Katmai National Park and Preserve

Landcover Classification

National Park Service

U.S. Department of the Interior



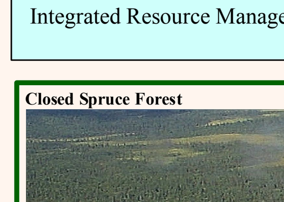
PROJECT DESCRIPTION

This project was undertaken by the National Park Service (NPS) Alaska Region Inventory and Monitoring Program in cooperation with Geographic Resource Solutions and the Alaska Natural Heritage Program. The goal of the NPS Inventory and Monitoring Program is to provide reliable and consistent information for assessing status and trends in the condition of National Park ecosystems. It conducts landcover mapping and classification under the inventory portion of the program to provide basic information useful for making resource management decisions, and to collect data that can be aggregated on a service-wide level for designing monitoring programs. To this end, the Inventory Program has developed a digital landcover map based on satellite imagery and field checked by vegetation survey. Map classes were calculated for each signature based on the vegetation attributes in the spectral database and a rule set that followed Viereck,et.al (1992) class breaks and naming conventions. The calculated map classes were intended to correspond to the important ecological types encountered in the study area.

The two levels of classification— ecological system and landcover class —provided through this project are important for addressing management and monitoring goals. The Katmai National Park and Preserve classifications can be used to understand habitat availability, provide baseline information about natural resources in the park, and for conducting coarse-scale analyses including regional ecological planning. For example, the classification and maps provided by this project can help wildlife biologists evaluate forage availability for bear and moose and visualize the distribution of wetlands, and rare habitats and species. Fine-scale vegetation structural information provided by the accompanying Natural Resource Technical Reports can also enhance ecological analyses for evaluating passerine bird habitat distribution.

Full documentation and products of the Katmai National Park and Preserve Landcover Mapping project can be found on the NPS Integrated Resource Management Applications portal at https://irma.nps.gov/DataStore/Reference/Profile/2170667.

Closed Spruce Forest

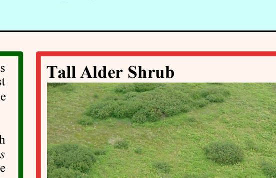


Classification: Tree canopy cover is 60% or more, and needleleaf trees make up 75% or more of the total tree cover. The class is comparable to the Viereck et al. (1992) hierarchical level closed needleleaf forest (I.A.1).

Distribution and Site Characteristics: The *closed spruce forest* class occurs on low elevation floodplains, moraines, and valley bottoms, but is absent east of the Aleutian Range. It generally occurs as small to medium size patches on well-drained, loamy or sandy soils. These sites have little (up to 10°) to no slope, and disturbance is often from alluvial processes. It occurs almost exclusively in the Lakes Region Spruce Covered Moraine subsection, and covers 0.04% (1,452 acres) of Katmai.

Vegetation: *Picea glauca* dominates the tree layer with cover ranging up to 66%, and *Populus balsamifera* and *Betula papyrifera* var. *kenaica* are common associates. Tree height can reach greater than 20 meters. *Salix* spp. and ericaceous shrubs are common yet sparse in the understory. This class is typically interspersed with other spruce classes such as *open spruce forest* and *spruce woodland*.

Tall Alder Shrub

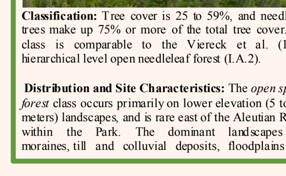


Classification: Tree canopy cover is less than 10% (or absent). Total shrub cover is 25% to 100% and alder contributes greater than 75% of the total shrub cover. The class is comparable to the Viereck et al. (1992)

Distribution and Site Characteristics: The *tall alder shrub* class is the most common class in Katmai covering 19.4% (793,447 acres) of the Park. It forms a matrix with the mesic herbaceous class on moderate to steep slopes (0 to 50°) .The steep slopes are typically ash covered, colluvium or glacial drift. This class is common on the Park's east side, especially on the thick ash deposits from the Novarupta eruption in the Barrier Range Mountains-North subsection. It occurs in all subsections, but is especially common (>20% of total area) in the following: Barrier Range Mountains-North, Barrier Range Mountains-South, Coastal Lower Slopes of Cape Douglas Mountains, Kamishak River Hills, Shelikof Strait Lowlands, and South Kejulik Mountains.

