

**Communities-** *Salix glauca*/*Arctostaphylos rubra*-*Vaccinium uliginosum*-*Arctagrostis latifolia* (Hettinger and Janz 1974). *Salix glauca*/*Dryas octopetala*-*Betula nana* (Hettinger and Janz 1974). *Salix glauca*/*Petasites frigidus* (Churchill 1955). *Salix glauca*/*Dryas octopetala* (Webber and others 1978). *Salix glauca*/*S. reticulata*-*Carex podocarpa*-*Artemisia arctica* (Scott 1974a). *Salix glauca*/*Arctostaphylos rubra*-*Dryas octopetala*-*Salix reticulata*-*Oxytropis deflexa* (Scott 1974a). *Salix glauca*-*S. planifolia*-*S. lanata*/*Equisetum arvense* (Craighead and others 1988). *Salix lanata*-*S. glauca*/*Dryas integrifolia* (Komarkova and Webber 1978). *Salix lanata*/*Equisetum arvense* (Craighead and others 1988, Webber and others 1978). *Salix planifolia*/*S. rotundifolia*-*S. phlebophylla*-*Petasites frigidus*-*Poa arctica*/*Luzula confusa* (Clebsch 1957). *Salix planifolia*-*s. lanata*/*Calamagrostis canadensis* (Craighead and others 1988). *Salix planifolia*-*s. lanata*-*Myrica gale*/*Calamagrostis canadensis* (Craighead and others 1988). *Salix glauca*/*Arctostaphylos alpina* (Webber and others 1978). *Salix glauca*/*Hylocomium splendens* (Jorgenson 1984). *Salix planifolia*/*Petasites frigidus*-*Sphagnum* spp. (Jorgenson 1984). *Salix planifolia*/*Betula glandulosa*-*Vaccinium uliginosum* (Brock and Burke 1980).

### **II.C.2.h. Open Low Willow-Sedge Shrub Tundra**

**Description-** These communities have 25 to 75 percent cover of shrubs, primarily willows, at least 20 centimeters (8 in) high (fig. 48). Shrubs taller than 1.5 meters (5 ft) provide less than 25 percent cover and tree canopy cover is less than 10 percent. *Salix planifolia* or *S. lanata* most commonly dominate these communities. These often are quite low, 20 to 50 centimeters (8 to 20 in) tall. *Carex aquatilis* typically dominates the understory, though other sedges, such as *C. vaginata* and *C. bigelowii*, are sometimes dominant. Other vascular plants commonly present include *Salix arctica* and *S. reticulata*. Nonsphagnaceous mosses, commonly including *Tomenthypnum nitens*, *Distichium capillaceum*, *Drepanocladus* spp., and *Campylium stellatum*, often are abundant. Lichens are scarce.

**Distribution and site characteristics-** Willow-sedge tundra occurs on terraces, pond margins, streambanks, low-center polygons, drained lake basins, and sometimes strangmoor strang in northern and western Alaska. It also may occur on moist alpine slopes in interior Alaska but has not been reported from there. Soils are poorly drained, usually more poorly drained than shrub-tussock tundra. Permafrost is present; reported active layer thicknesses range from 60 to 75 centimeters (24 to 30 in), but some northern stands may have permafrost at shallower depths.



Figure 48-Open low willow sedge-shrub tundra with *Salix planifolia* subsp. *pulchra* and scattered *Betula nana* and *Carex* spp. between the shrub clumps in arctic Alaska.

**Successional status-** Successional relations are mostly unknown. Many stands may be fairly stable. Drying trends may produce changes toward shrub-tussock tundra. Increased moisture may cause a decrease in willows and shift toward wet sedge meadow.

**Closely related types-** Willow-sedge tundra is similar to open low willow communities but has a strong sedge component. They are similar to willow-graminoid bogs but occur in tundra (arctic) settings. They also are similar to sedge-willow tundra but have more than 25 percent shrub cover, primarily willows.

**Photographs--** Figure 48, this publication.

**Primary references-** Komarkova and Webber 1978, Webber and Walker 1975, Webber and others 1978.

**Communities-** *Salix planifolia*-*Carex aquatilis* (Komarkova and Webber 1978, 1980). *Salix lanata*-*Carex aquatilis* (Webber and Walker 1975, Webber and others 1978). *Salix lanata*-*Carex vaginata*/*Hylocomium splendens* (Hettinger and Janz 1974). *Salix lanata*/*Carex* spp. (Craighead and others 1988). *Salix planifolia*-*Spiraea beauverdiana*/*Carex aquatilis* (Hultén 1966). *Salix planifolia*/*Carex bigelowii* (Craighead and others 1988). *Salix planifolia*/*Carex bigelowii*-*Petasites frigidus*/*Hylocomium splendens* (Hanson 1958, Hettinger and Janz 1974). *Salix planifolia*/*Carex podocarpa*-*Petasites frigidus* (Anderson 1974). *Salix planifolia*/*Carex bigelowii*-*Arctagrostis latifolia* (Churchill 1955).

#### *II.C.2.i. Open Low Willow-Graminoid Shrub Bog*

**Description-These** communities have 25 to 75 percent cover of shrubs at least 20 centimeters (8 in) tall, primarily willows. Shrubs taller than 1.5 meters (5 ft) provide less than 25 percent cover, and tree canopy cover is less than 10 percent. Dominant willows include *Salix barclayi*, *S. commutata*, and probably others. Scattered individuals of shrub birch (*Betula glandulosa* and *B. nana*) sometimes are present. Trees are absent or scarce. Understory dominants include *Calamagrostis canadensis*, *Carex aquatilis*, and *C. pluriflora*. Nonsphagnaceous mosses are abundant in some sites. Sphagnum is sometimes present. Lichens are absent or sparse.

**Distribution and site characteristics-** Willow-graminoid bogs occur in wet stream bottoms and lowland depressions in interior, southwestern, south-central, and south-east Alaska, but peat is generally thin. Permafrost is generally absent.

**Successional status-** Successional relations are largely unknown. If the substrate surface builds up or the water level drops, trees may invade, which leads to forest development. Willow graminoid bogs sometimes develop from wet meadows or bog meadows.

**Closely related types-** These communities are similar to willow-sedge tundra but occur within the trees (subarctic lowland sites). They are similar to open low willow communities but have a strong component of grasses or sedges in the understory. Some stands may be similar to sweetgale-graminoid bogs but have more willows and less sweetgale. Some may be similar to open tall scrub swamps but are not as tall and lack a significant alder component.

**Photographs-** Hogan and Tande 1983, plates 20 and 21.

**Primary references-** Hogan and Tande 1983, Streveler and others 1973, Wibbenmeyer and others 1982.

**Communities-** *Salix* spp./*Carex* spp./*Sphagnum* spp. (See footnote 3). *Salix commutata*/*Carex aquatilis*/*Calliergon giganteum* (Streveler and others 1973). *Salix barclayi*/*Calamagrostis canadensis*-*Carex* spp. (Streveler and others 1973). *Salix* spp. -*Betula nana*/*Calamagrostis canadensis*-*Carex aquatilis* (Batten 1979). *Salix* spp.-*Calamagrostis canadensis*/*Potentilla palustris* (Rosenberg 1986).

#### *II.C.2.j. Open Low Sweetgale-Graminoid Bog*

Description- These communities have 25 to 75 percent cover of shrubs at least 20 centimeters (8 in) tall, primarily sweetgale (*Myrica gale*) (fig. 49). Shrubs taller than 1.5 meters (5 ft) provide less than 25 percent cover, and tree canopy cover is less than 10 percent. Other shrubs that may be present include *Salix fuscescens*, *S. barclayi*, *Chamaedaphne calyculata*, *Betula glandulosa*, *B. nana*, and *Alnus tenuifolia*. Scattered birch and spruce trees may be present. Commonly dominant graminoids include *Calamagrostis canadensis*, *Carex livida*, *C. aquatilis*, *C. pluriflora*, *C. limosa*, *C. sitchensis*, *C. magellanica*, *C. canescens*, *C. lyngbyaei*, and *Trichophorum caespitosum*. Other common plants are *Potentilla palustris*, *Menyanthes trifoliata*, and *Equisetum* spp. *Utricularia* spp. may be present in flooded hollows between hummocks. Mosses, usually including *Sphagnum* spp., are abundant and together with the shrubs form a thick mat. Lichens are absent or sparse.

Distribution and site characteristics-Sweetgale-graminoid bogs occupy poorly drained lowlands (sometimes at the inland edge of coastal marshes), gentle slopes, depressions in string bogs, and floating bog mats at pond margins in southeastern, south-central, and southwestern Alaska. These sites are extremely wet, and standing water usually is present. The substrate is peat composed of sedges or mosses, or both, often with abundant woody fragments. The peat is at least 15 to 20 centimeters (6 to 8 in) thick and usually overlies silt or gravelly silt. Hummocky microrelief often is present. Soil reaction is only slightly acidic, with most recorded values clustering around pH 6. Permafrost is absent.



Figure 49-Open low shrub sweetgale-graminoid bog of *Myrica gale* and *Carex aquatilis*, which form a zone around a subarctic lowland sedge wet meadow of *Carex rostrata* in south-central Alaska.

**Successional status-** Successional relations are unknown. These communities appear to be fairly early stages of bog succession, given the thin peat accumulations and relatively high pH's of many stands. Exactly how they fit into a successional sequence remains to be discovered. Possibly ericaceous shrubs become more important as peat thickness increases and pH decreases. Bogs do not necessarily show a uniform increase in peat thickness with age (for example, string bogs). Patterns of peat generation and decomposition within a bog probably result from a complex interplay of many factors.

**Closely related types-**Some stands that are more or less intermediate between sweetgale-graminoid bogs and willow-graminoid bogs are found, but willows are secondary to sweetgale in sweetgale-graminoid bogs. These communities also are similar to subarctic lowland sedge-shrub wet meadows (III.A.3.h.) but have at least 25 percent shrub cover, primarily in sweetgale.

**Photographs-** Hogan and Tande 1983, plates 11, 12, 15, and 18; Scheierl and Meyer 1977, figure 21 (aerial view); figure 49, this publication.

**Primary references-** Crow 1968, Griggs 1936, Hanson 1951, Hogan and Tande 1983, Ritchie and others 1981.

**Communities-** *Myrica gale/Trichophorum caespitosum/Sphagnum* spp. (Hogan and Tande 1983, Tande 1983, Viereck 1970b). *Myrica gale/Empetrum nigrum-Eriophorum angustifolium-Carex pluriflora/Sphagnum recurvum-Pleurozium schreberi* (See footnote 3). *Myrica gale/Calamagrostis canadensis* (Batten and others 1978, Frohne 1953, Hanson 1951, McCormick and Pichon 1978, Quimby 1972, Ritchie and others 1981). *Myrica gale-Salix spp./Calamagrostis canadensis* (Crow 1968, Scheierl and Meyer 1977). *Myrica gale-Betula nana-Salix spp./Calamagrostis canadensis-Carex* spp. (Seguin 1977). *Myrica gale/Carex* spp. (Hogan and Tande 1983, Ritchie and others 1981). *Myrica gale-Salix spp./Carex* spp. (Ritchie and others 1981). *Myrica gale/Rubus chamaemorus/Sphagnum* spp. (Griggs 1936, Wibbenmeyer and others 1982). *Myrica gale/Hordeum brachyantherum* (Crow 1968). *Myrica gale/Poa eminens* (Crow 1968). *Myrica gale-Potentilla fruticosa-Betula nana/Ledum decumbens-Rubus chamaemorus* (Rosenberg 1986). *Myrica gale/Menyanthes trifoliata-Carex* spp. (Rosenberg 1986).

#### *II.C.2.k. Open Low Alder-Willow Shrub*

**Description-** These communities have 25 to 75 percent cover of shrubs at least 20 centimeters (8 in) tall. Shrubs taller than 1.5 meter (5 ft) provide less than 25 percent cover and tree canopy cover is less than 10 percent. Alders and willows dominate the shrub canopy. Common species include *Alnus crispa*, *Salix lanata*, *S. planifolia*, and *S. glauca*. Trees are scarce or, more commonly, absent. Shrubby understory species include *Spiraea beauverdiana*, *Betula glandulosa*, *B. nana*, *Empetrum nigrum*, *Vaccinium vitis-idaea*, and *Ledum decumbens*. Common herbs include *Equisetum arvense*, *Eriophorum angustifolium*, *Rubus chapaemorus*, *Petasites frigidus*, and *Carex bigelowii*. *Eriophorum vaginatum* tussocks may be scattered. A continuous moss mat consisting of feathermosses or sphagnum, or both, often is present. Lichens, such as *Cetraria cucullata* and *Cladonia* spp., are present locally.

**Distribution and site characteristics-** open low alder-willow shrub occurs on steep north slopes and along drainageways near tree line in interior Alaska and on river terraces in northern Alaska. The shrubs and mosses form a hummocky mat over mineral soil or rocks. Permafrost is probably present at most of these sites, but the thickness of the active layer has not been measured.

**Successional status-** These communities are probably fairly stable at many sites. With decreasing elevation and decreasing slope steepness, communities on drainageways grade into tall alder-willow communities. North Slope terrace communities probably become shrub-tussock tundra communities as the permafrost table rises and soils become colder and wetter.

**Closely related types-**Open low alder-willow shrub communities are similar to open tall alder-willow shrub and closed low alder-willow shrub but are composed primarily of low (less than 1.5 meters [5 ft] tall) shrubs and have open (less than 75 percent) shrub canopies. They also are similar to open low alder and open low willow communities but have substantial cover of both kinds of shrubs. Some stands may be similar to shrub-tussock tundra but have more and usually taller alders and willows and few tussocks.

**Primary references-** Bliss and Cantlon 1957, Brock and Burke 1980, Viereck 1963.

**Communities-** *Alnus crispa*-*Salix* spp./*Carex bigelowii*-*Empetrum nigrum*-*Vaccinium vitis-idaea*/*Cetraria cucullata*-*Cladonia* spp. (Bliss and Cantlon 1957, Viereck 1963). *Alnus crispa*-*Salix planifolia*/*Eriophorum angustifolium*/*Sphagnum* spp. (Brock and Burke 1980).

#### *II.C.2.I. Open Low Alder Shrub*

**Description-** These communities have 25 to 75 percent cover of shrubs at least 20 centimeters (8 in) tall, which are primarily alders. Shrubs taller than 1.5 meters (5 ft) provide less than 25 percent cover and tree canopy cover is less than 10 percent. *Alnus crispa* dominates most of these communities, but *A. tenuifolia* is dominant in some stands. Common understory species include *Betula nana* and the ericaceous shrubs *Ledum decumbens*, *Empetrum nigrum*, *Vaccinium uliginosum*, *V. vitis-idaea*, and *Arctostaphylos alpina*. *Carex bigelowii* is often present, and *Eriophorum vaginatum* tussocks may be present but not abundant. Mosses, such as *Hylocomium splendens*, *Aulacomnium* spp., *Tomenthypnum nitens*, and sometimes *Sphagnum* spp., form a continuous mat.

**Distribution and site characteristics-** Open low alder shrub occurs on gentle alpine slopes, broad drainageways, and locally in poorly drained flats in south-western, south-central, and interior Alaska and on river terraces in northern Alaska. The substrate consists of an organic mat over mineral soil and is generally acid. Permafrost is present at many of these sites.

**Successional status-** Successional relations are unknown. In northern Alaska, open low alder communities seem to occur in areas adjacent to and slightly better drained than areas supporting shrub-tussock tundra. Sometimes these areas are quite moist, but the water is moving (for example, open low alder shrub in broad drainageways receiving water from shrub-tussock tundra upslope). On level ground away from drainageways, open low alder shrub may give way to shrub-tussock tundra as the permafrost table rises and the soil becomes wetter and colder.

**Closely related types-** Open low alder shrub is similar to open tall alder shrub, but the general level of the canopy is lower than 1.5 meters (5 ft). These communities also are similar to open low alder-willow communities but have little or no willow cover. Some are similar to shrub-tussock tundra but have more alder and few, if any, tussocks.

**Primary references-** Bliss and Cantlon 1957, Drew and Shanks 1965.

**Communities-** *Alnus crispa/Vaccinium uliginosum-Ledum decumbens-Betula nana-Carex bigelowii/Hylocomium splendens-Aulacomnium palustre* (Bliss and Cantlon 1957). *Alnus crispa/Betula glandulosa-Ledum decumbens/Sphagnum* spp. (Drew and Shanks 1965, Ritchie and others 1981).

#### **II.C.2.m. Sagebrush-Juniper**

**Description-** Although these communities are known to exist on steep south-facing bluffs in interior and south-central Alaska, none has been described.

#### **II.C.2.n. Sagebrush-Grass**

**Description-** These communities have 25 to 75 percent cover of shrubs taller than 20 centimeters (8 in), which is primarily sagebrush (fig. 50). Shrubs taller than 1.5 meters (5 ft) generally are absent or at most contribute less than 25 percent cover. Tree canopy cover, primarily aspen, is less than 10 percent. Common sagebrushes include *Artemisia frigida* and *A. alaskana*. Common associated grasses include *Calamagrostis purpurascens*, *Agropyron spicatum*, *Bromus pumpellianus*, and *Festuca altaica*. Other common species include *Potentilla pennsylvanica* and *Poa glauca*. Mosses are scarce and lichens are scattered.

**Distribution and site characteristics-** Sagebrush-grass communities occur locally on steep south-facing bluffs primarily along major river systems in interior and south-central Alaska. The substrate varies from silt loams to rocky silts and is extremely steep, unstable, and dry. Plant cover is discontinuous and much bare ground is exposed. Soil reaction is generally circumneutral, pH 6-8. Permafrost is absent.

**Successional status-** These communities are stable in the specialized localities they exist in. They sometimes share the bluffs with open stands of stunted aspen, which presumably are on slightly moister microsites.



Figure 50-Open low sagebrush-grass shrub of *Artemisia frigida*, *Bromus pumpellianus*, *Calamagrostis purpurascens*, and *Agropyron spicatum* on a south-facing river bluff in interior Alaska.

**Closely related types-** Sagebrush-grass communities are similar to some of the dry grassland communities (especially some midgrass-shrub communities) but have at least 25 percent shrub (primarily sagebrush) cover. They also are similar to sagebrush-juniper communities, but juniper is much less important or absent. Some may grade into aspen woodlands but have less than 10 percent tree cover.

**Photographs-** Figure 50, this publication.

**Primary reference-** Hanson 1951.

**Communities-** *Artemisia frigida*-*Bromus pumpellianus* (Hanson 1951).

### **II. D. Dwarf Scrub**

These communities are dominated by dwarf shrubs (shrubs less than 20 centimeters [8 in] tall) and have at least 25 percent shrub cover. Trees provide less than 10 percent cover and usually are entirely absent; shrubs taller than 20 centimeters (8 in) provide less than 25 percent cover. If dwarf shrubs are the only plants present then cover can be as low as 2 percent (fig. 51, A and B).

Dominant plants are most commonly ericaceous shrubs or species of *Dryas*. Willows that normally exceed 20 centimeters (8 in) in height (including *Salix planifolia*, *S. lanata*, *S. glauca*, and *S. brachycarpa*) are absent or nearly so. A community with 50 percent cover of *Salix planifolia* would be classified as open low willow shrub regardless of the height of the willows. Ericaceous shrub communities on wetlands and those containing shrub birch as a codominant are treated as low shrub communities (shrubs 20 to 150 centimeters [8 in to 5 ft] tall). Other ericaceous shrub communities (primarily alpine heath) are treated here as dwarf shrub tundra (less than 20 centimeters [8 in] tall).

Closed and open forms of dwarf scrub tundra have been combined because the percentage of shrub cover is not as meaningful as it is in taller shrub-dominated communities. The dwarf shrub layer is overtopped by the herb layer, so changes in dwarf shrub cover have a relatively small effect on physiognomy.

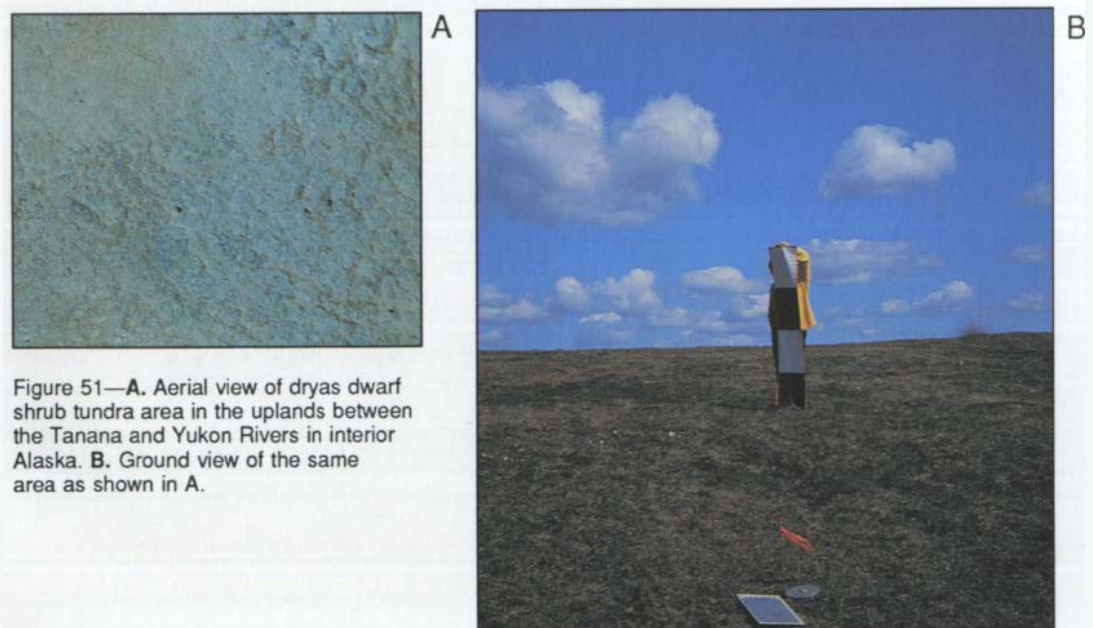


Figure 51—A. Aerial view of *dryas* dwarf shrub tundra area in the uplands between the Tanana and Yukon Rivers in interior Alaska. B. Ground view of the same area as shown in A.

### **II.D.1. *Dryas Dwarf Scrub***

These are dwarf scrub communities dominated by species of the genus *Dryas*. Ericaceous shrubs, willows, sedges, and lichens may be abundant or even codominant.

#### **II.D.1.a. *Dryas Dwarf Shrub Tundra***

**Description-** These communities are dominated by species of the genus *Dryas*, which form mats a few centimeters thick (figs. 52 and 53). Dwarf shrubs other than *Dryas* may be absent or common, or sometimes even codominant. Common dwarf shrubs include ericads *Vaccinium vitis-idaea*, *V. uliginosum*, *Cassiope tetragona*, *Arctostaphylos alpina*, and *A. rubra*, and prostrate willows *Salix reticulata* and *S. phlebophylla*. Shrub birch is absent or nearly so, as are shrubby willows such as *Salix glauca* and *S. brachycarpa*. Graminoids, such as *Hierochloë alpina*, *Trisetum spicatum*, *Carex microchaeta*, and *C. scirpoidea* may be present, but provide little cover. Forbs, including *Oxytropis nigrescens*, *Hedysarum alpinum*, *Minuartia* spp., *Anemone* spp., and *Saxifraga* spp. may be common. Mosses, such as *Tomenthypnum nitens* and *Racomitrium* spp., usually are present in small quantities, and lichens (such as *Cetraria cucullata*, *Cetraria* spp., *Cladina alpestris*, *Thamnolia* spp., and *Stereocaulon* spp.) may be common but not codominant. Trees are absent, and shrubs taller than 20 centimeters (8 in) are absent or provide less than 25 percent cover. Plant cover ranges from sparse to complete. Patterns, commonly steps or stripes, may be present.

**Distribution and site characteristics-** *Dryas* dwarf shrub tundra is common on windswept alpine sites throughout the northern two-thirds of the State and occasionally is present on well-drained, exposed arctic lowland sites. Soils are mostly thin, well drained, and stony (generally Pergelic Cryaquolls, Cryoborolls, or Cryochrepts). Permafrost usually is present, but the active layer is at least 50 centimeters (20 in) thick and usually much thicker. Most sites are exposed to strong winds, which remove fines and organic material.

**Successional status-**Successional relations are largely unknown. Most of these communities are probably quite stable. Soils change very slowly in these exposed settings, which creates a relatively constant environment for plant growth.

**Closely related types-** *Dryas* tundra is similar to *Dryas*-sedge tundra and *Dryas*-lichen tundra but has fewer sedges and lichens, respectively. Some stands may be similar to dwarf ericaceous tundra or dwarf willow tundra, but ericaceous shrubs and willows, if present at all, are subordinate to *Dryas* in the *Dryas* tundra communities. Some open low shrub communities (such as low willow and mesic shrub birch-ericaceous shrub) have large quantities of *Dryas*, but *Dryas* tundra lacks shrub birch and erect shrubby willows.

**Photographs-**Johnson and others 1966, figures 2 and 6; Racine and Anderson 1979, figure 12; figures 52 and 53, this publication.

**Primary references-**Johnson and others 1966; Jorgenson 1984; Komarkova and Webber 1978; Racine and Anderson 1979; Viereck 1962, 1963; Webber and others 1978.



Figure 52—Dryas dwarf shrub tundra with a nearly continuous mat of *Dryas octopetala* with scattered *Salix reticulata* and *Cassiope tetragona* in the Alaska Range in interior Alaska.



Figure 53—Dryas dwarf shrub tundra composed of mats of *Dryas drummondii* and *Dryas integrifolia*, a seral community on glacial outwash in the Alaska Range.

**Communities-** *Dryas octopetala* (Craighead and others 1988, Drew and Shanks 1965, Hanson 1953, Hettinger and Janz 1974, Johnson and others 1966, Nodler and others 1978, Pegau 1968, Viereck 1963). *Dryas octopetala-Salix arctica-Oxytropis nigrescens* (Bos 1967). *Dryas octopetala-Vaccinium* spp. (Jorgenson 1984, Racine and Young 1978, Talbot and others 1984). *Dryas octopetala-Cassiope tetragona* (Craighead and others 1988). *Dryas octopetala-Salix reticulata-Cassiope tetragona* (Anderson 1974; Batten 1977; Kessel and Schaller 1960; Viereck 1962, 1963). *Dryas octopetala-Vaccinium uliginosum-Salix reticulata* (Anderson 1974). *Dryas octopetala-Arctostaphylos alpina* (Jorgenson 1984, Webber and others 1978, Young 1974b). *Dryas octopetala-Arctostaphylos alpina-Tomenthypnum nitens-Carex bigelowii* (Webber and others 1978). *Dryas integrifolia* (Hettinger and Janz 1974, Komarkova and Webber 1978, Webber and Walker 1975). *Dryas integrifolia-Arctostaphylos rubra* (Jorgenson 1984, Koranda 1960, Webber and others 1978). *Dryas integrifolia-Lupinus arcticus* (Churchill 1955). *Dryas integrifolia-Hedysarum alpinum-Festuca rubra* (Hanson 1951). *Dryas drummondii-D. integrifolia* (Viereck 1966). *Dryas integrifolia-Poa glauca-Oxytropis borealis* (Koranda 1960). *Dryas integrifolia-Vaccinium* spp. (Drew and Shanks 1965, Jorgenson 1984). *Dryas integrifolia-Salix reticulata-Equisetum arvense* (Craighead and others 1988).

### II.D.1.b. *Dryas*-Sedge Dwarf Shrub Tundra

**Description-** These communities are dominated by *Dryas* spp. and also have a strong sedge component. *Carex scirpoidea*, *C. misandra*, *C. bigelowii*, *Kobresia myosuroides*, and several other sedges can be codominant with the dryas. Other dwarf shrubs, such as *Salix reticulata* and *Arctostaphylos* spp., may be common. Grasses and broad-leaved herbs may be scattered (for example, *Hierochloë alpina*, *Hedysarum* spp., *Saxifraga* spp.). Mosses, commonly *Tomenthypnum nitens*, *Rhytidium rugosum*, and *Hylocomium splendens*, are common as are fruticose lichens such as *Cladonia* spp. and *Cetraria* spp. The dryas, associated shrubs, and mosses form a mat a few centimeters thick through which the sedges and other herbs, if present, grow to heights of 10 to 30 centimeters (4 to 12 in). Trees are absent, and shrubs taller than 20 centimeters (8 in) are absent or provide less than 25 percent cover. Shrub species that normally grow taller than 20 centimeters (8 in) (such as *Betula glandulosa*, *B. nana*, *Salix glauca*, and *S. brachycarpa*) are absent or provide less than 20 percent cover. Total plant cover ranges from open to complete but often is greater than 75 percent.

**Distribution and site characteristics-** *Dryas*-sedge dwarf shrub tundra communities are common on alpine sites throughout the northern two-thirds of the State. They occupy well-drained soils that are usually not quite as exposed and windswept as those supporting dryas tundra communities. The permafrost table is at least 50 centimeters (20 in) below the surface and usually much deeper.

**Successional status-** Successional relations are unknown. Most of these communities probably are stable and change slowly with time.

**Closely related types-** *Dryas*-sedge tundra is similar to dryas tundra but has more sedges. It also is similar to dryas-lichen tundra, but sedges are more important than lichens. It is similar to sedge-dryas (herbaceous) tundra but has more than 25 percent shrub cover, primarily dryas. Some stands may be similar to some of the dwarf ericaceous scrub tundra types or dwarf willow scrub tundra types, but ericaceous shrubs and willows are less important or absent entirely. Some stands may even resemble some mesic shrub birch-ericaceous shrub communities but lack a shrub birch component and have only minor quantities of ericaceous shrubs.

**Primary references-** Drew and Shanks 1965, Gjaerevoll 1954, Viereck 1963.

**Communities-** *Dryas octopetala*-*Carex scirpoidea* (Gjaerevoll 1954). *Dryas octopetala*-*Kobresia myosuroides* (Drew and Shanks 1965, Hanson 1951, Johnson and others 1966, Spetzman 1959). *Dryas octopetala*-*Kobresia simpliciuscula* (Gjaerevoll 1954). *Dryas octopetala*-*Vaccinium vitis-idaea*-*Luzula* spp.-*Carex misandra* (Childs 1969). *Dryas octopetala*-*Carex franklinii* (Gjaerevoll 1954). *Dryas octopetala*-*Salix arctica*-*Carex bigelowii*-mosses (Anderson 1974). *Dryas integrifolia*-*Salix reticulata*-*Carex scirpoidea* (Batten 1977, Drew and Shanks 1965, Hanson 1953, Hettinger and Janz 1974). *Dryas integrifolia*-*Carex misandra*-*Rhytidium*

*rugosum* (Hettinger and Janz 1974). *Dryas octopetala*-*Carex microchaeta* (Webber and others 1978). *Dryas octopetala*-*Carex misandra*-*C. bigelowii* (Hanson 1951). *Dryas octopetala*-*Carex glacialis* (Gjaerevoll 1954). *Dryas octopetala*-*Carex nardina*-*C. vaginata*-lichens (George and others 1977). *Dryas integrifolia*-*Carex scirpoidea*-*Kobresia simpliciuscula* (Koranda 1960). *Dryas octopetala*-*Salix reticulata*-*Carex bigelowii* (Hanson 1950, Viereck 1968). *Dryas octopetala*-*Salix reticulata*-*Carex podocarpa* (Scott 1974a). *Dryas integrifolia*-*Carex scirpoidea* (Drew and Shanks 1965, Hettinger and Janz 1974). *Dryas integrifolia*-*Carex bigelowii* (Craighead and others 1988, Jorgenson 1984). *Dryas integrifolia*-*Oxytropis nigrescens*-*Carex rupestris* (Koranda 1960, Webber and Walker 1975). *Dryas integrifolia*-*Carex* spp. (Craighead and others 1988). *Dryas integrifolia*-*Eriophorum scheuchzeri*-*Tomenthyprnum nitens* (Jorgenson 1984).

### **II.D.1.c. Dryas-Lichen Dwarf Shrub Tundra**

**Description-** These communities are codominated by dryas and fruticose lichens (fig. 54). Common lichens include *Alectoria* spp., *Cetraria* spp. (especially *C. cucullata*), *Cladonia* spp., and *Thamnolia vermicularis*. Mosses, including *Tomenthyprnum nitens*, *Rhacomitrium* spp. and *Polytrichum* spp., may grow intertwined with the dryas mat. Dwarf shrubs other than dryas may be present, commonly *Salix reticulata*, *S. phlebophylla*, *Empetrum nigrum*, *Arctostaphylos* spp., and other ericaceous shrubs. Graminoids such as *Festuca* spp., *Hierochloe; alpina*, and *Carex* spp. may be present. Broad-leaved herbs, including *Oxytropis nigrescens*, *Minuartia* spp. and *Saxifraga* spp., may be common. Trees are absent and shrubs taller than 20 centimeters (8 in) (as well as shrub species normally growing taller than 20 centimeters [8 in], such as *Betula* spp., *Salix glauca*, and *S. brachycarpa*) are absent or provide less than 25 percent cover. Plant cover ranges from 2 to 100 percent. A substantial amount of the total cover is contributed by fruticose lichens.

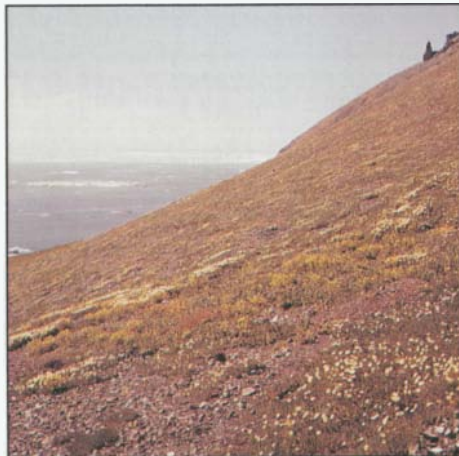


Figure 54-Dryas-lichen tundra with scattered mats of *Dryas octopetala*, a wide variety of other subshrubs and herbs, including *Oxytropis nigrescens*, *Minuartia arctica*, *Silene acaulis*, *Geum glaciale*, and *Potentilla biflora*; and an open cover of lichens, especially *Alectoria* spp., *Cetraria* spp., and *Cladonia* spp. in arctic Alaska.

**Distribution and site characteristics-** Dryas-lichen dwarf shrub tundra occurs throughout alpine regions of the northern two-thirds of the State on exposed wind-swept sites. It reaches its best development in western Alaska, particularly on the Seward Peninsula. Soils are young, thin, dry, and stony (Entisols). The permafrost table is at least 50 centimeters (20 in) below the surface and usually deeper. The lichens are extremely fragile when dry and subject to damage by trampling. Exposure to strong winds with consequent deflation of fines and organic material causes soil development to proceed extremely slowly on most sites occupied by these communities.

**Successional status-** Little is known except that lichens require many years (on the order of decades) to recover from severe trampling (Palmer and Rouse 1945). Most dryas-lichen stands seem to be stable as long as they are not overgrazed.

**Closely related types-** Dryas-lichen tundra is similar to dryas tundra and dryas-sedge tundra, but lichens are much more important and provide substantial cover. Some stands may be similar to some of the ericaceous scrub tundra types (particularly *Vaccinium*, bearberry, and crowberry), but dryas is the most important vascular plant present. Some mesic shrub birch-ericaceous low shrub communities have abundant dryas and lichens, but shrub birch is absent or unimportant in dryas-lichen tundra. Dryas-lichen tundra also can be similar to lichen tundra but has much more dryas. Vascular plants are scarce in lichen tundra stands.

**Photographs-** Figure 54, this publication.

**Primary references-** Drew and Shanks 1965, Hanson 1951, Johnson and others 1966, Pegau 1968, and Viereck 1962.

**Communities-** *Dryas octopetala-Cetraria* spp.-*Cladonia* spp. (Pegau 1968, Viereck 1962). *Dryas octopetala*-lichens (Anderson 1974, Brock and Burke 1980, Childs 1969, George and others 1977, Hanson 1951, Spetzman 1959). *Dryas infegrifolia*-lichens (Drew and Shanks 1965, Hanson 1951, Komarkova and Webber 1978, Webber and Walker 1975). *Dryas octopetala-lichens-Oxytropis nigrescens-Salix phlebophylla-Carex microchaeta* (Johnson and others 1966). *Dryas octopetala-Stereocaulon tomentosum* (Scott 1974a). *Dryas octopetala-Cetraria cucullata* (Scott 1974a, Viereck 1962). *Dryas octopetala-Empetrum nigrum-Salix arctica-Cetraria* spp.-*Cladonia* spp. (Young and Racine 1978). *Dryas octopetala-Salix reticulata-Cladonia rangiferina* (Scott 1974a).

#### *II.D.2. Ericaceous Dwarf Scrub*

These communities are dominated by ericaceous shrubs. Several of the level IV units are closely related, and assignment of communities to them is sometimes arbitrary.

##### *II.D.2.a. Bearberry Dwarf Shrub Tundra*

**Description-** These types are dominated by bearberry (*Arctostaphylos alpina* or *A. rubra*). Other ericaceous shrubs also may be abundant or even codominant, particularly *Vaccinium vitis-idaea*, *V. uliginosum*, *Ledum decumbens*, *Empetrum nigrum*, and *Cassiope tetragona*. Prostrate willows such as *Salix phlebophylla* and *S. rotundifolia* also may be common. Shrub birch is absent or unimportant as are normally erect willows such as *Salix glauca*. Common herbs include *Carex bigelowii*,

*Oxytropis nigrescens*, *Hierochloë alpina*, and *Carex* spp. but these generally provide little cover. Mosses are commonly intertwined in the mat of ericaceous shrubs or, in the case of *Rhacomitrium* spp., occur as distinct polsters. Moss species reported include *Dicranum* spp. and *Rhacomitrium lanuginosum*. *Tomenthyphnum nitens* and *Hylocomium splendens* probably also are common on many sites. Fruticose lichens may be abundant. Common species include *Cladina stellaris*, *C. rangiferina*, *C. arbuscula*, *Cetraria cucullata*, and *Stereocaulon tomentosum*. Trees generally are absent and never provide more than 10 percent cover. Shrubs taller than 20 centimeters (8 in) (and shrub species normally taller than 20 centimeters [8 in], such as *Betula* spp., *Salix glauca*, and *S. planifolia*) are absent or provide less than 25 percent cover. The mat of shrubs, mosses, and lichens commonly provides nearly complete vegetative cover, although open stands are present on exposed sites.

