dryas</i> Dwarf-Shrubland
20. Substrate is non-acidic.....	Alaska Arctic Non-Acidic <i>Dryas</i> Dwarf-Shrubland
21. Lichen cover >25%	22
21. Lichen cover <25%	Alaska Arctic Dwarf-Shrubland
22. Occurs primarily on permafrost plateaus on the Yukon-Kuskokwim Delta and the Kotzebue Sound lowlands ecoregions (Nowacki et al. 2001).....	Alaska Arctic Permafrost Plateau Dwarf-Shrub Lichen Tundra
22. Typically occurs on uplands and not on permafrost plateaus on the Yukon-Kuskokwim Delta and the Kotzebue Sound lowlands ecoregions (Nowacki et al. 2001)	23
23. Substrate is acidic.....	Alaska Arctic Acidic Dwarf-Shrub Lichen Tundra
23. Substrate is non-acidic.....	Alaska Arctic Non-Acidic Dwarf-Shrub Lichen Tundra

Herbaceous Ecological Systems

1. Site is wet (herbaceous cover may be 10-25% but typically >25%)	2
1. Site is dry to mesic. Common species include <i>Carex microchaeta</i> ssp. <i>nesophila</i> , <i>Alopecurus alpinus</i> , <i>Artemisia arctica</i> , <i>Polygonum bistorta</i> , <i>Valeriana capitata</i> , <i>Pedicularis</i> spp., <i>Polemonium acutiflorum</i> , <i>Phippsia algida</i> , <i>Alopecurus alpinus</i> and <i>Calamagrostis canadensis</i>	Alaska Arctic Mesic Herbaceous Meadow
2. Vegetation is submerged, floating, and growing in permanent water	Alaska Arctic Freshwater Aquatic Bed

- 2. Vegetation is not submerged, floating, or growing in permanent water 3
- 3. Dominant vegetation is emergent and standing water cover is typically >20% 4
- 3. Dominant vegetation is not emergent, sedge species with >25% cover, and standing water cover is typically 1-19% 5
- 4. Dominated by *Arctophila fulva* **Alaska Arctic Pendantgrass Freshwater Marsh**
- 4. Dominated by any one of the following species: *Carex aquatilis*, *Eriophorum angustifolium*, *Comarum palustre*, *Hippuris vulgaris*, *Carex utriculata*, *Menyanthes trifoliata*, *Lysimachia thyrsoflora*, and *Equisetum fluviatile* **Alaska Arctic Sedge Freshwater Marsh**
- 5. *Sphagnum* cover is >25% **Alaska Arctic Wet Sedge-Sphagnum Peatland**
- 5. *Sphagnum* cover is <25% **Alaska Arctic Wet Sedge Meadow**

Process-Driven Ecological Systems

- 1. Active and inactive floodplain (includes outwash)Go to **Floodplain Ecological Systems**
- 1. Not an active or inactive floodplain 2
- 2. Polygonal ground or strangmoor; dominates the Beaufort Coastal Plain ecoregion (Nowacki et al. 2001)..... Go to **Polygonal Ground (including Strangmoor) Ecological Systems**
- 2. Not dominated by polygonal ground or strangmoor 3
- 3. Tidally influenced sites Go to **Tidal Ecological Systems**
- 3. Not tidally influenced 4
- 4. Coastal beach, coastal dune, or beach meadow
 - **Alaska Arctic Marine Beach and Beach Meadow**
 - Key to common existing vegetation types of **Alaska Arctic Marine Beach and Beach Meadow** (Viereck et al. 1992):
 - A. Site dominated by herbaceous species *Leymus mollis* existing vegetation type
 - A. Site dominated or codominated by *Empetrum nigrum*
 - *Empetrum nigrum* existing vegetation type
- 4. Inland active dune with >75% of dune or slack surface is bare ground or sparsely vegetated
 - **Alaska Arctic Active Inland Dune**
 - Key to common existing vegetation types of **Alaska Arctic Active Inland Dune** (Viereck et al. 1992):
 - A. Cover of shrubs >20 cm tall is >25% and willows dominate
 - Low-Tall Willow existing vegetation type
 - A. Cover of shrubs >20 cm tall is <25%, herbaceous cover is >25%B
 - B. Site is dry to mesicMesic Herbaceous existing vegetation type
 - B. Site is wet and dominated by sedgesWet Sedge existing vegetation type

Floodplain (includes outwash) Ecological Systems and Existing vegetation types

- 1. Site is wet (herbaceous cover may be 10-25% but typically >25%) 2
- 1. Site is dry to mesic, or only periodically flooded 6