Vegetation: *Alnus* spp. or a combination of alder and tall willow greater than 1.5 meters in height dominate the landcover class. *Alnus viridis* ssp. *sinuata* is the most common species, however, *Alnus viridis* ssp. *fruticosa* dominates some sites. Alder height ranges from 0.5 meters at higher elevations to 8 meters tall downslope. It commonly forms a mosaic with the *mesic herbaceous* class. Younger, disturbed sites typically have a closed canopy whereas older sites have an open canopy.

Open Spruce Forest

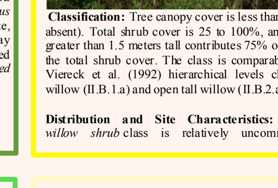


Classification: Tree cover is 25 to 59%, and needleleaf trees make up 75% or more of the total tree cover. The class is comparable to the Viereck et al. (1992) hierarchical level open needleleaf forest (I.A.2).

Distribution and Site Characteristics: The *open spruce forest* class occurs primarily on lower elevation (5 to 130 meters) landscapes, and is rare east of the Aleutian Range within the Park. The dominant landscapes are moraines, till and colluvial deposits, floodplains and ancient outwash deposits. The slope ranges from 0 to 20°. This landcover class is most common in and dominates the Lakes Region Spruce Covered Moraine subsection. It occurs in other subsections in minor amounts, and covers 2.3% (94,151 acres) of the Par.

Vegetation: The *open spruce forest* class is dominated by *Picea glauca* west of the Aleutian Range. *Betula papyrifera* var. *kenaica* and *Populus balsamifera* are common associates, and tree height ranges from 8 to 25 meters. *Alnus viridis* ssp. *sinuata, Salix glauca,* ericaceous shrubs and *Betula nana* often dominate the shrub layer. This class also occurs as small patches along the coast east of the Aleutian Range and is dominated by *Picea sitchensis* approximately 5 meters tall. *Populus balsamifera* ssp. *trichocarpa* is a common associate, and *Salix barclayi* or *Alnus viridis* ssp. *sinuata* may dominate the shrub layer. The class is often interspersed with the *spruce woodland, birch forest,* and *mixed broadleaf/needleleaf* landcover classes.

Tall Willow Shrub

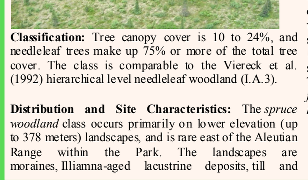


Classification: Tree canopy cover is less than 10% (or absent). Total shrub cover is 25 to 100%, and willow greater than 1.5 meters tall contributes 75% or more of the total shrub cover. The class is comparable to the Viereck et al. (1992) hierarchical levels closed tall willow (II.B.1.a) and open tall willow (II.B.2.a).

Distribution and Site Characteristics: The *tall willow shrub* class is relatively uncommon yet widespread throughout Katmai at low to mid elevations (range of 3 to 657 meters). It typically occurs as small patches on mountain side-slopes with slopes ranging from 0 to 30°. It is also frequently found in the Park's interior plateaus and lowlands, typically found along lakeshores, floodplains and the edge of small rivers/streams. The soils are dry to mesic, and the soil profile is typically mineral (silt, sand, or coarser) or a thin to thick layer of organic matter, typically litter, over mineral soil. Peat is uncommon. This class covers 3.5% (142,796 acres) of the Park. When alder and willow were found together the patches were mapped as *tall alder shrub*. The class occurs in all subsections except Cape Douglas Mountains.

Vegetation: This class includes all sites dominated by willows averaging greater than 1.5 meters tall and shrub cover ranging from 25 to 100%. The dominant willow species is *Salix barclayi*, although *Salix alaxensis, S. arbusculoides, S. bebbiana, S. commutata, S. glauca, S. pulchra* and *S. richardsonii* are common.

Spruce Woodland

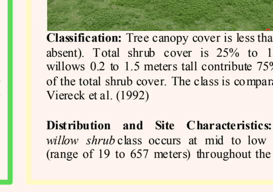


Classification: Tree canopy cover is 10 to 24%, and needleleaf trees make up 75% or more of the total tree cover. The class is comparable to the Viereck et al. (1992) hierarchical level needleleaf woodland (I.A.3).

Distribution and Site Characteristics: The *spruce woodland* class occurs primarily on lower elevation (up to 378 meters) landscapes, and is rare east of the Aleutian Range within the Park. The landscapes are moraines, Illiamna-aged lacustrine deposits, till and colluvial deposits, floodplains and ancient outwash deposits (Figures 2 and 3). The slope ranges from 0 to 10°. This landcover class is most common in the Lakes Region Spruce Covered Moraine subsection and the Lakes Region Old Lake Bed Deposits and Iliamna Drift Deposits Subsection. It occurs in other subsections in minor amounts and covers 1.2% (50,284 acres) of the Park.