**Distribution and site characteristics-** Bearberry dwarf shrub tundra communities occupy alpine areas of interior, northern, and western Alaska, possibly being most common in the west. They occupy shallow, rocky, well-drained soils on slopes and windswept ridges that are not as exposed as those supporting dryas tundra communities. Permafrost is at least 50 centimeters (20 in) deep and usually deeper.

**Successional status-**Successional relations are mostly unknown. Sometimes these communities occur on slopes between low scrub communities (such as mesic shrub birch-ericaceous shrub) and dryas communities. Bearberry dwarf shrub tundra communities seem to be stable over long periods. There may be a trend for shrub birch to establish and become more important as soil development proceeds and as exposure to wind decreases.

**Closely related types-** Bearberry tundra is closely related to vaccinium tundra and, in some cases, to crowberry tundra. Assigning stands to these units can become very arbitrary. Bearberry is more abundant in bearberry tundra than in the other ericaceous scrub tundras. Some dry windswept stands of bearberry tundra may be similar to some of the dryas-dominated communities but have less dryas and more bearberry. Bearberry tundra also may be similar to some dwarf willow scrub tundra communities but have more bearberry and less willow. Some bearberry stands may resemble some open low shrub communities, such as mesic shrub birch-ericaceous shrub or open low willow, but lack significant quantities of shrub birch or erect willows. Moist bearberry stands may resemble ericaceous scrub bogs but lack sphagnum and peat-forming sedges and generally occur on drier sites. They also may resemble mixed shrub-sedge tussock tundra but lack tussocks.

**Photographs--** Racine and Anderson 1979, figure 13.

**Primary references-** Hanson 1953, Jorgenson 1984, Racine and Anderson 1979, Webber and others 1978.

**Communities-** *Arctostaphylos alpina-Vaccinium vitis-idaea* (Hanson 1953). *Arctostaphylos alpina-Rhododendron camtschaticum* (Pegau 1968). *Arctostaphylos rubra-Cladina stellaris* (Webber and others 1978). *Arctostaphylos alpina-Vaccinium* spp.-*Empetrum nigrum-Cassiope tetragona*-lichens (Jorgenson 1984). *Arctostaphylos alpina-Vaccinium uliginosum-Dicranum* spp. -*Rhacomitrium lanuginosum* (Jorgenson 1984). *Arctostaphylos alpina-Carex bigelowii* (Racine and Anderson 1979).



Figure 55-Eriaceous dwarf shrub tundra of *Vaccinium uliginosum*, *V. vitis-idaea*, *Ledum decumbens*, *Cassiope tetragona*, and *Arctostaphylos alpina*, a snowbed community in arctic Alaska.

#### **II.D.2.b. *Vaccinium* Dwarf Shrub Tundra**

**Description-** *Vaccinium* dwarf shrub tundra communities are dominated by *Vaccinium uliginosum* or *V. vitis-idaea* (fig. 55). Other ericaceous shrubs, especially *Ledum decumbens*, *Arctostaphylos rubra*, *A. alpina*, *Empetrum nigrum*, and *Cassiope tetragona*, may be abundant or even codominant. Dwarf willows such as *Salix phlebophylla*, *S. rotundifolia*, and *S. arctica* also may be common. Common herbs include *Hierochloë alpina*, *Polygonum bistorta*, *Anemone* spp., *Festuca altaica*, and *Luzula* spp. Mosses, such as *Polytrichum* spp., *Dicranum* spp., and *Hylocomium splendens* may be common, but usually do not contribute much cover. Fruticose lichens may provide substantial cover or may even codominate with the shrubs. Common lichens include *Cladina stellaris*, *C. rangiferina*, *Cetraria islandica*, *C. delisei*, *C. cucullata*, *Stereocaulon* spp., *Alectoria nigricans*, *Thamnolia vermicularis*, and *Sphaerophorus fragilis*. Trees usually are absent and always provide less than 10 percent cover. Shrubs taller than 20 centimeters (8 in) (and shrub species that normally grow taller than 20 centimeters [8 in], such as *Betula* spp., *Salix glauca*, and *S. planifolia*) are absent or provide less than 25 percent cover.

**Distribution and site characteristics-** *Vaccinium* dwarf shrub tundra communities are common in alpine areas of interior, northern, and western Alaska on slopes and windswept ridges. They generally occupy shallow, stony, fairly well-drained soils. Permafrost is present at depths of 30 centimeters (12 in) or usually more. Sites are generally exposed to the wind and do not accumulate much snow in the winter but usually are not as exposed as sites supporting dryas communities.

**Successional status-** Successional relations are mostly unknown. Sometimes these communities occur on slopes between low scrub communities (such as mesic shrub birch-ericaceous shrub) and dryas communities. Many *vaccinium* communities seem to be stable over long periods. There may be a long-term trend for shrub birch to invade and become more important as soil development proceeds or as exposure to wind decreases.

**Closely related types-** *Vaccinium* dwarf shrub tundra is closely related to bearberry tundra and, in some cases, to crowberry tundra and even *Cassiope* tundra. *Vaccinium* spp. are more abundant in *Vaccinium* tundra than in the other ericaceous units. Dry windswept stands of *Vaccinium* tundra can be similar to *Dryas* tundra or dwarf willow tundra but have more *Vaccinium* and less *Dryas* or willow. Mesic *Vaccinium* stands can resemble mesic shrub birch-ericaceous shrub or open low willow shrub but lack significant quantities of shrub birch and erect willows. Moist *Vaccinium* stands can also resemble ericaceous shrub bogs but lack sphagnum and peat-forming sedges; they generally occur on drier sites. They can also resemble mixed shrub-sedge tussock tundra but lack tussocks.

*Photographs-* Figure 55, this publication.

**Primary references-** Drew and Shanks 1965, Hanson 1951, Johnson and others 1966, Webber and others 1978.

**Communities-** *Vaccinium vitis-idaea-Dryas octopetala-Empetrum nigrum-Festuca altaica* (Scott 1974a). *Vaccinium vitis-idaea-Salix phlebophylla-Arctostaphylos alpina* (Anderson 1974). *Vaccinium vitis-idaea-Empetrum nigrum-Cladonia* spp. (Racine and Anderson 1979). *Vaccinium uliginosum-Diapensia lapponica-Phyllodoce coerulea-Salix Polaris-S. arctica* (Fries 1977). *Loiseleuria procumbens-Vaccinium uliginosum-Salix arctica-Ledum decumbens* (Griggs 1936). Bryophyte-*Vaccinium uliginosum-Dryas octopetala-Carex bigelowii* (Anderson 1974). *Vaccinium* spp.-*Ledum decumbens-Arctostaphylos alpina-Cassiope tetragona* (Hanson 1958, Johnson and others 1966). *Ledum decumbens-Vaccinium vitis-idaea-Cetraria* spp. (Hanson 1951). *Rhododendron lapponicum-Vaccinium uliginosum- V. vitis-idaea* (Drew and Shanks. 1965). *Festuca altaica-Vaccinium vitis-idaea-V. uliginosum-Empetrum nigrum-Dryas octopetala* (Hanson 1951). *Vaccinium uliginosum-V. vitis-idaea* (Hettinger and Janz 1974). *Vaccinium uliginosum-Empetrum nigrum-Ledum decumbens-Cladonia* spp. (Steigers and others 1983). *Vaccinium uliginosum-lichens* (Craighead and others 1988).

#### *II.D.2.c. Crowberry Dwarf Shrub Tundra*

**Description-** Crowberry dwarf shrub tundra communities are dominated by *Empetrum nigrum* (fig. 56). Other dwarf shrubs may be abundant. *Vaccinium uliginosum*, *V. vitis-idaea*, *Arctostaphylos alpina*, *Cassiope tetragona*, *Salix arctica*, and *Dryas octopetala* are common associates in the more continental, northern parts of the range of this unit; *Phyllodoce aleutica*, *Cassiope stelleriana*, *C. lycopodioides*, *C. mertensiana*, *Vaccinium caespitosum*, and *Luetkea pectinata* are common in the oceanic climate prevalent in the Aleutian Islands and along the gulf coast. The herb component is variable and usually provides little cover; It may include *Geum calthifolium*, *Arnica* spp., *Campanula* spp., *Pedicularis* spp., *Artemisia arctica*, *Fauria crista-galli*, and *Carex* spp. Mosses apparently are common in most stands, but species names have not been reported. Lichens, especially *Cladonia* spp., are common in many stands. Trees usually are absent and always provide less than 10 percent cover. Shrubs taller than 20 centimeters (8 in) (including shrub birch) are absent or provide less than 25 percent cover.

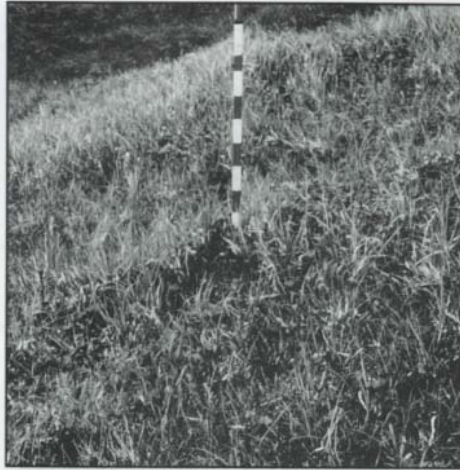


Figure 56-Crowberry tundra dominated by *Empetrum nigrum* with *Carex* spp. and *Calamagrostis nutkaënsis* in the Aleutian Islands.

**Distribution and site characteristics-** These communities are common in the Aleutian Islands and northwestern, southwestern, and south-central Alaska on slopes and level ground. They become infrequent east of Prince William Sound, apparently being replaced **by** mountain-heath dwarf shrub tundra communities. Soils are variable, ranging from thin well-drained mineral soil (most common in western Alaska and windswept Aleutian localities) to rather poorly drained peats. The peat is generally less than 30 centimeters (12 in) thick and often is broken by bedrock outcrops. Permafrost is present at depths of 30 to 60 centimeters (12 to 24 in) at most western and southwestern sites but is absent elsewhere.

**Successional status-** Successional relations are unknown, but crowberry tundra communities occupy large areas and appear to be stable.

**Closely related types-** Crowberry dwarf shrub tundra can be similar to all other dwarf shrub types, especially the ericaceous ones, but has more *Empetrum nigrum*. It also is similar to some ericaceous scrub bog communities but occurs on thin peats and has little or no sphagnum. Some western Alaska stands may resemble mesic shrub birch-ericaceous scrub communities, or even mixed shrub-sedge tussock tundra communities, but have more crowberry and lack sedge tussocks and shrub birch.

**Photographs-** Figure 56, this publication.

**Primary references-** Bos 1967, Byrd 1984, Cooper 1942, Everett 1971, Griggs 1936.

**Communities-** *Empetrum nigrum*-*Cassiope stelleriana*-*Phyllodoce aleutica*-*Vaccinium* spp. (Cooper 1942, Fox 1983, Heusser 1960, Isleib and Kessel 1973, Palmer 1942). *Empetrum nigrum*-*Vaccinium* spp. (Friedman 1982, Griggs 1936, Racine and Young 1978). *Empetrum nigrum*-*Lycopodium* spp./*Brachythecium albicans*-*Cladonia* spp. (Bank 1951). *Empetrum nigrum*-*Carex pluriflora*-*C. macrochaeta*/*Cladonia* spp. (Bank 1951, Everett 1971, Hultén 1960, Shacklette and others 1969). *Empetrum nigrum*-*Cassiope lycopodioides*-*Carex circinnata*/mosses (Byrd 1984). *Empetrum nigrum*-*Arctostaphylos alpina* (Bos 1967, Fries 1977). *Empetrum nigrum*-*Vaccinium uliginosum* (Hultén 1962). *Empetrum nigrum*-*Carex bigelowii*-*Arctostaphylos alpina* (Bos 1967). *Empetrum nigrum*-*Salix arctica*-*Cetraria* spp. (Young and Racine 1978).

#### *II.D.2.d. Mountain-Heath Dwarf Shrub Tundra*

**Description-** Mountain-heath dwarf shrub tundra communities **are** dominated by *Phyllodoce aleutica* (*P. aleutica* ssp. *glanduliflora* in southeastern Alaska). Associated (sometimes codominant) dwarf shrubs include *Cassiope mertensiana*, *C. stelleriana*, *Luetkea pectinata*, *Vaccinium uliginosum*, and *V. caespitosum*. Several herbs, including *Lupinus nootkatensis*, *Valeriana sitchensis*, and *Sedum rosea*, may be minor components of the vegetation. Mosses and lichens probably are common, but species names have not been reported. Trees are absent or provide less than 10 percent cover. Shrubs taller than 20 centimeters (8 in) are absent or provide less than 25 percent cover. Plant cover ranges from open to complete but usually is fairly high.

**Distribution and site characteristics-** Mountain-heath dwarf shrub tundra communities are common on alpine slopes and snowbed margins in south-central and southeastern Alaska. Most are well protected by snow in winter. Soils usually are relatively thin and often are stony.

**Successional** status-Successional relations are unknown. These communities appear to be stable.

**Closely related** types-Mountain-heath dwarf shrub tundra can be similar to crow-berry tundra and some stands of cassiope tundra but has a greater proportion of *Phyllodoce* spp. Some stands also may be similar to dricaceous shrub bogs but have little or no sphagnum or other peat formers and much more mountain-heath.

**Primary** references-Klein 1965, Racine and Young 1978, Streveler and others 1973.

**Communities-** *Phyllodoce aleutica*-*Cassiope stelleriana* (Heusser 1960). *Phyllodoce aleutica*-*Cassiope* spp.-*Vaccinium* spp. (Klein 1965). *Phyllodoce aleutica*-*Cassiope mertensiana* (Jaques 1973). *Luetkea pectinata*-*Phyllodoce* spp.-*Cassiope* spp. (Racine and Young 1978, Streveler and others 1973).

#### *II.D.2.e. Cassiope Dwarf Shrub Tundra*

**Description-** Cassiope dwarf shrub tundra communities are dominated by *Cassiope tetragona* in the northern two-thirds of the State and by *Cassiope mertensiana* in snow beds in the mountains bordering the Pacific Coast (fig. 57). Common associated dwarf shrubs (sometimes codominant) include *Vaccinium vitis-idaea*, *V. uliginosum*, *Empetrum nigrum*, *Salix reticulata*, *S. arctica*, and *Dryas* spp. with *Cassiope tetragona*; and *Cassiope stelleriana*, *Phyllodoce aleutica* ssp. *glanduliflora*, *Vaccinium uliginosum*, *V. caespitosum*, and *Empetrum nigrum* with *Cassiope mertensiana*. Herbs, including *Luzula* spp., *Pyrola* spp., *Saxifraga* spp., and *Carex bigelowii*, are minor components of these communities! Mosses, including *Distichium capillaceum*, *Tomenthypnum nitens*, *Drepanocladus rebolvens*, *Aulacomnium palustre*, and *Hylocomium splendens*, are abundant in *Cassiope tetragona* stands. Mosses associated with *C. mertensiana* are unknown. Lichens, such as *Cetraria richardsonii* and *C. cucullata*, are common in *Cassiope tetragona* stands but provide little cover. Trees are absent, and shrubs over 20 centimeters (8 in) tall (including shrub birch of any height) are absent or provide less than 25 percent cover. Plant cover is usually complete or nearly so.



Figure 57-Ericaceous dwarf shrub tundra of *Cassiope tetragona* with some *Dryas octopetala* and *Vaccinium vitis-idaea*, a snowbed community in the Alaska Range.

**Distribution and site characteristics-** *Cassiope* dwarf shrub tundra is widespread on moist alpine sites throughout Alaska with the possible exception of the Aleutian Islands. It occurs on moist, thin, stony soils, commonly on north slopes, gelifluction lobes, or snow accumulation areas, although it can occur on ridge crests and slopes of all aspects. Sometimes the soil is a thin organic mat over boulders. *Cassiope* tundra occurs on sites well protected by snow in winter that become snow free in the early to middle part of the growing season.

**Successional status-** Successional relations are unknown. These communities seem extremely stable.

**Closely related types-** *Cassiope mertensiana* communities may be similar to mountain-heath and crowberry communities but have a greater cover of *Cassiope* spp. They also may be similar to some ericaceous shrub bog communities but lack sphagnum and peat-forming sedges, occur on better drained soils at higher elevations, and are dominated by *Cassiope* spp.

*Cassiope tetragona* communities may be similar to bearberry, vaccinium, and crowberry communities but have a greater cover of *Cassiope tetragona*. Some stands might intergrade with mesic shrub birch-ericaceous shrub stands, but *cassiope* tundra lacks shrub birch, generally has lower species diversity, and is dominated by *Cassiope tetragona*.

**Photographs-** Figure 57, this publication.

**Primary references-** Hanson 1953, Jorgenson 1984, Ward 1957, Webber and others 1978.

**Communities-** *Cassiope tetragona* (Anderson 1974; Komarkova and Webber 1978, 1980; Pegau 1968; Scott 1974a; Webber and others 1978). *Cassiope tetragona*-*Salix rotundifolia*-mosses (Batten 1977, Jorgenson 1984, Webber and Walker 1975). *Cassiope tetragona*-*Vaccinium uliginosum*-mosses (Hanson 1953, Scott 1974a). *Cassiope tetragona*-*Vaccinium vitis-idaea* (Childs 1969, Webber and others 1978). *Cassiope tetragona*-*Dryas integrifolia* (Komarkova and Webber 1978, 1980; Koranda 1960). *Cassiope tetragona*-*Vaccinium vitis-idaea*-*Carex bigelowii*-*Hylocomium splendens*-lichens (Jorgenson 1984). *Cassiope tetragona*-*Dicranum* spp. (Jorgenson

1984). *Cassiope mertensiana*-*C. stelleriana*-*Empetrum nigrum* (Fox 1983; Heusser 1954, 1960; Ward 1957). *Luetkea pectinata*-*Cassiope stelleriana*-*lycopodium alpinum*-*Cladonia* spp. (Hanson 1951).

#### 11.D.3. Willow Dwarf Scrub

These are dwarf scrub communities dominated by prostrate willows. Shrubs taller than 20 centimeters (8 in) (including normally erect willow species such as *Salix planifolia* and *S. brachycarpa* of any height) are absent or provide less than 25 percent cover.

##### 11.D.3.a. Willow Dwarf Shrub Tundra

Description-Willow dwarf shrub tundra communities are dominated by dwarf willows such as *Salix polaris*, *S. reticulata*, *S. phlebophylla*, *S. rotundifolia*, *S. ovalifolia*, and *S. arctica*. Other common dwarf shrubs (sometimes codominant) include *Empetrum nigrum*, *Cassiope lycopodioides*, *Dryas* spp., *Vaccinium uliginosum*, *V. vitis-idaea*, and *Ledum decumbens*. Dwarf birch is absent or nearly so, as are shrubby, normally erect willows such as *Salix planifolia*, *S. lanata*, *S. glauca*, and *S. brachycarpa*. Common herbs include *Hierochloë alpina*, *Minuartia* spp., *Carex microchaeta*, *C. scirpoidea*, *Carex* spp., *Saxifraga* spp., *Poa arctica*; and *Anemone* spp. Mosses, including *Dicranum* spp., *Aulacomnium* spp., *Hylocomium splendens*, *Tomenthypnum nitens*, and *Rhacomitrium* spp., may be common. Lichens may be common but usually do not provide much cover. Species include *Dactylina arctica*, *Cladonia rangiferina*, *C. alpestris*, *Sphaerophorus globosus*, *Thamnolia vermicularis*, *Cetraria cucullata*, and, in rocky fell-fields, *Rhizocarpon* spp. and *Umbilicaria* spp. Trees are absent or provide less than 10 percent cover. Shrubs taller than 20 centimeters (8 in) are absent or provide less than 25 percent cover. Plant cover ranges from very sparse to complete.

**Distribution and site characteristics-** Willow dwarf shrub tundra communities are common in alpine areas and other windswept tundra settings throughout the State except for southeastern Alaska. They occupy a wide variety of habitats including snowbeds, wet high-alpine drainage channels, gelifluction lobes, windblown high-center polygon summits, stabilized sand dunes, mesic slopes, exposed slopes, and ridges. Soils are generally thin and well drained but range from wet (snowbeds and some gelifluction lobes) to dry. In moist and mesic settings, a thin organic mat may be present at the surface. Permafrost is present 30 centimeters (12 in) or more below the surface at most sites, except for the Aleutian Islands where permafrost is absent.

**Successional status-** Successional relations are unknown. Most communities seem to be stable.

**Closely related types-** Willow dwarf shrub tundra communities are similar to many dwarf ericaceous shrub tundra communities but have greater cover by dwarf willows. They also are similar to some open low shrub willow and birch communities but lack significant quantities of shrubby birches and willows. They also resemble mesic sedge-willow tundra but have more than 25 percent shrub cover, primarily of dwarf willows.

**Photographs-** Byrd 1984, figure 6; Shacklette and others 1969, figure 29.

**Primary references-** Anderson 1974, Byrd 1984, Hettinger and Janz 1974, Klein 1959, Shacklette and others 1969.

**Communities-** *Salix rotundifolia* (Klein 1959, Komarkova and Webber 1978, White and others 1975). *Salix rotundifolia-Oxyria digyna* (Anderson 1974). *Salix ovalifolia-Empetrum nigrum-Festuca rubra-Calamagrostis deschampsoides* (Hanson 1951). *Salix Polaris-S. reticulata-Hylocomium splendens-Carex podocarpa* (Scott 1974a). *Salix ovalifolia* (White and others 1975). *Salix reticulata-Carex microchaeta-Rhacomitrium lanuginosum* (Hettinger and Janz 1974). *Salix reticulata-Carex saxatilis* (Hettinger and Janz 1974). *Salix rotundifolia-Potentilla vahliana-Saxifraga oppositifolia* (Racine and Anderson 1979). *Salix polaris-Cetraria islandica-Cladina rangiferina* (Scott 1974a). *Salix arctica-Carex nesophila-Cladina alpestris-Cetraria cucullata* (Klein 1959). *Salix arctica-S. rotundifolia-Empetrum nigrum* (Shacklette and others 1969). *Salix rotundifolia-S. ovalifolia-Cassiope lycopodioides-Empetrum nigrum* (Shacklette and others 1969). *Salix ovalifolia-Artemisia borealis* (Webber and others 1978). *Salix rotundifolia-S. phlebophylla* (Clebsch 1957). *Salix phlebophylla* (Craighead and others 1988). *Salix reticulata-Dryas integrifolia-Carex bigelowii-Tomenthypnum nitens* (Hettinger and Janz 1974). *Salix reticulata-Ledum decumbens* (Hettinger and Janz 1974). *Salix spp. -Cassiope tycopodioides* (Byrd 1984). *Salix reticulata-Carex bigelowii-Aulocornium spp.* (Jorgenson 1984). *Salix reticulata-Dryas octopetala-Carex scirpoidea* (Anderson 1974).

### III. Herbaceous

Herbaceous communities lack woody plants or have less than 10 percent of their cover in tree species and less than 25 percent of their cover in shrubs. Most of these communities are dominated by graminoids (grasses or sedges), but others are dominated by broad-leaved herbs (forbs) or bryoids (bryophytes or lichens). Many tundra communities are included in the herbaceous unit, but the term "tundra" is not used above level IV. Communities of aquatic herbs are grouped within level II as aquatic communities.

#### III.A. Graminoid Herbaceous

Graminoid herbaceous communities are dominated by grasslike plants, usually grasses (Gramineae) or sedges (Cyperaceae). Horsetails (Equisetaceae) and rushes (Juncaceae) are not included (unless codominant with a grass or sedge) but are treated instead as forbs in this classification.

##### III.A.1. Dry Graminoid Herbaceous

These are communities dominated by graminoids, occurring on well-drained to excessively drained sites. Forbs may be codominant in some stands. Shrubs may be present but provide less than 25 percent cover.

###### III.A.1.a. *Elymus*

**Description-** These communities are dominated by species of the genus *Elymus*, usually *E. arenarius* (fig. 58). Often the elymus grows in dense pure stands, but it also commonly mixes with other grasses or forbs. Common secondary, or sometimes codominant, species include the strand plants *Lathyrus maritimus*, *Senecio pseudo-arnica*, *Honckenya peploides*, *Ligusticum scoticum*, and *Mertensia maritima* and the grasses *Poa eminens* and *Festuca rubra*. A different species, *Elymus innovatus*, dominates certain dry inland sites; common codominants with this species include *Festuca altaica* and *Poa glauca*. Mosses, lichens, and woody plants are scarce or absent in most elymus communities, though feathermosses are abundant in some.



Figure 58-Dry graminoid herbaceous stand of *Elymus arenarius* with *Senecio pseudo-arnica* and *Mertensia maritima* on sand dunes in the Aleutian Islands.

*Elymus arenarius* ranges in height from around 20 centimeters (8 in) in the Arctic to over 1 meter (3 ft) in the southern part of the State. *Elymus innovatus* is usually 30 to 70 centimeters (12 to 30 in) tall depending on site conditions. Vegetative cover of communities of both species may be complete or sparse.

**Distribution and site characteristics-** *Elymus arenarius* communities are characteristic of coastal and near-coastal sand dunes and the upper parts of coastal sand beaches around the State. Exceptions are the Aleutian Island communities where dominance is shared by ferns or large forbs of the family Umbelliferae (Apiaceae), which do not occur on coastal sands but on well-drained, mesic soils on slopes. In northern Alaska, because of the small tidal range and the extreme erosive force periodically exerted on beaches by storms, *Elymus* communities are rare on exposed beaches and more commonly are found on the inland side of spits and barrier islands. Along much of the Beaufort Sea coast, sand substrates are rare and *Elymus* communities are restricted mostly to dune fields at river mouths and small isolated pockets of sand scattered along the coast. *Elymus innovatus* communities form small localized stands on flood plains and dry south-facing slopes in the Alaska and Brooks Ranges. Substrates of the coastal *Elymus arenarius* communities consist of circumneutral (pH 6.4 to 7.3) sands or pebbles. Although many of these communities are inundated by infrequent storm surges, water drains quickly without leaving any appreciable quantity of salt in the soil. Substrates of other *Elymus* communities are well drained and consist of silt loams to river gravels. Permafrost is absent from all but the most northern sites; even there it is at least 1 meter (3 ft) below the surface.

**Successional status--** *Elymus arenarius* is normally the first species to colonize shifting dune sands. On beaches, *Elymus* communities gradually replace halophytic herb communities as uplift or beach progradation decreases the frequency of tidal inundation. Increasing numbers of grasses, sedges, forbs, or low shrubs invade the *Elymus* communities as the substrate is stabilized; the exact species depends on site characteristics and location. In western Alaska, ericaceous shrubs, particularly crowberry (*Empetrum nigrum*), and several grasses and sedges gradually replace the *Elymus*. In south-central and southeastern Alaska, succession proceeds through various herbaceous and shrubby types to culminate in Sitka spruce forest.

*Elymus innovatus* types on flood plains develop from pioneer perennial-herb communities, apparently in a few decades if the sites are not disturbed. In the Alaska Range, *Betula glandulosa* commonly invades the elymus communities to produce an open low birch shrub scrub in a relatively short time. *Elymus innovatus* types on steep slopes appear to be stable and may represent microclimatic, topographic, or edaphic climaxes.

**Closely related types**-Most coastal elymus communities grade seaward into halophytic herb communities. The point at which *Elymus arenarius* is sufficiently abundant to constitute an elymus community is often somewhat arbitrary. Some midgrass-herb communities of silty coastal slough levees resemble elymus communities but have less *Elymus arenarius* and often contain *Puccinellia* spp. or *Triglochin maritimum*, species not typical of elymus communities. The Aleutian Island elymus-umbel communities closely resemble some umbel or umbel-fern (mesic forb) communities, distinguished only by a higher cover of *Elymus arenarius*. The *Elymus innovatus* types are similar physiognomically to, and sometimes grade into, some of the dry fescue and midgrass types but differ in dominant species.

**Photographs**-- Byrd 1984, figure 3 and 4; Hanson 1951, figure 30; Shacklette and others 1969, figure 5; Viereck 1966, figure 5; figure 58, this publication.

**Primary references**- Byrd 1984, Hanson 1951, Johnson and others 1966, Racine and Anderson 1979, Shacklette and others 1969, Viereck 1966.

**Communities**- *Elymus arenarius* (Bank 1951; Batten and others 1978; George and others 1977; Griggs 1936; Hanson 1951, 1953; Johnson and others 1966; Klein 1959; Meyers 1985; Racine and Anderson 1979; Rosenberg 1986; Shacklette and others 1969; Spetzman 1959; Stephens and Billings 1967; Ugolini and Walters 1974; Young 1971). *Elymus arenarius-Honckenya peploides* (Manuwal 1979). *Elymus arenarius-Honckenya peploides-Mertensia maritima* (Fries 1977, Potter 1972, Wiggins and Thomas 1962). *Elymus arenarius-Poa eminens-Calamagrostis canadensis* (Quimby 1972). *Elymus arenarius-Poa eminens-Carex ramenskii* (Byrd and Ronsse 1983). *Elymus arenarius-Senecio pseudo-arnica-Lathyrus maritimus* (Bank 1951, Hultén 1960, Rausch and Rausch 1968). *Elymus arenarius-Senecio pseudo-arnica-Claytonia sibirica* (Friedman 1982). *Elymus arenarius-Lathyrus maritimus* (Hanson 1951). *Elymus arenarius-Lathyrus maritimus-Poa eminens* (Hanson 1953). *Elymus arenarius-Heracleum lanatum-Angelica lucida* (Byrd 1984). *Elymus arenarius-Heracleum lanatum-Angelica lucida-Athyrium filix-femina* (Byrd 1984). *Elymus arenarius-Ligusticum scoticum-Anemone narcissiflora* (Shacklette and others 1969). *Elymus arenarius/Potentilla egedii* (Crow and Koppen 1977). *Elymus arenarius-Festuca rubra* (Hanson 1951, Palmer and Rouse 1945). *Elymus arenarius-Lathyrus maritimus-Senecio pseudo-arnica-Angelica lucida* (Fries 1977). *Elymus arenarius-Polemonium boreale-Senecio pseudo-arnica* (Young and Racine 1978). *Elymus arenarius-Calamagrostis canadensis-Deschampsia beringensis* (Friedman 1982). *Elymus arenarius-Dryas integrifolia* (Komarkova and Webber 1980). *Elymus innovatus-Festuca altaica/Hylocomium splendens* (Viereck 1966). *Elymus innovatus-Poa glauca* (Hanson 1951).



Figure 59-Dry fescue stand of *Festuca altaica* and *Elymus innovatus* with scattered herbs of *Aconitum delphinifolium* and *Solidago multiradiata* on glacial outwash in the Alaska Range.

### III.A.1.b. Dry Fescue

**Description-** Dry fescue communities that have been reported are dominated by *Festuca altaica*, though stands dominated by *F. rubra* may exist and then would belong here also (fig. 59). *Festuca altaica* may grow in pure stands, or other grasses such as *Calamagrostis canadensis* or *C. purpurascens* may be common or even co-dominant. Forbs, including *Epilobium angustifolium*, *Achillea borealis*, and *Mertensia paniculata*, may be common but not codominant. Mosses often are abundant, primarily feathermosses and sometimes also *Polytrichum* spp. Scattered low shrubs may be present but are not conspicuous. Lichens usually are sparse.

**Distribution and site characteristics-** Dry fescue communities occur on various dry to mesic sites, including level lowland meadows in south-central Alaska, dry slopes at low elevations in interior Alaska, and alpine and subalpine slopes in the mountains (except in southeastern Alaska). Associated species differ among these sites; they range from *Calamagrostis canadensis*, *Angelica lucida*, and *Sanguisorba stipulata* in south-central lowlands to *Calamagrostis purpurascens* and *Artemisia frigida* on dry interior slopes to *Carex* spp., *Salix reticulata*, and ericaceous shrubs in alpine meadows. The substrate is usually mesic to dry, slightly to highly acid (pH 4.6 to 6.6) silts or loams. Permafrost is absent with the possible exception of some alpine stands.

**Successional status-** Edaphic evidence indicates that at least some of the coastal fescue communities may have replaced *Carex lyngbyaei* halophytic sedge wet meadows. Willows probably invade the fescue meadows ultimately and convert them to low or tall scrub (Hanson 1951).

Hanson (1951) suggests that fire may initiate development of some fescue communities on dry slopes in interior Alaska. These grasslands are then slowly reclaimed by willow, birch, and white spruce.

Little is known of successional relations of alpine and subalpine fescue communities, but many appear to be fairly stable over long periods.

**Closely related types-** Some dry fescue communities are similar to some dry *Elymus innovatus* communities, and others are similar to mesic bluejoint communities; the dry fescue communities have a greater cover of fescue. With increasing shrubs or herbs, dry fescue communities grade into midgrass-shrub or midgrass-herb communities, respectively. Shrubs are inconspicuous in dry fescue communities and forbs are not dominant.

**Photographs-** Figure 59, this publication.

**Primary references--** Hanson 1951, Viereck 1962.

Communities- *Festuca altaica* (Hanson 1951, 1953; Pegau 1972; Viereck 1962).  
*Festuca altaica-Calamagrostis canadensis* (Hanson 1951).

### *III.A.1.c. Midgrass-Shrub*

**Description-** These communities are commonly dominated by medium-height grasses such as *Festuca altaica*, *Calamagrostis purpurascens*, *Agropyron spicatum*, *Poa* spp., and *Bromus pumpeilianus* (fig. 60). Shrubs are conspicuous but provide less than 25 percent cover. The shrubs occasionally provide more cover than the grass but still less than 25 percent. Common shrubs on alpine and subalpine slopes include ericaceous shrubs, such as *Vaccinium vitis-idaea* and *Empetrum nigrum*, and low willows. Sagebrush (*Artemisia* spp., especially *Artemisia frigida*) is the common shrub on dry slopes. Feathermosses may be common (especially on alpine sites) or absent. Lichens often are common but may be absent. Total canopy cover is open (dry slope communities are almost always open) or closed. The grasses generally are 30 to 70 centimeters (12 to 30 in) tall, the shrubs 10 to 30 centimeters (8 to 12 in) tall.

**Distribution and site characteristics--** Midgrass-shrub communities occur on dry slopes at low elevations and on mesic to dry slopes and plateaus in alpine and subalpine settings. They generally are restricted to interior and south-central Alaska and the surrounding mountain ranges.

Soils are typically silt loams, often with abundant intermixed gravel or rock fragments. Low-elevation dry slope soils are generally slightly acid to moderately basic (pH 6 to 8). Alpine soils are usually acid (pH 5 to 6). Permafrost has not been reported but may be present under some alpine stands.

**Successional status-** These communities appear to be fairly stable. The *Festuca altaica-ericaceous* shrub types may have developed from dry fescue communities and may be evolving toward open ericaceous shrub scrub. The dry slope types appear to be stable and generally occupy slopes too steep and dry for woody plants other than sagebrush.

**Closely related types-** The *Festuca altaica-shrub* types are similar to dry fescue communities but have a conspicuous shrub element. The dry slope grass-sagebrush types are similar to sagebrush-juniper open low shrub scrub, but juniper is lacking, grasses are dominant, and sagebrush has less than 25 percent cover.

**Photographs-** Figure 60, this publication.

**Primary references-** Hanson 1951, Scott 1974a.

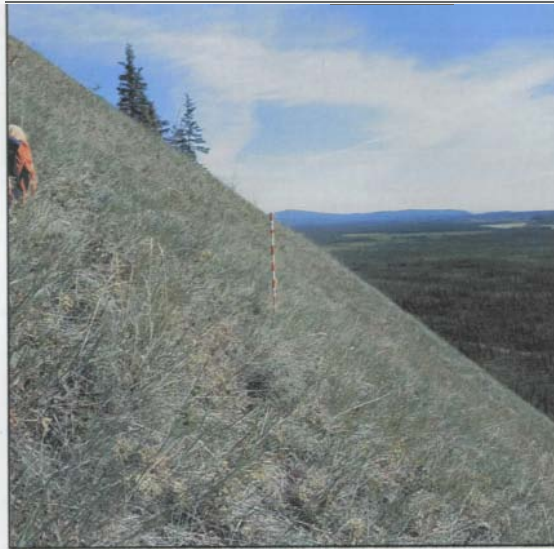


Figure 60-Midgrass-shrub stand of the grasses *Calamagrostis purpurascens*, *Bromus pumpellianus*, and *Elymus innovatus*, shrubs of *Artemisia frigida*, and the herbs *Pulsatilla patens*, *Antennaria rosea*, *Silene menziesii*, and *Arabis holboellii* on a south-facing bluff in interior Alaska.

**Communities-** *Festuca altaica*-*Salix lanata*-*Artemisia arctica* (Scott 1974a). *Calamagrostis purpurascens*-*Artemisia frigida* (Batten and others 1979, Hanson 1951). *Festuca altaica*-*Empetrum nigrum*-*Salix reticulata* (Scott 1974a). *Agropyron spicatum*-*Artemisia frigida* (Batten and others 1979, Hanson 1951). *Festuca altaica*-*Calamagrostis canadensis*-*Empetrum nigrum* (Bos 1967). *Poa glauca*-*Artemisia frigida*-*Calamagrostis purpurascens* (Hanson 1951).

#### III.A.1.d. Midgrass-Herb

**Description-** These communities are dominated by middle-height grasses and broad-leaved herbs (fig. 61). A few communities have been included here that are dominated entirely by grasses, or grasses and sedges are codominant. Common dominant grasses include *Festuca altaica*, *F. rubra*, *Deschampsia beringensis*, *Poa eminens*, and *Agropyron subsecundum*. Herbs reported as codominant include *Anemone narcissiflora*, *Lupinus arcticus*, *Aconitum delphinifolium*, *Mertensia paniculata*, *Cornus canadensis*, *Geranium erianthum*, *Potentilla egedii*, and *Achilles borealis*. Woody plants are rare or absent. Nonsphagnaceous mosses (especially feathermosses) are common in many of these communities. Plant cover is usually high.

**Distribution and site characteristics-** Midgrass-herb communities are found on various mesic sites, including alpine and subalpine meadows, streambanks, lowland meadows, and coastal slough levees. Coastal slough levee variants are found throughout the State, but the others are restricted to the Aleutian Islands and interior south-central, and southeastern Alaska. On coastal slough levees, the substrate is usually barely modified, tidally deposited silt. Other midgrass-herb communities generally occur on well-developed, well-drained silt loams or occasionally on sands. Soil pH is circumneutral to acid (usually 5.4 to 7.4), but values as low as 4.6 have been reported. The alpine sites tend to be acidic and the low-elevation sites circumneutral. Permafrost generally is absent but has been reported at depths of about 1 meter (3 ft) from sites in the Alaska Range. Associated species characteristic of coastal slough levees are *Festuca rubra*, *Poa eminens*, and *Potentilla egedii*. *Agropyron* spp. and *Deschampsia beringensis* are restricted to low elevations; *Festuca altaica* and most of the herbs occur over a broad elevational range.