2. Cover of shrubs >20 cm tall is >25% **Alaska Arctic Floodplain** or
..... **Alaska Arctic Mesic-Wet Willow Shrubland**
2. Cover of shrubs >20 cm tall is <25% 3
3. Vegetation is submerged, floating, or growing in permanent water.....
..... **Alaska Arctic Freshwater Aquatic Bed**
3. Vegetation is not submerged, floating, or growing in permanent water 4
4. Site is wet, but dominant vegetation is not emergent; sedge species with >25% cover, typically *Carex aquatilis* and *Eriophorum angustifolium*, but other sedge species may dominate.
..... **Alaska Arctic Wet Sedge Meadow**
4. Dominant vegetation is emergent; semipermanent, or standing water is present..... 5
5. Dominated by *Arctophila fulva*..... **Alaska Arctic Pendantgrass Freshwater Marsh**
5. Dominated by other species, including *Carex aquatilis*, *Eriophorum angustifolium*, *Comarum palustre*, *Hippuris vulgaris*, *Carex utriculata*, *Menyanthes trifoliata*, *Lysimachia thyrsoiflora*, and *Equisetum fluviatile* **Alaska Arctic Sedge Freshwater Marsh**
6. System occurs on the floodplain of the Yukon River or Kuskokwim River.
..... **Alaska Arctic Large River Floodplain**
6. System is a floodplain (includes outwash), excluding floodplains of the Yukon River or Kuskokwim River **Alaska Arctic Floodplain**

Key to common existing vegetation existing vegetation types (Viereck et al. 1992) within the **Alaska Arctic Floodplain** and the **Alaska Arctic Large River Floodplain** ecological systems:

- A. Total broadleaf tree cover is >25%..... Balsam Poplar Forest existing vegetation type
- A. Total broadleaf tree cover is <25% B
- B. Cover of shrubs >20 cm tall is >25%..... C
- B. Cover of shrubs >20 cm tall is <25%..... D
- C. Alder dominates the shrub layer Alder existing vegetation type
- C. Willows dominate the shrub layer Low-Tall Willow existing vegetation type
- D. Cover of shrubs <20 cm tall is >25%..... E
- D. Cover of shrubs <20 cm tall is <25%, herbaceous cover is >25%
..... Mesic Herbaceous existing vegetation type
- E. *Dryas* spp. dominate the shrub layer..... *Dryas* existing vegetation type
- E. Other dwarf-shrubs dominate the shrub layer..... Dwarf Shrub existing vegetation type

Polygonal Ground (including Strangmoor) Ecological Systems

1. Dominated by wet sedges, emergent vegetation and water (combined cover >50%); drier ridges commonly support *Carex aquatilis*, *Eriophorum vaginatum*, *Salix* spp. or *Betula nana*. Typically low-centered polygons..... **Alaska Arctic Polygonal Ground Wet SedgeTundra**
1. Not dominated by wet sedges, emergent vegetation and water (combined cover <50%); these are typically high-centered polygons 2
2. Tussocks with >35% cover 3

- 2. Tussocks with <35% cover..... 4
- 3. Total shrub cover is >25%..... **Alaska Arctic Polygonal Ground Shrub-Tussock Tundra**
- 3. Total shrub cover is <25% **Alaska Arctic Polygonal Ground Tussock Tundra**
- 4. Combined cover of dwarf- and low shrubs is >25% (sedge cover is typically <25%)
..... **Alaska Arctic Polygonal Ground Mesic Shrub Tundra**
- 4. Not as above; these sites are a mosaic of different polygon systems such as wet sedge, tussock,
tussock shrub and mesic shrub Polygonal Ground mosaics

Tidal Ecological Systems and Existing Vegetation Types

- 1. Vascular plant species cover is <10% **Alaska Arctic Tidal Flat**
 - 1. Vascular plant species cover is >10% 2
 - 2. Dwarf-shrub cover is >10%, and the combined cover of the following species is >10%: *Carex rariflora*, *Calamagrostis deschampsioides*, *Puccinellia andersonii*, and *Deschampsia caespitosa*.
..... **Alaska Arctic Coastal Sedge-Dwarf-Shrubland**
 - 2. Dwarf-shrub cover is <10%, or the combined cover of the following species is <10%: *Carex rariflora*, *Calamagrostis deschampsioides*, *Puccinellia andersonii*, and *Deschampsia caespitosa*. 3
 - 3. The combined cover of the following species is >10%: *Carex rariflora*, *Calamagrostis deschampsioides*, *Dendranthema arcticum* (= *Chrysanthemum arcticum*), *Salix ovalifolia*, *Eriophorum angustifolium*, and *Carex aquatilis*
..... **Alaska Arctic Coastal Brackish Meadow**
 - 3. The combined cover of the following species is <10%: *Carex rariflora*, *Calamagrostis deschampsioides*, *Dendranthema arcticum* (= *Chrysanthemum arcticum*), *Salix ovalifolia*, *Eriophorum angustifolium*, and *Carex aquatilis*
..... **Alaska Arctic Tidal Marsh**
- Key to this system's common existing vegetation types (Viereck et al. 1992):
- A. Site dominated or codominated by *Carex ramenskii*, *Carex subspathacea* or *Carex lyngbyei*
..... Tidal Sedge existing vegetation type
 - A. Site dominated by other species, such as *Dupontia fisheri*, *Puccinellia* spp. or *Argentina egedii* (= *Potentilla egedii*)..... Tidal Herbaceous existing vegetation type