Vegetation: The tree layer is dominated by *Picea glauca*, total tree cover ranges from 10 to 24% and tree height ranges from 3.6 to 17 meters. The shrub layer may be dominated by tall shrubs such as *Alnus viridis* ssp. *sinuata* or *Salix glauca*, or low to dwarf shrubs such as *Ledum palustre, Vaccinium uliginosum, Vaccinium vitis-idaea, Empetrum nigrum* and willow species. Lichen commonly dominates the ground layer. This class is typically interspersed with the *open spruce forest, low willow,* and *dwarf shrub-mesic herbaceous* landcover classes.

Low Willow Shrub

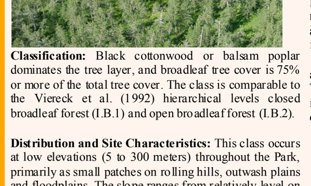


Classification: Tree canopy cover is less than 10% (or absent). Total shrub cover is 25% to 100%, and willows 0.2 to 1.5 meters tall contribute 75% or more of the total shrub cover. The class is comparable to the Viereck et al. (1992)

Distribution and Site Characteristics: The *low willow shrub* class occurs at mid to low elevations (range of 19 to 657 meters) throughout the Park, and sporadically above the alder zone on mountain slopes. It typically occurs on flat surfaces such as floodplains and valley bottoms, but also occurs on steep slopes (Figures 2 and 3). The sites range from dry to wet on mineral to peat substrates. It does not dominate any ecoregion, but is most common in the Alagnak River Lowlands, Bristol Bay Lowlands, Lakes Region Hills, and Lowland Outwash and Drift Deposits subsections (Table 2). It covers 4.1% (168,729 acres) of the Park.

Vegetation: This class is dominated by low stature (20 centimeters to 1.5 meters in height) willow, with cover ranging from 25% to 95%. The dominant overstory species include *Salix barclayi, S. glauca* and *S. pulchra*. Understory shrub species include *Betula nana, Empetrum nigrum* and *Vaccinium uliginosum*. Herbaceous species include *Calamagrostis canadensis, Carex kelloggii, C. aquatilis* var. *aquatilis, Carex utriculata, Chamerion angustifolium* ssp. *angustifolium* and *Equisetum pratense*. In valley bottoms, including floodplains, it occurs as a mosaic with the *birch forest, cottonwood/poplar forest* and *mixed broadleaf/needleleaf forest* classes.

Cottonwood/Poplar Forest

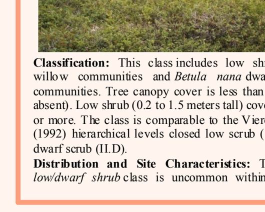


Classification: Black cottonwood or balsam poplar dominates the tree layer, and broadleaf tree cover is 75% or more of the total tree cover. The class is comparable to the Viereck et al. (1992) hierarchical levels closed broadleaf forest (I.B.1) and open broadleaf forest (I.B.2).

Distribution and Site Characteristics: This class occurs at low elevations (5 to 300 meters) throughout the Park, primarily as small patches on rolling hills, outwash plains and floodplains. The slope ranges from relatively level on floodplains, to moderate to steep on hillsides. The class is concentrated in the Lakes Region Spruce Covered Moraine subsection and Kamishak River Hills subsection, both of which have extensive floodplains. It occurs in most subsections but does not dominate any one subsection. These balsam poplar and black cottonwood forests cover 1.5% (62,064 acres) of Katmai.

Vegetation: In general, *Populus balsamifera* ssp. *trichocarpa* is most common along the coastal fringe of the Park, and *Populus balsamifera* is more common in the remainder of the Park. Cover ranges from 25% to 70%, and tree height ranges from 6 to 21 meters—1.5 meters for young stands. *Betula papyrifera* var. *kenaica* is a common associate, and *Picea glauca* often occurs as saplings or seedlings. Tall shrubs commonly dominate the understory, however in stands not dominated by tall shrubs, a herbaceous layer dominates with lichens present in varying amounts.