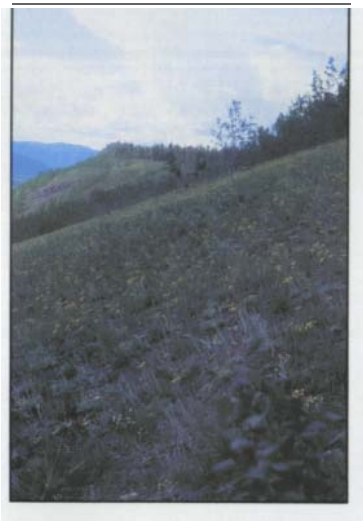


Figure 61-A midgrass-herb stand dominated by the herbs *Eriogonum flavum* and *Bupleurum triradiatum*, and the grass *Calamagrostis purpurascens*, with scattered shrubs of *Artemisia frigida* on a south-facing bluff in interior Alaska.

**Successional status-** The slough levee types often develop from halophytic herb communities as silt accumulation decreases flooding frequency. Tall willows, and eventually alder and *Populus* spp., invade these sites with further soil development and further removal from tidal influence. Successional relations of the other midgrass-herb communities are less clear. Some of the coastal meadow sites probably developed from coastal marshes (halophytic sedge wet meadows) and eventually may succeed to tall scrub and forest unless paludification leads to bog development. Some of the stands on slopes appear to persist indefinitely.

**Closely related types-** These communities are similar to some of the hair-grass and dry fescue types but are dominated by forbs, or at least dominated by two or more different kinds of grasses. Some midgrass-herb types also are similar to mesic mixed herb communities but differ in having a codominant grass element.

Coastal levee communities often grade seaward into halophytic herb communities but differ in having substantial quantities of *Poa eminens* or *Festuca rubra*. As the levees become higher or sandier, these communities may grade into *Elymus arenarius* types.

**Photographs-** Hanson 1951, figure 24; figure 61, this publication.

**Primary references-** Hanson 1951, Ritchie and others 1981.

**Communities-** *Festuca altaica-Anemone narcissiflora* (Anderson 1974, Pegau 1972). *Festuca altaica-Lupinus arcticus* (Scott 1974a). *Festuca altaica-Carex podocarpa-Aconitum delphinifolium-Mertensia paniculata-Artemisia arctica* (Hanson 1951). *Festuca altaica-Sanguisorba stipulata-Lycopodium alpinum-Salix reticulata/feathermosses* (Hanson 1951). *Festuca altaica-Calamagrostis canadensis-Comus canadensis-Geranium erianthum* (Hanson 1951). *Festuca rubra-Dodecatheon pulchellum-Lathyrus palustris* (Hanson 1951). *Festuca rubra-Angelica lucida-Achilles borealis-Cardamine umbellata* (Byrd 1984). *Festuca rubra-Carex supina-Agroropyron boreale* (Hanson 1951). *Festuca rubra-Angelica lucida* (Byrd 1984). *Festuca brachyphylla-Poa arctica* (Shacklette and others 1969). *Poa eminens-Potentilla egedii*

(Crow 1977b, Ritchie and others 1981). *Poa eminens-Festuca rubra-Potentilla egedii* (Vince and Snow 1984). *Poa eminens-Deschampsia beringensis-Festuca rubra* (Shacklette and others 1969). *Agropyron pauciflorum-Epilobium angustifolium* (Hanson 1951). *Carex macrochaeta-Festuca rubra* (Byrd 1984). *Agropyron pauciflorum-Festuca rubra-Achillea borealis-Lathyrus palustris* (Hanson 1951). *Poa glauca-Carex macrochaeta-Calamagrostis canadensis-Angelica lucida* (Hanson 1951). *Carex macrochaeta-Deschampsia beringensis* (Friedman 1982). *Potentilla egedii-Festuca rubra* (del Moral and Watson 1978). *Hedysarum alpinum-Deschampsia beringensis* (Crow 1968).

### III.A.1.e. Hair-Grass

**Description-** These communities are dominated by hair-grasses (*Deschampsia* spp.), usually *D. beringensis*. Broad-leaved herbs may be common but not codominant. Mosses may be common or absent. Woody plants and lichens generally are rare. The canopy may be open or closed, and the hair-grass usually grows 40 to 80 centimeters (16 to 32 in) tall.

These are often rather diverse stands, with small numbers of a great many species. Sometimes the hair-grass is only weakly dominant over the other species in the stand. Common associated species (not all are likely to be present at any one site) include *Potentilla egedii*, *Calamagrostis canadensis*, *Poa eminens*, *Achilles borealis*, *Festuca rubra*, and *Hedysarum alpinum*.

**Distribution and site characteristics-** Hair-grass communities are found in southern Alaska (including the Aleutian Islands) in coastal or near-coastal settings such as channel levees, fringes of coastal marshes, cliff tops, and cliff bases. Soils are generally well drained and mesic to dry. Textures range from clays to sands, and pH generally is circumneutral to slightly acid, with the few reported values hovering around 6.7 to 6.8. Some hair-grass communities are flooded irregularly by brackish water during storm surges, but this seems to have no appreciable effect on soil salinity. Permafrost is absent.

Successional status-Hair-grass communities may be near the middle of several successional sequences. Communities on coastal channel levees probably develop from halophytic herb communities via midgrass-herb communities. Hair-grass communities at the upper fringes of coastal marshes may develop from halophytic sedge (especially *Carex lyngbyaei*) stands if drainage is adequate and the marsh is prograding.

Some hair-grass communities may be invaded by *Calamagrostis canadensis* (Hanson 1951) and eventually replaced by it. Other stands may be replaced eventually by willows or alders.

Closely related types-Hair-grass communities are most similar to midgrass-herb communities but lack a dominant broad-leaved herb (forb) component. Forbs may be common or scarce but not codominant. Some hair-grass communities have a substantial cover of *Calamagrostis canadensis* and are similar to bluejoint meadows or bluejoint-herb meadows but have less bluejoint (*Calamagrostis canadensis*) and more hair-grass.

**Primary references-** Hanson 1951, Ritchie and others 1981, Stephens and Billings 1967.

**Communities-** *Deschampsia beringensis* (Batten and others 1978, Hanson 1951, Ritchie and others 1981, Seguin 1977, Stephens and Billings 1967<sup>4</sup>). *Deschampsia beringensis-Juncus arcticus* (Batten and others 1978). *Deschampsia beringensis-carex lyngbyaei* (McCartney 1976). *Deschampsia beringensis-Festuca rubra* (Batten and others 1978, Hanson 1951).

### III.A.2. Mesic Graminoid Herbaceous

Communities dominated or codominated by graminoids and occupying relatively mesic sites are included here. Forbs may be codominant in some communities and shrubs may be present, but these provide less than 25 percent cover.

#### III.A.2.a. Bluejoint Meadow

**Description-** Bluejoint meadows are dominated by bluejoint reedgrass (*Calamagrostis canadensis*), though a community dominated by *C. nutkaënsis* has been reported from the Aleutian Islands (fig. 62). Other grasses and herbs may be present but not codominant. Mosses are often absent or scarce, especially in well-developed, dense stands of bluejoint. In slightly more open stands, a patchy layer of feathermosses may be present. Lichens and woody plants are absent or scarce within the bluejoint meadows, though often a mosaic pattern composed of bluejoint meadows and tall shrub (especially alder) communities exists. The vegetation is usually very dense; cover is usually complete and canopy height is 0.8 to 1.4 meters (32 to 55 in), occasionally reaching 2 meters (6 ft). Bluejoint meadows often occur as nearly pure stands of *Calamagrostis canadensis*, but sometimes minor amounts of species such as *Heracleum lanatum*, *Angelica lucida*, *Epilobium angustifolium*, *Trientalis europaea*, *Mertensia paniculata*, *Viburnum edule*, and *Equisetum arvense* are present.

**Distribution and site characteristics-**Bluejoint meadows are very common in south-central and southwestern Alaska and are present in the Aleutian Islands and northwestern and interior Alaska. They occur on flood plains, upland slopes from valley bottoms to tree line, streambanks, lowland fens, and recently drained lake basins. They often occur in a mosaic pattern with shrub or broadleaf forest communities. They do not occur on windswept alpine sites. Though sometimes abundant at the fringes of coastal marshes, they are freshwater communities. Soils are usually silts, loams, mucks, or sedge peats and may be extremely wet (more or less permanently flooded with a few centimeters of water) to mesic or even dry. A mulch of decaying plant material several centimeters or even decimeters thick usually is present at the soil surface. The wetter sites usually are hummocky. Soils are acid, usually ranging from pH 5 to 6. Permafrost has not been reported in bluejoint meadows but may exist at depths of 1 meter (3 ft) or more below the surface of communities in western Alaska.

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<sup>4</sup> Reported by Stephens and Billings (1967) as *Deschampsia* (= *Vahlodea*) *atropurpurea*, but species identification is questionable.



Figure 62-A bluejoint meadow of *Calamagrostis canadensis* that has developed after logging and fire in interior Alaska.

**Successional status-** In southwestern Alaska, bluejoint meadows are stable and appear to be climax or near-climax (Griggs 1936). They seem to develop from bluejoint-herb communities as the bluejoint gradually excludes other herbs.

Bluejoint communities on the Seward Peninsula are small and largely restricted to disturbed sites such as villages and recently drained lake basins (Racine and Anderson 1979). It seems likely that accumulation of organic matter in these sites will eventually raise the permafrost table and inhibit drainage, thereby leading to replacement by tussock tundra or wet sedge meadow.

Within the tree line, development of bluejoint communities is generally initiated by disturbance such as fire or land-clearing. Bluejoint communities may be preceded by a bluejoint-herb stage. Though bluejoint meadows may persist for some time, most probably will evolve through alder or willow scrub to a forest community if disturbance is not renewed (Mitchell and Evans 1966).

**Closely related types-** Bluejoint meadows are similar to bluejoint-herb meadows but are more strongly dominated by bluejoint (*Calamagrostis canadensis*). Some bluejoint stands are invaded by willows, alders, or other shrubs. As long as these remain minor components of the vegetation, the stand is considered bluejoint meadow; otherwise it would be considered a bluejoint-shrub community. Some bluejoint stands may have small admixtures of midgrasses (such as *Deschampsia beringensis* and *Festuca altaica*) and resemble some of the dry midgrass communities, but again these stands are more strongly dominated by *Calamagrostis canadensis*.

**Photographs-** Racine and Anderson 1979, figure 12; Tande 1983, plate 24; figure 62, this publication.

**Primary references-** Byrd 1984, Hanson 1951, Racine and Anderson 1979, Ritchie and others 1981.

**Communities-** *Calamagrostis canadensis* (Bank 1951; Batten and others 1978; Burns 1964; Craighead and others 1988; Friedman 1982; Fries 1977; Hanson 1951, 1953; Heusser 1960; Hultén 1966; McCormick and Pichon 1978; Pegau 1968, 1972; Racine 1976; Racine and Anderson 1979; Ritchie and others 1981; Tande 1983; Wibbenmeyer and others 1982; Young and Racine 1976). *Calamagrostis canadensis/Galium trifidum* (Crow 1977b). *Calamagrostis nutkaënsis/Festuca rubra* (Amundsen and Clebsch 1971, Byrd 1984).

### III.A.2.b. Bluejoint-Herb

**Description-** Bluejoint-herb communities are dominated equally by bluejoint (*Calamagrostis canadensis*) and various herbs, commonly including *Epilobium angustifolium*, *Angelica lucida*, *Athyrium filix-femina*, *Equisetum arvense*, and *E. fluviatile*. Sedges and other grasses, such as *Carex macrochaeta*, *Deschampsia beringensis*, and *Festuca rubra*, also may be present in significant amounts. Woody plants are absent or scattered. Feathermosses may be absent or common and *Polytrichum* spp. are sometimes present. *Sphagnum* spp. are sometimes present in small quantities on certain wet sites. Lichens are scarce or absent. The canopy is about 0.8 to 1.5 meters tall, sometimes taller. Cover usually is complete or nearly so. Productivity of a mesic stand in south-central Alaska was determined to be 465 grams per square meter per year (4,150 lb/acre), primarily *Epilobium angustifolium* and *Calamagrostis canadensis* (Mitchell and Evans 1966).

**Distribution and site characteristics-** Bluejoint-herb communities are common in the southern half of the State and occupy the same wide range of sites as bluejoint meadows: flood plains, upland slopes from valley bottoms to tree line, streambanks, and fens. Soils also are similar to those of bluejoint meadows, usually silts or loams or sometimes sedge peats. They may be extremely wet (flooded with 10 to 30 centimeters [4 to 12 in] of fresh water) but more commonly are mesic. The wetter sites usually have a hummocky microrelief pattern. Soil reaction is moderately acid, generally pH 5 to 6 (minimum value reported is pH 4.4). A layer of decaying plant material often is present at the surface but usually is not as thick as in pure bluejoint stands. Permafrost has not been reported from any of these communities but may exist at depths of 1 meter (3 ft) or more under stands in western Alaska.

**Successional** status-In southwestern Alaska, bluejoint-herb communities may develop from fell-fields as soils become richer and deeper and from dwarf birch-ericaceous shrub communities as drainage improves (Griggs 1936). Where drainage and soil development are adequate, the bluejoint may eventually suppress the herbs thereby resulting in the bluejoint-alder grassland climax of that area.

In the forested parts of the State, most of the mesic bluejoint-herb communities have developed when fire, land-clearing, or some other disturbance destroyed forest communities. If disturbance is not renewed, most of these stands eventually are invaded by shrubs (alder or willow, or both) and transformed to scrub vegetation and ultimately forest. If shrub invasion is delayed long enough, the bluejoint may crowd out other herbs, thereby producing a bluejoint meadow.

The wet types may be derived from wet sedge meadows or wet herb marshes. In turn, they eventually are invaded by shrubs and become scrub communities.

**Closely related** types-Bluejoint-herb communities are similar to bluejoint meadows but have a substantial component of broad-leaved herbs or, rarely, other graminoids or ferns. They also may be similar to some bluejoint-shrub stands but lack a significant shrub component. Some mesic forb herbaceous communities may contain bluejoint but as a nondominant. *Elymus* spp. and various midgrasses may be present in some bluejoint herb communities but are less abundant than they are in the *elymus* or midgrass communities.

Photographs-Mitchell and Evans 1966, figure 1.

**Primary references-** Batten and others 1978, del Moral and Watson 1978, Griggs 1936, Hanson 1951, Mitchell and Evans 1966, Ritchie and others 1981.

**Communities-** *Calamagrostis canadensis-Epilobium angustifolium* (Hanson 1951, Klein 1959, Mitchell and Evans 1966, Young and Racine 1978). *Calamagrostis canadensis-Epilobium angustifolium-Geranium erianthum* (Heusser 1960). *Calamagrostis canadensis-Thalictrum minus-Geranium erianthum-Epilobium angustifolium* (Hultén 1960). *Calamagrostis canadensis-Epilobium angustifolium-Heracleum lanatum-Angelica genuflexa* (Griggs 1936). *Calamagrostis canadensis-Deschampsia beringensis-Heracleum lanatum-Angelica lucida* (Bank 1951). *Calamagrostis canadensis-Festuca altaica* (Hanson 1951). *Calamagrostis canadensis-Festuca altaica-Elymus arenarius* (Hanson 1951). *Calamagrostis canadensis-Elymus arenarius* (Hanson 1951). *Calamagrostis canadensis-C. nutkaensis-Geranium erianthum* (Friedman 1982). *Calamagrostis canadensis-Equisetum sylvaticum* (Hanson 1951). *Calamagrostis canadensis-Equisetum fluviatile-Potentilla palustris* (Ritchie and others 1981). *Calamagrostis canadensis-Hordeum brachyantherum* (Batten and others 1978). *Calamagrostis canadensis-Deschampsia beringensis* (Batten and others 1978, Hanson 1951). *Calamagrostis canadensis-Angelica genuflexa* (Hanson 1951). *Calamagrostis canadensis-Carex macrochaeta-Angelica lucida* (Hanson 1951). *Calamagrostis canadensis-Carex macrochaeta* (Hanson 1951). *Calamagrostis canadensis-Athyrium filix-femina* (Hanson 1951). *Carex macrochaeta-Calamagrostis nutkaensis* (Friedman 1982). *Calamagrostis nutkaensis-Heracleum lanatum* (del Moral and Watson 1978).

### III.A.2.c. Bluejoint-Shrub

**Description-** Bluejoint-shrub communities are dominated by bluejoint (*Calamagrostis canadensis*) and have a conspicuous shrub element. The shrubs can be tall or short but must total less than 25 percent cover. The only such community reported consists of scattered clumps of tall alder (*Alnus sinuata*) growing in a matrix of pure bluejoint. Bluejoint-willow and bluejoint-sweetgale stands certainly must exist, however. Herbs other than bluejoint may be common or absent. Mosses are absent where the bluejoint is dense (as is usually the case) but may be present in more open stands. Lichens are scarce or absent.

**Distribution and site characteristics-**Although bluejoint-shrub communities have been reported only from southwestern Alaska, they probably are distributed widely in south-central and interior Alaska on the full range of sites occupied by bluejoint meadows: flood plains, upland slopes from valley bottoms to tree line, and fens. Soils are wet to mesic silts, loams, or peats with acid reaction (pH 5 to 6).

**Successional status-**Griggs (1936) considers a landscape mosaic of bluejoint meadows and tall alder copses to be climax in southwestern Alaska beyond the tree line. He believes it to be the endpoint of both wet (via dwarf birch-ericaceous shrub communities and bluejoint-herb communities) and dry (via bluejoint-herb communities) seres on sites where soil development can proceed toward a mesic condition.

In forested parts of the State, bluejoint-shrub communities probably develop when shrubs invade bluejoint meadows or bluejoint-herb stands, though sometimes they may develop directly after fire or other disturbance. If disturbance is not renewed, bluejoint-shrub communities probably develop into scrub and then forest communities.

**Closely related types-** Bluejoint-shrub communities are similar to bluejoint meadows and bluejoint-herb communities but have a substantial (but still less than 25 percent cover) component of low or tall shrubs. They are also similar to open low or tall shrub communities with bluejoint understories but have less shrub cover. Wet bluejoint-shrub types grade into shrub-grass fen communities but have less shrub cover.

**Photographs-** Griggs 1936, figure 11.

**Primary reference-** Griggs 1936.

**Communities-** *Calamagrostis canadensis-Alnus sinuata* (Griggs 1936).

#### *III.A.2.d. Tussock Tundra*

**Description-** Tussock tundra is dominated by sedges in a tussock growth form (fig. 63). *Eriophorum vaginatum* is the primary tussock-former, but in some stands *Carex bigelowii* is the dominant tussock-forming sedge. Tussocks occur in many sizes and densities but commonly are 10 to 60 centimeters (4 to 24 in) tall and spaced 30 to 60 centimeters (12 to 24 in) apart. Low shrubs often grow between the tussocks; occasionally these grow as high as the tops of the sedges but usually are much lower. These shrubs, commonly *Betula nana*, *Ledum decumbens*, *Vaccinium vitis-idaea*, *V. uliginosum*, and *Empetrum nigrum*, total less than 25 percent cover. Mosses are common between tussocks. *Sphagnum* spp. may be locally abundant but more commonly are absent or sparse. Lichens are common.

**Distribution and site characteristics-** Tussock tundra is widespread in northern and western Alaska on poorly drained, acid soils over permafrost on flats and gentle slopes with gradients up to 10 percent. It typically occurs on upland tundra or meadow tundra soils (Pergelic Cryaquepts or Histic Pergelic Cryaquepts). These are poorly drained, gleyed soils, often with a poorly decomposed organic horizon at the surface, which may constitute most of the active layer. Soil pH is usually in the range of 4.4 to 5.5. Permafrost usually is present at depths of 30 to 50 centimeters (12 to 20 in). In some areas, the vegetation and surface organic mat frequently are broken by frost scars of mineral soil. *Carex bigelowii* tussock tundra is much less common than *Eriophorum vaginatum* tussock tundra and usually occupies slightly steeper and better drained sites when the two occur in the same area.

**Successional status-** Tussock tundra, especially in the arctic foothills and the hilly parts of the arctic coastal plain, is very stable and may represent climax vegetation on poorly drained flats, plateaus, benches, and gentle slopes. It may develop from wet sedge meadows if drainage improves (usually through headward erosion of streams and gullies). Conversely, it sometimes may develop from dwarf birch-ericaceous shrub communities if drainage is impeded or if the permafrost table rises. If sphagnum can invade and accumulate to the point of overtopping the sedge tussocks, the tussocks will be killed and the site may convert to an ericaceous shrub-herb/sphagnum community. Tussock senescence also occurs if the permafrost table rises into the organic mat at the soil surface, because the roots of a tussock-former must reach mineral soil to survive.

Disturbance, such as soil frost activity or fire, may be necessary for the maintenance of some tussock tundra stands, particularly in more southerly areas.



Figure 63-Tussock tundra dominated by the sedge *Eriophorum vaginatum* with scattered shrubs of *Ledum decumbens*, *Betula nana*, and *Salix planifolia* subsp. *pulchra* in arctic Alaska.

**Closely related types-** A continuous gradation exists from stands of pure *Eriophorum vaginatum* with no shrubs to stands with shrub cover of 50 percent or even more. Tussock communities with more than 25 percent shrub cover are grouped with birch and ericaceous shrub tundra or (within tree line) mixed shrub-sedge tussock/sphagnum bog. Locally in western Alaska, small stands of bluejoint or medium-height grasses may be physiognomically similar to tussock tundra when the grasses take on a tussock growth form. Tussock tundra is, however, always dominated by sedges. Some poorly drained treeless communities within the tree line are similar to tussock tundra, but usually a substantial shrub cover also is present and the communities can be grouped with mixed shrub-sedge tussock/sphagnum bogs.

**Photographs-** Figure 63, this publication.

**Primary references-** Brock and Burke 1980, Komarkova and Webber 1978.

**Communities-** *Eriophorum vaginatum* (Batten 1977, Craighead and others 1988, Johnson and others 1966, Komarkova and Webber 1978, Young 1974b). *Eriophorum vaginatum-Salix planifolia-Carex bigelowii/Hylocomium splendens* (Hettinger and Janz 1974). *Eriophorum vaginatum-Carex bigelowii* (Brock and Burke 1980, Churchill 1955, Craighead and others 1988, Jorgenson 1984).

#### **III.A.2.e. Mesic Sedge-Grass Meadow Tundra**

**Description-** These are tundra communities (alpine or arctic) dominated by combinations of grasses and sedges. Dominant sedges are commonly *Carex microchaeta*, *C. podocarpa*, *C. bigelowii*, and *C. aquatilis*. Dominant grasses reported include *Poa arctica* and *Arctagrostis latifolia*. *Festuca* spp., *Hierochloë alpina*, and *Trisetum spicatum* also may be codominants. Forbs and woody plants are absent or scattered. Lichens and nonsphagnaceous mosses may be common. Canopy heights usually are fairly low, but *Arctagrostis latifolia* may grow to 1 meter (3 ft). Plant cover usually is complete or nearly so. A *Carex aquatilis-Poa arctica* stand at Barrow with abundant mosses produced an aboveground biomass of 362 grams per square meter per year (3,230 lb/acre) and an aboveground vascular annual production of 39 grams per square meter (350 lb/acre) (Webber 1978).

**Distribution and site characteristics-** Small stands of sedge-grass tundra are found infrequently in alpine and arctic tundra on sheltered well-drained sites, including old beach ridges, high-center polygons, streambanks, south-facing mesic alpine slopes, and protected alpine swales. Soils are well-drained, thin, and predominantly mineral, though an organic or organic-rich horizon of variable thickness may be present at the surface. Some soils are highly acid (pH 4.2), but others may be circumneutral. Permafrost is present at depths as shallow as 36 centimeters (14 in) beneath sites on the arctic coastal plain but is much further below the surface of south-facing alpine sites.

**Successional status-** Successional relations of mesic sedge-grass meadow tundra are unknown, but most stands seem to be stable.

**Closely related types-** Mesic sedge-grass meadows with *Carex aquatilis* are similar to wet sedge meadows and wet sedge-grass meadows, but the soil is better drained and the codominant grass is never *Dupontia fischeri*. Other stands may be similar to mesic sedge-herb, grass-herb, or sedge-willow tundras but lack a codominant herb or willow component.

**Primary references-** Batten 1977, Webber 1978.

**Communities-** *Carex aquatilis-Poa arctica* (Clebsch 1957, Webber 1978). *Carex microchaeta-Poa arctica* (Batten 1977). *Carex podocarpa-Arctagrostis latifolia* (Scott 1974a).

### III.A.2.f. Mesic Sedge-Herb Meadow Tundra

**Description-** Mesic sedge-herb meadow tundra communities are characterized by the codominance of sedges and broad-leaved herbs. *Carex macrochaeta* has been reported as a codominant sedge, but any of the sedges important in mesic sedge-grass meadow tundra also could be important here. *Calamagrostis canadensis* may be present but is not a codominant. A wide variety of herbs can occur with the sedge, including *Geranium erianthum*, *Erigeron peregrinus*, *Anemone* spp., *Pedicularis* spp., *Saxifraga* spp., and *Polygonum* spp. Woody plants are scarce to common but total less than 25 percent cover. Willows are not conspicuous. Nonsphagnaceous mosses are common to abundant. Lichens are scarce or common. The plant canopy is usually low (under 50 centimeters [20 in]), and cover is usually high.

**Distribution and site characteristics-** scattered small stands of mesic sedge-herb meadow tundra occur on sheltered alpine slopes throughout the State. Soils are well drained, loamy, sometimes stony and thin, and sometimes thicker with an organic surface horizon. Moist stands near valley bottoms may have hummocky microrelief features. Permafrost is present at northern sites but absent from southern alpine localities.

**Successional status-** Successional relations of these communities are unknown.

**Closely related types-** These stands are similar to mesic sedge-grass meadow tundra but have more forbs and fewer grasses. They can be similar to mesic sedge-willow tundra but have fewer willows and more forbs. Stands with abundant forb cover are similar to mesic mixed herb communities but have a codominant sedge component. They are also similar to alpine herb-sedge (snowbed) communities, but sedge-herb tundra usually has more sedge cover, higher total vegetation cover, and different dominant sedge species.

**Primary reference-** Hjeljord 1971.

**Communities-** *Carex macrochaeta*-*Geranium erianthum*-*Erigeron peregrinus*-*Lupinus nootkatensis* (Hjeljord 1971).

*III.A.2.g. Mesic Grass-Herb Meadow Tundra*

**Description-** Mesic grass-herb meadow tundra is dominated by grasses (commonly *Arctagrostis latifolia*, *Bromus pumpellianus*, *Trisetum spicatum*, and *Poa* spp.) and forbs (including *Oxyria digyna*, *Petasites frigidus*, and *Saxifraga* spp., among many others). Canopy height is usually under 50 centimeters (20 in). Plant cover is variable (open to closed).

**Distribution and site characteristics-** These communities are restricted to occasional small stands on various mesic sites throughout the arctic part of the State, including streambanks, sheltered pockets on slopes, and high-center polygons. Soils are relatively thin and well drained. Permafrost is probably present beneath all stands but may be under a thick active layer.

**Successional status-** Successional relations of mesic grass-herb meadow tundra are unknown, but it seems likely that the successional trend would be for sedges or low shrubs to gradually invade and gain dominance on at least some of these sites.

**Closely related types-** These stands are similar to mesic sedge-herb tundra but have more grasses and few sedges. Some stands may be similar to some mesic mixed herb communities but have more grass cover.

**Primary reference-** Koranda 1960.

**Communities-** *Bromus pumpellianus*-*Trisetum spicatum*-*Bupleurum triradiatum* (Koranda 1960). *Luzula confusa*-*Poa arctica*-*Petasites frigidus* (Wiggins 1951).

*III.A.2.h. Sedge- Willow Tundra*

**Description-** Sedge-willow tundra is dominated by sedges (commonly *Carex aquatilis*, *C. bigelowii*, or *C. microchaeta*) and has a conspicuous willow component, though total shrub cover is less than 25 percent. Common willows include *Salix planifolia*, *S. lanata*, *S. fuscescens*, *S. reticulata*, *S. phlebophylla*, *S. rotundifolia*, *S. ovalifolia*, and *S. arctica*. Other shrubs may be present but are usually minor components of the vegetation. *Dryas integrifolia* may be common at some sites. Mosses, especially species of *Aulacomnium*, *Tomenthypnum*, *Hylocomium*, and *Polytrichum*, are common and may form a continuous mat. *Sphagnum* spp. are generally rare, but are abundant at some sites. Lichens are relatively scarce but common locally. Canopy height is about 15 to 50 centimeters (6 to 20 in); cover usually is complete.

**Distribution and site characteristics-** Sedge-willow tundra is found on wet to mesic sites on flood plains, benches, plateaus, low-center polygons, drained lake basins, and north slopes, primarily in the Arctic but also in alpine areas. Frost scars are abundant in some communities. *Carex aquatilis* dominates the wetter sites; other sedges dominate on the more mesic sites. Acid to circumneutral tundra soils (poorly drained, fine-textured mineral soils with a surface organic mat of variable thickness) commonly form the substrate, with permafrost at about 35 to 150 centimeters (14 to 60 in) (the deeper extremes from Alaska Range alpine sites). Low microrelief ridges, hummocks, or solifluction lobes often are present, and the shrubs often are concentrated on these features.

**Successional status-** Successional status of these stands is largely unknown, but many sedge-willow tundra stands appear to be stable. If drainage were to improve, through lowering of the permafrost table or some other cause, the willows might increase in area and size and form scrub communities. If the sites became wetter, the willows might decrease and wet sedge meadows form. Considerable fluctuation in moisture regimen of these sites may have minimal impact, however, on the moisture conditions within the small raised microrelief features where the willows are concentrated.

**Closely related types-** Subarctic lowland sedge-shrub wet meadows are the subarctic counterpart of sedge-willow tundra and are differentiated primarily by geography, though the dominant sedge species commonly also are different. *Carex aquatilis*-willow communities are similar to some wet sedge meadow types but have more willows. Other sedge-willow communities resemble mesic sedge-grass tundra but likewise have a greater cover of willows. Some of the shrubbier sedge-willow tundra stands resemble willow-sedge tundra and willow-sedge fen but have less than 25 percent shrub cover.

**Photographs-** Batten 1977, figure 14; Drew and Shanks 1965, figure 10; Hettinger and Janz 1974, plate 10C; Johnson and others 1966, figures 10 and 15.

**Primary references-** Drew and Shanks 1965; Hanson 1950, 1951; Johnson and others 1966; Viereck 1963.

**Communities-** *Carex aquatilis*-*Salix planifolia* (Childs 1969, Clebsch 1957, Dennis 1968, Hanson 1951, Hettinger and Janz 1974, Koranda 1960, Webber and others 1978). *Carex aquatilis*-*Salix lanata* (Craighead and others 1988, Spetzman 1959). *Carex aquatilis*-*Alnus crispa*-*Salix* spp. (Bliss and Cantlon 1957). *Carex bigelowii*-*Salix planifolia* (Hettinger and Janz 1974, Johnson and others 1966, Koranda 1960, Viereck 1963). *Carex bigelowii*-*Salix reticulata*-*S. planifolia* (Batten 1977, Hettinger and Janz 1974). *Carex bigelowii*-*Salix reticulata* (Drew and Shanks 1965, Hettinger and Janz 1974). *Eriophorum angustifolium*-*Salix planifolia* (Fries 1977). *Eriophorum angustifolium*-*Salix fuscescens* (Johnson and others 1966). *Eriophorum angustifolium*-*Carex pluriflora*-*Salix reticulata* (Hanson 1951). *Carex bigelowii*-*C. membranacea*-*Salix polaris*-*Equisetum arvense* (Hanson 1950). *Carex nesophila*-*Salix rotundifolia*-*S. reticulata* (Klein 1959). *Carex subspathacea*-*Dupontia fischeri*-*Salix ovalifolia* (Meyers 1985).

#### *III.A.2.1. Sedge-Birch Tundra*

**Description-** Sedge-birch tundra is dominated by sedges (commonly *Carex aquatilis* or *C. bigelowii*) with a substantial admixture of shrub birch (*Betula nana* or *B. glandulosa*). Total shrub cover is less than 25 percent. Mosses, including feathermosses and *Sphagnum* spp., may be common.

**Distribution and site characteristics-** sedge-birch tundra has been infrequently reported from flood plains and gentle slopes in northern Alaska. A hummocky microtopography usually is present, and the shrubs usually are concentrated on the hummocks.

**Successional status-**Successional relations of these communities are unknown.

**Closely related types-** Sedge-birch tundra is similar to wet sedge meadow tundra and mesic sedge-grass tundra but has a substantial dwarf birch component. At the other extreme, some shrubby stands may be similar to birch-sedge fens (not yet reported from northern Alaska) or birch and ericaceous shrub tundra but have less than 25 percent shrub cover.

**Photographs-** Hettinger and Janz 1974, plate 11 A.

**Primary references-** Hettinger and Janz 1974. !

Communities- *Carex bigelowii*-*C. aquatilis*-*Betula nana* (Hettinger and Janz 1974).

### III.A.2.j. Sedge-Dryas Tundra

**Description-** Sedge-dryas tundra communities are dominated by sedges (most commonly *Carex aquatilis* or *C. bigelowii* but *Eriophorum angustifolium* and *Kobresia simpliciuscula* also are included) and have a substantial component of *Dryas integrifolia* or *D. octopetala*. Total shrub cover (including dryas) is less than 25 percent. Willows and ericaceous shrubs may be minor components of the vegetation. Nonsphagnaceous mosses (often including *Drepanocladus* spp. and *Tomenthypnum nitens*) are common; lichens usually are scarce. Canopy height is less than 30 centimeters (12 in) and commonly lower. Cover may be open to complete.

**Distribution and site characteristics-** Sedge-dryas tundra is common on protected mesic alpine slopes and calcareous tundra lowlands throughout the State except southeastern Alaska. In lowland wet to mesic areas (terraces, flats, polygon rims), it is more or less restricted to calcareous substrates with circumneutral soil reaction. In alpine areas, it is found on both calcareous and acidic, parent materials. Sometimes these communities occur in a mosaic pattern with other communities. An example would be low-center polygons with wet sedge meadow tundra in the centers and sedge-dryas tundra on the rims.

Lowland soils supporting these communities include Pergelic Cryaquepts and Pergelic Cryaquolls. An organic mat a few centimeters thick usually is present at the surface. Solifluction lobes are common in communities on slopes. Permafrost has been reported at depths of 25 to 30 centimeters (10 to 12 in) at sites on the arctic coastal plain; the active layer is probably thicker at alpine sites.

**Successional status-** Successional relations of sedge-dryas tundra are unknown. Drying trends probably would favor the dryas; trends toward increasing moisture or (in the lowlands at least) increasing acidity probably would favor the sedges.

**Closely related types-** Some sedge-dryas communities are similar to mesic sedge-herb tundra communities but have a greater cover of dryas. At the other extreme, stands with abundant dryas are similar to dryas-sedge tundra (open dwarf scrub) but have less than 25 percent of dryas cover.

**Photographs-Drew** and Shanks 1965, figure 12; Johnson and others 1966, figures 5 and 9; Webber and Walker 1975, p. 85.

**Primary references-Drew** and Shanks 1965, Johnson and others 1966, Webber and Walker 1975, Webber and others 1978.

**Communities-** *Carex aquatilis-Dryas integrifolia* (Webber and Walker 1975, Webber and others 1978). *Carex bigelowii-Dryas integrifolia* (Childs 1969, Hettinger and Janz 1974, Webber and others 1978). *Carex bigelowii-Eriophorum angustifolium-Dryas integrifolia* (Drew and Shanks 1965). *Carex bigelowii-Eriophorum angustifolium-Dryas octopetala* (Anderson 1974). *Carex bigelowii-C. membranacea-Dryas octopetala* (Hanson 1950). *Carex bigelowii-Dryas octopetala* (Johnson and others 1966). *Carex bigelowii-Dryas octopetala-Salix reticulata* (Anderson 1974, Scott 1974a, Webber and others 1978). *Kobresia simpliciuscula-Dryas integrifolia* (Webber and others 1978). *Eriophorum angustifolium-Dryas integrifolia* (Webber and Walker 1975, Webber and others 1978).

### III.A.3. Wet Graminoid Herbaceous

Communities dominated or codominated by graminoids and occupying wet sites are included here. Forbs may be codominant in some communities, and shrubs may be present but provide less than 25 percent cover. Soils are saturated with water or are underwater for all or most of the growing season.

#### III.A.3.a. Wet Sedge Meadow Tundra

**Description-** Wet sedge meadow tundra is commonly dominated by *Carex aquatilis*, *Eriophorum angustifolium*, or both (fig. 64). Woody plants are generally absent, though sometimes prostrate willows are important. Mosses, commonly of the genera *Scorpidium* or *Drepanocladus*, may be absent or common. Sphagnum is usually not important but is codominant on a few sites. Lichens are rare or absent.

*Scorpidium scorpioides* indicates circumneutral, many soils; *Sphagnum* spp. indicates acid sites; *Carex chordorrhiza* is characteristic of very wet, floating sedge peats.

**Distribution and site characteristics-** Large stands of wet sedge meadow tundra are common on arctic lowlands, and small stands are locally common in alpine areas everywhere except southeast Alaska. They occur on drained lake basins, lake margins, depressions, and on level to gently sloping flood plains and terraces.

Soils are fine-grained and poorly drained. They may be mineral or organic, or may consist of a few centimeters of organic matter over mineral soil. Permafrost is present, usually 30 to 50 centimeters (12 to 20 in) below the surface, though possibly up to 1 meter (3 ft) below the surface near the southern limit of this type. Soil pH ranges from circumneutral (7.5) to highly acid (4.5) (Drew and Shanks 1965, Holowaychuk and Smeck 1979). The soil is generally flooded at breakup, with a few centimeters of standing water persisting into at least the early part of the growing season.

**Successional status-** Successional relations among tundra communities are complex (Britton 1967). It appears that wet sedge meadows may replace grass marshes (*Arctophila fulva*) if sedimentation or drainage causes the water table to drop. A further decrease in moisture may enable tussock tundra to move in. A rise in the water table may cause tussock tundra to be replaced by wet sedge meadow.