Mixed Low/ Dwarf Shrub

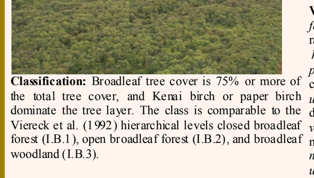


Classification: This class includes low shrub non-willow communities and *Betula nana* dwarf shrub communities. Tree canopy cover is less than 10% (or absent). Low shrub (0.2 to 1.5 meters tall) cover is 25% or more. The class is comparable to the Viereck et al. (1992) hierarchical levels closed low scrub (II.C) and dwarf scrub (II.D).

Distribution and Site Characteristics: The *mixed low/dwarf shrub* class is uncommon within Katmai covering 2.3% (95,474 acres) of the Park. It occurs at low to mid elevations (1 to 732 meters), on level to steep (45°) slopes, predominantly on the lowlands and plateaus west of the Aleutian Range. It occurs rarely in the mountains. The soils range from wet to relatively dry. This class is frequently found in numerous subsections including the Alagnak River Lowlands, Bristol Bay Lowlands, Kukaklek Lake Moraines, Lakes Region Hills, Lakes Region Hills/Kukaklek Lake Moraines, Lakes Region Old Lake Bed Deposits/Iliamna Drift Deposits, and Lowland Outwash and Drift Deposits.

Vegetation: Typically, *Betula nana, Myrica gale* or *Spiraea stevenii* dominate this class. Along the coast, *Myrica gale* or *Rubus spectabilis* often dominate sites. Tussock cover ranges from 0 to 90%. Associated species include low willow (*Salix* spp.), *Vaccinium uliginosum, Rubus spectabilis, Ledum* spp., *Calamagrostis canadensis* and the genera *Eriophorum* and *Carex* spp. This class is commonly interspersed with the *low willow shrub* class, dwarf shrub classes, and the *mesic herbaceous* class.

Birch Forest

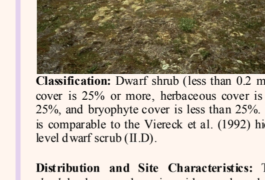


Classification: Broadleaf tree cover is 75% or more of the total tree cover, and Kenai birch or paper birch dominate the tree layer. The class is comparable to the Viereck et al. (1992) hierarchical levels closed broadleaf forest (I.B.1), open broadleaf forest (I.B.2), and broadleaf woodland (I.B.3).

Distribution and Site Characteristics: *Birch forest* is the most common forested landcover class in Katmai and covers 3.4% (139,190 acres) of the Park. It occurs at low elevations (19 to 286 meters) predominantly on the slopes and valley bottoms. It also occurs as localized patches on outwash plains and floodplains throughout the Park, but is scarce in the coastal portion of the Park especially where ashfall from Novarupta is extensive. The slope ranges from relatively level on floodplains, to moderate to steep (37°) on hillsides.

Vegetation: Forest canopy closure for the *birch forest* class ranges from 25 to 85%, and tree height ranges from 1 to 10 meters. *Betula papyrifera* var. *kenaica* dominates most sites, although *Betula papyrifera* may dominate some sites. Common codominants include both *Populus balsamifera* and *Populus balsamifera* ssp. *trichocarpa*. The tall shrub layer is dominated by *Alnus incana* ssp. *tenuifolia, Alnus viridis* ssp. *sinuata* and *Salix barclayi*. The understory may be dominated by *Betula nana, Calamagrostis canadensis, Equisetum silvaticum* or *Vaccinium uliginosum*. Mosses and lichens are present in varying amounts.

Dwarf Shrub

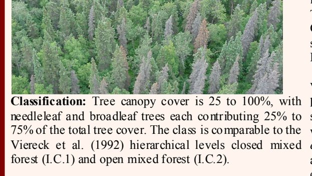


Classification: Dwarf shrub (less than 0.2 meters tall) cover is 25% or more, herbaceous cover is less than 25%, and bryophyte cover is less than 25%. The class is comparable to the Viereck et al. (1992) hierarchical level dwarf scrub (II.D).

Distribution and Site Characteristics: The *dwarf shrub* landcover class is widespread and common covering 10.4% (423,755 acres) of Katmai. It occurs in alpine areas, the rolling plateaus and hills west of the Aleutian Range, and low elevation lands on the western edge of the Park. It is found on unstable to stable surfaces such as gentle to steep mountain slopes, high mountain valley floors, and rounded mountain ridges—often exposed bedrock. Slopes range from 0 to >40°. The soils are typically a thin layer of dry to mesic sand, litter or organic matter. Its elevation ranges from 6 to 2,400 meters based on field data.

Vegetation: The *dwarf shrub* class is comprised of shrubs that reach a height of 20 centimeters or less. Most sites are a blend of dwarf shrubs with some sedge species interspersed with exposed rock. Lichen cover ranges from sparse to 80%. The dominant dwarf shrubs include *Arctostaphylos alpina, Empetrum nigrum, Luetkea pectinata, Phyllodoce aleutica*, and *Vaccinium uliginosum*. Other codominants or common species include *Arctostaphylos uva-ursi, Betula nana, Ledum palustre* ssp. *decumbens, Loiseleuria procumbens, Salix arctica, S. reticulata*, and *Rhododendron camtschaticum. Cladina* spp. are common.

Mixed Broadleaf/Needleleaf Forest

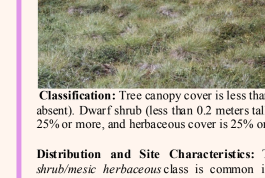


Classification: Tree canopy cover is 25 to 100%, with needleleaf and broadleaf trees each contributing 25% to 75% of the total tree cover. The class is comparable to the Viereck et al. (1992) hierarchical levels closed mixed forest (I.C.1) and open mixed forest (I.C.2).

Distribution and Site Characteristics: The *mixed broadleaf/needleleaf forest* is a common forested landcover class in Katmai covering 1.6% (66,634 acres) of the Park. It occurs at low elevations (53-250 meters) predominantly on the slopes and valley bottoms surrounding the Savonoski River, Naknek Lake, Lake Grosvenor, Lake Brooks and Nonvianuk Lake. The geomorphology ranges from Illiamna-aged lacustrine deposits, moraines, till and colluvial deposits, outwash plains and floodplains. The slope ranges from relatively level on floodplains, to moderate to steep on hillsides. The class is concentrated in the Lakes Region Spruce Covered Moraine subsection, is uncommon in other subsections and does not occur east of the Aleutian Range.

Vegetation: Forest cover ranges from 25 to 75%, and tree height ranges from 5 to 11 meters. The dominant tree species are typically *Picea glauca* mixed with *Betula papyrifera* var. *kenaica* or, occasionally, *Picea glauca* mixed with *Populus balsamifera*. If tall shrubs are present they typically are willow species. More commonly, low shrubs dominate the understory and include *Arctostaphylos alpina, Betula glandulosa, Empetrum nigrum, Ledum decumbens, Spiraea stevenii*, *Vaccinium uliginosum* and *V. vitis-idaea*. Mosses and lichens are present in varying amounts.