Figure 64-Wet sedge meadow tundra of *Eriophorum angustifolium* and *Carex aquatilis* in arctic Alaska.

**Closely related types-** Wet sedge meadow tundra is similar to subarctic lowland sedge wet meadow (Ill.A.3.g.), which occupies similar sites within the tree line. Although some species commonly dominate both, many species dominating the subarctic sites are not present in the Arctic. Also, *Eriophorum angustifolium* is less commonly dominant on the subarctic sites than it is in the Arctic. This unit is also similar to wet sedge-grass and wet sedge-herb meadow tundras (which are essentially variants of wet sedge meadow tundra) but lack conspicuous grass or broad-leaved herb elements. Fresh sedge marsh also is similar but does not include any tundra (arctic) communities, is permanently flooded with relatively deep water, and is dominated by genera other than *Carex*.

**Photographs-** Batten 1977, figure 13 (aerial view); Bergman and others 1977, plates I, II, and III; Churchill 1955, figure 9; Drew and Shanks 1965, figure 14; Hettinger and Janz 1978, plate 10E; Johnson and others 1966, figures 8, 9, 15, and 16; Komarkova and Webber 1978, figure 66; Racine 1978a, figures 12 and 13; Racine and Anderson 1979, figure 24; Webber 1978, figure 7; figure 64, this publication.

**Primary references-** Drew and Shanks 1965, Racine and Anderson 1979, Webber and Walker 1975.

**Communities-** *Eriophorum angustifolium* (Craighead and others 1988, Holowaychuk and Smeck 1979, Murray 1974, Racine 1976, Racine and Anderson 1979, Viereck 1963, White and others 1975). *Eriophorum angustifolium-E. scheuchzeri* (Britton 1967). *Eriophorum angustifolium-Carex membranacea* (Murray 1974). *Eriophorum angustifolium-E. brachyantherum-Carex aquatilis* (Murray 1974, Young 1974b). *Eriophorum angustifolium-Trichophorum caespitosum* (Murray 1974). *Eriophorum angustifolium-Carex pluriflora-Salix reticulata* (Hanson 1951). *Eriophorum angustifolium-Carex aquatilis-C. lachenalii* (Klein 1959, Rausch and Rausch 1968). *Eriophorum angustifolium-Carex bigelowii* (Anderson 1974, Drew and Shanks 1965, Hanson 1950). *Eriophorum angustifolium-Carex chordorrhiza* (Webber and others 1978). *Eriophorum angustifolium-Equisetum fluviatile* (Craighead and others 1988).

*Eriophorum scheuchzeri*/*Drepanocladus revolvens* (Jorgenson 1984). *Carex aquatilis-Eriophorum angustifolium* (Batten 1977; Bergman and others 1977; Childs 1969; Craighead and others 1988; Hopkins and Sigafos 1951; Porter 1966; Racine 1977, 1978a, 1978b; Spetzman 1959). *Carex aquatilis-Eriophorum angustifolium/Drepanocladus lycopodioides* (Webber and Walker 1975, Webber and others 1978). *Carex aquatilis-Eriophorum angustifolium/Rhytidium rugosum* (Johnson and others 1966). *Carex aquatilis-Eriophorum angustifolium/Scorpidium scorpioides* (Neiland and Hok 1975, Webber and Walker 1975). *Carex aquatilis-Eriophorum angustifolium/Sphagnum* spp. (Bos 1967, Johnson and others 1966). *Carex aquatilis-Eriophorum angustifolium-Carex rotundata* (Hanson 1953, Jorgenson 1984). *Carex aquatilis-Eriophorum angustifolium-E. russeolum* (Murray 1974; Racine 1978a, 1978b). *Carex aquatilis-Eriophorum angustifolium-E. scheuchzeri* (Jorgenson 1984, Koranda 1960, Pegau 1968). *Carex aquatilis* (Bergman and others 1977; Britton 1967; Churchill 1955; Clebsch 1957; Craighead and others 1988; Dennis 1968; Fries 1977; George and others 1977; Kessel and Schaller 1960; Komarkova and Webber 1978; Koranda 1960; Meyers 1985; Murray 1974; Pegau 1972; Peterson and Billings 1978; Racine 1976, 1978a, 1978b; Racine and Anderson 1979; Spetzman 1959; Webber 1978; White and others 1975; Young 1971). *Carex aquatilis/Scorpidium scorpioides* (Neiland and Hok 1975, Webber and Walker 1975, Webber and others 1978). *Carex aquatilis/Drepanocladus* spp. (Webber and others 1978). *Carex aquatilis-C. rotundata* (George and others 1977; Hanson 1951, 1953; Webber and others 1978). *Carex aquatilis-Eriophorum russeolum/Drepanocladus lycopodioides* (Webber 1978). *Carex aquatilis-Eriophorum scheuchzeri* (Britton 1967, Webber and others 1978). *Carex aquatilis-Eriophorum scheuchzeri-Carex rotundata* (Jorgenson 1984). *Carex aquatilis-C. chordorrhiza-C. limosa-C. microglochin-Eriophorum scheuchzeri-E. angustifolium* (Drew and Shanks 1965). *Carex chordorrhiza* (Batten 1977, Spetzman 1959). *Eriophorum scheuchzeri* (Racine 1976). *Carex rariflora* (Batten 1977, Hanson 1951). *Carex bigelowii-C. rariflora-C. saxatilis* (Hettinger and Janz 1974). *Carex rariflora-Hippuris tetraphylla/Sphagnum* spp. (Hultén 1962). *Carex rotundata* (Brock and Burke 1980).

### III.A.3.b. Wet Sedge-Grass Meadow Tundra

**Description-** Communities of this unit are dominated by sedges and grasses, or sometimes by grasses alone. Dominant sedges commonly are *Carex aquatilis* or *Eriophorum angustifolium*, or sometimes both. The dominant grass usually is *DuPontia fischeri* but sometimes is *Alopecurus alpinus* or other grasses (but not *Arctophila fulva*, which is characteristic of grass marsh types). The presence of *DuPontia fischeri* as a codominant species often is sufficient to include a community with this unit. Woody plants and lichens are absent or unimportant; mosses are common; sphagnum occasionally is present. Cover usually is close to 100 percent. Biomass of a stand at Barrow has been reported to be 84 to 92 grams per square meter (750 to 820 lb/acre) aboveground and 995 to 1,305 grams per square meter (8,875 to 11,640 lb/acre) belowground, with total vascular plant production of 45 to 52 grams per square meter per year (400 to 460 lb/acre) (Webber 1978).

**Distribution and site characteristics-** wet sedge-grass meadow tundra communities that have been reported all have been within a few kilometers of the Arctic coast, where they occupy shallow polygon troughs, streambanks, and low wet areas. Soils range from tundra humic gleys to histosols and are wet and fine textured. They usually are somewhat acid, with reactions as low as pH 4.1 reported (Webber 1978) and may be flooded by up to 15 centimeters (6 in) of water much of the growing season. Permafrost is present at shallow depths (ca. 30 to 40 centimeters [12 to 16 in]).

**Successional status-** Most wet sedge-grass meadow tundra communities probably are fairly stable ecologically. They may replace fresh grass marsh if the water table drops.

**Closely related types-** This unit differs from fresh grass marsh in that the latter is wetter and dominated by *Arctophila fulva*. Wet sedge meadow tundra lacks grass; wet sedge-herb meadow tundra has a substantial component of broad-leaved herbs. Mesic sedge-grass meadow tundra rarely is dominated by *Carex aquatilis* and never is dominated by *Eriophorum angustifolium* or *Dupontia fischeri*.

**Photographs-** Webber 1978, figures 5 and 66.

**Primary references-** Webber 1978, Webber and Walker 1975.

Communities- *Dupontia fischeri* (Britton 1967, Clebsch 1957, Dennis 1968, Meyers 1985, Potter 1972, Wiggins 1951). *Dupontia fischeri-Alopecurus alpinus* (Bergman and others 1977). *Dupontia fischeri-Petasites frigidus* (Dennis 1968). *Dupontia fischeri-Eriophorum angustifolium* (Brown and others 1970, Dennis 1968, Meyers 1985, Webber 1978, Young 1971). *Dupontia fischeri-Eriophorum angustifolium/Bryum* spp. (Webber 1978). *Dupontia fischeri-Eriophorum scheuchzeri* (Spetzman 1959). *Eriophorum angustifolium-Carex glareosa-Deschampsia caespitosa-Dupontia fischeri-Arctagrostis latifolia* (Johnson and others 1966). *Carex aquatilis-Dupontia fischeri* (Potter 1972, Webber and others 1978, Wiggins 1951). *Carex aquatilis-Dupontia fischeri/Oncophorus wahlenbergii* (Webber 1978). *Carex aquatilis-Dupontia fischeri/Bryum* spp. (Webber and Walker 1975, White and others 1975). *Carex aquatilis-Dupontia fischeri-Carex membranacea* (Koranda 1960). *Eriophorum scheuchzeri-Alopecurus alpinus* (Koranda 1960). *Alopecurus alpinus* (Britton 1967).

### III.A.3.c. Wet Sedge-Herb Meadow Tundra

**Description-These** communities are dominated by sedges and broad-leaved herbs (forbs). *Carex aquatilis* is often the dominant sedge, but several other carices may dominate in certain settings. Several herbs may share dominance; some of the most common are *Menyanthes trifoliata*, *Petasites frigidus*, and *Potentilla palustris*. In southeast Alaska, *Fauria crista-galli* may be the codominant herb. Woody plants and lichens are absent or rare. Mosses may be present or absent, but sphagnum is absent or at least unreported from these communities. Plant cover is usually open or even sparse.

**Distribution and site characteristics-** Small stands of these communities are locally common in tundra areas (arctic and alpine) throughout the State in very wet, poorly drained sites with standing water, such as oxbow lakes, lake and pond margins, kettles and other depressions, and very wet polygon pans. The standing water is usually shallow (15 centimeters [6 in] or less) but probably is sometimes deeper. Soils are poorly drained and fine textured, mineral or organic-rich, but without a well-preserved organic mat. Soil pH ranges from basic to acid but probably are not extremely acid. Permafrost is present at most sites 50 to 100 centimeters (20 to 40 in) below the surface but is absent from southeastern and south-central Alaska alpine sites.

**Closely related types--** This is a variant of wet sedge meadow tundra, differing in having a codominant broad-leaved herb component. It is similar to the subarctic lowland sedge meadow (III.A.3.f.) within the tree line, though with more herbs. With increasing sphagnum, it also is similar to the subarctic lowland sedge-moss bog meadow (III.A.3.k.). Mesic sedge-herb meadow tundra (III.A.2.f.) is dominated by different species and occupies well-drained soils, usually on slopes. The wet herb units under the wet forb herbaceous branch of this classification (level 3, III.B.3.) lack a significant sedge component and are generally restricted to the forested parts of the State.

**Primary references-** Bliss and Cantlon 1957, Webber and others 1978.

**Communities-** *Carex aquatilis-Menyanthes trifoliata* (Racine 1976, Webber and others 1978). *Carex aquatilis-C. membranacea-Petasites frigidus* (Scott 1974a). *Carex aquatilis-Potentilla palustris* (Bliss and Cantlon 1957, Webber and others 1978). *Carex nigricans-Eriophorum angustifolium-Fauria crista-galli-Trichophorum caespitosum* (Fox 1983, Jaques 1973). *Trichophorum caespitosum-Triglochin palustris* (Webber and others 1978).

#### *III.A.3.d. Fresh Sedge Marsh*

**Description-** These communities are dominated by tall emergent sedges, primarily *Scirpus validus* or *Eleocharis palustris* (fig. 65). Trees, shrubs, and lichens are absent; aquatic mosses may be present, but are not abundant. Plant cover may appear fairly dense when viewed from the side but generally is less than 50 percent because the dominant plants have no leaves.:

**Distribution and site characteristics-** Fresh sedge marshes occur locally in deep (15 to 100 centimeters [6 to 14 in]) water of ponds, sloughs, and oxbow lakes in south-central and southeastern Alaska. Our reports have been from coastal settings where fresh sedge marshes occur in fresh water, although most of these sites are infrequently flooded by sea water during storm surges. These communities also are expected to occur in inland lakes, ponds, and sluggish streams. Soils are mineral or organic-rich mucks.

**Successional status-** These communities are early colonizers of ponds and other water bodies and may be replaced eventually by wet sedge meadow as plant detritus and other sediments accumulate. Under certain circumstances, these communities could be encroached upon by horizontal growth of peat mats of adjacent bog or fen communities.



Figure 65-Fresh sedge marsh of emergent sedges, *Carex aquatilis*, *Scirpus validus*, and *Eleocharis palustris*, surrounding a small lake in south-central Alaska

**Closely related types-** Wet sedge meadows are similar to fresh sedge marshes but have less water and are generally dominated by species of the genus *Carex*. Fresh grass marshes are dominated by grasses (primarily *Arctophila fulva*) and are most common in the Arctic. Fresh sedge marsh communities dominated by *Eleocharis palustris* are similar to halophytic sedge wet meadow communities dominated by that species but are found in sites not susceptible to tidewater flooding.

**Photographs-** Batten and others 1978, figure 54; figure 65, this publication.

**Primary references-** Batten and others 1978, del Moral and Watson 1978.

**Communities-** *Scirpus validus* (Batten and others 1978, del Moral and Watson 1978, Hanson 1951, Neiland 1971b, Ritchie and others 1981), *Eleocharis palustris-Hippuris vulgaris* (Heusser 1960). *Eleocharis palustris-Myriophyllum spicatum* (Crow 1968). *Eleocharis palustris-Equisetum fluviatile-E. palustre* (Worley 1980).

#### III.A.3.e. Fresh Grass Marsh

**Description-** These communities are dominated by grasses growing in deep water. *Arctophila fulva* is characteristically dominant or codominant. Woody plants and lichens are absent. Aquatic mosses (not sphagnum) often are present but usually contribute little cover or biomass. Total plant cover may be sparse or dense but usually is less than complete.

**Distribution and site characteristics-** This vegetation is common in deep (generally 15 to 200 centimeters or 6 to 79 in) water in ponds, slow-flowing streams, lake margins, and thermokarst pits in arctic and northwestern Alaska, primarily the arctic coastal plain, though small stands can be found on lake margins throughout the State. It generally seems to occur in shallower water in the southern part of the State and sometimes grows in wet mud without standing water. Soils can be mineral or organic; water pH ranges from circumneutral down to about 5.0.

**Successional status-** Marshes are early colonizers of water bodies and may eventually be replaced by wet meadow communities.

**Closely related types-** Fresh sedge marshes are similar, but they are dominated by species of the leafless (or nearly so) genera *Scirpus* and *Eleocharis* and do not occur in the Arctic. Wet meadow communities are flooded by shallow water, if flooded at all, and are dominated by different species.

**Photographs-** Webber and Walker 1975, p. 89.

**Primary references-** Bergman and others 1977, Webber and Walker 1975, Wiggins and Thomas 1962.

**Communities-** *Arctophila fulva* (Batten 1977, Bergman and others 1977, Britton 1967, Childs 1969, Clebsch 1957, Hultén 1966, Komarkova and Webber 1978, Meyers 1985, Murray 1974, Potter 1972, Racine and Anderson 1979, Rausch and Rausch 1968, Streveler and others 1973, Webber and others 1978, Wiggins and Thomas 1962). *Arctophila fulva-Carex aquatilis* (Webber and Walker 1975, Wiggins 1951). *Arctophila fulva-Ranunculus pallasii* (Johnson and others 1966, Spetzman 1959, Webber 1978, Young 1974b). *Arctophila fulva-Menyanthes trifoliata* (Spetzman 1959). *Arctophila fulva-Calamagrostis canadensis* (Craighead and others 1988). *Glyceria borealis-Eleocharis palustris* (Rosenberg 1986).

#### III.A.3.f. Subarctic Lowland Sedge Wet Meadow

**Description-** This group of freshwater wetland communities is dominated by coarse, relatively tall sedges, such as *Carex aquatilis*, *C. lyngbyaei*, *C. rostrata*, *C. saxatilis*, and *C. sitchensis* (fig. 66). *Carex lyngbyaei* is restricted to settings near the coast. Woody plants and lichens are scarce, if present at all. Mosses, both bryaceous and sphagnaceous, may be common but clearly are subordinate to the sedges. In most stands, the sedges are not rooted in a moss mat. Plant cover usually is complete or nearly so.

**Distribution and site characteristics-** These wetlands are common throughout the subarctic parts of the State. They occur on flood plains and near lake and pond margins, sloughs, and upland depressions. Soils are water saturated or flooded. Flooding usually is shallow (up to 15 centimeters [6 in]), but water depths up to 1 meter (3 ft) are reported from sites near the coast, particularly around Cook Inlet (Neiland 1971b, Ritchie and others 1981). Soils may be either mineral or organic, but if organic they are usually well decomposed. Well-preserved peats are rare substrates for these types. Permafrost generally is absent.

**Successional status-** Wet meadows eventually may replace fresh sedge marshes as sedimentation raises the soil level or drainage lowers the water level. If climatic and edaphic conditions allow peat to accumulate, wet sedge meadows eventually may succeed to sedge-bog meadows.

**Closely related types-** This unit is comparable to wet sedge meadow tundra (III.A.3.a.) in the Arctic, except that *Eriophorum angustifolium* seems to be more important in the arctic type, and most of the *Carex* spp. that commonly dominate subarctic sites are not present in the Arctic (except *Carex aquatilis*). It is similar to the subarctic lowland sedge bog meadow (III.A.3.j.) but differs from it in having much coarser and more densely grown sedges and in lacking a peat substrate. It is similar to subarctic lowland herb wet meadow but is dominated by sedges instead of broad-leaved herbs or *Equisetum* spp. Some communities, particularly those dominated by *Carex lyngbyaei*, are similar to certain halophytic sedge wet meadow communities but occur on sites never flooded by tidewater.

**Photographs-** Drury 1956, figure 16; Racine 1976, figure 35; Racine 1978a, figures 14 and 15; figure 66, this publication.

**Primary references-** Drury 1956, Neiland 1971 b, Shacklette and others 1969.



Figure 66-Subarctic lowland sedge wet meadow of *Carex aquatilis*, *C. lyngbyaei*, *C. rostrata*, *C. saxatilis*, and *C. sitchensis* near the coast in south-central Alaska.

**Communities-** *Carex aquatilis* (Ritchie and others 1981, Rosenberg 1986). *Carex aquatilis*-*Menyanthes trifoliata*/*Scorpidium* spp. (Ritchie and others 1981). *Carex aquatilis*-*Equisetum arvense* (Johnson and Vogel 1966, Murray 1974, Scott 1974a). *Carex aquatilis*-*C. saxatilis* (Hanson 1951, Pegau 1972). *Carex saxatilis* (Rosenberg 1986). *Carex saxatilis*-*Calamagrostis canadensis*/*Calliergon giganteum* (Drury 1956). *Carex rostrata* (Craighead and others 1988; Racine 1976, 1978b; Ritchie and others 1981; Rosenberg 1986). *Carex rostrata*-*C. aquatilis* (Calmes 1976, Dachnowski-Stokes 1941, Drury 1956, Hultén 1966, Rosenberg 1986, Tande 1983). *Carex rostrata*-*Eriophorum angustifolium*-*Calamagrostis canadensis* (Racine 1978b). *Carex rostrata*-*Eriophorum angustifolium*-*Equisetum fluviatile* (Porsild 1939). *Carex rostrata*-*Eriophorum angustifolium*-*Arctophila fulva* (Porsild 1939). *Carex rostrata*-*Equisetum fluviatile* (Craighead and others 1988). *Carex rostrata*-*C. saxatilis*-*Equisetum fluviatile* (Porsild 1939). *Carex lyngbyaei* (Byrd 1984, Griggs 1936, Hultén 1960, Scheierl and Meyer 1977). *Carex lyngbyaei*-*C. aquatilis* (Dachnowski-Stokes 1941, Streveler and others 1973). *Carex lyngbyaei*-*C. sitchensis* (Neiland 1971b, Quimby 1972, Ritchie and others 1981). *Carex lyngbyaei*-*C. saxatilis* (Streveler and others 1973). *Carex lyngbyaei*-*Calamagrostis canadensis* (Batten and others 1978, Crow 1977b, Hanson 1951). *Carex lyngbyaei*-*Lathyrus palustris* (Batten and others 1978, Crow 1968). *Carex lyngbyaei*-*Cicuta mackenziana* (Crow 1968). *Carex lyngbyaei*-*C. pluriflora*-*C. anthoxantha*-*C. macrochaeta* (Amundsen and Clebsch 1971, Shacklette and others 1969). *Carex lyngbyaei*-*C. macrochaeta*/*Cladina portentosa* (Amundsen 1977, Amundsen and Clebsch 1971, Everett 1971, Shacklette and others 1969). *Carex pluriflora*-*Deschampsia beringensis* (Crow 1977b). *Deschampsia beringensis*-*Carex lyngbyaei* (McCartney 1976). *Carex sitchensis* (Ritchie and others 1981). *Carex sitchensis*-*Caltha palustris* (Thomas 1957). *Carex lasiocarpa* (Rosenberg 1986). *Eriophorum angustifolium*-*Carex livida* (Rosenberg 1986).

### **III.A.3.g. Subarctic Lowland Sedge-Shrub Wet Meadow**

**Description-** These wetland types are dominated by sedges but have a conspicuous shrub component. Trees are absent or insignificant. Shrubs are conspicuous but still total less than 25 percent cover. Lichens are scarce; mosses are occasional to common. *Carex lyngbyaei* is the only dominant sedge reported, but communities dominated by other coarse sedges probably exist. Important shrubs are commonly *Myrica gale* or *Salix* spp.

**Distribution and site characteristics-** These types have been reported infrequently from the upper parts of coastal marshes in south-central and southeastern Alaska. They may be more widespread than the paucity of reports indicates and could be expected to occur near edges of wetlands in the interior as well. The coastal marsh sites are quite wet and usually have a hummocky surface. The water is essentially fresh, though sites that have been reported may be subject to infrequent sea-water flooding during extreme storm surges.

**Successional status-** These communities seem to represent broad ecotones between sedge wetlands and adjacent scrub types.

**Closely related types-** Some stands are similar to the sweetgale-grass type but with less sweetgale (*Myrica gale*) and with sedge instead of grass. This type also is similar to some wet sedge meadow types but has 'more shrubs. The arctic counterpart of this unit is mesic sedge-willow tundra.

**Photographs-** Scheierl and Meyer 1977, figure 28 (aerial).

**Primary reference-** Frohne 1953.

**Communities-** *Carex lyngbyaei*-*Salix* spp. (Scheierl and Meyer 1977). *Carex lyngbyaei*-*Myrica gale* (Frohne 1953). *Scirpus microcarpus*-*Salix barclayi*-*S. sitchensis* (Worley 1980).

#### III.A.3.h. Halophytic Grass Wet Meadow

**Description-** These are communities dominated or codominated by grasses, characteristically species of the salt-tolerant genus *Puccinellia*. Halophytic forbs, such as *Honckenya peploides*, *Triglochin maritimum*, *Plantago maritima*, *Spergularia canadensis* or *Cochlearia officinalis* are often codominant. Woody plants, mosses, and lichens are absent; marine algae are present at some sites. Vegetation is sparse and productivity is low. Aerial standing crop reaches a maximum of about 400 grams per square meter (3,600 lb/acre) dry matter in southern Alaska (Crow and Koppen 1977); amounts approximately one-fifth this large might be more typical.

**Distribution and site characteristics-** These communities are found at the seaward edges of coastal marshes throughout the State. Soils are mostly clays and fine silts subject to regular, if not daily, tidal inundation. Salinity ranges from 1 to 35 parts per thousand (Vince and Snow 1984), with most reports averaging around 10 parts per thousand. The soil reaction is generally circumneutral (pH 6.5 to 7.5), at least in the southern part of the State. Water runs off quickly after high tides and the surface rapidly dries, but beneath the surface the soil remains wet (Neiland 1971). Permafrost is absent except at the northernmost sites.

These communities become smaller and less common as one goes north, probably as a result of decreasing tidal range and the extreme erosive power of sea ice combined with storm surges.

**Successional status-Where** sediment continues to accumulate, marsh development will probably cause gradual seaward migration of these communities and replacement at the inland edge by halophytic sedge wet meadow communities.

**Closely related types-** Halophytic grass wet meadow communities occur in the same settings as and are very similar to halophytic herb wet meadows, except that the latter lack significant grass cover. Halophytic grass meadows often grade inland into halophytic sedge wet meadows, which are generally taller, denser, and more productive. The ecotone between the two usually is narrow and abrupt

**Photographs--** Batten and others 1978, figures 24 and 39; Neiland 1971 b, figure 10.

**Primary references-** Crow and Koppen 1977, Jefferies 1977, Meyers 1985, Neiland 1971 b, Vince and Snow 1984.

**Communities-** *Puccinellia nutkaënsis-Spergularia canadensis* (Crow 1977b, Crow and Koppen 1977). *Puccinellia nutkaënsis-Suaeda depressa* (Crow and Koppen 1977). *Puccinellia nutkaënsis-Plantago maritima* (Crow and Koppen 1977). *Puccinellia nutkaënsis-Glaux maritima* (Crow 1977b, Crow and Koppen 1977). *Puccinellia nutkaënsis-fucus* spp. (Crow 1977b, Crow and Koppen 1977). *Puccinellia nutkaënsis-Honckenya peploides* (Crow 1977b). *Puccinellia nutkaënsis* (Batten and others 1978, Cooper 1931, Streveler and others 1973, Vince and Snow 1984). *Puccinellia grandis-Triglochin maritimum* (McCormick and Pichon 1978, Neiland 1971b, Quimby 1972). *Puccinellia grandis-Plantago maritima-Elymus arenarius* (Neiland 1971b). *Puccinellia grandis* (Batten and others 1978, McCormick and Pichon 1978). *Puccinellia glabra-Plantago maritima* (Hanson 1951). *Puccinellia borealis-Potentilla egedii* (Hanson 1953). *Puccinellia phryganodes* (Jefferies 1977, Meyers 1985, Rosenberg 1986). *Puccinellia phryganodes-Triglochin maritimum* (Quimby 1972, Rosenberg 1986, Vince and Snow 1984). *Puccinellia phryganodes-Salicornia europaea* (Hanson 1951). *Puccinellia phryganodes-Cochlearia officinalis* (Thomas 1951). *Puccinellia andersonii* (Meyers 1985).

### III.A.3.i. Halophytic Sedge Wet Meadow

**Description-** These communities generally form the main body of coastal marshes around the State (fig. 67). They can be grouped into two main phases: (1) monotypic stands of coarse sedges near the seaward edges of coastal marshes, and (2) more diverse stands dominated by more delicate sedges farther inland. Communities of the first phase are composed of dense swards of sedges. *Carex lyngbyaei* generally dominates in southern Alaska, and *Carex ramenskii* and *C. subspathacea* are characteristic dominants of northern sites. Woody plants, mosses, and lichens are absent. Plant cover is often complete (100 percent) and is usually over 50 percent, though sparse stands do occur. Reported aerial standing crops range from 466 grams per square meter (4,150 lb/acre) for *Carex lyngbyaei* communities at Cook Inlet (Vince and Snow 1984) to 94 grams per square meter (838 lb/acre) for *C. subspathacea* at Barrow (Jefferies 1977). The dominant sedges range in height from over 1 meter (3 ft) in *Carex lyngbyaei* communities of southern Alaska to a few centimeters in northern Alaska.

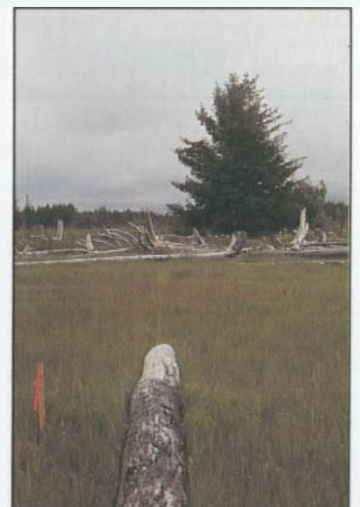


Figure 67-Halophytic sedge wet meadow of *Carex lyngbyaei* in the tidal zone in south-central Alaska.

Communities of the second phase are commonly dominated by *Carex pluriflora* in the south and *C. rariflora* in the north. Low shrubs may be present, but mosses and lichens are absent. Plant cover is usually complete or nearly so and plant height is generally 20 to 40 centimeters (8 to 16 in).

**Distribution and site characteristics-** The coarse sedge communities of the first phase are common throughout the State along borders of brackish ponds, drainage-ways, and tidal flats. Areas tend to be quite small in northern Alaska, where tidal fluctuation is small and coastal erosion is intense. Frequency of tidal inundation ranges from several times per month to once per summer. Soils consist of silts and clays, without microtopography, that often overlay sand or gravel. Water quickly runs off most of the seaward sites after flooding, which allows the surface centimeter or two of soil to dry. Soil salinity ranges from 6 to 12 parts per thousand. Soil reaction is circumneutral to slightly acid.

Communities of the second phase occur inland from those of the first phase and form a broad ecotone with freshwater wetlands. The substrate is a saturated hummocky peat, often with a few centimeters of water in the depressions. Soil salinity is generally between 0 and 6 parts per thousand; soil reaction ranges from slightly acid to as low as pH 4.4.

**Successional status-** Succession depends primarily on whether the coastline is prograding (as on deltas), subsiding, or stable. The successional trend on a prograding marsh would be from halophytic forb or halophytic grass to halophytic sedge phase one to halophytic sedge phase two to various freshwater wetland types. Where the coastline is subsiding, the successional trend would be reversed.

Closely **related** types-Seaward edges of communities of the first phase commonly border abruptly on halophytic grass wet meadow communities. The sedge communities are substantially taller and denser than the grass communities. Communities of the second phase frequently grade inland into fresh wet meadows or bogs. They are especially similar to subarctic lowland sedge-bog meadows, but the latter are farther from the sea (never tidally inundated) and support mosses and a greater diversity of sedges. With increasing shrubs, these inland halophytic sedge meadows may grade inland into sweetgale, willow fen, or shrubby bog communities. Communities dominated by *Eleocharis palustris* are similar to certain fresh sedge marshes but are exposed to periodic flooding by tidewater.

**Photographs-** Batten and others 1978, figure 9; Neiland 1971b, figures 12 and 13; Racine and Anderson 1979, figure 22; figure 67, this publication.

**Primary references--** del Moral and Watson 1978, Frohne 1953, Jefferies 1977, Meyers 1985, Stephens and Billings 1967, Vince and Snow 1984.

**Communities-** *Carex subspathacea* (Hanson 1951, 1953; Meyers 1985). *Carex subspathacea-Puccinellia phryganodes* (Bergman and others 1977, Byrd and Ronsse 1983, Nodler and others 1978, Webber and others 1978). *Carex ursina* (Jefferies 1977). *Carex mackenziei* (Byrd and Ronsse 1983, Ritchie and others 1981). *Carex ramenskii* (Batten and others 1978, Hanson 1951, Jefferies 1977, Neiland 1971b, Quimby 1972, Vince and Snow 1984). *Carex ramenskii-Potentilla egedii* (Byrd and Ronsse 1983, George and others 1977, Rosenberg 1986). *Carex ramenskii-Triglochin maritimum-Potentilla egedii* (Hanson 1951, Ritchie and others 1981). *Carex lyngbyaei* (Batten and others 1978; Craighead and others 1988; Crow 1968, 1977b; Crow and

Koppen 1977; del Moral and Watson 1978; Friedman 1982; Frohne 1953; Hanson 1951; Klein 1965; McCormick and Pichon 1978; Neiland 1971b; Racine and Anderson 1979; Ritchie and others 1981; Rosenberg 1986; Stephens and Billings 1967; Streveler and others 1973; Vince and Snow 1984; Wibbenmeyer and others 1982). *Carex lyngbyaei-Poa eminens-Potentilla egedii* (Rosenberg 1986). *Carex lyngbyaei-Triglochin maritimum* (Crow 1968, Crow and Koppen 1977, Ritchie and others 1981). *Carex lyngbyaei-Potentilla egedii* (Crow 1977b). *Carex lyngbyaei-Eleocharis palustris* (Crow 1968, 1977b). *Carex lyngbyaei-Hippuris tetraphylla* (Crow 1968). *Carex lyngbyaei-Polygonum amphibium* (Thomas 1957). *Carex pluriflora* (Vince and Snow 1984). *Carex pluriflora-C. lyngbyaei* (Hanson 1951, Ritchie and others 1981, Rosenberg 1986). *Carex pluriflora-Triglochin palustris* (Crow 1977b). *Carex pluriflora-Deschampsia beringensis* (Crow 1977b). *Carex rariflora-Salix ovalifolia-Empetrum nigrum* (Byrd and Ronsse 1983, Hanson 1951). *Eleocharis palustris* (Crow 1977b, del Moral and Watson 1978). *Scirpus paludosus* (McCormick and Pichon 1978, Neiland 1971b, Quimby 1972).

### III.A.3.j. Subarctic Lowland Sedge-Bog Meadow

**Description-** These communities are dominated by low peat-forming sedges growing on bog peats. Common sedges include *Eriophorum russeolum*, *Carex limosa*, *C. pluriflora*, *C. chordorrhiza*, *C. livida*, *C. magellanica*, and *Trichophorum caespitosum*. These species are much smaller and more delicate than the coarse robust species that dominate sedge wet meadows. Shrubs, mosses (including sphagnum), and lichens may be common or absent but are not dominant. *Andromeda polifolia* is commonly present in minor quantities. Plant cover is complete or nearly so.

**Distribution and site characteristics-** Sedge-bog meadows are found throughout the nonarctic part of the State, (including the Aleutian islands) in filled-in sloughs, boggy pond margins, and other topographic depressions. These are among the wettest bog communities with saturated peaty soils often forming quaking mats. The peat, composed primarily of sedge material, is generally at least 30 centimeters (12 in) thick and usually much thicker. It often is marked with small pools or sometimes may be shallowly flooded. Permafrost is generally absent, though isolated pockets of ice may occur under hummocks in interior Alaska. Reported soil reactions range from pH 5.4 to 6.4.

**Successional status-** Floating mats of these communities may actively extend into shallow lakes and replace marsh or aquatic communities there. Likewise, peat accumulation in wet meadows can lead to their gradual transformation into sedge-bog meadows. Continued bog development may cause these communities to be replaced by mossier and shrubbier bog communities.

Closely related types-Sedge-bog meadows are similar to sedge wet meadows, but the former are dominated by low slender sedges and occur on well-preserved peats. They are also similar to sedge-moss bogs but lack a dominant moss component. As broad-leaved herbs increase at the expense of sedges, these communities grade into subarctic lowland herb bog meadows.

**Photographs-** Calmes 1976, figures 2, 8, 9, and 17.

**Primary references-** Calmes 1976, Drury 1956, Shacklette 1961.

**Communities-** *Eriophorum russeolum-E scheuchzeri* (Wilson and Underwood 1979). *Eriophorum* spp.-*Menyanthes trifoliata* (Dachnowski-Stokes 1941). *Eriophorum russeolum-Carex kelloggii-Calamagrostis canadensis* (Heusser 1960). *Eriophorum russeolum-Carex limosa-Calamagrostis canadensis* (Cooper 1939, Streveler and others 1973). *Carex limosa-C. chordorrhiza* (Calmes 1976, Drury 1956). *Carex limosa-C. capillaris* (Viereck 1970b). *Carex pluriflora* (Hultén 1960). *Carex pluriflora-Eriophorum russeolum* (Bank 1951). *Carex kelloggii-C. canescens* (Shacklette 1961a). *Carex livida-Menyanthes trifoliata* (Hogan and Tande 1983).

### III.A.3.k. Subarctic Lowland Sedge-Moss Bog Meadow

**Description-** These communities are dominated by mosses, principally *Sphagnum* spp. (fig. 68). Low sedges, such as those listed above for sedge-bog meadows, are generally present and usually codominant. The aspect is of low slender sedges and other herbs growing out of a matrix of sphagnum mosses. Low shrubs and lichens may be present or absent but are not dominant. *Andromeda polifolia* and *Vaccinium oxycoccos* are low, delicate shrubs that are commonly present, though they provide little cover. Widely scattered stunted trees may be present. Plant cover is complete or nearly so.

**Distribution and site characteristics-** The subarctic lowland sedge-moss bogs occur throughout the nonarctic parts of the State on peat in filled-in lakes and other depressions or on slopes where precipitation is adequate (Aleutian Islands, southeastern Alaska, and parts of south-central Alaska) and may form floating mats. The substrate is wet acidic peat at least 30 centimeters (12 in) thick and frequently is dotted with small pools. The reaction of the peat is generally pH 4.0 to 5.5, though values as high as 6.2 have been reported. The pH of the water in the pools is usually slightly higher than that of the associated peat. Permafrost is generally absent, but isolated pockets may be present under moss hummocks in interior Alaska.

**Successional status-** Floating mats of these communities may advance into shallow lakes to replace marsh or aquatic vegetation. Continued peat accumulation in sedge-bog meadows combined with invasion of sphagnum mosses also can result in establishment of these sedge-moss bogs. Continued bog development may yield surface conditions resulting eventually in shrub or forest invasion of the bog.

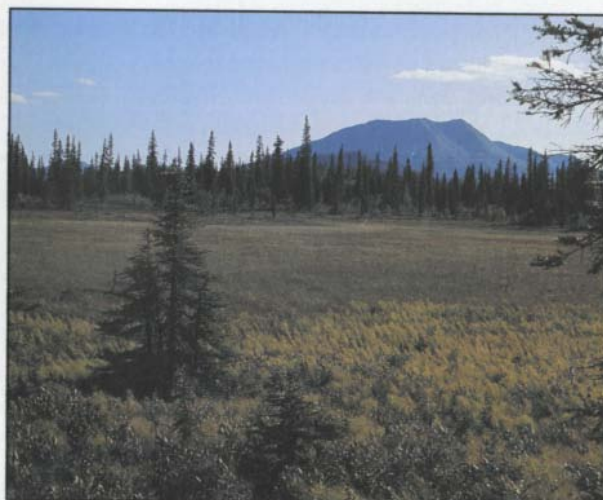


Figure 68-Subarctic lowland sedge-moss bog meadow dominated by the sphagnum mosses *Sphagnum fuscum* and *S. warnstorffii*. the sedges *Carex pauciflora*, *C. limosa*, and *Eriophorum angustifolium*, and the low shrubs *Andromeda polifolia*, *Betula nana*, and *Vaccinium oxycoccos* in southwest Alaska.