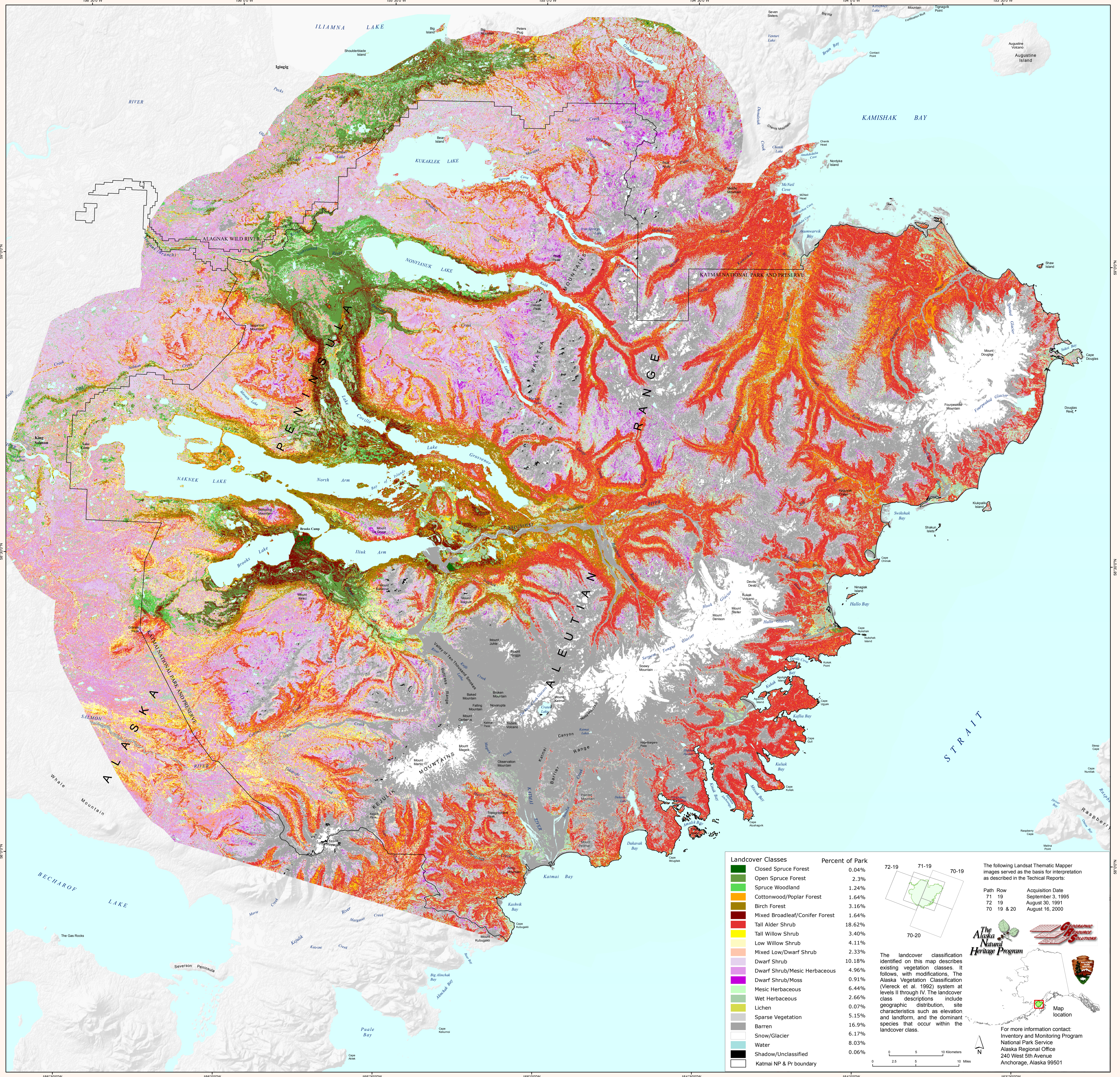
Dwarf Shrub Mesic Herbaceous



Classification: Tree canopy cover is less than 10% (or absent). Dwarf shrub (less than 0.2 meters tall) cover is 25% or more, and herbaceous cover is 25% or more.

Distribution and Site Characteristics: The *dwarf shrub/mesic herbaceous* class is common in Katmai covering 4.8% (195,972 acres) of the Park (Table 2). It occurs at low to mid elevations on relatively level ground, predominantly on the lowlands and plateaus in the eastern portion of the Park (Figures 2 and 3). It is rare in the mountains and coastal areas. The soils are mesic with organic tussocks over mineral soil. Small seasonal pools of water often occur between the tussocks. Permafrost likely occurs. It is common in numerous subsections including the Alagnak River Lowlands, Bristol Bay Lowlands, Kukaklek Lake Moraines and Lakes Region Hills

Vegetation: This class typically has low and dwarf shrubs interspersed with a lush sedge/grass layer that sometimes forms tussocks. A variety of shrubs may occur including *Betula nana, Dryas octopetala, Empetrum nigrum, Ledum palustre* ssp. *decumbens, Loiseleuria procumbens, Luetkea pectinata, Rhododendron camtschaticum, Salix arctica, S. barclayi, S. polaris, S. pulchra, S. reticulata, S. rotundifolia, S. stolonifera* and *Vaccinium uliginosum*. Herbaceous genera include *Eriophorum* and *Carex*. This class commonly forms a mosaic with the *low willow shrub* class, other dwarf shrub classes, and the *mesic herbaceous* class.



Landcover Classes	Percent of Park
Closed Spruce Forest	0.04%
Open Spruce Forest	2.3%
Spruce Woodland	1.24%
Cottonwood/Poplar Forest	1.64%
Birch Forest	3.16%
Mixed Broadleaf/Conifer Forest	1.64%
Tall Alder Shrub	18.62%
Tall Willow Shrub	3.40%
Low Willow Shrub	4.11%
Mixed Low/Dwarf Shrub	2.33%
Dwarf Shrub	10.18%
Dwarf Shrub/Mesic Herbaceous	4.96%
Dwarf Shrub/Moss	0.91%
Mesic Herbaceous	6.44%
Wet Herbaceous	2.66%
Lichen	0.07%
Sparse Vegetation	5.15%
Barren	16.9%
Snow/Glacier	6.17%
Water	8.03%
Shadow/Unclassified	0.06%
Katmai NP & Pr boundary	

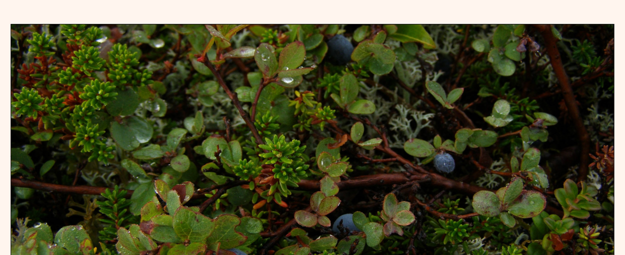
The following Landsat Thematic Mapper images served as the basis for interpretation as described in the Techical Reports:

Path	Row	Acquisition Date
71	19	September 3, 1995
72	19	August 30, 1991
70	19 & 20	August 16, 2000

The landcover classification identified on this map describes existing vegetation classes. It follows, with modifications, The Alaska Vegetation Classification (Viereck et al. 1992) system at levels II through IV. The landcover class descriptions include geographic distribution, site characteristics such as elevation and landform, and the dominant species that occur within the landcover class.

For more information contact:
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The Alaska Natural Heritage Program — Geographic Resource Solutions



Dwarf Shrub/Moss

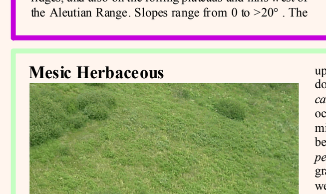


Classification: Dwarf shrub (less than 0.2 meters tall) cover is 25% or more, and bryophyte cover is greater than 25%. The class is comparable to the Viereck et al. (1992) hierarchical level dwarf scrub (II.D).

Distribution and Site Characteristics: The *dwarf shrub/moss* landcover class occurs on alpine slopes and ridges, and also on the rolling plateaus and hills west of the Aleutian Range. Slopes range from 0 to >20°. The soils are typically a thin layer of organic matter over mineral soil or bedrock. This class is uncommon in all subsections and occurs primarily in the Kamishak River Hills and Walatka Mountains subsections. It covers 0.9% (37,123 acres) of Katmai.

Vegetation: The *dwarf shrub/moss* class is dominated by dwarf shrubs and bryophytes, primarily species from the genus *Racomitrium*. Most sites are also a blend of sedge and lichen species often interspersed with exposed rock. Dwarf shrub species may include *Arctostaphylos alpina, A. uva-ursi, Betula nana, Empetrum nigrum, Ledum palustre* ssp. *decumbens, Loiseleuria procumbens, Luetkea pectinata, Phyllodoce aleutica, Rhododendron camtschaticum, Salix arctica, S. reticulata* and *Vaccinium uliginosum*. In the mountains, this class often grades into other dwarf shrub classes and the *barren, low willow shrub,* and *sparse vegetation* classes. Downslope it grades into the *tall alder shrub, low willow shrub* and *mesic herbaceous* classes.

Mesic Herbaceous

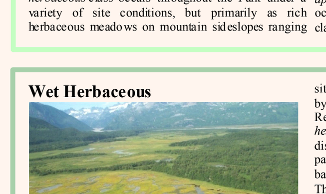


Classification: Tree canopy is less than 10% (or absent), shrub cover is less than 25%, and herbaceous cover is greater than 25%. Sites are dry to mesic with little to no standing water.

Distribution and Site Characteristics The *mesic herbaceous* class occurs throughout the Park under a variety of site conditions, but primarily as rich herbaceous meadows on mountain sideslopes ranging up to 45° slope. In these locations the class is dominated by the plant associations *Calamagrostis canadensis* and *Calamagrostis canadensis*-forb. It occurs both above the alder zone up to 523 meters, and mixed in with alder moving down slope. Sites may also be dominated by a mixture of forbs and *Luetkea pectinata* at higher elevations. This class also occurs as grassy meadows on low elevation moist depressions west of the Aleutian Range. Standing water may be seasonally present in small amounts. The sites are dominated by *Calamagrostis canadensis* and *Chamerion angustifolium* ssp. *angustifolium*

Vegetation: The *mesic herbaceous* class also occurs as small linear patches on high beach ridges or dunes along the coast (0 to 5 meters elevation). In these locations, *Leymus mollis* is dominant or codominant with various herbaceous species such as *Achillea borealis, Angelica lucida, Chamerion angustifolium* ssp. *angustifolium, Heracleum lanatum* and *Lathyrus japonicus* var. *maritimus*. This class nearly always occurs as small patches within a mosaic of other classes.