**Closely related types-** These communities are similar to sedge-bog meadows, though the latter lack a dominant moss component. They also are similar to herb-bog meadows, where broad-leaved herbs have increased their influence at the expense of sedges.

**Photographs-** Calmes 1976, figures 3 and 17; Cooper 1942, figure 4; figure 68, this publication.

**Primary references-** Calmes 1976, Cooper 1942, Dachnowski-Stokes 1941, Drury 1956.

**Communities-** *Carex aquatilis*-*Menyanthes trifoliata*/*Sphagnum* spp. (Scheierl and Meyer 1977). *Carex aquatilis*/*Sphagnum riparium* (Luken and Billings 1983). *Carex nigricans*-*C. limosa*/*Sphagnum recurvum* (Cooper 1942). *Carex limosa*-*C. chordorrhiza*/*Sphagnum* spp. (Calmes 1976; Drury 1956; Hanson 1953, 1958). *Carex limosa*-*Eriophorum russeolum*/*Sphagnum fuscum*-*S. papillosum* (Dachnowski-Stokes 1941). *Carex pluriflora*-*Calamagrostis* spp./*Sphagnum* spp. (Thomas 1957; also see footnote 3). *Carex chordorrhiza*-*Menyanthes trifoliata*/*Sphagnum* spp. (Scheierl and Meyer 1977). *Carex canescens*-*C. magellanica*/*Sphagnum teres* (Calmes 1976, Drury 1956). *Eriophorum russeolum*-*Equisetum fluviatile*/*Sphagnum* spp. (Racine 1978b). *Eriophorum russeolum*-*Carex rotundata*/*Sphagnum* spp. (Rosenberg 1986). *Eriophorum russeolum*-*Carex pluriflora*/*Sphagnum* spp. (Rosenberg 1986). *Eriophorum russeolum*-*Carex limosa*/*Sphagnum squarrosum* (Hogan and Tande 1983). *Eriophorum scheuchzeri*-*Menyanthes trifolia*/*Sphagnum* spp. (Heusser 1960). *Trichophorum caespitosum*-*Eriophorum* spp. -*Rhynchospora alba*/*Sphagnum* spp. (Dachnowski-Stokes 1941, Streveler and others 1973). *Rhynchospora alba*-*Drosera anglica*/*Sphagnum lindbergii*-*S. tenellum* (Neiland 1971b). *Carex pluriflora*-*Eriophorum russeolum*/*Sphagnum teres*-*S. magellanicum* (Shacklette and others 1969).

### III.B. Forb Herbaceous

Included are communities dominated by forbs (broad-leaved herbs), rushes (Juncaceae), horsetails (Equisetaceae), and ferns. Graminoids may be present but are not dominant. Shrubs may be present but provide less than 25 percent cover.

#### III.B.1. Dry Forb Herbaceous

This includes forb communities on dry sites. Most of these are sparsely vegetated pioneer communities.

##### III.B.1.a. Seral Herbs

**Description-** These are open communities of herbs colonizing previously unvegetated landscapes (fig. 69). A wide variety of herbs may be present. Some of the most common are *Epilobium latifolium*, *Artemisia tilesii*, *Crepis nana*, *Hedysarum mackenzii*, and *Oxyria digyna*. Grasses may be present but usually are widely scattered. Woody plants and small patches of mosses may be present but provide little cover. Lichens are scarce. Cover is often low and varying amounts of bare ground are exposed.

**Distribution and site characteristics-** Seral herb communities are found throughout the State, primarily on unstable sites such as flood plains, riverbanks, and eroding bluffs. Though biomass and cover are low, diversity often is high. The substrate usually is coarse and excessively drained.

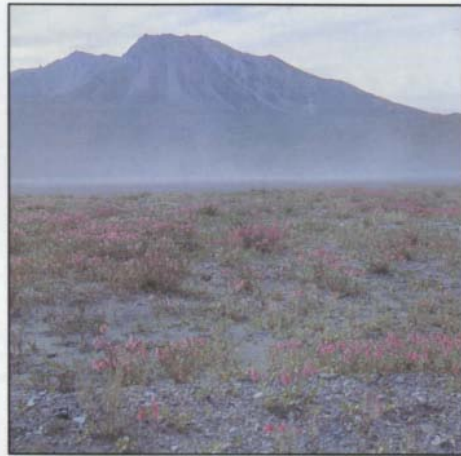


Figure 69-Seral herb stand dominated by *Epilobium latifolium* with scattered *Artemisia tilesii*, *Crepis nana*, *Astragalus nutzotinensis*, and several other herb species on the gravel bar of a glacial river in the Alaska Range in interior Alaska.

**Successional status-** These are early successional communities colonizing recently exposed surfaces. If disturbance is not renewed, many will develop into grass or scrub communities depending on locality and climate.

**Closely related types-** Seral herb communities are similar to alpine herb communities, but the former usually are on lowlands (including mountain flood plains) recently or periodically disturbed by a catastrophic agent, commonly moving water (floods on flood plains or storm surges on coastal bluffs). Alpine herb communities are typical of talus slopes and rock outcrops, where soil development is minimal and disturbance comes in the form of frost action or rockfall.

**Photographs-** Figure 69, this publication.

**Primary references-** Johnson and others 1966, Spetzman 1959.

**Communities-** *Epilobium latifolium* (Scott 1974a, Webber and others 1978). *Epilobium latifolium*-*Artemisia tilesii* (Batten 1977, Bliss and Cantlon 1957, Johnson and others 1966, Spetzman 1959). *Epilobium latifolium*-*Crepis nana* (Young 1974b). *Hedysarum alpinum*-*Artemisia arctica* (Webber and others 1978). *Cochlearia officinalis*-*Oxyria digyna*-*Saxifraga rivularis* (Potter 1972). *Cochlearia officinalis*-*Phippsia algida*-*Stellaria humifusa* (Webber 1978). *Artemisia arctica* ssp. *comata* (Meyers 1985). *Wilhelmsia physodes*-*Artemisia arctica*-*Chrysanthemum arcticum* (Thomas 1951). *Equisetum variegatum* (Helm and others 1984, Young 1974b). *Dryas drummondii*-*Epilobium latifolium* (Talbot and others 1984).

### **III.B.1.b. Alpine Herb-Sedge (Snowbed)**

**Description-** This unit includes a wide variety of vegetation types below late-lying snowbanks in mountainous areas throughout the State. Dominant species may be herbs (such as *Oxyria digyna*, *Koenigia islandica*, *Saxifraga rivularis*, *Cardamine bellidifolia*, *Poa arctica*, *Carex lachenalii*, and *Claytonia sarmentosa*), mosses, and lichens, commonly *Cetraria delisei*. Woody plants are absent. Cover is sparse, and much bare ground generally is present.

**Distribution and site characteristics-** Snowbed communities occur below outcrops and in depressions, streambeds, or other topographic features that break the wind and allow substantial snowdrifts to accumulate. Soils are well drained, often stony, and may be dry late in the season. These sites are irrigated, at least seasonally, by water from late-melting snowdrifts upslope.

The sites themselves are covered with snow through part or most of the summer. Species present must adapt to a short growing season.

**Successional status-** These specialized communities are not likely to change as long as winter precipitation and wind patterns do not change significantly.

**Closely related types-** These communities may resemble mesic sedge-herb meadow tundra but have a more open vegetative cover and less sedge cover and are located in snowbeds. In some cases, these snowbed communities may grade into alpine herb communities on adjacent talus, but a topographic break and changes in species usually separate the two. Open dwarf scrub snowbed communities are dominated by prostrate mat-forming shrubs, are usually more densely vegetated than alpine herb-sedge snowbeds, and occur on sites with long growing seasons.

**Primary references-** Johnson and others 1966, Scott 1974a.

**Communities-** *Cetraria delisei-Oxyria digyna-Koenigia islandica-Saxifraga rivularis* (Johnson and others 1966). *Carex lachenalii-Oxyria digyna-Claytonia sarmentosa* (Scott 1974a). *Rhacomitrium canescens-Dicranoweisia cirrata-Oxyria digyna* (Scott 1974a). *Anthelia julacea-Scapania paludosa-Saxifraga, hirculus-Leptarrhena pyrolifolia* (Shacklette and others 1969). *Rubus arcticus-Sedum rosea-Polygonum bistorta-Saxifraga hirculus* (Racine and Young 1978). *Carex nigricans* (Jaques 1973).

#### 111.B.1.c. Alpine Herbs

**Description-** Alpine herb communities consist of sparse vegetation on talus and blockfields. A wide variety of herbs may be present, often with no particular species dominating. Species commonly present include *Draba* spp., *Saxifraga* spp., *Festuca brachyphylla*, *Potentilla* spp., *Diapensia lapponica*, *Oxyria digyna*, *Androsace* spp., *Epilobium latifolium*, and *Smelowskia* spp. Woody plants are absent or nearly so. Small patches of mosses such as *Andreaea* spp. may be present between rocks. Lichens, especially crustose lichens, may be common. These communities are open with much bare rock between individual plants.

**Distribution and site characteristics-** Alpine herb communities occur on talus, rock outcrops, and blockfields throughout the State. These are sites too steep or too windblown for soil development. The substrate consists of lithosols or regosols between rocks.

**Successional status-** These are early successional communities colonizing stony, unvegetated surfaces. They persist at these sites indefinitely because soil formation is slow and fine materials are either blown away or moved downslope as soon as they are formed.

**Closely related types-** Alpine herb communities are very similar to seral herb communities, but seral communities occur primarily on flood plains, cutbanks, and other sites where succession to other communities will occur fairly rapidly after disturbance ceases. Alpine herb communities are maintained in a successional state indefinitely by steep slopes and wind erosion. Some species are common in both communities (notably *Epilobium latifolium*). Others, such as *Artemisia tilesii* and *Hedysarum mackenzii*, are more typical of seral herb communities. Still others, such as *Draba* spp. and *Smelowskia* spp., are more typical of alpine herb communities.

Alpine herb communities also may be similar to alpine herb-sedge (snowbed) communities, but the latter occur in depressions below snowbeds lasting late in the spring and usually are quite distinctive. Mesic mixed herb communities are on well-developed soils and have much denser (usually closed) vegetation. Very open dwarf scrub communities may resemble alpine herb communities, but in the latter the plants are primarily woody mat-formers, such as dryas, crowberry, or prostrate willows.

Very open alpine herb communities with lichens present may resemble lichen communities (III.C.2.), but herbs are almost completely absent from lichen communities.

**Photographs-** Johnson and others 1966, figure 5; Racine and Anderson 1979, figure 17; Shacklette and others 1969, figures 6, 7, 18, 30, 32, and 33.

**Primary references-** Griggs 1936, Johnson and others 1966, Racine and Anderson 1979, Shacklette and others 1969, Spetzman 1959.

**Communities-** *Saxifraga tricuspidata-Draba caesia* (Batten 1977, Johnson and others 1966). *Saxifraga oppositifolia* (Griggs 1936). *Saxifraga oppositifolia-Epilobium latifolium* (Viereck 1963). *Saxifraga tricuspidata-Artemisia arctica* (Webber and others 1978). *Potentilla hyparctica-Cerastium aleuticum-Draba aleutica* (Shacklette and others 1969). *Potentilla villosa-Draba hyperborea-Saxifraga bracteata* (Shacklette and others 1969). *Artemisia arctica-Potentilla hyparctica-Hierochloë alpina* (Heusser 1954, 1960). *Diapensia lapponica-Saxifraga bronchialis-Sibbaldia procumbens-Trisetum spicatum* (Griggs 1936). *Saxifraga* spp.-*Festuca brachyphylla-Poa glauca-Luzula confusa-Minuartia* spp. (Spetzman 1959). *Oxyria digyna-Saxifraga punctata-Sedum rosea-Primula tschuktschorum* (Fries 1977). *Veronica stelleri-Cassiope lycopodioides-Tofieldia coccinea-Salix rotundifolia* (Shacklette and others 1969). *Carex circinnata-Umbilicaria proboscidea-Agrostis borealis* (Shacklette and others 1969). *Geum rossii-Silene acaulis-Oxyria digyna* (Friedman. 1982). *Hierochloë alpina-Luzula tundricola-Potentilla elegans* (Racine and Anderson 1979).

### III.8.2. Mesic Forb Herbaceous

These forb communities primarily occur on rich, sheltered, well-drained sites with deep soils.

#### III.B.2.a. Mixed Herbs

**Description-** These communities are dominated by herbs and have complete or nearly complete vegetative cover (fig. 70). Locally common herbs include *Campanula* spp., *Angelica* spp., *Lupinus* spp., *Artemisia* spp., *Lathyrus* spp., *Anemone* spp., *Delphinium* spp., and *Aconitum delphinifolium*. Sedges, grasses, ferns, and mosses (especially feathermosses) also are common at many sites. Lichens may be present; woody plants are rare.



Figure 70-A mesic forb herbaceous community dominated by *Fauria crista-galli* and *Luetkia pectinata* near the coast in south-central Alaska.

**Distribution and site characteristics-** Mixed herb communities are found in small, local patches on deep, loamy, fairly well-drained soils along streambanks, on stabilized dunes, on ancient beach ridges, and in sheltered pockets on subalpine slopes. These communities have been reported from southeastern and south-central Alaska and the Aleutian Islands; they probably are present throughout the State. Snow generally accumulates on these sites throughout winter but melts early in spring. Permafrost has not been reported, but communities of this type on relatively thick active layers may exist over permafrost in northern and western Alaska.

**Successional status-** Successional relations are largely unknown and probably differ considerably by individual location and site characteristics. In general, it seems likely that mixed herb communities would tend to develop toward scrub or forest types or, occasionally, bogs in the forested parts of the State and toward sedge or tussock communities elsewhere.

**Closely related types-** Mesic mixed herb communities with *Heracleum lanatum* or *Angelica* spp. are similar to large umbel types but differ in having less Umbelliferae cover. Other mesic mixed herb communities are similar to mesic sedge-herb meadow tundra, but have fewer sedges. They also can be similar to alpine herb and seral herb communities but grow much more densely and occur on much more mesic sites with deeper soils. Still other mesic mixed herb communities can resemble some of the dry or mesic grass types (elymus, bluejoint, fescue, or other medium-height grasses) but have more herbs and fewer grasses.

**Photographs-** Shacklette and others 1969, figure 13; figure 70, this publication.

**Primary references-** Anderson 1974, Bank 1951, Hanson 1951, Klein 1965, Shacklette and others 1969.

**Communities-** *Fauria crista-galli* (Shacklette 1965). *Fauria crista-galli-Caltha biflora* (Fox 1983, Klein 1965). *Achillea borealis-Arnica unalaschcensis-Claytonia sibirica-Geum calthifolium* (Shacklette and others 1969). *Polygonum viviparum-Campanula lasiocarpa-Primula cuneifolia-Cardamine umbellata* (Bank 1951). *Epilobium latifolium-Mertensia paniculata-Arctagrostis latifolia* (Anderson 1974). *Aconitum delphinifolium-Aquilegia formosa-Sanguisorba stipulata-Geranium erianthum* (Cooper 1942). *Streptopus amplexifolius-Linnaea borealis-Juncus arcticus* (Bank 1951). *Platanthera spp.-Fritillaria camschatcensis-Polygonum viviparum-Erigeron peregrinus* (Bank 1951). *Athyrium filix-femina-Carex lyngbyaei-Heracleum lanatum-Geum macrophyllum* (Shacklette and others 1969). *Lupinus arcticus-Aconitum delphinifolium-Anemone narcissiflora* (Brock and Burke 1980). *Fritillaria camschatcensis-Aconitum maximum-Angelica lucida* (Friedman 1982). *Iris setosa-Dodecatheon pulchellum* (Frohne 1953). *Hedysarum alpinum-Equisetum variegatum* (Crow 1968). *Lupinus nootkatensis-Lathyrus maritimus-Achilles borealis* (Hanson 1951).

### III.B.2.b. Fireweed

**Description-** These communities are dominated by fireweed (*Epilobium angustifolium*). Grasses, sedges, mosses, lichens, and woody plants may be present but are inconspicuous.

**Distribution and site characteristics-Fireweed** communities are common on disturbed sites in south-central Alaska and on recent burns in interior Alaska, though none has been reported in the literature.

**Successional status-** If disturbance is not renewed, most of these communities probably will be invaded by bluejoint (*Calamagrostis canadensis*) fairly quickly. They then may persist for several years as bluejoint or bluejoint-herb communities before yielding to scrub and eventually forest communities. Alternatively, fireweed communities may be replaced rapidly by shrubs or trees sprouting from roots and rhizomes that survived the original disturbance.

**Closely related types-** Fireweed communities can be similar to some bluejoint-herb communities but have less bluejoint and a stronger dominance of fireweed.

*Primary references-None.*

Communities- *Epilobium angustifolium* (undescribed).

### III.B.2.c. Large Umbel

**Description-** These communities are dominated by tall herbs (0.5 to 1.5 meters [20 in to 5 ft]) of the family Umbelliferae, most commonly of the genera *Heracleum* and *Angelica*. Other broadleaved herbs, grasses, and sedges may be common, but it is the large umbellifers that are most conspicuous in these communities. Woody plants are absent or rare; nonsphagnaceous mosses often are abundant; lichens may be present. Cover is complete or nearly so.

**Distribution and site characteristics-Small** stands are common on relatively deep soils of sheltered subalpine mesic slopes and streambanks in south-central and southeastern Alaska and the Aleutian Islands. These sites usually are protected by snow in winter but become snow-free in early summer. Permafrost is absent.

**Successional status-**Successional relations are unknown. Stands in the Aleutian Islands may be quite stable. Those in south-central Alaska eventually may be replaced by scrub or forest communities.

**Closely related types--** These communities are closely related to the mixed herb and fern types but have more cover of *Heracleum lanatum* or *Angelica* spp. Communities containing *Elymus arenarius* are closely related to some of the elymus (dry graminoid herbaceous) types but have more umbels and less elymus.

**Primary reference-** Byrd 1984.

**Communities-** *Heracleum lanatum-Veratrum viride-Senecio triangularis* (Cooper 1942, Fox 1983). *Heracleum lanatum-Athyrium filix-femina-Angelica lucida* (Byrd 1984, Friedman 1982). *Artemisia tilesii-Heracleum lanatum-Elymus arenarius* (Byrd 1984).

#### *III.B.2.d. Ferns*

**Description-** These communities are characterized by a lush growth of ferns, often *Athyrium filix-femina* or *Dryopteris* spp. Herbs, grasses, and sedges may be common but are inconspicuous. Woody plants are absent or rare, mosses may be common, and lichens may be present. Cover is complete or nearly so.

**Distribution and site characteristics-** Fern communities usually are found at low elevation in localized patches in relatively deep, well-drained, moist soils in south-eastern and south-central Alaska and the Aleutian Islands. These sites are snow covered in winter but become snow free early in spring. Permafrost is absent. The single community reported is at the bases of rock cliffs at low elevations in the Aleutian Islands.

**Successional status-** Successional relations are unknown.

**Closely related types-** Fern communities can be similar to large umbel communities and mesic mixed herb communities but are strongly dominated by ferns.

**Primary reference--** Bank 1951.

**Communities-** *Athyrium filix-femina-Cystopteris fragilis-Botrychium* spp. - *Gymnocarpium dryopteris* (Bank 1951).

#### *111.B.3. Wet Forb Herbaceous*

These wet forb communities occur on soils saturated with water or semipermanently flooded.

##### *III.B.3.a. Fresh Herb Marsh*

**Description-** Fresh herb marsh communities are dominated by emergent herbs in deep water (15 centimeters [6 in] or more). Characteristically, the dominant or co-dominant emergent is *Equisetum fluviatile*; although it is not really an herb, it is included with true herbs on the basis of being nongraminoid and nonwoody. Common associated emergent herbs (sometimes codominant) include *Menyanthes trifoliata* and *Potentilla palustris*. Floating-leaved or submerged aquatic plants, such as *Potamogeton* spp., *Hippuris vulgaris*, and *Myriophyllum spicatum*, may be present or even abundant. Aquatic mosses often are common. Woody plants and lichens are absent. Plant cover is open.

**Distribution and site characteristics-** Fresh herb marshes occur in permanently flooded sites (usually with 15 to 100 centimeters [6 to 40 in] of water), including sloughs, oxbow lakes, sluggish rivers, and lake margins, in and near the forested parts of the State. Soils may be mineral silts or sands or well-decomposed organic mucks.

**Successional status-** These are early successional communities in aquatic seres; they replace open water or aquatic communities. As sedimentation and organic matter accumulation gradually build up the soil to near the water level, these communities probably will be replaced by graminoid wet meadows. They also can be replaced by laterally expanding floating bog mats.

**Closely related types-** Fresh herb marshes are similar to graminoid marshes in that they consist of tall emergent plants in deep water. The former are dominated, however, by nongraminoid emergents, typically *Equisetum fluviatile*.

Fresh herb marshes also are similar to subarctic lowland herb wet meadows and bog meadows. Many of the common secondary species of marshes are codominant in herb wet meadows or herb bog meadows. Wet meadows are flooded with much less water than marshes or have no standing water at all. Herb bog meadows often occur in shallower water than herb marshes but sometimes are in fairly deep water or on floating mats submerged slightly below the surface that sink when walked on. The substrate of the bog meadows is peat, in contrast to the mineral or well-decomposed organic substrate of marshes. Neither herb wet meadows nor herb bog meadows are dominated by *Equisetum fluviatile*.

**Primary references-** Racine 1976, Ritchie and others 1981.

Communities- *Equisetum fluviatile* (Craighead and others 1988, Racine 1976, Ritchie and others 1981). *Equisetum fluviatile-Menyanthes trifoliata* (Hultén 1966, Racine 1978b, Ritchie and others 1981, Rosenberg 1986). *Equisetum fluviatile-Polygonum amphibium* (Young and Racine 1976).

### *III.B.3.b. Subarctic Lowland Herb Wet Meadow*

**Description-** Herb wet meadows are dominated by herbs or nonwoody plants other than grasses and sedges, commonly *Equisetum arvense*, *E. variegatum*, *Caltha palustris*, and *Juncus arcticus*. Scattered grasses and sedges may be present. Nonsphagnaceous mosses may be common or absent. Lichens and woody plants are rare or absent. Cover usually is less than complete.

**Distribution and site characteristics-** Herb wet meadows are found in seepage areas, pools, pond margins, and marsh edges throughout most of the State, especially the southern two-thirds. Stands usually are quite small and widely scattered. They occur on saturated or shallowly flooded soils. If standing water is present, it usually is less than 15 centimeters (6 in) deep. Soils usually are mineral silts or sometimes sands; often they have a few centimeters of well-decomposed organic muck at the surface. Soil reaction is circumneutral to acid but not extremely acid; pH values of 6.1 to 7.0 have been reported, but some herb meadows probably occur on more acidic substrates.

**Successional status-** As soil development proceeds, adjacent wet sedge meadows may expand into and overwhelm many of these communities, which eventually evolve to bog or scrub communities.

**Closely related types-** Herb wet meadows are similar to fresh herb marshes but are not as wet and are not dominated by *Equisetum fluviatile*. They also are similar to herb bog meadows but occupy essentially mineral substrates instead of peats. They also resemble wet sedge-herb tundra and subarctic lowland wet sedge meadows, but sedges are absent or scarce.

**Photographs-** Batten and others 1978, figure 26; Racine and Anderson 1979, figure 25.

**Primary references-** Cooper 1939, Hanson 1951, Shacklette and others 1969.

**Communities-** *Equisetum arvense* (Craighead and others 1988, Hultén 1960). *Equisetum arvense-E variegatum* (Batten and others 1978). *Equisetum arvense-E. variegatum/Philonotis fontana* (Cooper 1939). *Caltha palustris* (Murray 1974). *Caltha palustris-Claytonia sibirica* (Shacklette and others 1969). *Caltha palustris-Sparganium hyperboreum* (Amundsen 1977, Amundsen and Clebsch 1971). *Caltha palustris-Angelica lucida-Platanthera* spp. (Friedman 1982). *Juncus arcticus* (del Moral and Watson 1978, Hanson 1951). *Senecio congestus* (Racine and Anderson 1979). *Parnassia kotzebuei/Philonotis fontana* (Shacklette and others 1969).

### III.B.3.c. Subarctic Lowland Herb Bog Meadow

**Description-** Herb bog meadows are dominated by broad-leaved herbs, commonly *Menyanthes trifoliata* (fig. 71). Other common herbs include *Potentilla palustris* and *Caltha palustris*. Aquatic plants such as *Hippuris vulgaris* and *Sparganium* spp. may be present. Mosses, sometimes including sphagnum, usually are present. Graminoids, woody plants, and lichens are absent or scarce. Plant cover is usually open.

**Distribution and site characteristics-Small** stands of herb bog meadows are found on the wettest parts of floating peat mats, in shallow bog pools, and on boggy pond margins throughout the southern two-thirds of the State. The substrate is peat, often a floating peat mat, and may be strongly acidic. Standing water usually is present. The peat mat is often shallowly submerged and sinks 20 to 50 centimeters (8 to 20 in) or more when walked on.



Figure 71-Subarctic lowland herb bog meadow of *Menyanthes trifoliata*, *Potentilla palustris*, and *Caltha palustris* near the coast in south-central Alaska.

**Successional status-** In some cases, these communities extend into ponds, replacing aquatic or emergent (marsh) communities. In other cases, they occupy bog pools brought into existence by various bog processes. As the peat mat thickens, many herb bog meadow communities gradually will be replaced by sedge bog or sedge-moss bog communities.

**Closely related types-** Herb bog meadows are similar to herb wet meadows but occur on peat substrates and are usually dominated by different species (commonly *Menyanthes trifoliata*). They also are similar to herb marshes but have a peat substrate and are never dominated by *Equisetum fluviatile*. Herb bog meadows are similar to sedge bog meadows and sedge-moss bog meadows but have few sedges.

**Photographs-** Dachnowski-Stokes 1941, figure 10; Tande 1983, plate 23; figure 71, this publication.

**Primary references-** Dachnowski-Stokes 1941, Griggs 1936, Racine 1978b, Ritchie and others 1981, Tande 1983.

**Communities-** *Menyanthes trifoliata* (Dachnowski-Stokes 1941, Griggs 1936, Palmer 1942, Ritchie and others 1981, Rosenberg 1986, Young and Racine 1976). *Menyanthes trifoliata/Sphagnum* spp. (Racine 1978b, Scheierl and Meyer 1977, Seguin 1977). *Menyanthes trifoliata-Ranunculus pallasii* (Webber and others 1978). *Menyanthes trifoliata-Potentilla palustris* (Griggs 1936, Tande 1983). *Hippuris vulgaris-Menyanthes trifoliata* (Cooper 1942). *Viola langsдорffii/Sphagnum girgensohnii-Rhytidadelphus triquetrus* (Bank 1951).

#### III.B.3.d. Halophytic Herb Wet Meadow

**Description-** These communities are dominated by halophytic herbs such as *Triglochin maritimum*, *Plantago maritima*, *Honckenya peploides*, *Mertensia maritima*, *Atriplex* spp., and *Cochlearia officinalis* (fig. 72). Scattered halophytic grasses (usually *Puccinellia* spp.) or sedges may be present. Woody plants, mosses, and lichens generally are absent. Scattered shrubs may be present in some slough levee halophytic herb communities, along with scattered representatives of other less halophytic species such as *Poa eminens*, *Festuca rubra*, and *Elymus arenarius*.

Plant cover often is open. A relatively dense stand of *Triglochin maritimum* and *Potentilla egedii* in upper Cook Inlet had a peak standing crop of  $412 \pm 63$  grams per square meter ( $3,675 \pm 560$  lb/acre) (Vince and Snow 1984).

**Distribution and site characteristics-** Halophytic herb communities occur throughout the State at the seaward edges of beaches and coastal marshes, on gentle swales and backslopes within coastal marshes, and on coastal slough levees. The substrate consists of tidally deposited silts, sands, or pebbles and is inundated at least a few times per month by high tides. As the tides recede, water runs rapidly off the surface leaving it firm, but silt substrates remain saturated below the upper 1 or 2 centimeters (0.5 to 1 in). Measured substrate salinity and pH range from 6 to 13 parts per thousand and pH 6.4 to 8.6, respectively.

**Successional status-These** are early successional communities; on prograding beaches and marshes, most will be replaced gradually on marshes by halophytic sedge meadows (usually *Carex lyngbyaei*, *C. subspathacea*, or *C. ramenskii*) and on beaches by *Elymus arenarius* communities.



Figure 72-Halophytic herb wet meadow of *Triglochin maritimum* in upper tidal area in south-central Alaska.

**Closely related types-** Halophytic herb communities occupy habitats similar to halophytic grass wet meadows (*Puccinellia* spp.) and often intergrade with the latter but have few grasses and many herbs. They sometimes intergrade in a similar way with halophytic sedge wet meadows (*Carex ramenskii*, *C. subspathacea*, or *C. lyngbyaei*). Again, the boundary between communities must sometimes be arbitrary, but halophytic herb communities have few sedges and relatively abundant herbs.

Halophytic herb communities on slough levees can resemble some midgrass-herb communities (*Deschampsia beringensis*, *Festuca rubra*, or *Poa eminens*), but grasses are widely scattered and herbs are much more conspicuous in the former.

**Photographs-** Neiland 1971 b, figure 9; Racine 1978b, figure 38; figure 72, this publication.

**Primary references-** Batten and others 1978, Frohne 1953, Hanson 1951, Neiland 1971 b, Ritchie and others 1981, Vince and Snow 1984.

**Communities-** *Triglochin maritimum* (Frohne 1953, Quimby 1972, Ritchie and others 1981). *Triglochin maritimum-Potentilla egedii* (Hanson 1951, Vince and Snow 1984). *Triglochin maritimum-Plantago maritima* (Batten and others 1978, Vince and Snow 1984, Ritchie and others 1981). *Triglochin maritimum-Puccinellia* spp. (Racine 1978b). *Triglochin palustris-Atriplex gmelini* (Neiland 1971 b). *Honckenya peploides* (Batten and others 1978, Crow 1977b, Meyers 1985). *Mertensia maritima-Honckenya peploides* (Amundsen and Clebsch 1971, Batten and others 1978, Britton 1967, Griggs 1936, Hanson 1953, Potter 1972, Spetzman 1959, Streveler and others 1973, Thomas 1951). *Cochlearia officinalis* (Wiggins and Thomas 1962). *Cochlearia officinalis-lathyrus maritimus* (Bank 1951). *Cochlearia officinalis-Puccinellia phryganodes* (Webber and others 1978). *Honckenya peploides-Senecio pseudo-amica* (Shacklette and others 1969, Young 1971). *Cochlearia officinalis-Fucus distichus* (Batten and others 1978). *Cochlearia officinalis-Achilles borealis* (Byrd 1984). *Plantago maritima-Puccinellia* spp. (Hanson 1951). *Stellaria humifusa* (Meyers 1985).

### III.C. Bryoid

This unit includes communities dominated by bryophytes and lichens. Bryophytes and lichens also may be abundant in graminoid and forb communities and some shrubby communities, but here they occur to the near-exclusion of vascular plants.

#### 111.C.1. Bryophyte

These are communities dominated by mosses or hepatics



Figure 73-A wet bryophyte community along a small stream in arctic Alaska

### III.C.1.a. Wet Bryophyte

**Description-** These are communities of bryophytes, including mosses and hepatics (fig. 73). Common dominants include *Gymnocolea acutiloba*, *Scapania paludosa*, and *Nardia* spp. Vascular plants and lichens are absent or nearly so. *Sphagnum* spp. have not been reported. Plant cover is usually nearly 100 percent.

**Distribution and site characteristics-** Wet bryophyte communities have been reported from the southern (high precipitation) part of the State. They are always of small extent and widely scattered and often are associated with peculiar substrate conditions (for example, copper concentrations on Latouche Island [Shacklette 1961a]). Substrates are varied but often consist of 10 to 60 centimeters (4 to 24 in) of wet to mesic organic material (moss or liverwort peat) overlying mineral soil. Permafrost is absent from all sites reported.

**Successional status-** Successional relations are various and many are unknown. Some communities maintained by mineral concentrations, such as the *Gymnocolea acutiloba* community on Latouche Island, appear to have remained stable over a long period (Shacklette 1961a). The *Scapania-Nardia* community on Yakobi Island colonized mountain rivulets, thereby providing a substrate for invasion by *Fauria* herb meadows and, later, copperbush thickets (Shacklette 1965).

**Closely related types-**Wet bryophyte communities are similar to dry bryophyte communities but are dominated by different species and occupy wetter substrates. They also are similar to some subarctic lowland sedge-moss bog communities, and the distinction between them is sometimes arbitrary. *Sphagnum* communities generally are included with the sedge-moss bog types even if sedges are very sparse or locally absent from small areas. Wet bryophyte communities have virtually no vascular plants and are defined arbitrarily not to be parts of bogs or other broad landscape features.

**Photographs--** Figure 73, this publication.

**Primary references-** Shacklette 1961a, 1965.

**Communities-** *Gymnocolea acutiloba* (Shacklette 1961a). *Scapania paludosa-Nardia compressa* (Shacklette 1965). *Nardia scalaris-Bryum stenotrichum* (Shacklette 1961a). *Pleuroclada albescens* (Shacklette 1961a). *Scapania paludosa-Nardia scalaris-Marsipella emarginata* (Shacklette and others 1969).



Figure 74-A dry bryophyte community of *Rhacomitrium lanuginosum* on coarse gravel outwash in a coastal area of south-central Alaska.

### **III.C.1.b. Dry Bryophyte**

**Description-** These are communities dominated by bryophytes, usually mosses such as *Rhacomitrium* spp., *Grimmia apocarpum*, and *Andreaea rupestris* (fig. 74). Lichens may be common. Vascular plants are rare or absent. Cover usually is sparse.

**Distribution and site characteristics-** Dry bryophyte communities are fairly rare and have been reported primarily from the Aleutian Islands, though they probably are more widespread. They are most common on windswept coarse mineral substrates, including sand dunes and gravelly slopes. These are sparsely vegetated types with much exposed substrate.

Moss mound communities also are included within this unit. These well-vegetated microcommunities occupy a substrate of dead mosses. Some mounds consist of mosses throughout, others have rock cores. Substrates are generally acidic (pH 5 to 7).

**Successional status-** The windswept barren dry bryophyte communities are an early successional stage but may persist indefinitely because of wind deflation of soil materials. Moss mounds are temporary features; eventually growth ceases and the mounds start to break apart, finally becoming indistinguishable from the surrounding vegetation.

**Closely related types-** Dry bryophyte communities are similar to wet bryophyte communities but are dominated by different species and occupy drier sites. The dry windswept bryophyte types also are similar to some lichen communities but are dominated by bryophytes instead of lichens. Both resemble some of the most sparsely vegetated open dwarf shrub (mat and cushion) communities, but the latter have more vascular plants, particularly shrubs or subshrubs.

**Photographs-** Shacklette and others 1969, figure 10; figure 74, this publication.

**Primary reference-** Shacklette and others 1969.

**Communities-** *Rhacomitrium lanuginosum-Dicranum* spp. (Shacklette and others 1969). *Rhacomitrium lanuginosum-Grimmia apocarpa-Ulota phyllantha* (Shacklette and others 1969). *Andreaea rupestris-Grimmia apocarpa-Rhacomitrium lanuginosum* (Shacklette and others 1969).



Figure 75-A community of crustose and foliose lichens on a granite boulder in the Alaska Range in interior Alaska.

### **III.C.2. Lichen**

These are communities dominated by lichens.

#### **III.C.2.a. Crustose Lichen**

**Description-** These communities are dominated by crustose lichens, such as *Rhizocarpon* spp. and *Lecanora* spp. (fig. 75). Xerophytic saxicolous (rock inhabiting) foliose lichens, especially *Umbilicaria* spp., *Xanthoria* spp., and *Parmelia saxatilis*, also may be abundant. Fruticose lichens, mosses and vascular plants are absent or rare. Plant cover always is sparse.

**Distribution and site characteristics-** These communities grow on rocks on extremely xeric, windblown, soilless sites such as rockfields, outcrops, and recent lava flows where nothing but saxicolous lichens can grow. They are common in alpine regions throughout the State.

**Successional status-** Crustose lichen communities are probably the earliest successional stage of many xeric seres but are likely to persist indefinitely because of severe environmental conditions at the sites they inhabit.

**Closely related types-** Crustose lichen communities are similar to foliose and fruticose lichen communities but are even more xeric and consist entirely of saxicolous lichens. They also may be similar to some very open dwarf scrub (mat and cushion) communities, but the latter have more vascular plants.

**Photographs-** Racine and Anderson 1979, figure 18; Shacklette and others 1969, figure 7; figure 75, this publication.

**Primary reference-** Racine and Anderson 1979.

**Communities-** *Umbilicaria* spp. (Rausch and Rausch 1968). *Umbilicaria* spp.-*Rhizocarpon* spp. (Anderson 1974, Hanson 1953, Kessel and Schaller 1960, Klein 1959, Pegau 1968, Rausch and Rausch 1968, Webber and others 1978). *Umbilicaria* spp.-*Parmelia* spp. (Webber and others 1978). *Umbilicaria* spp.-*Cetraria* spp.-*Cornicularia* spp.-*Pseudephebe* spp. (Talbot and others 1984). *Xanthorea candelaria*-*Ramalina scoparia*-*R. almquistii* (Shacklette and others 1969). *Lecanora* spp.-*Parmelia saxatilis*-*Xanthorea candelaria* (Racine and Anderson 1979).



Figure 76-A community of fruticose lichens, primarily *Cetraria nivalis* and *Thamnolia vermicularis*, on rock scree in arctic Alaska.

### **III.C.2.b. Foliose and Fruticose Lichen**

**Description-** Foliose and fruticose lichen communities are dominated by foliose and fruticose lichens, such as species of *Cladonia*, *Cladina*, and *Stereocaulon* (fig. 76). Crustose lichens may be common. Mosses are uncommon. Vascular plants are absent or nearly so. This unit is reserved for communities where lichens are common and other life forms are absent or nearly so.

**Distribution and site characteristics-** Foliose and fruticose lichen communities are most important in southwestern and northwestern Alaska, where they occur on fellfields and exposed ridges. These sites are slightly more amenable to plant growth than are those occupied by crustose lichen communities, but the sites are still too severe for vascular plant growth.

**Successional status-** Successional relations are unknown.

**Closely related types-** Foliose and fruticose lichen communities are similar to crustose lichen communities but are dominated by foliose and at least some fruticose lichens. They also are similar to some lichen-rich open dwarf shrub types, but vascular plants are absent or very scarce. Dwarf shrubs or sedges, or both, have been common in all the fruticose lichen-rich communities reported to date. Communities with a dense cover of lichens but with some shrub or herbaceous cover have been placed in dwarf scrub or graminoid herbaceous tundra types in this classification.

**Photographs-** Figure 76, this publication.

Primary references-None known.

**Communities-** *Cladina stellaris*-*Sphaerophorus fragilis* (Klein 1959). *Cladonia* spp.-*Cetraria* spp. (Johnson and others 1966). *Cladonia* spp.-*Cladina* spp. (Brock and Burke 1980). *Alectoria* spp.-*Stereocaulon* spp. (Brock and Burke 1980).

### **III.D. Aquatic Herbaceous**

These are communities dominated by plants with leaves that float on the water surface or grow entirely below the surface of the water.

#### **III.D.1. Freshwater Aquatic Herbaceous**

This unit includes aquatic communities in fresh water.

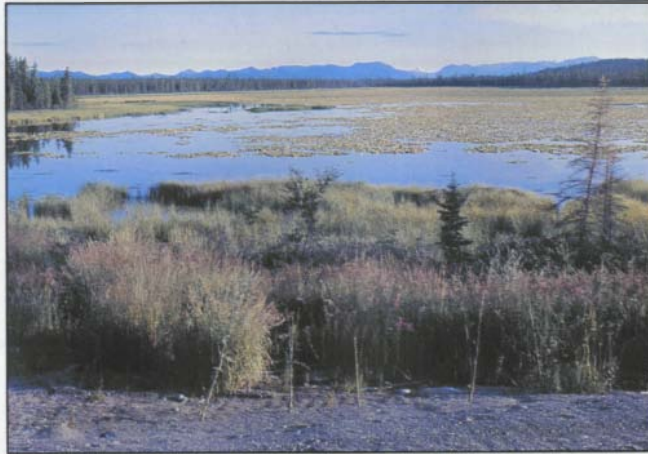


Figure 77-A freshwater aquatic pondlily community of *Nuphar polysepalum* in a shallow lake in south-central Alaska.

### III.D.1.a. Pondlily

**Description-** These are aquatic communities dominated by pondlilies (*Nuphar polysepalum* or *Nymphaea tetragona*) (fig. 77). Other aquatic plants, such as *Callitriche* spp., *Potamogeton* spp., *Sparganium* spp., *Hippuris vulgaris*, *Myriophyllum spicatum*, or aquatic mosses, also may be common. Emergent species such as *Scirpus* spp. and *Carex* spp. may be scattered but usually are absent.

**Distribution and site characteristics-** Pondlily communities are common in ponds, bog pools, and shallow lake embayments throughout the forested parts of the State and extend somewhat beyond the trees in the western part of the State. Water depth generally ranges from 3.0 to 9.5 meters (10 to 30 ft). The substrate is usually a well-decomposed organic-rich muck, but pondlilies also grow in peat-bottomed pools.

**Successional status-** These are early stages of aquatic seres and most will be replaced by emergent sedges or floating bog mat communities as the ponds fill in.

**Closely related types-** Pondlily communities are distinctive. Pondlilies are large, conspicuous, and tend to dominate aquatic communities wherever they are present.

**Photographs-** Cooper 1942, figure 4; Hogan and Tande 1983, plate 28; Shacklette 1961b, figure 355.1; Tande 1983, plate 26; figure 77, this publication.

**Primary references-** Cooper 1942, Hogan and Tande 1983, Ritchie and others 1981, Shacklette 1961b.

**Communities-** *Nuphar polysepalum* (Dachnowski-Stokes 1941; Griggs 1936; Hogan and Tande 1983; Heusser 1960; Johnson and Vogel 1966; Palmer 1942; Porsild 1939; Racine 1976, 1978b; Ritchie and others 1981; Tande 1983). *Nuphar polysepalum-Callitriche verna* (Streveler and others 1973). *Nuphar polysepalum-Sparganium angustifolium* (Cooper 1942). *Nuphar polysepalum-Isoetes muricata* (Shacklette 1961b). *Nuphar polysepalum-Hippuris vulgaris* (Drury 1956, Isleib and Kessel 1973). *Nuphar polysepalum-Potamogeton gramineus* (Rosenberg 1986). *Nuphar polysepalum-Potamogeton* spp. (Talbot and others 1984).



**Figure 78-** A freshwater aquatic common marestalk community of *Hippuris vulgaris* in a shallow pond in arctic Alaska.

### III.D.1.b. Common Marestalk

**Description-** These aquatic communities are dominated by common marestalk (*Hippuris vulgaris*) (fig. 78). This species may occur in pure, usually small, stands or may be associated with other aquatic species, commonly *Sparganium* spp. and *Myriophyllum spicatum*. Emergent plants are absent or rare.

**Distribution and site characteristics-** Common marestalk communities occur throughout the State in shallow freshwater pools and flooded depressions, usually in 5 to 30 centimeters (2 to 12 in) of water. In some localities, the water occasionally dries to leave the marestalk in wet mud for a few days or even weeks of the growing season. The substrate is mineral soil or organic-rich muck. Marestalk stands are usually small in area but quite common.

**Successional status-** Like most aquatic communities, these are early successional and probably will be replaced by wet sedge meadows or sedge bogs as the organic substrate builds up.

**Closely related types-** These communities are similar to other aquatic communities but have common marestalk as a dominant component. They are especially similar to four-leaf marestalk communities (which grow in brackish ponds) but are dominated by common marestalk instead of four-leaf marestalk.

Some marshes (*Scripus* spp., *Equisetum fluviatile*, and *Arctophila fulva* communities) and wet sedge meadows have abundant marestalk. Emergents are common in all those communities but are absent or nearly so from common marestalk communities.

**Photographs-** Figure 78, this publication.

**Primary references-** Ritchie and others 1981, Webber and others 1978.

**Communities-** *Hippuris vulgaris* (Potter 1972, Racine 1976, Ritchie and others 1981). *Hippuris vulgaris-Potamogeton gramineus* (Webber and others 1978). *Hippuris vulgaris-Sparganium hyperboreum* (Hultén 1966, Porsild 1939, Streveler and others 1973). *Hippuris vulgaris-Potentilla palustris* (Spetzman 1959).

### 111.D.1.c. Aquatic Buttercup

**Description-** These communities are dominated or codominated by aquatic buttercups, including *Ranunculus trichophyllus*, *R. gmelini*, *R. hyperboreus*, and *R. pallasii*. Common associated aquatic plants include *Hippuris vulgaris*, *Myriophyllum spicatum* and *Potamogeton* spp. and, in streams, the aquatic moss *Fontinalis neomexicana*. Emergent plants are absent or rare.

**Distribution and site characteristics-** Aquatic buttercup communities are common in several habitats throughout the State. They occur in ponds, sloughs, oxbow lakes, sluggish rivers, swift streams, beaded drainages, and wet polygon centers. Water depths range from a few centimeters to a meter or more. *Ranunculus hyperboreus* and, to a lesser degree, *R. gmelini* are facultative aquatics and can live for a time in wet mud during periods of low water. Substrates are usually mineral soils or organic-rich mucks.

**Successional status-** Like all aquatic communities, these are early successional and most will be replaced eventually by marshes or wet meadows.

**Closely related types-** These communities are similar to other aquatic communities but have aquatic buttercups as major components. Again, they may be similar to some marsh or wet meadow communities but lack emergent plants.

**Primary references-** Johnson and others 1966, Shacklette and others 1969.

Communities- *Ranunculus trichophyllus-Hippuris vulgaris* (Friedman 1982, Hanson 1953, Shacklette and others 1969). *Ranunculus trichophyllus-Potamogeton natans* (Seguin 1977). *Ranunculus hyperboreus-R. gmelini-R. trichophyllus* (Johnson and others 1966). *Ranunculus hyperboreus-R. trichophyllus* (Griggs 1936). *Fontinalis neomexicana-Ranunculus trichophyllus* (Bank 1951, Shacklette and others 1969). *Ranunculus trichophyllus* (Streveler and others 1973).

### 111.D.1.d. Burreed

**Description-** These communities are dominated by burreed (*Sparganium* spp.) (fig. 79). These species often form pure stands or commonly mix with other aquatic species including *Potamogeton* spp, *Hippuris vulgaris*, *Ranunculus pallasii*, and aquatic mosses such as *Calliergon sarmentosum*. Emergent plants are absent or rare. The leaves of most burreed species lie flat on the surface of the water, but the central portion of the leaves of some species (*Sparganium angustifolium* and *S. multipedunculatum*) commonly arch out of the water, with only the tips floating on the surface.

**Distribution and site characteristics-** Burreed communities occupy small areas, but are widely distributed throughout the State. They are found in freshwater ponds, sloughs, oxbow lakes, shallow embayments, and sluggish rivers, usually in 10 to 50 centimeters (4-20 in) of water. The substrate is usually mineral silts or organic-rich mucks.

**Successional status-** Many of these early successional aquatic communities probably will be replaced by marshes or wet meadows.

**Closely related types-** Burreed communities are similar to other aquatic communities but have burreed as a major component. They also may be similar to some marsh or wet meadow communities but lack emergent species.



Figure 79-A freshwater aquatic burreed community of *Sparganium hyperboreum* in a shallow pool in south-central Alaska.

**Photographs-** Figure 79, this publication.

**Primary references-** Racine 1976, 1978b; Racine and Anderson 1979; Spetzman 1959.

**Communities-** *Sparganium hyperboreum* (Heusser 1960, Johnson and others 1966, Murray 1974, Spetzman 1959). *Sparganium hyperboreum-Potamogeton perfoliatus* (Hultén 1966). *Sparganium hyperboreum-Potamogeton pectinatus* (Racine 1978b, Young 1974b). *Sparganium hyperboreum-Ranunculus pallasii* (Racine 1976, Racine and Anderson 1979, Wiggins and Thomas 1962, Young 1974b).

#### **III.D.1.e. Water Milfoil**

**Description-** These communities are dominated by water milfoil (*Myriophyllum spicatum*). Common associated or codominant aquatic species include *Potamogeton* spp., *Sparganium* spp., and *Callitriche* spp. Emergent plants are absent or rare.

**Distribution and site characteristics-** Water milfoil communities are common as small stands in freshwater ponds, sloughs, oxbow lakes, and flooded depressions throughout interior, south-central, and western Alaska. They usually occur in shallow water about 10 to 100 centimeters (4 to 40 in) deep. Substrates include mud, organic-rich muck, and peat.

**Successional status-** Most of these communities probably will be replaced by marshes or wet meadows as succession advances.

**Closely related types-** Water milfoil communities are similar to other aquatic communities but have a dominant component of water milfoil. This species also is common in the understory of some marshes (dominated by *Scirpus validus* or *Equisetum fluviatile*) and the wetter parts of some wet meadows (dominated by *Menyanthes trifoliata* or various sedges), but water milfoil communities have few or no emergents.

**Photographs--** Batten and others 1978, figure 16; Dachnowski-Stokes 1941, figure 17.

**Primary references-** Racine and Anderson 1979, Ritchie and others 1981.

**Communities-** *Myriophyllum spicatum-Potamogeton perfoliatus* (Batten and others 1978, Racine 1976). *Myriophyllum spicatum-Potamogeton* spp. (Dachnowski-Stokes 1941, Ritchie and others 1981, Young 1974b). *Myriophyllum spicatum-Utricularia vulgaris* (Porsild 1939, Racine and Anderson 1979).

#### *III.D.1.f. Fresh Pondweed*

**Description-** These communities are dominated by pondweeds (*Potamogeton* spp.). Some species grow mostly submerged (*Potamogeton pectinatus*), and others extend to the water surface and have some floating leaves (*P. gramineus*). Common associated aquatic plants include *Myriophyllum spicatum*, *Hippuris vulgaris*, *Sparganium* spp., and *Callitriche* spp. *Chara* spp. may be common on mineral substrates at the bottom of clear water bodies. Emergent plants are absent or rare.

**Distribution and site characteristics--**Pondweed communities are common in freshwater lakes, ponds, and sluggish rivers throughout Alaska, except for the littoral fringe of the arctic coastal plain. They occur in 10 centimeters (4 in) to at least 3 meters (10 ft) of water and are rooted in a substrate of mud or organic-rich muck.

**Successional status-** Communities in shallow water will probably be replaced by marshes or wet meadows. Those in deep water may eventually suffer the same fate but after a much longer time.

**Closely related types-** These communities are similar to other aquatic communities, but have a dominant component of pondweeds. They are especially similar to brackish pondweed communities and sometimes contain the same species, but the brackish pondweed types are restricted to shallow ponds on the coast periodically inundated by tides. Some pondweeds are found occasionally in the understories of marsh communities, but pondweed communities contain few or no emergents.

**Primary reference-** Ritchie and others 1981.

**Communities-** *Potamogeton gramineus-P. alpinus* (Porsild 1939). *Potamogeton berchtoldi-P. alpinus* (Porsild 1939). *Potamogeton pectinatus* (Spetzman 1959). *Potamogeton filiformis-Ruppia spiralis* (Cooper 1939). *Potamogeton perfoliatus* (Ritchie and others 1981).

#### *III.D.1.g. Water Star-Wort*

**Description-** These communities are dominated or codominated by water star-wort (*Callitriche* spp.). Other aquatic plants may be associated with the star-wort, but the only one reported is *Subularia aquatica*. Emergent plants are rare or absent.

**Distribution and site characteristics-** water star-wort communities have been reported only from Amchitka Island, but small communities are probably scattered in freshwater ponds, bog pools, and shallow lake embayments throughout the State, except for the arctic coastal plain. These communities have been reported only from rock-bottomed seasonal pools, but they probably also exist in perennial water bodies with various substrates and 1 or 2 meters (3 to 6 ft) of water.

**Successional status-** Most of these communities probably are eventually replaced by marshes or wet meadows.

**Closely related types-** These communities are similar to other aquatic communities but have a dominant component of water star-wort.

**Primary reference-** Shacklette and others 1969.

Communities- *Subularia aquatica-Callitriche anceps* (Shacklette and others 1969).

#### III.D.1.h. Aquatic Cryptogam

**Description-** These are aquatic communities dominated by cryptogams. Reported dominants include the mosses *Fontinalis* spp., the liverwort *Scapania paludosa*, the lichen *Siphula ceratites*, and the vascular cryptogam *Isoetes muricata*. Other species, such as *Scorpidium scorpioides*, *Drepanocladus* spp., and *Calliergon* spp., undoubtedly also dominate certain aquatic habitats. Various aquatic vascular plants may be scattered among the cryptogamic dominants. Emergent plants are absent or rare.

**Distribution and site characteristics-** Aquatic cryptogam communities are infrequently reported, but small stands of them are common in freshwater ponds, sloughs, slow-flowing streams, and bog pools throughout the State. Substrates range from rocks to peats. Many cryptogams are facultative aquatics and can thrive for a time if the water body dries up.

**Successional status-** Many of these communities eventually will be replaced by wet meadows or bog meadows.

**Closely related types-** These may be similar to other aquatic types but are dominated by cryptogams and lack a dominant vascular element. Aquatic cryptogams also may be present or abundant in marshes, some wet meadows, and vascular aquatic plant communities.

**Primary references-** Shacklette and others 1969, Worley 1972.

**Communities-** *Fontinalis antipyretica* (Worley 1972). *Siphula ceratites-Scapania paludosa* (Shacklette and others 1969). *Isoetes Muricata-Ranunculus reptans-Limosella aquatica* (Shacklette and others 1969).

#### III.D.2. Brackish Water Aquatic Herbaceous

This unit includes aquatic communities of brackish water ponds near the sea coast.

##### III.D.2.a. Four-Leaf Marestalk

**Description-** These communities are dominated by four-leaf marestalk (*Hippuris tetraphylla*). Other aquatic species that tolerate brackish water, such as *Potamogeton pectinatus*, *Ruppia spiralis*, or *Zannichellia palustris*, may be present or common. Cryptogams are absent. Emergent plants are absent or scarce.

**Distribution and site characteristics-** Four-leaf marestalk communities are common in brackish ponds in coastal marshes throughout the State. They occur in tidally deposited mineral silts and clays in 5 to 50 centimeters (2 to 20 in) of water. The water generally is slightly brackish (1 to 10 parts per thousand salinity). These ponds are inundated periodically by tides, but many are only inundated a few times each growing season.

**Successional status-** Most of these communities eventually will be replaced by halophytic wet sedge meadows.

**Closely related types-** These communities are similar to other aquatic communities but are dominated by four-leaf marestalk. They are especially similar to common marestalk communities, which occur exclusively in fresh water,, but are dominated by four-leaf marestalk instead of common marestalk and occur in brackish, coastal settings. Four-leaf marestalk may be common in the understory of the wetter parts of some halophytic sedge wet meadow communities, but emergent plants are lacking from four-leaf marestalk communities.

**Primary references-** Batten and others 1978, del Moral and Watson 1978.

**Communities-** *Hippuris tetraphylla* (Potter 1972). *Hippuris tetraphylla-Potamogeton pectinatus* (Batten and others 1978). *Hippuris tetraphylla-Potamogeton filiformis-Myriophyllum spicatum* (Crow 1968, Isleib and Kessel 1973). *Hippuris tetraphylla-Potamogeton filiformis* (del Moral and Watson 1978, Thomas 1957).

#### *III.D.2.b. Brackish Pondweed*

**Description-** These communities are dominated by species of pondweed that tolerate brackish water, primarily *Potamogeton pectinatus* and *P. filiformis*. Wigeongrass (*Ruppia spiralis*) and horned pondweed (*Zannichellia palustris*) communities also are included. *Hippuris tetraphylla* may be present. Emergent plants are absent or rare.

**Distribution and site characteristics-Brackish** pondweed communities occupy shallow (10 to 50 centimeters [4 to 20 in] deep) brackish ponds in coastal marshes throughout Alaska, except for the Chukchi and Beaufort seacoasts. These ponds are tidally inundated several times each summer and have salinities of roughly 1 to 10 parts per thousand. The substrate consists of tidally deposited silts and clays.

**Successional status-** Most ponds containing brackish pondweed communities are replaced eventually by halophytic sedge wet meadows.

**Closely related types-** These communities are similar to fresh pondweed communities, and most of the dominant species also grow in fresh water. The brackish pondweed communities occur, however, only within or at the edges of coastal marshes and may include *Hippuris tetraphylla* or other salt-tolerant species as minor constituents. Pondweed species with broad leaves (such as *Potamogeton gramineus* and *P. perfoliatus*) never dominate brackish communities.

**Primary references-** Neiland 1971b, Palmer 1942.

**Communities-** *Myriophyllum spicatum-Potamogeton filiformis* (Crow 1968). *Potamogeton filiformis* (Crow 1968). *Potamogeton* spp. (Neiland 1971b, Palmer 1942). *Potamogeton* spp. -*Zannichellia palustris* (Rosenberg 1986).

#### *III.D.3. Marine Aquatic Herbaceous*

This unit includes communities in the ocean.



Figure 80(left)-A marine aquatic eelgrass community of *Zostera marina* in a lagoon in south-west Alaska. (Photograph courtesy Joanna Roth.)

Figure 81(right)-A marine algae community of *Fucus* spp. in coastal south-central Alaska. (Photograph courtesy Glenn Juday.)

### III.D.3.a. Eelgrass

**Description-** These communities are dominated by eelgrass (*Zostera marina*) and normally occur as pure stands of this species (fig. 80).

**Distribution and site characteristics-** Eelgrass communities occur in protected bays, inlets, and lagoons with clear water along the Alaska coast as far north as the north shore of the Seward Peninsula. They occur in the subtidal and lower intertidal zones. The substrate usually is marine silts and clays but sometimes is cobbles.

**Successional status-** These communities probably would be considered climax in most instances.

**Closely related types-** Eelgrass communities are distinctive and unlikely to be mistaken for another type except, perhaps, certain communities of marine algae. Surfgrass (*Phyllospadix scouleri*) communities occur occasionally on rocks exposed to surf in southeastern Alaska.

**Photographs-** Figure 80, this publication.

**Primary references-** Batten and others 1978, McRoy 1968, Roth 1986.

**Communities-** *Zostera marina* (Batten and others 1978, McRoy 1968, Palmer 1942, Roth 1986).

### III.D.3.b. Marine Algae

**Description-** These communities are dominated by various species of marine algae, including species of fucus, *Laminaria*, *Gigartina*, *Porphyra*, *Alaria*, and *Ulva* (fig. 81). Plants other than algae are not present.

**Distribution and site characteristics-** Marine algae communities are widespread on subtidal and intertidal rocky shores along the Pacific coast and the Aleutian Islands.

**Successional status-** Successional relations are unknown to us.

**Closely related types--** These communities are quite distinctive. Rarely, *Fucus* communities will border on and intergrade with halophytic herb communities on gravels near river mouths, but even then they usually are distinct.

**Photographs-** Lebednik and Palmisano 1977, several figures; figure 81, this publication.

**Primary references-** Batten and others 1978, Lebednik and Palmisano 1977.

**Communities-** Many communities occur, but a review of marine ecological literature is beyond the scope of this vegetation classification, which is terrestrially oriented. Species of *Fucus*, *Gigartina*, *Porphyra*, and *Ulva* are important along Alaska coasts (Batten and others 1978, Druehl 1970, Palmer 1942, Stevens 1965).

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**Table 3-List of scientific and common names used In the text**

Scientific names	Common name
Trees: <sup>a</sup>	
<i>Abies amabilis</i> (Dougl.) Forbes	Pacific silver fir
<i>Abies lasiocarpa</i> (Hook.) Nutt.	Subalpine fir
<i>Alnus rubra</i> Bong.	Red alder
<i>Betula papyrifera</i> Marsh. var. <i>humilis</i> (Reg.) Fern. & Raup	Alaska paper birch
<i>Chamaecyparis nootkatensis</i> (D. Don) Spach	Alaska-cedar
<i>Larix laricina</i> (Du Roi) K. Koch	Tamarack, larch
<i>Picea glauca</i> (Moench) Voss	White spruce
<i>Picea mariana</i> (Mill.) B.S.P.	Black spruce
<i>Picea sitchensis</i> (Bong.) Carr.	Sitka spruce
<i>Pinus cuntorta</i> Dougl.	Lodgepole pine
<i>Populus balsamifera</i> L.	Balsam poplar
<i>Populus tremuloides</i> Michx.	Quaking aspen
<i>Populus trichocarpa</i> Torr. & Gray	Black cottonwood
<i>Taxus brevifolia</i> Nutt.	Pacific yew
<i>Thuja plicata</i> Donn	Western redcedar
<i>Tsuga heterophylla</i> (Raf.) Sarg.	Western hemlock
<i>Tsuga mertensiana</i> (Bong.) Carr.	Mountain hemlock
Shrub and subshrubs: <sup>a</sup>	
<i>Alnus crispa</i> (Ait.) Pursh	American green alder
<i>Alnus sinuata</i> (Reg.) Rydb.	Sitka alder
<i>Alnus tenuifolia</i> Nutt.	Thinleaf alder
<i>Andromeda polifolia</i> L.	Bog-rosemary
<i>Arctostaphylos alpina</i> (L.) Spreng.	Alpine bearberry
<i>Arctostaphylos rubra</i> (Rehd.& Wilson) Fern.	Red-fruit bearberry
<i>Arctostaphylos uva-ursi</i> (L.) Spreng.	Bearberry, kinnikinnik
<i>Artemisia alaskana</i> Rydb.	Alaska sagebrush
<i>Artemisia frigida</i> Willd.	Fringed sagebrush
<i>Betula glandulosa</i> Michx.	Resin birch, bog birch
<i>Betula nana</i> L.	Dwarf arctic birch
<i>Cassiope lycopodioides</i> (Pall.) D. Don	Alaska cassiope
<i>Cassiope mertensiana</i> (Bong.) D. Don	Mertens cassiope
<i>Cassiope stelleriana</i> (Pall.) DC.	Starry cassiope
<i>Cassiope tetragona</i> (L.) D. Don	Four-angled cassiope
<i>Chamaedaphne calyculata</i> (L.) Moench	Leatherleaf
<i>Cladothamnus pyrolaeiflorus</i> Bong.	Copperbush
<i>Cornus stolonifera</i> Michx.	Red-osier dogwood
<i>Diapensia lapponica</i> L.	Diapensia
<i>Dryas drummondii</i> Richards.	Drummond mountain-avens
<i>Dryas integrifolia</i> Vahl	Entire-leaf mountain-avens
<i>Dryas octopetala</i> L.	White mountain-avens
<i>Elaeagnus commutata</i> Bernh.	Silverberry
<i>Empetrum nigrum</i> L.	Crowberry
<i>Gaultheria shallon</i> Pursh	Salal
<i>Kalmia polifolia</i> Wang.	Bog kalmia
<i>Ledum decumbens</i> (Ait.) Small (= <i>Ledum</i> <i>palustre</i> L. ssp. <i>decumbens</i> (Ait.) Hult.)	Narrow-leaf Labrador-tea

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**Table 3-List of scientific and common names used in the text (continued)**

Scientific names	Common name
<i>Ledum groenlandicum</i> Oeder (= <i>Ledum palustre</i> L. ssp. <i>groenlandicum</i> (Oeder) Hult.)	Labrador-tea
<i>Linnaea borealis</i> L.	Twinflower
<i>Loiseleuria procumbens</i> (L.) Desv.	Alpine-azalea
<i>Menziesia ferruginea</i> Sm.	Rusty menziesia
<i>Myrica gale</i> L.	Sweetgale
<i>Oplopanax horridus</i> (Sm.) Miq.	Devilsclub
<i>Phyllodoce aleutica</i> (Spreng.) Heller	Aleutian mountain-heath
<i>Phyllodoce aleutica</i> ssp. <i>glanduliflora</i> (Hook.): Hult.	Glandular Aleutian mountain-heath
<i>Phyllodoce coerulea</i> (L.) Bab.	Blue mountain-heath
<i>Potentilla fruticosa</i> L.	Bush cinquefoil
<i>Rhododendron camtschaticum</i> Pall.	Kamchatka rhododendron
<i>Rhododendron lapponicum</i> (L.) Wahlenb.	Lapland rosebay
<i>Ribes triste</i> Pall.	American red currant
<i>Rosa acicularis</i> Lindl.	Prickly rose
<i>Rubus idaeus</i> L. var. <i>strigosus</i> (Michx.) Maxim.	American red raspberry
<i>Rubus spectabilis</i> Pursh	Salmonberry
<i>Salix alaxensis</i> (Anderss.) Cov.	Feltleaf willow
<i>Salix arbusculooides</i> Anderss.	Littletree willow
<i>Salix arctica</i> Pall.	Arctic willow
<i>Salix barclayi</i> Anderss.	Barclay willow
<i>Salix bebbiana</i> Sarg.	Bebb willow
<i>Salix brachycarpa</i> Nutt. ssp. <i>niphoclada</i> (Rydb.) Argus	Barren-ground willow
<i>Salix commutata</i> Bebb	Undergreen willow
<i>Salix fuscescens</i> Anderss.	Alaska bog willow
<i>Salix glauca</i> L.	Grayleaf willow
<i>Salix hastata</i> L.	Halberd willow
<i>Salix interior</i> Rowlee	Sandbar willow
<i>Salix lanata</i> L. ssp. <i>richardsonii</i> (Hook.) A. Skwartz.	Richardson willow
<i>Salix lasiandra</i> Benth.	Pacific willow
<i>Salix novae-angliae</i> Anderss.	Tall blueberry willow
<i>Salix ovalifolia</i> Trautv.	Ovalleaf willow
<i>Salix phlebophylla</i> Anderss.	Skeletonleaf willow
<i>Salix planifolia</i> Pursh ssp. <i>pulchra</i> (Cham.) Argus	Diamondleaf willow
<i>Salix polaris</i> Wahlenb. ssp. <i>pseudopolaris</i> (Flod.) Hult.	Polar willow
<i>Salix reticulata</i> L.	Netleaf willow
<i>Salix rotundifolia</i> Trautv.	Least willow
<i>Salix sitchensis</i> Sanson	Sitka willow
<i>Sambucus callicarpa</i> Greene	Pacific red elder
<i>Shepherdia canadensis</i> (L.) Nutt.	Buffaloberry
<i>Sorbus sitchensis</i> Roem.	Sitka mountain-ash
<i>Spiraea douglasii</i> Hook.	Douglas spirea
<i>Spiraea beauverdiana</i> Schneid.	Beauverd spirea
<i>Vaccinium alaskaense</i> Howell	Alaska blueberry
<i>Vaccinium caespitosum</i> Michx.	Dwarf blueberry

**Table 3-List of scientific and common names used in the text (continued)**

Scientific names	Common name
<i>Vaccinium ovalifolium</i> Sm.	Early blueberry
<i>Vaccinium oxycoccos</i> L.	Bog cranberry
<i>Vaccinium parvifolium</i> Sm .	Red huckleberry
<i>Vaccinium uliginosum</i> L.	Bog blueberry
<i>Vaccinium vitis-idaea</i> L.	Mountain-cranberry
<i>Viburnum edule</i> (Michx.) Raf.	High bushcranberry
Herbs: <sup>b</sup>	
<i>Achillea borealis</i> Bong.	Northern yarrow
<i>Aconitum delphinifolium</i> DC.	Monkshood
<i>Aconitum maximum</i> Pall.	Kamchatka aconite
<i>Agropyron boreale</i> (Turcz.) Drobov (= <i>Agropyron latiglume</i> (Scribn. & Sm.) Rydb.)	Northern wheatgrass
<i>Agropyron pauciflorum</i> (Schwein.) Hitchc.	Few-flowered wheatgrass
<i>Agropyron spicatum</i> (Pursh) Scribn. & Sm.	Bluebunch wheatgrass
<i>Agropyron subsecundum</i> (Link) Hitchc.	Wheatgrass
<i>Agrostis borealis</i> Hartm.	Red bentgrass
<i>Alopecurus alpinus</i> Sm.	Alpine/foxtail
<i>Androsace</i> L.	No common name
<i>Anemone narcissiflora</i> L.	Narcissus-flowered anemone
<i>Angelica genuflexa</i> Nutt.	Bent-leaved angelica
<i>Angelica lucida</i> L.	Sea coast angelica
<i>Antennaria rosea</i> Greene	Pussytoe
<i>Aquilegia formosa</i> Fisch.	Western columbine
<i>Arabis holboellii</i> Hornem.	No common name
<i>Arctagrostis latifolia</i> (R.Br.) Griseb.	Polar grass
<i>Arctophila fulva</i> (Trin.) Anders.	Pendent grass
<i>Arnica unalaschcensis</i> Less.	No common name
<i>Artemisia arctica</i> Less.	Arctic wormwood
<i>Artemisia arctica</i> Less. ssp. comata (Rydb.) Hult.	No common name
<i>Artemisia borealis</i> Pall.	Northern wormwood
<i>Artemisia tilesii</i> Ledeb.	No common name
<i>Astragalus alpinus</i> L.	Alpine milk vetch
<i>Astragalus nutzotinensis</i> Rousseau	Sickle pod
<i>Athyrium filix-femina</i> (L.) Roth	Lady fern
<i>Atriplex gmelini</i> C.A. Mey.	Orach, spearscale
<i>Blechnum spicant</i> (L.) Roth	Deer fern
<i>Botrychium</i> L.	Moonwort
<i>Bromus pumpellianus</i> Scribn.	Brome grass
<i>Bupleurum triradiatum</i> Adams	Thorough-won
<i>Calamagrostis canadensis</i> (Michx.) Beauv.	Bluejoint
<i>Calamagrostis deschampsoides</i> Trin.	No common name
<i>Calamagrostis nutkaënsis</i> (Presl) Steud.	Pacific reed-grass
<i>Calamagrostis purpurascens</i> R. Br.	Purple reed-grass
<i>Callitriche anceps</i> Fern.	Water star-wart
<i>Callitriche verna</i> L. emend. Lönnr.	Vernal water star-won
<i>Caltha biflora</i> DC.	Broad-leaf marsh-marigold
<i>Caltha palustris</i> L.	Yellow marsh-marigold

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**Table 3-List of scientific and common names used in the text (continued)**

Scientific names	Common name
<i>Campanula lasiocarpa</i> Cham.	Bellflower
<i>Cardamine bellidifolia</i> L.	Alpine bittercress
<i>Cardamine umbellata</i> Greene	Bittercress
<i>Carex</i> L.	Sedge
<i>Carex anthoxanthea</i> Presl	No common name
<i>Carex aquatilis</i> Wahlenb.	Water sedge
<i>Carex bigelowii</i> Torr.	Bigelow sedge
<i>Carex canescens</i> L.	Silvery sedge
<i>Carex capillaris</i> L.	Hair-like sedge
<i>Carex chordorrhiza</i> Ehrh.	Creeping sedge
<i>Carex circinnata</i> CA. Mey.	Coiled sedge
<i>Carex franklinii</i> Boott	No common name
<i>Carex glacialis</i> Mack.	Glacier sedge
<i>Carex glareosa</i> Wahlenb.	Weak cluster sedge
<i>Carex kelloggii</i> W. Boott	Kellogg sedge
<i>Carex lachenalii</i> Schkuhr	Arctic hares-foot sedge
<i>Carex lasiocarpa</i> Ehrh.	No common name
<i>Carex limosa</i> L.	Shore sedge
<i>Carex livida</i> (Wahlenb.) Willd.	Livid sedge
<i>Carex lyngbyaei</i> Hornem.	Lyngbye sedge
<i>Carex mackenziei</i> Krecz.	Mackenzie sedge
<i>Carex macrochaeta</i> C.A. Mey.	Alaska long-awned sedge
<i>Carex magellanica</i> Lam.	Bog sedge
<i>Carex membranacea</i> Hook.	Fragile sedge
<i>Carex microchaeta</i> Holm	No common name
<i>Carex microglochin</i> Wahlenb.	False uncinia
<i>Carex misandra</i> R. Br.	Short-leaved sedge
<i>Carex nardina</i> E. Fries	Hepburn sedge
<i>Carex nesophila</i> Holm	Bering Sea sedge
<i>Carex nigricans</i> C.A. Mey.	Blackish sedge
<i>Carex pauciflora</i> Lightf.	Few-flowered sedge
<i>Carex pluriflora</i> H u It.	Many-flowered sedge
<i>Carex podocarpa</i> R.Br.	Short-stalk sedge
<i>Carex ramenskii</i> Kom.	Ramenski sedge
<i>Carex rariflora</i> (Wahlenb.) J.E. Sm.	Loose-flowered alpine sedge
<i>Carex rostrata</i> Stokes	Beaked sedge
<i>Carex rotundata</i> Wahlenb.	Round-fruited sedge
<i>Carex rupestris</i> All.	Rock sedge
<i>Carex saxatilis</i> L.	No common name
<i>Carex scirpoidea</i> Michx.	Northern single-spike sedge
<i>Carex sitchensis</i> Prescott	Sitka sedge
<i>Carex subspathacea</i> Wormsk.	Hoppner sedge
<i>Carex supina</i> Willd.	No common name
<i>Carex ursina</i> Dew.	No common name
<i>Carex vaginata</i> Tausch	Sheathed sedge
<i>Cerastium aleuticum</i> Hult.	Aleutian chickweed
<i>Chrysanthemum arcticum</i> L.	Arctic daisy
<i>Cicuta mackenzieana</i> Raup	Water hemlock
<i>Circaea alpina</i> L.	Enchanter's nightshade
<i>Claytonia sarmentosa</i> C.A. Mey.	Spring beauty
<i>Claytonia sibirica</i> L.	Siberian spring beauty

**Table 3-List of scientific and common names used in the text (continued)**

Scientific names	Common name
<i>Cochlearia officinalis</i> L.	Scurvy grass
<i>Coptis aspleniifolia</i> Salisb.	Goldthread
<i>Coptis trifolia</i> (L.) Salisb.	Goldthread
<i>Cornus canadensis</i> L.	Bunchberry, dwarf dogwood
<i>Crepis nana</i> Richards.	Dwarf hawks-beard
<i>Cystopteris fragilis</i> (L.) Bernh.	Fragile fern
<i>Delphinium glaucum</i> S.Wats.	Glaucous larkspur
<i>Deschampsia beringensis</i> Hult.	Bering hair-grass
<i>Deschampsia caespitosa</i> (L.) Beauv.	Tufted 'hair-grass
<i>Dodecatheon jeffreyi</i> Van Houtte	Jeffrey's shooting star
<i>Dodecatheon pulchellum</i> (Raf.) Merr.	Pretty shooting star
<i>Draba aleutica</i> Ekman	Aleutian draba
<i>Draba caesia</i> Adams	No common name
<i>Draba hyperborea</i> (L.) Desv.	No common name
<i>Drosera anglica</i> Huds.	Long-leaved sundew
<i>Drosera rotundifolia</i> L.	Round leaved sundew
<i>Dryopteris dilatata</i> (Hoff m.) Gray	Spinulose shield-fern
<i>Dupontia fischeri</i> R. Br.	Tundra grass, dupontia
<i>Eleocharis palustris</i> (L.) Roem. & Schult.	Spike rush
<i>Elymus arenarius</i> L.	Dunegrass
<i>Elymus innovatus</i> Beal	Downy ryegrass
<i>Epilobium adenocaulon</i> Haussk.	Northern willow-herb
<i>Epilobium angustifolium</i> L.	Fireweed
<i>Epilobium latifolium</i> L.	Dwarf fireweed
<i>Equisetum arvense</i> L.	Meadow horsetail
<i>Equisetum fluviatile</i> L. ampl. Ehrh.	Swamp horsetail
<i>Equisetum palustre</i> L.	Marsh horsetail
<i>Equisetum pratense</i> Ehrh.	Meadow horsetail
<i>Equisetum sylvaticum</i> L.	Woodland horsetail
<i>Equisetum variegatum</i> Schleich.	Variiegated scouring-rush
<i>Erigeron peregrinus</i> (Pursh) Greene	Coastal fleabane
<i>Eriogonum flavum</i> Nutt.	Umbrella plant
<i>Eriophorum angustifolium</i> Honck.	Tall cottongrass
<i>Eriophorum brachyantherum</i> Trautv. & Mey.	No common name
<i>Eriophorum russeolum</i> E. Fries	Russett cottongrass
<i>Eriophorum scheuchzeri</i> Hoppe	White cottongrass
<i>Eriophorum vaginatum</i> L.	Tussock cottongrass
<i>Fauria crista-galli</i> (Menzies) Makino	Deer cabbage
<i>Festuca altaica</i> Trin.	Fescue grass
<i>Festuca brachyphylla</i> Schult.	Sheep fescue
<i>Festuca rubra</i> L.	Red fescue
<i>Fritillaria camschatcensis</i> (L.) Ker-Gawl.	Black lily, indian rice
<i>Galium boreale</i> L.	Northern bedstraw
<i>Galium trifidum</i> L.	Small bedstraw
<i>Gentiana douglasiana</i> Bong.	Swamp gentian
<i>Geocaulon lividum</i> (Richards.) Fern.	Northern commandra
<i>Geranium erianthum</i> DC.	Northern geranium
<i>Geum calthifolium</i> Menzies	Caltha-leaved avens
<i>Geum glaciale</i> Adams	Glacier avens
<i>Geum macrophyllum</i> Willd.	Large-leaved avens
<i>Geum rossii</i> (R. Br.) Ser.	Ross avens

**Table 3-List of scientific and common names used in the text (continued)**

Scientific names	Common name
<i>Glaux maritima</i> L.	Sea milkwort
<i>Glyceria borealis</i> (Nash) Batchelder	Northern manna grass
<i>Goodyera repens</i> (L.) R. Br.	Rattlesnake plantain
<i>Gymnocarpium dryopteris</i> (L.) Newm.	Oak fern
<i>Hedysarum alpinum</i> L.	Alpine sweet-vetch
<i>Hedysarum mackenzii</i> Richards.	Northern sweet-vetch
<i>Heracleum lanatum</i> Michx.	Cow parsnip
<i>Hierochloë alpina</i> (Sw.) Roem. & Schult.	Alpine holygrass
<i>Hippuris tetraphylla</i> L.	Four-leaf maretail
<i>Hippuris vulgaris</i> L.	Common maretail
<i>Honckenya peploides</i> (L.) Ehrh:	Seabeach sandwort
<i>Hordeum brachyantherum</i> Nevski	Meadow barley
<i>Iris setosa</i> Pall.	Wild Iris
<i>Isoëtes muricata</i> Dur.	Quillwort
<i>Juncus arcticus</i> Willd.	Arctic rush
<i>Kobresia myosuroides</i> (Vill.) Fiori & Paol.	No common name
<i>Kobresia simpliciuscula</i> (Whalenb.) Mack.	No common name
<i>Koenigia islandica</i> L.	Koenigia
<i>Lathyrus maritimus</i> L.	Beach pea
<i>Lathyrus palustris</i> L.	Wild-pea
<i>Leptarrhena pyrolifolia</i> (D. Don) Ser.	Leatherleaved saxifrage
<i>Ligusticum scoticum</i> L.	Beach lovage
<i>Limosella aquatica</i> L.	Mudwort
<i>Luetkea pectinata</i> (Pursh) Kuntze	Luetkea
<i>Lupinus arcticus</i> S. Wats.	Arctic lupine
<i>Lupinus nootkatensis</i> Donn	Nootka lupine
<i>Luzula confusa</i> Lindeb.	Wood rush
<i>Luzula tundricola</i> Gorodk.	Tundra woodrush
<i>Lycopodium alpinum</i> L.	Alpine club moss
<i>Lycopodium complanatum</i> L.	Ground-cedar
<i>Lysichiton americanum</i> Hult. & St. John	Yellow skunk cabbage
<i>Maianthemum dilatatum</i> (How.) Nels. & Macbr.	False lily-of-the-valley
<i>Menyanthes trifoliata</i> L.	Buckbean
<i>Mertensia maritima</i> (L.) S.F. Gray	Oysterleaf
<i>Mertensia paniculata</i> (Ait.) G. Don	Bluebell
<i>Minuartia arctica</i> (Stev.) Aschers. & Graebn.	Arctic sandwort
<i>Myriophyllum spicatum</i> L.	Water milfoil
<i>Nuphar polysepalum</i> Engelm.	Yellow pondlily
<i>Nymphaea tetragona</i> Georgi	Dwarf waterlily
<i>Oxyria digyna</i> (L.) Hill	Mountain sorrel
<i>Oxytropis borealis</i> . DC:	Boreal oxytrope
<i>Oxytropis deflexa</i> (Pall.) DC.	Deflexed oxytrope
<i>Oxytropis nigrescens</i> (Pall.) Fisch.	Blackish oxytrope
<i>Parnassia kotzebuei</i> Cham. & Schlecht.	Kotzebue grass-of-parnassus
<i>Pedicularis labradorica</i> Wirsing	Labrador lousewort
<i>Petasites frigidus</i> (L.) Franch..	Arctic sweet coltsfoot
<i>Phippsia algida</i> (Soland.) R. Br.	Snow grass
<i>Phyllospadix scouleri</i> Hook.	Scouler's surfgrass
<i>Plantago maritima</i> L.	1 Goose-tonque
<i>Platanthera</i> L.C. Rich.	Bog orchid
<i>Poa arctica</i> R. Br.	Arctic bluegrass

**Table 3-List of scientific and common names used in the text (continued)**

Scientific names	Common name
<i>Poa eminens</i> Presl	Coastal bluegrass
<i>Poa glauca</i> M.Vahl	Glaucous bluegrass
<i>Polemonium acutiflorum</i> Willd.	Blue Jacob's ladder
<i>Polemonium boreale</i> Adams	Northern Jacob's ladder
<i>Polygonum amphibium</i> L.	Water smartweed
<i>Polygonum bistorta</i> L.	Meadow bistort
<i>Polygonum viviparum</i> L.	Alpine bistort
<i>Polystichum munitum</i> (Kaulf.) Presl.	Sword fern
<i>Potamogeton alpinus</i> Balb.	Northern pondweed
<i>Potamogeton berchtoldi</i> Fieb.	Berchtold pondweed
<i>Potamogeton filiformis</i> Pers.	Filiform pondweed
<i>Potamogeton gramineus</i> L.	Grasslike pondweed
<i>Potamogeton natans</i> L.	Floating pondweed
<i>Potamogeton pectinatus</i> L.	Fennel-leaf pondweed
<i>Potamogeton perfoliatus</i> L.	Clasping-leaf pondweed
<i>Potentilla biflora</i> Willd.	Two-flowered cinquefoil
<i>Potentilla egedii</i> Wormsk.	Common silverweed
<i>Potentilla elegans</i> Cham.,& Schlecht.	Elegant cinquefoil
<i>Potentilla hyparctica</i> Malte	Arctic cinquefoil
<i>Potentilla palustris</i> (L.) Scop.	Marsh fivefinger
<i>Potentilla pennsylvanica</i> L.	Pennsylvania cinquefoil
<i>Potentilla vahliana</i> Lehm.	One-flowered cinquefoil
<i>Potentilla villosa</i> Pall.	Villous cinquefoil
<i>Prenanthes alata</i> (Hook.) Dietr.	Rattlesnake root
<i>Primula cuneifolia</i> Ledeb.	Wedge-leaf primrose
<i>Primula tschuktschorum</i> Kjellm.	Chukch primrose
<i>Puccinellia andersonii</i> Swallen	Anderson alkali grass
<i>Puccinellia borealis</i> Swallen	Northern alkali grass
<i>Puccinellia glabra</i> Swallen	Glabrous alkali grass
<i>Puccinellia grandis</i> Swallen	-Large alkali grass
<i>Puccinellia phryganodes</i> (Trin.) Scribn. & Merr.	Creeping alkali grass
<i>Puccinellia nutkaënsis</i> (Presl) Fern. & Weath.	Pacific alkali grass
<i>Pulsatilla patens</i> (L.) Mill.	Pasqueflower
<i>Pyrola asarifolia</i> Michx.	Liverleaf wintergreen
<i>Pyrola grandiflora</i> Radius	Large-flowered wintergreen
<i>Pyrola secunda</i> L.	One-sided wintergreen
<i>Ranunculus gmelini</i> DC.	No common name
<i>Ranunculus hyperboreus</i> Rottb.	Arctic buttercup
<i>Ranunculus pallasii</i> Schlecht.	Pallas buttercup
<i>Ranunculus reptans</i> L.	Creeping buttercup
<i>Ranunculus trichophyllus</i> Chaix.	White water crowfoot
<i>Rhynchospora alba</i> (L.) M. Vahl	Beak rush
<i>Rubus arcticus</i> L.	Nagoon-berry
<i>Rubus chamaemorus</i> L.	Cloudberry
<i>Rubus pedatus</i> Sm.	Five-leaf bramble
<i>Ruppia spiralis</i> L.	Ditch grass
<i>Salicornia europaea</i> L.	Glasswort
<i>Sanguisorba stipulata</i> Raf.	Sitka burnet
<i>Saxifraga bracteata</i> D. Don	No common name

**Table 3-List of scientific and common names used in the text (continued)**

Scientific names	Common name
<i>Saxifraga bronchialis</i> L.	Spotted saxifrage
<i>Saxifraga hirculus</i> L.	Bog saxifrage
<i>Saxifraga oppositifolia</i> L.	Purple mountain saxifrage
<i>Saxifraga punctata</i> L.	Cordate-leaved saxifrage
<i>Saxifraga rivularis</i> L.	Brook saxifrage
<i>Saxifraga tricuspidata</i> Rottb.	Prickly saxifrage
<i>Scirpus microcarpus</i> Presl.	Small-fruit bullrush
<i>Scirpus paludosus</i> Nels.	Bayonet-grass
<i>Scirpus validus</i> M. Vahl	Great bulrush
<i>Sedum rosea</i> (L.) Scop.	Roseroot
<i>Senecio congestus</i> (R. Br.) DC.	Marsh fleabane
<i>Senecio pseudo-arnica</i> Less.	No common name
<i>Senecio triangularis</i> Hook.	No common name
<i>Sibbaldia procumbens</i> L.	Sibbaldia
<i>Silene acaulis</i> L.	Moss campion
<i>Silene menziesii</i> Hook.	No common name
<i>Smelowskia</i> C.A. Mey.	No common name
<i>Solidago multiradiata</i> Ait.	Goldenrod
<i>Sparganium angustifolium</i> Michx.	Narrow-leaved burreed
<i>Sparganium hyperboreum</i> Laest.	Northern burreed
<i>Sparganium multipedunculatum</i> (Morong) Rydb.	Emerald burreed
<i>Spergularia canadensis</i> (Pers.) G. Don	Canada sand-spurry
<i>Stellaria humifusa</i> Rottb.	Low chickweed
<i>Streptopus amplexifolius</i> (L.) DC.	Twisted-stalk
<i>Suaeda depressa</i> (Pursh) S. Wats.	Sea blite
<i>Subularia aquatica</i> L.	Awlwort
<i>Thalictrum minus</i> L.	Meadow rue
<i>Tiarella trifoliata</i> L.	Lace flower
<i>Tofieldia coccinea</i> Richards.	Northern asphodel
<i>Trichophorum caespitosum</i> (L.) Hartm. (= <i>Scirpus caespitosus</i> L.)	Tufted clubrush
<i>Trientalis europaea</i> L.	Starflower
<i>Triglochin maritimum</i> L.	Maritime arrow grass
<i>Triglochin palustris</i> L.	Marsh arrow grass
<i>Trisetum spicatum</i> (L.) Richter	Downy oatgrass
<i>Utricularia vulgaris</i> L.	Common bladderwort
<i>Vahlodea atropurpurea</i> (Wahlenb.) E. Fries (= <i>Deschampsia atropurpurea</i> (Wahlenb.) Scheele)	Mountain hair-grass
<i>Valeriana sitchensis</i> Bong.	Sitka valerian
<i>Veratrum viride</i> Ait.	False hellebore
<i>Veronica stelleri</i> Pall.	Alpine speedwell
<b>Viola</b> <i>langsдорffii</i> Fisch.	Langsdorff violet
<i>Wilhelmsia physodes</i> (Fisch.) McNeill	Merckia
<i>Zannichellia palustris</i> L.	Horned pondweed
<i>Zostera marina</i> L.	Eelgrass

**Table 3-List of scientific and common names used In the text (continued)**

Scientific names	Common name
Bryophytes: <sup>c</sup>	
<i>Andreaea rupestris</i> Hedw.	No common name
<i>Anthelia juiacea</i> (L.) Dum.	No common name
<i>Aulacomnium palustre</i> (Hedw.) Schwaegr.	No common name
<i>Aulacomnium turgidum</i> (Wahlenb.) Schwaegr.	No common name
<i>Brachythecium albicans</i> (Hedw.) B.S.G.	No common name
<i>Bryum stenotrichum</i> C. Muell.	No common name
<i>Calliergon giganteum</i> (Schimp.) Kindb.	No common name
<i>Calliergon sarmentosum</i> (Wahlenb.) Kindb.	No common name
<i>Campylium stellatum</i> (Hedw.) C. Jens.	No common name
<i>Dicranoweisia cirrata</i> (Hedw.) Lindb. ex Milde	No common name
<i>Dicranum scoparium</i> Hedw.	No common name
<i>Distichium capillaceum</i> (Hedw.) B.S.G.	No common name
<i>Drepanocladus lycopodioides</i> (Brid.) Warnst.	No common name
<i>Drepanocladus revolvens</i> (Sw.) Warnst.	No common name
<i>Drepanocladus uncinatus</i> (Hedw.) Warnst.	No common name
<i>Fontinalis antipyretica</i> Hedw.	No common name
<i>Fontinalis neomexicana</i> Sull. & Lesq.	No common name
<i>Grimmia apocarpa</i> Hedw. (= <i>Schistidium apocarpum</i> )	No common name
<i>Gymnocolea acutiloba</i> (Schiffn.) K. Müll	No common name
<i>Hylocomium splendens</i> (Hedw.) B.S.G.	Feathermoss
<i>Marsupella emarginata</i> (Ehrh.) Dum.	No common name
<i>Mnium</i> Hedw.	No common name
<i>Nardia compressa</i> (Hook.) S. Gray	No common name
<i>Nardia scalaris</i> S. Gray	No common name
<i>Oncophorus wahlenbergii</i> Brid	No common name
<i>Philonotis fontana</i> (Hedw.) Brid.	No common name
<i>Plagiothecium undulatum</i> (Hedw.) B.S.G.	No common name
<i>Pleuroclada albescens</i> (Hook.) Spruce	No common name
<i>Pleurozium schreberi</i> (Brid.) Mitt.	Feathermoss
<i>Polytrichum juniperinum</i> Hedw.	No common name
<i>Ptilium crista-castrensis</i> (Hedw.) De Not.	No common name
<i>Rhacomitrium canescens</i> (Hedw.) Brid.	No common name
<i>Rhacomitrium lanuginosum</i> (Hedw.) Brid.	No common name
<i>Rhytidiadelphus loreus</i> (Hedw.) Warnst.	No common name
<i>Rhytidiadelphus triquetrus</i> (Hedw.) Warnst.	Feathermoss
<i>Rhytidium rugosum</i> (Hedw.) Kindb.	No common name
<i>Scapania paludosa</i> (K. Mull) K. Mull	No common name
<i>Scorpidium scorpioides</i> (Hedw.) Limpr.	No common name
<i>Sphagnum</i> L.	Sphagnum moss
<i>Sphagnum fuscum</i> (Schimp.) Klinggr.	Sphagnum moss
<i>Sphagnum girgensohnii</i> Russ.	Sphagnum moss
<i>Sphagnum lindbergii</i> Schimp. ex Lindb.	Sphagnum moss
<i>Sphagnum mageilanicum</i> Brid.	Sphagnum moss
<i>Sphagnum papillosum</i> Lindb.	Sphagnum moss
<i>Sphagnum riparium</i> Angstr.	Sphagnum moss

Footnote on page 253.

**Table 3-List of scientific and common names used in the text (continued)**

(Scientific 'names	Common name
<i>Sphagnum recurvum</i> P.-Beauv.	Sphagnum moss
<i>Sphagnum squarrosum</i> Crome	Sphagnum moss
<i>Sphagnum tenellum</i> Ehrh. ex Hoffm.	Sphagnum moss
<i>Sphagnum teres</i> (Schimp.) Angstr. ex C. Hartm.	Sphagnum moss
<i>Sphagnum warnstorffii</i> Russ.	Sphagnum moss
<b><i>Tomenthypnum nitens</i></b> (Hedw.) Loeske	No common, name
<i>Ulota phyllantha</i> Brid.	No comm.on name
Lichens: <sup>d</sup>	
<i>Alectoria nigricans</i> (Ach.) Nyl.	No common name
<i>Cetraria cuctillata</i> (Bellardi) Ach.	No common name
<i>Cetraria delisei</i> (Bory ex. Schaerer) Nyl.	No common name
<i>Cetraria islandica</i> (L.) Ach.	No common name
<i>Cetraria nivalis</i> (L.) Ach.	No common name
<i>Cladina arbuscula</i> (Wallr.) Hale & Culb.	No common name
<i>Cladina portentosa</i> (Dufour) Follm. (= <i>Cladina impexa</i> B. de Lesd.)	No common name
<i>Cladina rangiferina</i> (L.) Nyl. (= <i>Cladonia rangiferina</i> (L.) Rabenh.)	Reindeer lichen
<i>Cladina stellaris</i> (Opiz) Brodo (= <i>Cladina alpestris</i> . (L.) Nyl.) (=, <i>Cladonia alpestris</i> (L.) Rabenh.)	No common name
<i>Cladonia</i> Hill ex Browne	No common name
<i>Cladonia pyxidata</i> , (L.) Hoffm.	No common name
<i>Cornicularia</i> (Schreber) Hoffm.	No common name
<i>Dactylina arctica</i> (Richardson) Nyl.	No common name
<i>Lecanora</i> Ach. in Luyken	No common name
<i>Masonhalea richardsonii</i> (Hook.) Kärnef. (= <i>Cetraria richardsonii</i> Hook.)	No common name
<i>Nephroma arcticum</i> (L.) Torss.	No common name
<i>Parmelia saxatilis</i> (L.) Ach.	No common name
<i>Peltigera</i> Willd.	No common name
<i>Peltigera aphthosa</i> (L.) Willd.	No common name
<i>Peltigera canina</i> (L.) Willd.	Dog lichen
<i>Pseudephebe</i> M. Choisy	No common name
<i>Ramalina almqvistii</i> Vainio	No common name
<i>Ramalina scoparia</i> Vainio	No common name
<i>Rhizocarpon</i> Ramond ex DC.	No common name
<i>Siphula ceratites</i> (Wahlenb.) Fr.	No common name
<i>Sphaerophorus fragilis</i> (L.) Pers.	No common name
<i>Sphaerophorus globosus</i> (Huds.) Vainio	No common name
<i>Stereocaulon tomentosum</i> Fr.	No common name
<i>Thamnia subuliformis</i> (Ehrh.) Culb.	No common name
<i>Thamnia vermicularis</i> (Swartz) Ach. ex Schaerer	Worm lichen
<i>Umbilicaria proboscidea</i> (L.) Schrader	No common. name
<i>Xanthoria candelaria</i> (L.) Th.. Fr.	No common name

**Table 3-List of scientific and common names used in the text (continued)**

Scientific names	Common name
Algae: <sup>e</sup>	
<i>Alaria</i> Grev.	No common name
<i>Chara</i> Valliant	No common name
<i>Fucus distichus</i> L.	No. common name
<i>Gigartina</i> Stackh.	No common name
<i>Laminaria</i> Lamour.	No common name
<i>Pophyra</i> C.A.	No common name
<i>Ulva</i> L.	No common name

<sup>a</sup> Nomenclature from Viereck and Little (1972).

<sup>b</sup> Nomenclature from Hulten (1968): some common names from Welsh (1974).

<sup>c</sup> Nomenclature from Crum and others (1973) for mosses and Stotler and Crandall-Stotler (1977) for hepatics.

<sup>d</sup> Nomenclature from Egan (1987).

<sup>e</sup> Nomenclature-for marine algae from Smith (1969) and for freshwater algae Smith (1950).

## Glossary<sup>1</sup>

**Abundance-** (1) The total number of individuals of a species in an area, population, or community; (2) total number of individuals in a sample divided by the number of occupied sampling units gives relative abundance; (3) also may be expressed subjectively on a five-part scale as very rare, rare, infrequent, abundant, and very abundant.

**Active layer-** The layer of soil above the permafrost that thaws and freezes annually.

**Age distribution-** The classification of individuals of a population according to age classes or periods, such as prereproductive, reproductive, and postreproductive, or into numerical intervals such as 10-year age classes

**All-aged-** Applied to a stand of trees in which trees of all ages are found.

**Alluvial-** Refers to material transported and deposited by running water.

**Alluvial soil-** Soil that has developed from transported and relatively recently deposited material (alluvium), characterized by little or no modification of the original material by soil-forming processes.

**Alluvium-** A general term for all detrital material deposited or in transit by streams, including gravel, sand, silt, clay, and all variations and mixtures of these.

**Alpine-** (1) Refers to those portions of mountain landscapes above tree growth, or the organisms living there; (2) that vegetation 'occurring between the upper limit of trees (tree line) and the lower limit of snow (snowline) on mountains high enough to possess both of these features; (3) implies high elevation, particularly above tree line, and a cold climate.

**Alpine meadow-** (1) A dense, low, meadowlike type of herbaceous plant cover found above tree line; (2) low herbaceous vegetation dominated by grasses, sedges, and other herbs in the alpine zone; (3) nearly synonymous with alpine grassland.

**Alpine tundra-** That portion of the landscape above the upper limit of tree growth that supports a plant cover of dwarf shrubs and herbs.

**Annual plant-** A plant completing its life cycle and dying in 1 year or less; for example, *Bromus tectorum*.

**Aquatic plant, emerged or emersed-** A plant adapted to life with its lower parts submerged in water, its upper parts raised out of water.

**Aquatic plant, immersed-** A plant adapted for life submerged or almost submerged in water; for example, *Myriophyllum* spp.

**Aquatic sites-** Sites permanently or at least characteristically flooded where all dominant plants are aquatics with floating or submerged leaves; for example, species of *Potamogeton*, *Hippuris*, *Myriophyllum*, and several others. Depth of water is not significant but its persistence is.

**Arctic-** High-latitude region where tree growth usually is absent because of unfavorable environmental conditions (low temperatures, short growing season) and more or less following the 10 °C mean daily isotherm for the warmest month of the year. In general, north of 67° N. latitude; sometimes defined in Alaska as north of the "P-Y-K Line," or north of the Porcupine, Yukon, and Kuskokwim Rivers.

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<sup>1</sup> Definitions for terms are from Gabriel and Talbot (1984).

**Association, plant-** A stand or group of stands made up of plants characterized by a definite floristic composition consisting of uniformity in physiognomy and structure and uniform habitat conditions. The term generally is reserved for a climax community.

**Avalanche track-** The central, channellike corridor along which an avalanche has moved; it may take the form of an open path in a forest, with bent and broken trees, or an eroded surface marked by pits, scratches, and grooves.

**Barren-** (1) An area devoid of trees or tall shrubs, as in the Canadian "barren ground" terminology for tundra; (2) an area devoid of vegetation or nearly so.

**Beach-** Depositional area at the shore of an ocean or lake covered by silt, sand, gravel or larger rock fragments and extending into the water for some distance. The zone of demarcation between land and water.

**Bedrock-** The solid rock underlying the soil and other unconsolidated material or that is exposed at the surface.

**Biennial plant-** A plant requiring 2 years to complete its life cycle; for example, raspberries.

**Biomass-** (1) The total amount of living material present in a particular area or habitat (community biomass) at any given time on a per-unit-area basis expressed in terms of either mass ( $\text{g}/\text{m}^2$ ,  $\text{kg}/\text{ha}$ ) or energy ( $\text{cal}/\text{m}^2$ ); (2) an expression of the total weight of matter incorporated into a population of organisms (species biomass).

**Biome-** A continental-scale ecosystem characterized by similarities in plant life-form and environment (for example, tundra or coniferous forest) but including all plants and animals in the area.

**Bog-** (1) A peat-forming ecosystem influenced solely by water falling directly onto it as rain or snow and generally dominated by sphagnum mosses; (2) a peat-covered or peat-filled area, generally with a high water table dominated by mosses, especially sphagnum—although the water table is near the surface, there is little standing water except in ponds; (3) in Alaska, bog vegetation may be predominantly herbs, shrubs, or trees with *Sphagnum* spp. usually present and often dominating the moss layer; substrate is composed of very wet sedge peat or sphagnum peat with depth of peat ranging from 30 centimeters (12 in) to several meters.

**Basin bog-** A bog that has built up to the water level in a lake or an old river channel, and the upper surface of the peat is either horizontal or gently sloping.

**Blanket bog-** Term used in Britain for bog covering undulating semiuplands: (1) bogs of cool temperate regions formed under a maritime rainfall at lower elevations; (2) bogs that have developed on hills under high rainfall and low temperatures as in southeastern Alaska.

**Ericaceous shrub bog-** Sites in Alaska on wet, peaty soils on which ericaceous shrubs are codominant with sedges, mosses, other shrubs, or trees. Trees, when present, provide less than 25 percent of the cover. Peats may be either sedge or sphagnum, and accumulations range from 15 centimeters (6 in) to 12 meters (39 ft).

**Flat raised bog-** A bog having a tendency for peat growth to extend up the sloping valley sides, thereby leaving the boundary between bog and valley side poorly marked.

**Lacustrine bog-** The transitional stage in which some mineral water is still a major influence in the development of the bog.

**Paludification-** A bog formed over previously dry land where a rise in the water table saturates the soil without forming a lake.

**Quaking bog-** (l) Bog that has developed on a mat of *Carex* or *Sphagnum* growing over a wafer surface; (2) a carpet of bog vegetation that is floating and sinks and quivers when walked on. Often called a floating bog.

**Raised bog-** Bog with an elevated central area caused by peat accumulation. This central zone is generally isolated from the local water table and chiefly dependent on precipitation for water and minerals.

**String bog-** A common taiga landscape consisting of alternating low bog ridges (German: strange) and wet, sedgy hollows (Swedish: *flarke*, English: flarks). The ridges and hollows are oriented across the major slope of the peatland at right angles to water movement. Synonym of *strangmoor* (German) and more properly termed a "fen" because it usually is fed by wafers from outside the mire.

**Treed bog-** A type of ericaceous shrub bog with 10 to 25 percent of the cover in trees at least 135 centimeters (53 in) tall. See *muskeg*.

**Bog ridge-** A ridge of peat moss supporting shrubs or trees and superimposed on a matrix composed primarily of sedges. The ridges are narrow, usually with their long axes across the slope, and may form into net patterns. Synonyms are *strange* (German), *strangar* (Swedish), and *pounu* (Finnish).

**Boreal-** (l) Northern, or having to do with northern regions; (2) one of three transcontinental regions, extending from the northern polar seas south to southern Canada.

**Boulders-** Rock fragments larger than 60 centimeters (2 ft) in diameter.

**Brackish water-** Slightly salty water with a saline content intermediate between those of fresh water and sea wafer.

**Breast height-** A standard height for measurement of tree diameters 1.37 meters (4.5 ft) above average ground level in the United States; in Europe and most Commonwealth countries, 1.3 meters (4.25 ft).

**Broad-leafed-** With leaves other than linear in outline as opposed to grasslike or graminoid.

**Broadleaf-** (adj.) A conventional term applied to trees and shrubs of the Angiospermae, in loose contrast to the generally needle-leaved Gymnospermae. See *hardwood*.

**Browse-** (n.) Twigs or shoots, with or without attached leaves, of shrubs or trees that are available for forage for wild or domestic animals. (v.) To eat such plant material.

**Bryoid-** (1) A moss, liverwort, or hornwort; (2) in the Alaska vegetation classification, a herbaceous vegetation class including both bryoid communities and lichen communities.

**Bryophyte-** A plant of the phylum Bryophyta, which includes mosses, liverworts, and hornworts.

**Burn-** An area over which fire has run.

**Caespitose (cespitose)-** Plants with short stems and branches usually covered with leaves and forming dense tufts or cushions; for example, *Silene acaulis*. See *cushion plant*.

**Canopy-** (1) More or less continuous cover of branches and foliage formed collectively by crowns of adjacent trees, shrubs, or herbs, depending on the type of vegetation; (2) the cover of leaves and branches formed by the tops or crowns of plants as viewed from above.

**Canopy closure-** In a stand, the progressive reduction of space between crowns as they grow and spread laterally. A canopy in which the individual crowns are nearing general contact is termed a "close canopy"; and having achieved contact, a "closed canopy."

**Canopy cover-** See *cover*.

**Character (characteristic) species-** A plant species nearly always found in a community type regardless of its abundance or influence.

**Circumboreal-** Occurring simultaneously in the northern parts of North America, Asia, and Europe. The zoological equivalent of this botanical term is holarctic.

**Circumpolar-** Occurring around the North or South Pole.

**Classification-** (1) A "bottom-up" synthesis in which units are grouped by similarities to form a first category of classes; classification proceeds upward through synthesizing of new categories until all classes are included in one superclass; (2) the orderly arrangement of objects by their differences and similarities.

**Clay-** As a soil separate, mineral soil particles less than 0.002 millimeter (0.0005 in) in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Climax-** That state of a biotic community that is attained when population structures of all its species fluctuate rather than exhibit unidirectional change. Such a community will remain in a self-perpetuating state so long as present climatic, edaphic, and biotic conditions continue.

**Climatic climax-** The ultimate phase of ecological development of plant communities permitted by the climate of a region.

**Edaphic climax-** Any distinctive type of stable community that develops on soils different from those supporting a climatic climax.

**Fire climax-** Any type of apparently stable vegetation whose distinctiveness depends on being burned at regular intervals.

**Zootic climax-** Any type of stable vegetation whose continued existence depends on continuous stress from heavy use by animals.

**Climax species-** A species that is self-perpetuating in the absence of disturbance, with no evidence of replacement by other plant species.

**Climax vegetation-** (l) The pattern or complex of climax communities (associations) in a landscape corresponding to the pattern of environmental gradients or habitats; (2) the stabilized plant community of a particular site, where the plant cover reproduces itself and does not change so long as the environment remains the same; (3) the final, stable community in an ecological succession that is able to reproduce itself indefinitely under existing environmental conditions.

**Codominant-** One of several species dominating a plant community, no one to the exclusion of the others.

**Colluvial-** (1) In soils, material that has been transported downhill and has accumulated on lower slopes or at the bottom of the hill; (2) pertaining to material transported and deposited by mass-wasting and local unconcentrated runoff on and at the base of steep slopes.

**Community-** A general term for an assemblage of plants living together and interacting among themselves in a specific location with no particular ecological status being implied. The basic unit of vegetation.

**Community-type-** An abstract community, or a group or class of similar abstract communities, that is relatively stable and recurs in similar habitats. Successional status is uncertain.

**Competition-** The influence of one plant on another that results when both draw from one or more resources in short supply.

**Conifer-** (n.) A plant belonging to Coniferales that bears cones and needlelike or scalelike leaves. Sometimes misleadingly referred to as a softwood.

**Coniferous-** (adj.) Bearing cones.

**Constancy-** The relative consistency of occurrence of a species in stands of equal size located in a community-type, expressed as a percentage of the stands in which the species occurs.

**Cover-** (l) Any vegetation producing a protecting mat on or just above the soil surface; (2) the area of ground covered by the vertical projection of the aerial parts of plants of one or more species; (3) the entire canopy of all plants of all sizes and species found in an area.

**Canopy cover-** The proportion of the ground area covered by the vertical projection of the canopy. Expressed as a percentage of area.

**Crown cover-** The ground area covered by the crown of a tree or shrub, as delimited by the vertical projection of its outermost perimeter.

**Crown-** The upper portion of a tree or shrub including the branches and foliage.

**Crown closure-** (l) The closing together of the crowns of trees in a forest as they age and grow; (2) by extension of the term, the proportion of the ground area covered by the aggregate vertical projection of all the tree crowns in a crown cover. Expressed as a percentage of area.

**Cryaquepts-** Gray or olive soils with a high water table during all or most of the summer. They generally are strongly mottled. These soils have many textures and may have substratum of gravelly sand below 30 centimeters (12 in). Only thin accumulations of organic matter occur on the soil surface, and only thin dark upper horizons occur in the mineral soil.

**Cryochrepts-** Soils in which small or moderate amounts of organic matter have been incorporated into the upper portion of the mineral soil. Usually are well drained and support forest vegetation. Textures are most often loam or silt loam but may be gravelly. Many of these soils contain permafrost.

**Cryptogam-** (1) Any plant reproducing sexually without forming seeds; (2) collective term for the Thallophytes, Bryophytes, and Pteridophytes.

**Cushion plant-** An herbaceous or low woody plant so densely branched that it forms a dense, resilient mat or cushion; for example, *Silene acaulis*.

**Diameter at breast height (d.b.h.)-** The diameter of a tree, measured outside the bark, at 1.37 meters (4.5 ft) above ground level. See *breast height*.

**Decadent-** Declining or decaying.

**Deciduous-** Woody plants, or pertaining to woody plants, that seasonally lose all their leaves and temporarily become bare-stemmed.

**Density, stand-** The number of plants per unit of area at a given time. Expressed as number per square meter or stems per acre.

**Depauperate-** Describing an unusually sparse growth of undergrowth plants.

**Disjunct-** Pertaining to discontinuous range having two or more potentially interbreeding populations separated by a distance precluding genetic exchange by pollination or dissemination.

**Distribution-** (1) The geographic range of a species at any one time; (2) the pattern of occurrence of individuals of a taxon in an area.

**Disturbance-** Any mechanism limiting plant biomass by causing its partial or total destruction.

**Diversity-** An expression of the variety of species that exist in a community, or of the variety of communities in a landscape.

**Dominance-** The degree of influence that a plant species exerts over a community as measured by its mass or basal area per unit area of the ground surface, or by the proportion it forms of the total cover, mass, or basal area of the community.

**Dominant-** (1) The plant species having the greatest canopy coverage; (2) the most numerous or vigorous species in a stand; (3) a taxon or group of taxa characterizing the community in its larger aspects, usually preponderant either numerically or in mass.

**Drainage (hydrology)-** Process of downward removal of water from soil, particularly by surface and subsurface runoff and artificially by ditching and other measures for hastening removal.

**Drainage (pedology)-** Frequency and duration of the periods when the soil is free of saturation or partial saturation. Commonly expressed in terms of seven subjective drainage classes extending from very poorly drained to excessively drained.

**Very poorly drained-** Drainage class where water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season.

**Poorly drained-** Drainage class where water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods.

**Somewhat poorly drained-** Drainage class where water is removed slowly enough that the soil is wet for significant periods during the growing season.

**Moderate/y well drained-** Drainage class where water is removed from the soil somewhat slowly during some periods. These soils are wet for only a short time during the growing season.

**Well drained-** Drainage class where water is removed from the soil readily, but not rapidly. Water is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods.

**Somewhat excessively drained-** Drainage class where water is removed from the soil rapidly. Many somewhat excessively drained soils are sand textured and rapidly permeable.

**Excessively drained-** Drainage class where water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, stony, or shallow.

**Drift-** (1) Any rock material such as boulders, till, gravel, sand, or silt and clay transported by a glacier and deposited by or from the ice or by water derived from melting of the ice; (2) snow lodged on the lee of a surface irregularity under the influence of wind.

**Duff-** Forest litter and other organic debris in various stages of decomposition on top of the mineral soil; typical of conifer forests in cool climates where the rate of decomposition is slow and litter accumulation exceeds decay.

**Dwarf scrub-** Vegetation made up of dwarf shrubs and averaging less than 0.2 meter (8 in) tall.

**Dwarf shrub-** A shrub or woody plant usually less than 0.2 meter (8 in) tall.

**Dwarf tree forest-** In Alaska, vegetation with 10 percent or more crown cover in dwarf trees that will not achieve heights of 3 meters (10 ft) or more at maturity; for example, some black spruce bogs.

**Ecosystem-** (1) Totality of an environment plus its included organisms, or habitat and community as an interacting unit; (2) a community, including all component organisms, together with the environment forming an interacting system. The fundamental unit in ecology.

**Ecotone-** A transition zone between two well-defined plant communities or units of vegetation.

**Ecotype-** Within a species, a race that is genetically adapted to a local habitat different from the habitat of other races of that species:

**Edaphic-** (adj.) Pertaining to the soil and particularly the influence of soil on organisms.

**Edge-** The more or less well-defined boundary between two or more elements in a landscape; for example, forest and grassland.

**Emergent-** Aquatic plant, usually rooted, that during part of its life cycle has portions above water; for example, cattail and bulrush.

**Endemic-** A taxon confined to a particular region and having a comparatively restricted distribution (usually a relatively small geographic area or an unusual or rare type of habitat).

**Eolian soil material-** Material accumulated through wind action. Commonly refers to sandy deposits in dunes or to silt (loess) in blankets on the surface.

**Ephemeral-** Short-lived existence, or occupying a site for a brief period.

**Epiphyte-** A plant using another living plant as a substratum (that is, growing upon another plant but deriving no sustenance from the supporting structure); for example, many mosses and lichens growing on trees.

**Ericaceous-** Refers to the heath family, Ericaceae; for example, blueberry.

**Eutrophic-** Literally, "well fed." Refers to habitats, particularly soils and water, rich in nutrients.

**Even aged-** A stand of trees with individuals that originated at nearly the same time and thus have essentially the same age. The maximum difference in age in an even-aged stand is usually 10 to 20 years.

**Evergreen-** Plants, or pertaining to plants, that remain green the year round, either by retaining at least some of their leaves at all times or by having green stems that carry on the principal photosynthetic functions.

**Exotic-** A plant or species not native to the region it is growing in; for example, clover in alpine tundra.

**Exposure-** (1) The openness of a site to weather conditions, particularly sun and wind; (2) the direction a slope faces.

**Fauna-** (1) The sum total of all species of animals living in a defined area at one time; (2) a collective term for all animal species in the same way that "vegetation" is a collective term for all plant communities.

**Feathermoss-** Common name for some species of mosses; for example, *Hylocomium splendens*, *Pltiurozium schreberi*, *Ptilium crista-castrensis*, and *Rhytidiadelphus trique trus*.

**Fellfield-** From the Danish *fjoeldmark*, or rock desert. A type of tundra ecosystem characterized by rather flat relief, very stony soil, and low, widely spaced vascular plants.

**Fen-** A general term for a mire (peat-forming ecosystem) with little or no *Sphagnum* spp. and with a source of water and minerals outside the limits of the mire. Fens, in comparison with bogs, are less acidic or even alkaline and mineral rich. Fens generally support a more varied vegetation, composed of: grasses, sedges, or reeds, than bogs do.

**Eutrophic fen-** Nutrient-rich fen with green sedges predominate and *Sphagnum* spp. are absent. Usually on sites with nutrient-rich ground water.

*Forested fen-See swamp.*

**Mesotrophic fen-** A moderately nutrient-poor fen where greyish-green sedges are predominant and *Sphagnum* spp. occur. With an increase in *Sphagnum* spp., it would become a bog.

**Patterned fen-** A mire (peat-forming ecosystem) characterized by low peat ridges alternating with parallel wet hollows, the pattern developing parallel to the contour (at right angles to water movement) on gentle slopes.

**String fen-** A patterned fen with long strings and flarks. (see bog, string bog).

**Shrub fell-** A type of mire (peat-forming ecosystem) usually flooded with slowly flowing water. Vegetated with low (less than 1.5 meters [5 ft] tall) erect shrubs and a generally open canopy. Trees may be present or absent. Sedge peat often is present.

**Fertility, soil-** The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, soil physical conditions, and other growth factors are favorable.

**Fire cycle-** The length of time necessary for an area equal to the entire area of interest to burn. The size of the area of interest must be clearly specified. Expressed as years per area. Synonym of fire rotation.

**Fire effect-** Any consequence, neutral, detrimental, or beneficial, resulting from a fire.

**Fire frequency-** The number of fires per unit of time in some designated area (which may be as small as a single point). The size of the area must be specified. Expressed as number of fires per unit of time per unit of area.

**Fire interval-** The number of years between two successive fires documented in a designated area (that is, the interval between two successive fire occurrences). The size of the area must be clearly specified. Unit of measurement is years. Synonym of fire-free interval and fire-return interval.

**Fire regime-** The type, intensity, size, and frequency of fires typical for a specific land area. The fire regime determines the scale of fire effects and the way fire influences an ecosystem.

**Floating aquatic plant-** Plant adapted to a floating aquatic existence, not rooted in soil; for example, duckweed and some algae.

**Flood plain-** A nearly level alluvial plain bordering a stream and subject to periodic flooding unless protected artificially.

**Flooding-** The temporary covering of the soil with water from overflowing streams, runoff from adjacent slopes, and exceptionally high tides.

**Flora-** A collective term for all plant species in the same way that "vegetation" is a collective term for all plant communities. Flora indicates what species are present; not abundance or spatial arrangement.

**Floristic-** Pertaining to the species composition of vegetation.

**Foliage cover-** See *cover*.

**Foot slope-** The inclined surface at the base of a hill; also, the toe of a hill.

**Forb-** An herbaceous plant other than a grass, sedge, or other grasslike plant.

**Forest-** (1) Plant community predominately of trees and other woody plants, growing more or less closely together; (2) in the Alaska vegetation classification, vegetation with at least 10 percent of the crown cover by trees (that is, single stemmed woody plants at least 3 meters [10 ft] in height at maturity).

**Broadleaf forest-** In the Alaska vegetation classification, forest vegetation in which 75 percent or more of the forest canopy is made up of broadleaf trees.

**Closed forest-** A community completely dominated by the tree stratum because of the closure of the crowns. In the Alaska vegetation classification, defined as having over 60 percent tree canopy coverage.

**Conifer forest--** See *forest, needleleaf*.

**Hardwood forest-** See *forest, broadleaf*.

**Mixed forest--** (1) A forest composed of two or more species of trees; (2) according to the Alaska vegetation classification, a forest composed of both needleleaf and broadleaf trees.

**Needleleaf forest-** In the Alaska vegetation classification, forest vegetation in which 75 percent or more of the forest canopy is made up of needleleaf trees.

**Open boreal forest-** The widespread forest within the subarctic zone between the tree line and closed boreal forest. Synonym of subarctic woodland, open woodland, and lichen-woodland.

**Forest cover-**All trees and other woody plants occupying the ground in a forest.

**Forest floor-** An inclusive term for deposited dead plant matter on the mineral soil surface in a forest. Includes litter and unincorporated humus. See *duff*.

**Forest type-** A forest stand, community, or association essentially similar throughout its extent in composition and development under essentially similar conditions. Usually used in an abstract sense to mean both climax and seral species.

**Forest-tundra-** Characterized by a mosaic of forest communities, krummholz, tree islands, or trees growing along river and lake shores or in sheltered positions and a tundra vegetation on exposed ridges between the rivers and in xeric habitats.

**Forest-tundra ecotone-** A transition belt between the dense conifer forest and alpine or arctic tundra.

**Formation-** A continental-scale vegetation unit comprising all plant communities that resemble each other in appearance and in major features of their environment; for example, northern coniferous forest and tropical rain forest.

**Frequency-** (1) Number of recurring events in unit time (for example, forest fires per year); (2) the degree of uniformity with which individuals of a species are distributed in an area and, more specifically, a stand. Expressed as a percentage of plots (quadrats) of equal size in which a species occurs in a stand.

**Fruticose-** Shrubby, as in fruticose lichens; for example, *Cladonia rangiferina*.

**Fuel-** (1) Any combustible material that will support a forest or range fire; (2) dead and down woody material in a forest.

**Glacial drift-** Rock debris transported by a glacier and deposited either directly from the ice or from the melt water.

**Glacial outwash-** Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

**Glacial till-** Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and stones transported and deposited by glacial ice.

**Gradient-** A more or less continuous change of some property in space. Gradients of environmental properties are ordinarily reflected in gradients of biota.

**Graminoid-** Grasslike in appearance with leaves mostly very narrow or linear.

**Grass-** A member of the family Gramineae and characterized by hollow stems that are circular in cross section and bladelike leaves arranged on the culm or stem in two ranks.

**Grassland-** A landscape in which the existing plant cover is dominated by grasses.

**Gravel-** Rounded or angular fragments of rock 2 millimeters to 7.5 centimeters (0.08-3 in) in diameter.

**Groundwater- Water** that moves downward from the upper soil layers into permanently saturated soil and geologic zones.

**Growth form-** The characteristic shape or appearance of a plant as a result of its development in response to environmental conditions within its genetic constitution.

**Habitat-** The natural abode of a plant or animal; refers to the kind of environment a plant or animal normally lives in as opposed to the range or geographical distribution.

**Half-shrub-** A perennial plant with a woody base whose annually produced stems die back each year; for example, *Artemisia frigida*.

**Halophyte-** A plant adapted to existence in a saline environment and more or less restricted to saline or alkaline soils or to sites influenced by salt water.

**Halophytic-** Refers to halophyte.

**Hardwood-** Generally, a colloquial term for trees having broad leaves, in contrast to the needleleaf conifers. Inaccurate, in that the wood of many conifers is harder than that of many "hardwoods."

**Heath-** Community of grasslike plants and shrubs of one or more of the heath families Ericaceae, Empetraceae, or Diapensiaceae found on infertile sites. Frequently found on bogs in Alaska.

**Heathland-** Landscape dominated by evergreen sclerophyllous shrubs growing on soils very low in plant nutrients. The vegetation always contains members of the heath families-Ericaceae, Empetraceae, and Diapensiaceae.

**Herb-** Flowering plant with no significant woody tissue above the ground; includes forbs and grasses.

**Herbaceous--** In the Alaska vegetation classification, vegetation with 2 percent or more of the crown cover in vascular and nonvascular (mosses and lichens) plants and less than 10 percent of crown cover of woody plants.

**Aquatic herbaceous-** In the Alaska vegetation classification, vegetation in which there is a predominance of cover of floating or submerged plants growing in wafer. Can include mosses and algae as well as vascular plants. In this classification, emergent plants are not included in aquatic vegetation but are placed in the wet forb herbaceous and graminoid herbaceous units.

**Bryoid herbaceous-** In the Alaska vegetation classification, a category of vegetation in which the predominance of cover is in mosses or lichens.

**Forb herbaceous-** In the Alaska vegetation classification, herbaceous vegetation in which the predominance of cover is in nongrasslike plants. This includes forbs, rushes, ferns, and horsetails.

**Graminoid herbaceous-** In the Alaska vegetation classification, herbaceous vegetation with the predominance of cover in grasses or sedges.

**Herbland-** Any landscape on which herbaceous species dominate the vegetation.

**Holarctic-** Occurring simultaneously in the northern parts of North America, Asia, and Europe. The botanical equivalent of this zoological term is circumboreal.

**Horizon, soil--** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes.

**Humification-** The process of decomposition whereby organic material is humified and becomes humus.

**Hummock-** A microtopographic elevated area on a raised bog, composed principally of hummock-forming species such as *Sphagnum fuscum*, *S. imbricatum*, and *S. flavicomans*.

**Hummocky-** Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even.

**Hydrophyte-** A plant usually found growing in wafer or in soil containing water well in excess of field capacity most of the time.

**Hygrophyte-** A plant that is more or less restricted to moist sites; for example, *Drosera rotundifolia*.

**Ice lenses-** segregated ground ice oriented more or less parallel to the ground surface.

**Ice wedges-** wedge-shaped vertical or inclined sheets of foliar ground ice that form in thermal contraction cracks in permafrost. Formation and active growth of wedges requires temperatures of -40 to -45°C (-40 to -50 °F) for creation of contraction cracks.

**Importance-** Density, basal area, cover, or frequency each could be interpreted as an "importance value" depending on the values the investigator considers most important for a particular species or community.

**Indicator-** A plant whose presence, abundance, or vigor is indicative of certain site conditions; for example, *Cassiope tetragona* on sites with late-melting snowbeds.

Indigenous-Native to the area; not introduced by man.

**Karst-** A limestone plateau marked by sinks, or karst holes, and solution channels interspersed with abrupt ridges. Not a single feature but a landscape.

**Krummholz-** Scrubby, stunted trees often forming a characteristic zone at the limit of tree growth in mountains.

**Lacustrine deposit-**Mineral material deposited in lake water and exposed when the water level lowers or the land raises.

**Landscape-** All the natural features, such as hills, forest, and water, that distinguish one part of Earth's surface from another.

**Landslide-** The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated.

**Layer (vegetation)-** A structural component of a community consisting of plants of about the same stature or height; for example, tree layer, shrub layer, herb layer, and moss layer.

**Lichen-woodland-** Subarctic forest in which the open ground between trees is covered with light-colored fruticose lichens; for example, *Cladonia rangiferina*.

**Linear leaf-** A leaf many times as long as wide and with essentially parallel sides at least in the middle portions.

**Lithophyte-** A plant growing on a rock; for example, lichens and mosses.

**Lithosol-** A young soil consisting mainly of partly weathered rock fragments or of nearly bare rock.

**Litter-** A surface layer on the forest floor of loose organic debris consisting of freshly fallen or slightly decomposed plant parts.

**Littoral-** That portion of the sea shore subject to alternate submergence and emergence by abnormal tides.

**Liverwort-**A small plant in the class Hepaticae, phylum Bryophyta, usually growing in moist places; for example, *Marchantia*.

**Loam-** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**Loess-** Soil material transported and deposited by wind and consisting of predominantly silt-sized particles.

**Low moor-** Type of fen composed of peat or muck soil, formed in eutrophic or mesotrophic waters (commonly a former lake) and, therefore, relatively rich in minerals and supporting a rich vegetation.

**Lowland-** A relative term for land lying along streams and flood plains.

**Marine aquatic-** Aquatic plant community types in ocean settings, either subtidal or intertidal, but low enough to be inundated at least once daily by high tides.

**Marsh-** (1) A periodically wet or continually flooded nonpeat-forming ecosystem where the surface is not deeply submerged and supports sedges, cattails, and rushes or other hygrophytic plants. Subclasses include freshwater and saltwater marshes. Less acid and less continuously flooded than a bog, often only intermittently flooded. (2) In Alaska, sites are characteristically flooded with 15 centimeters (6 in) or more of water; may have no standing water late in the summer but soils remain saturated. Vegetation usually is dominated by emergent herbaceous plants. Typical species are *Arctophila fulva*, *Scirpus* spp., *Equisetum fluviatile*, and *Eleocharis palustris*. Woody plants, lichens, and sphagnum are absent or rare.

**Salt marsh--** Similar to a fresh marsh, but adjacent to the sea and inundated periodically (tidally or seasonally) with saline water.

**Tidal marsh--** low marsh lands traversed by interlacing channels and sloughs and subject to tidal inundation. Usually the vegetation is composed of salt-tolerant (halophytic) grasses and sedges.

**Meadow-** Closed herbaceous vegetation, commonly in stands of limited extent. Often used to denote stands of grasses and sedges.

**Brackish marsh meadow-** Coastal flats and lower beach habitats regularly inundated by tides. Soils are mineral, sometimes overlain by a tough sod of roots and rhizomes or by shallow (up to 20 centimeters [8 in]) peat.

**Fresh marsh meadow-** Fresh or essentially fresh community types predominately on mineral soils or less than 30 centimeters (12 in) of peat. Where peat is present, it usually is sedge peat.

**Sedge meadow-** A vegetation unit (usually in wet situations) consisting of low grasslike plants belonging to Cyperaceae; for example, cottongrass.

**Wet meadow-** In Alaska, sites characterized by saturated soils or by flooding to depths of less than 15 centimeters (6 in) and vegetation dominated by herbaceous species, usually graminoids. Moss cover varies but generally is low. Soils are mineral but may be overlain by a shallow organic layer.

**Mesic-** Refers to sites of habitats characterized by intermediate moisture conditions; that is, neither decidedly wet (hygric) nor decidedly dry (xeric).

**Mesophyte-** A plant whose normal habitat is neither very wet nor very dry; for example, paper birch.

**Metamorphic rock-** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat and pressure. Nearly all such rocks are crystalline.

**Microrelief-** Small-scale local differences in topography, including mounds, swales, and pits that are only a few feet in diameter and height.

**Microsere-** A time sequence of communities, of small areal extent, that may be observed even in climax stands. Microseres involve such processes as the replacement of a large individual plant after it dies, the sequence of decomposers that follow each other in a unit of litter, and the development of vegetation on an abandoned ant nest.

**Mineral soil-** Soil that is mainly mineral material and low in organic material (usually less than 20 percent). Its bulk density is greater than that of organic soil.

**Mire-** General term embracing all peat-forming ecosystems described in English by other terms such as bog, fen, carr, muskeg, moor, and peatland. Does not include marshes because they are, by definition, nonpeat-forming and seasonally flooded. Mires are subdivided into fens and bogs by origin and chemistry of their respective water supplies.

**Moisture, soil-** The relative amount of moisture in the soil, usually applied to the A- and B-horizons and occasionally to the humic material.

**Moor-** (1) A term applied to any area of deep peat whether acid or alkaline (bog or fen); (2) in England, the term is applied to high-lying country covered with heather and other ericaceous dwarf shrubs, mainly *Vaccinium*.

**Moor, string-** See *fen, string* and *bog, string*.

**Moraine-** An accumulation of glacial drift built within a glaciated region by the direct action of glacial ice. Examples are lateral, terminal, and recessional moraines.

**Moss-** A plant in the class Musci of the phylum Bryophyta; usually, but not always, occurring in a wet habitat.

**Moss peat-** Peats composed generally of *Sphagnum* spp. It also includes peats having a high percentage of other constituents, such as sedge-moss peat, woodmoss peat, and moss-sedge peat.

**Mottling, soil-** Irregular spots of different soil colors that differ in number and size. Mottling generally indicates poor aeration and impeded drainage.

**Muck-** Black, well-decomposed organic material accumulated under conditions of imperfect drainage. Contains more mineral matter and is usually darker than peat, and the original plant parts are not recognizable.

**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 (generally *Sphagnum* spp.) underlain by peat.

**Needleleaf-** Plant bearing stiff, linear, needlelike leaves, or vegetation composed of needleleaf plants; for example, *Picea glauca*.

**Needleleaf deciduous-** Needleleaf plant that loses its leaves and has bare stems seasonally; for example, *Larix laricina*.

**Nets, nonsorted-** Patterned ground with a mesh intermediate between that of a nonsorted circle and a nonsorted polygon, and with a nonsorted appearance due to absence of a border of stones, such as characterize a sorted net.

**Nets, polygonal-** Honeycomb patterns in the soils of arctic and alpine regions, with borders formed of relatively large stones or boulders and centers consisting of finer particles sorted by solifluction processes.

**Nets, sorted-** Patterned ground with a mesh intermediate between that of a sorted circle and a sorted polygon, and with a sorted appearance commonly due to a border of stones surrounding finer material.

**Neutral soil-** A soil having a pH value between 6.6 and 7.3.

**Old-growth stand-** Not synonymous with old-aged forest and must be recognized on the basis of stand characteristics rather than age of trees. Old-growth stands contain trees of wide range of sizes and ages and have a deep, multilayered canopy. They contain large standing dead snags and large down dead trees and other coarse woody debris.

**Oligotrophic-** (1) Describing bog formed of plants growing in waters poor in nutrients, as in a raised bog; (2) pertaining to water poorly supplied with the basic nutrients needed by plants.

**Organic matter-** The more or less decomposed material of the soil derived from organic sources, usually from plant remains. The term covers matter in all stages of decay.

**Organic terrain-** Tract of land having a surficial layer of living plant material (vegetation) and a sublayer of peat or fossilized plant detritus of any depth existing in association with various hydrological conditions and underlying mineral formations. Term used somewhat interchangeably with muskeg in Canada.

**Outwash, glacial-** Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by water originating mainly from the melting of glacial ice.

**Outwash fan-** Material deposited by fast-flowing, heavily loaded water whose velocity is suddenly reduced; for example, at the mouth of a gorge or ravine.

**Outwash plain-** A land form of mainly sandy- or coarse-textured material of glaciofluvial origin deposited gradually. An outwash plain commonly is smooth; where pitted, it generally is low in relief.

**Overstory-** The portion of the trees forming the upper canopy in a forest stand of more than one story.

**Paludification-** Literally, "swamping." Process of mire (peat-forming ecosystem) formation over previously forested land or grassland due to climatic or autogenic processes leading to waterlogging and anaerobiosis.

**Parent material-** (1) The great variety of unconsolidated, more or less chemically weathered organic and mineral material from which soil forms. Consolidated bedrock is not yet parent material by this definition. (2) The C-horizon of the soil.

**Patterned ground-** A collective 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 ground that is subject to intensive frost action. Circles, polygons, and nets are most typically formed on level ground, and stripes and steps are found on slopes.

**Peat-** Layer consisting largely of organic residues originating under more or less water-saturated conditions through the incomplete decomposition of plant and animal constituents; results from anaerobic conditions, low temperatures, and other complex causes.

**Amorphous granular peat-** Descriptive term applied to one of the primary macroscopic elements of peat that is granular in nature but has no particular shape.

**Sedge peat-** Peat composed of sedge species, primarily *Carex*, with *Juncus*, *Eriophorum*, and *Scirpus*. In some instances, sedge peat is so-termed because a unit proportion of peat is more than 50 percent sedge.

*Sphagnum* peat-Peat that develops from sphagnum mosses.

**Peatland-** A generic term including all types of peat-covered terrain. Many peatlands are a complex of bogs and fens, sometimes called a “mire complex.” A loose synonym of muskeg and organic terrain.

**Perennial-** A plant that lives for 3 or more years.

**Pergelic-** A soil temperature regime that has mean annual soil temperatures of less than 0 °C (32 °F). Permafrost is present.

**Periglacial-** Refers to areas, conditions, processes, and deposits adjacent to the margin of a glacier.

**Permafrost-** Perennially frozen ground, or ground in which a temperature below 0 °C (32 °F) has existed continuously for 2 or more years. Permafrost is defined exclusively by temperature, and no moisture or ice need be present.

**Active layer-** The layer of ground above the permafrost that freezes and thaws each year.

**Continuous permafrost-** A zone of perennially frozen ground in which permafrost is present everywhere except under lakes and rivers that do not freeze to the bottom.

**Discontinuous permafrost-** A zone including numerous permafrost-free areas that progressively increase in size and area from north to south until the permafrost-free zone is reached.

**Permafrost table-** The upper surface of permafrost.

**pH value--** A numerical designation of acidity and alkalinity in the soil, the negative logarithm of hydrogen-ion concentration. pH 7.0 is neutral; values above 7.0 indicate alkalinity and those below 7.0 indicate acidity.

**Phase-** Subdivision of a unit of vegetation representing a characteristic variation in species composition or abundance as caused by a change in environmental conditions.

**Phenology-** The study of the time of appearance of characteristic periodic events in the life cycle of organisms in nature and how these events are influenced by environmental factors, such as temperature, latitude, and elevation; for example, flowering and leaf-fall in plants.

**Physiognomy-The** general outward appearance of a plant community, determined by the life-form of the dominant species; for example, forest or scrub.

**Physiography-** Branch of physical science dealing with the physical features of Earth's surface and the description of the landscape.

**Pingo-** An Eskimo term for a perennial, conical-shaped ice-cored mound as much as 65 meters (213 ft) high and 1000 meters (3280 ft) in diameter. Generally found on the arctic slope, but open-system pingos also occur south of the Brooks Range.

**Pioneer-** Plant capable of invading bare sites and persisting there (that is, colonizing, until replaced by other species as succession proceeds); for example, *Stereocaulon* spp. and *Epilobium* spp.

**Pleistocene-** The geological epoch preceding the Recent in the Quaternary period of the Cenozoic era; began about 1 million years ago and lasted for about 1 million years.

**Polygons-** One of the forms of patterned ground caused by intensive frost action.

**High-centered polygons-** Polygons bordered by eroding ice wedges that have permitted the polygon margin to collapse into thermal contraction cracks. Generally, a later developmental stage of ice-wedge polygon that is associated with improved drainage.

**Ice wedge polygons-** Large-scale polygonal features commonly outlined by shallow trenches underlain by ice wedges.

**Low-centered polygons-** Polygons bordered by active ice wedges, which are covered by low ridges of peat that cause the margins of the polygon to be higher than the surface of the center.

**Population-** A group of individual plants of the same species in a common location or habitat.

**Presence-** The occurrence of a taxon in a vegetation (association or stand) table. Plots do not have to be of equal size.

**Profile, soil-** A vertical section of the soil extending through all its horizons and into the parent material.

**Prominence-** The degree to which a species characterizes or dominates the community, or conspicuously impresses the observer, regardless of any numerical abundance.

**Quadrat-** A small, clearly demarcated plot or sample area of known size where ecological observations are made. Quadrats may be square, rectangular, or circular.

**Quaternary-** The latest geologic period of the Cenozoic era, which began about 1 million years ago and includes the Recent and Pleistocene epoch.

**Range-** That portion of Earth's surface enclosed by a line drawn about the outermost limits of the distribution of a taxon. A species does not occupy all the area within its range owing to differences in soil, topography, and so forth.

**Raw humus-** A loose term for any appreciable accumulation of slightly to moderately decomposed organic matter on the surface of a mineral soil.

**Regeneration-** Renewal of a tree crop, whether by natural or artificial means; also the young crop itself.

**Regolith-** The unconsolidated mantle of weathered rock and soil material overlying the solid rock of the earth.

**Regosol-** Young soils located on deep, unconsolidated soft mineral deposits; for example, sand dunes and loess.

**Relief-** Variations in elevation of Earth's surface.

**Revegetation-** The reestablishment or improvement of a plant cover. May take place naturally through reproductive processes of the existing flora or be induced by humans through seeding or transplanting.

**Riparian-** Pertaining to streamside environment.

**Saline-** Pertaining to soil or water containing, sufficient soluble salts to interfere with normal plant growth.

**Sand-** As a soil separate, individual rock or mineral fragments from 0.05 to 2.0 millimeters (0.002 to 0.08 in) in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and no more than 10 percent clay.

**Sandstone-** Sedimentary rock containing dominantly sand-size particles.

**Saprophyte-** A plant incapable of synthesizing its nutrient requirements from inorganic sources and that obtains food from dead or decaying organic material.

**Scree-** Sheet of coarse rock debris mantling a mountain slope. Whereas talus is an accumulation of rock material at the base of a cliff, scree includes loose material lying on slopes without cliffs.

**Scrub-** (1) Woody vegetation predominantly of shrubs, ranging between 0.2 meter (8 in) and 3 meters (10 ft) in height; (2) in the Alaska vegetation classification, treeless vegetation (or with less than 10 percent tree crowns) and with shrubs comprising 25 percent or more of the absolute crown cover.

**Dwarf shrub scrub-** In the Alaska vegetation classification, scrub vegetation that is less than 20 centimeters (8 in) tall and with 25 percent or more crown cover in dwarf shrubs. If tall or low shrubs are present, their combined cover should be less than 25 percent.

**Dwarf free scrub-** In the Alaska vegetation classification, vegetation with 10 percent or more crown cover in dwarf trees that will not achieve heights of 3 meters (10 ft) at maturity on those sites.

**Low shrub scrub-** In the Alaska vegetation classification, scrub vegetation less than 1.5 meters (5 ft) in height and with 25 percent or more crown cover in shrubs.

**Scrubland-** In the Alaska vegetation classification, landscape occupied by scrub vegetation or capable of growing shrubs.

**Sedge-** A plant in Cyperaceae, grasslike in appearance, but with solid stems that are triangular in cross section.

**Sedimentary rock-** Rock made of particles deposited from suspension in water. The chief types of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate.

**Seral-** Nonclimax; that is, a species or a community demonstrably susceptible to replacement by another species or community, usually within a few decades or a few centuries at most.

**Sere-** A sequence of plant communities that follow one another in an ecological succession on the same habitat from a pioneer stage to, and terminate in, a particular kind of stable (climax) association.

**Series-** Term for a group of habitat types having the same tree species dominant at climax; for example, white spruce series or black spruce series.

**Shrub-A** woody perennial plant differing from a tree by its low stature and by generally producing several basal stems instead of a single bole, and from a perennial herb by its persistent and woody stem(s).

**Dwarf shrub-** shrub less than 20 centimeters (8 in) tall.

**Low shrub-** In the Alaska vegetation classification, a shrub between 20 centimeters (8 in) and 1.5 meters (5 ft) in height.

**Tall shrub-** A shrub more than 1.5 meters (5 ft) in height.

**Shrubland-** A landscape occupied by a scrub vegetation and probably not capable of growing trees.

**Silt-** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter [0.0005 in]) to the lower limit of very fine sand (0.05 millimeter [0.002 in]). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Site-** An area considered in terms of its environment and ecological factors with reference to capacity to produce a particular vegetation; the combination of biotic, climatic, and soil conditions of an area.

**Slough-** A former stream channel now containing standing water, at least seasonally.

**Snag-** Standing dead tree from which the leaves and most of the branches have fallen.

**Snowbed-** Area where snow accumulates each winter and melts late each growing season; for example, cornice on the lee of a ridge.

**Snowfield-** An area or mass of snow that remains throughout much of the summer.

**Softwood-** In common usage, the wood of a coniferous tree. Inaccurate, in that the wood of many conifers is harder than that of many "hardwoods"; for example, spruce is harder than aspen.

**Soil-** The unconsolidated mineral and organic material on the immediate surface of Earth that serves as a natural medium for the growth of land plants.

**Soil reaction-** The degree of acidity or alkalinity of a soil expressed in pH values.

**Soil texture-** A property defined by particle size distribution and thus dependent on relative proportions of sand, silt, and clay particles in a mass of soil.

**Coarse-textured soil-** Sand or loamy sand.

**Moderately coarse-textured soil-** Sandy loam and fine sandy loam.

**Medium-textured soil-** Very fine sandy loam, loam, silt loam, or silt.

**Moderately fine-textured soil-** Clay loam, sandy clay loam, and silty clay loam.

**Fine-textured soil-** Sandy clay, silty clay, and clay.

**Solifluction-** Downslope movement (“flowing soil”) of earth materials resulting from frost action characteristic of areas with cold arctic or alpine climate.

**Solum-** The upper and most weathered part of a soil profile, above the parent material, in which processes of soil formation are active. The solum in mature soils consists of the A- and B-horizons.

**Sphagnum moss-** Moss plants of the genus *Sphagnum*.

**Spruce bog-** A loosely applied term describing confined areas of organic terrain where coniferous trees are a prominent feature of the vegetational cover.

**Stand-** A concrete (vs. abstract) aggregation of plants of more or less similar uniformity in physiognomy, species composition, spatial arrangement, and condition to distinguish it from adjacent communities. Concrete stands, which we sample or measure, are aggregated into abstract communities, and communities are further abstracted into a general vegetation.

**Steppe-** Temperate zone vegetation dominated by grasses and occurring in climates where zonal soils are too dry to support trees. Open grass or other herbaceous vegetation, the plants or tufts discrete but averaging less than their diameters apart.

**Stones-** Rock fragments 25 to 60 centimeters (10 to 24 in) in diameter.

**Stone stripes-** Patterned ground with bands of fine rock debris that alternate with channels filled with coarse rock fragments and are oriented parallel to the direction of the steepest slopes.

**Stony-** Refers to a soil containing stones in numbers that interfere with or prevent tillage.

**Strand-** That portion of the shore between high and low water on beaches, spits, reefs, and so forth.

**Stratum (vegetation)-** A horizontal layer in a community in which the plants are about the same height.

**Structure (soil)-** The arrangement of primary soil particles into compound panicles or aggregates that are separated from adjoining aggregates.

**Structure (vegetation)-** (1) The spatial distribution pattern of life forms in a plant community, especially with regard to their height, abundance, or coverage within the individual layers; (2) the three components of vegetation structure are (a) vertical structure (stratification into layers), (b) horizontal structure (spatial distribution of individuals and species populations), and (c) quantitative structure (abundance of each species).

**Subalpine-** The first distinctive type of vegetation, usually open forest, below the alpine tundra.

**Subarctic-** Pertaining to regions immediately outside the Arctic Circle. Often interpreted as constituting a biotic transition belt (the forest-tundra ecotone) between the treeless arctic zone and the forested boreal zone.

**Subarctic forest-** The northern part of the boreal forest, characterized by open stands of small conifers, chiefly black spruce, with abundant lichens on the ground.

**Subarctic woodland-** See *forest, open boreal*.

**Submerged aquatic plant-** Plant adapted to totally submerged aquatic existence or with only leaves floating.

**Subsoil-** Technically, the B-horizon; roughly, the part of the solum below plow depth.

**Substratum-** The soil or other material that plants are rooted in or attached to.

**Succession-** The gradual replacement of one community of plants by another; the sequence of communities being termed a sere and each community a seral (successional) stage. The endpoint of succession is a stable, climax community.

***Primary succession-*** Plant succession on newly formed soils or on surfaces exposed for the first time that have never borne vegetation.

***Secondary succession-*** Plant succession subsequent to the destruction of all or part of the original vegetation on a site.

**Succulent-** Having the stems or leaves conspicuously fleshy.

**Surface soil-** Commonly refers to the top horizon in the soil profile (generally the A-horizon).

**Swale-** A moist or marshy depression, particularly in a grassland or prairie.

**Swamp-** In the Alaska vegetation classification, wetland sites dominated by tall shrubs and occasional trees. Standing or flowing water usually is present. Although peat generally is absent, soils may be high in organic matter content. A wooded fen.

**Synecology-** The study of plant communities and their environmental relations.

**Taiga-** A Russian term meaning "land of little sticks," and originally applied to the open conifer lichen woodland between the boreal conifer forest and the tundra. This term often is used more broadly to denote the northern portion of the boreal forest.

**Talus-** In polar and arid temperate climates, the debris from rock falls accumulates at the foot of cliffs and steep slopes. The sloping heap of rock fragments is termed "talus," from the French term for slope.

**Taxon-** A neutral term for a taxonomic group of any rank, such as subspecies, species, or genus.

**Temperate-** Climates with regular winter seasons of freezing weather, alternating with summer seasons that either are hot or are warm but of long duration.

**Terrace-** An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is infrequently subject to overflow.

**Thermokarst-** A permafrost-related landscape characterized by a peculiar topography of pits, hummocks, depressions, and small ponds caused by the melting of ground ice and the settling or caving of the ground surface.

**Tidal-** Refers to plants or vegetation within reach of the influence of tides.

**Tidal marsh-** Low marshlands traversed by interlacing channels and sloughs and subject to tidal inundation. Usually the vegetation is composed of salt-tolerant grasses and sedges.

**Till-** An unstratified, nonsorted deposit of gravel, boulders, sand and finer materials that has been transported and laid down by glacial ice with little or no transportation or sorting by water.

**Till plain-** An extensive flat-to-undulating area underlain by glacial till.

**Timberline-** Some consider the upper edge of continuous forest to be timberline; others recognize timberline as the altitude of the highest tree or a midpoint between these extremes.

**Tolerance-** The relative ability of a plant species to survive and develop under a deficiency of an essential growth requirement, such as light, moisture, or nutrient supply.

**Tree-** A woody perennial plant, typically large (a mature height of at least 3 meters [10 feet]) and with a single well-defined stem and a definite crown shape.

**Tree line-** A loose term for the limit beyond which trees cannot or do not occur. Tree line is more generally used to refer to the altitudinal boundary, and the term "tree limit" is used for the latitudinal boundary.

**Tree, dwarf-** In the Alaska vegetation classification, a plant species that would, under normal conditions, be a tree 'but which will not achieve a height of 3 meters (10 ft) on the site where found; for example black spruce on bogs or near treeline.

**Tundra-** A cold-climate landscape having a vegetation without trees. The absence of trees is caused by a complex of conditions that ultimately is related to regional climate. This regional aspect distinguishes tundra from treeless bogs where low edaphic extremes prevent tree growth in areas within a generally forested region.

***Alpine tundra-*** That portion of the landscape above the upper limit of tree growth in the higher mountain regions that supports a plant cover of dwarf shrubs and herbs.

***Dwarf shrub scrub tundra-*** A tundra landscape (beyond the limits of tree growth) with a dwarf shrub scrub vegetation.

***Herbaceous tundra-*** A tundra landscape (beyond the limits of tree growth) with an herbaceous vegetation.

***Mat and cushion tundra-*** A tundra landscape (beyond the limits of tree growth) with a vegetation composed of mat and cushion plants.

***Sedge-grass tundra-*** A tundra landscape (beyond the limits of tree growth) with an herbaceous vegetation of nontussock-forming sedges and grasses.

***Shrub tundra-*** A tundra landscape (beyond the limits of tree growth) with a scrub vegetation.

***Tussock tundra-*** A tundra landscape (beyond the limits of tree growth) with an herbaceous vegetation of tussock-forming plants, particularly *Eriophorum* spp.

**Tussock-** A plant form that is tufted and bears many stems arising as a large, dense cluster from the crown.

**Type-** A kind of vegetation; for example, cover type, community-type, or forest type.

**Cover type-** A descriptive term used to group stands similar in composition and development, by which they may be differentiated from other groups of stands. It suggests repetition of the same character under similar conditions.

**Undergrowth-** A loose term generally meaning shrubs and herbs growing under a forest canopy.

**Understory-** That portion of the trees in a stand below the upper crown cover or overstory. Also commonly applied to shrubs and herbs growing under a forest or shrub canopy.

**Uneven-aged-** A stand of trees in which the individuals are of considerably different ages but are not all ages.

**Upland-** Land at higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Vascular plant-** Fern or seed plant having an internal system of vascular tissue for transport of food (via phloem) and water (via xylem).

**Vegetation-** (1) The mosaic of plant communities in the landscape; (2) plants in general, or the sum total of plant life in an area.

**Actual vegetation-** The currently existing vegetation mosaic of an area; the vegetation actually, existing at the time of observation, regardless of the character, condition, and stability of its component communities.

**Climax vegetation-** The final, stable community in an ecological succession that is able to reproduce itself indefinitely under existing climatic conditions.

**Original vegetation-** Exists in a landscape before European influence affects it significantly.

**Potential natural vegetation-** The climax vegetation, that would develop if human influence were removed.

**Vegetation type-** A kind of vegetation, or the kind of community of any size, rank, or stage of succession.

**Vegetation zone-** The vegetation cover found in a specified geographic region or zone having a uniform macroclimate.

**Vegetative cover-** More properly called plant cover, vegetal cover, or vegetational cover.

**Water table-** The upper limit of the soil or underlying rock material that is wholly saturated with water.

**Perched water table-** The surface of a local zone of saturation held above the main body of ground water by an impermeable layer or stratum (for example, clay or permafrost) and separated from the main body of ground water by an unsaturated zone.

**Waterlogged-** Saturated with water. Replacement of most of the soil air by water.

**Watershed-** An entire drainage basin including all living and nonliving components of the system.

**Wetland-** Lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the area.

**Wet meadow-** These sites are characterized by saturated soils or by flooding to depths of less than 15 centimeters (6 in). The vegetation is dominated by herbaceous species, usually by graminoids. Moss cover varies but generally is low. Soils are mineral but may be overlain by a shallow organic layer.

**Woodland-** In the Alaska vegetation classification, forest vegetation with 10 to 25 percent crown cover by the tree crowns.

**Broadleaf woodland-** In the Alaska vegetation classification, a broadleaf forest vegetation with 10 to 25 percent crown cover of the tree crowns.

**Conifer woodland-** See *woodland, needleleaf*.

**Lichen woodland-** See *forest, open boreal*.

**Mixed woodland-** In the Alaska vegetation classification, a mixed broadleaf and needleleaf forest vegetation with 10 to 25 percent crown cover by the tree crowns.

**Needleleaf woodland-** In the Alaska vegetation classification, a needleleaf vegetation with 10 to 25 percent crown cover by the tree crowns.

**Xeric-** Refers to a dry habitat or site

**Xerophyte-** A plant capable of surviving periods of prolonged moisture deficiency. A plant that grows on dry sites.

**Zonal-** In Russian geobotany, term applied to vegetation unit that reflects a close relation to current climatic conditions of a large region on soils with nonextreme properties. Zonal plant community corresponds more or less to climatic climax community.

**Zone-** An area characterized by similar flora or fauna; a belt or area that certain species are limited to.

**Viereck, LA.; Dyrness, C.T.; Batten, A.R.; Wenzlick, K.J. 1992. The Alaska vegetation classification, Gen. Tech. Rep. PNW-GTR-286. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 278 p.**

The Alaska vegetation classification presented here is a comprehensive, statewide system that has been under development since 1976. The classification is based, as much as possible, on the characteristics of the vegetation itself and is designed to categorize existing vegetation, not potential vegetation. A hierarchical system with five levels of resolution is used for classifying Alaska vegetation. The system, an agglomerative one, starts with 888 known Alaska plant communities, which are listed and referenced. At the broadest level of resolution, the system contains three formations-forest, scrub, and herbaceous vegetation. In addition to the classification, this report contains a key to levels I, II, and III; complete descriptions of all level IV units; and a glossary of terms used.

Keywords: Vegetation, classification, Alaska, tundra, boreal forest, coastal forest, plant communities.

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