Wet Herbaceous

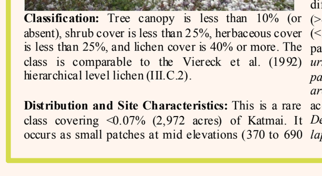


Classification: Tree canopy is less than 10% (or absent), shrub cover is less than 25%, and herbaceous cover is greater than 25%. The dominant vegetation is emergent; semi-permanent or standing water is present.

Distribution and Site Characteristics: The *wet herbaceous* class is common on lacustrine deposits, sloughs, saturated river terraces, estuaries, pools of hillside streams, and the edges of lakes and ponds. The sites have standing or semi-permanent water dominated by hydrophilic vegetation, and have little to no slope. Relative to other classes, the patch size of the *wet herbaceous* class is generally small and patchy in distribution throughout Katmai, although some large patches occur in tidal deltas. The highest elevation, based on field data, is 728 meters.
This is a dominant landcover class in the Shelikof Strait Lowlands subsection, and lowlands of the Lakes Region Spruce Covered Moraine subsection—especially along the Savonoski River Floodplain. The class covers 2.5% (103,817 acres) of Katmai.

Vegetation: Sites are often dominated by a monoculture or mixture of species including, in freshwater, *Calamagrostis canadensis, Carex aquatilis, C. utriculata, Equisetum fluviatile, Eriophorum scheuchzeri, E. angustifolium, E. russeolum* and *Nuphar polysepalum. Sphagnum* spp. are also common. In tidal marshes, sites are dominated by *Carex lyngbyaei, C. mackenziei, C. ramenskii, Eleocharis palustris, Hippuris tetraphylla, Plantago maritime* and *Puccinellia nutkaensis*. Species diversity is low on most sites.

Lichen

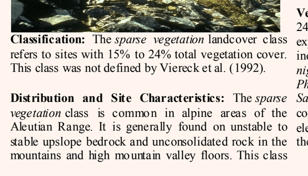


Classification: Tree canopy is less than 10% (or absent), shrub cover is less than 25%, herbaceous cover is less than 25%, and lichen cover is 40% or more. The class is comparable to the Viereck et al. (1992) hierarchical level lichen (III.C.2).

Distribution and Site Characteristics: This is a rare class covering <0.07% (2,972 acres) of Katmai. It occurs as small patches at mid elevations (370 to 690 meters) on rounded hilltops and the lowlands and plateaus west of the Aleutian Range. Soils are dry to mesic, may be hummocky, and consist of a thin layer of organic matter over a thin layer of silts or directly over rock. The *lichen* class is rare yet present in most subsections. Based on total acres it is most common in the Kukaklek Lake Moraines and Lakes Region Hills/ Kukaklek Lake Moraines subsections.

Vegetation: The *lichen* class occurs as a mosaic within a matrix of other dwarf shrub classes. The vascular species composition and associated cover values for this class grade into the other dwarf shrub classes—the difference being the *lichen* class has more lichen cover (>40%) and less dwarf shrub cover (<25%). *Cladina* spp. are prevalent growing between patches of dwarf shrubs such as *Arctostaphylos uva-ursi, Betula nana, Empetrum nigrum, Ledum palustre* ssp. *decumbens, Loiseleuria procumbens, Salix arctica, S. reticulata* and *Vaccinium uliginosum*. Herbaceous species are *Carex aquatilis, C. spectabilis, Deschampsia* spp. and *Diapensia lapponica* ssp. *obovata*.

Sparse Vegetation

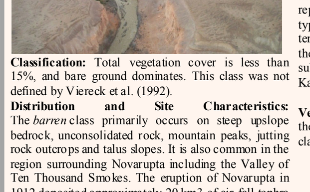


Classification: The *sparse vegetation* landcover class refers to sites with 15% to 24% total vegetation cover. This class was not defined by Viereck et al. (1992).

Distribution and Site Characteristics: The *sparse vegetation* class is common in alpine areas of the Aleutian Range. It is generally found on unstable to stable upslope bedrock and unconsolidated rock in the mountains and high mountain valley floors. This class also occurs on sandbars and alluvial fans. The slope ranges up to 45°. The soils are a thin layer of dry to mesic sand, litter or organic matter. Vegetation typically occurs as patches on the organic matter interspersed with exposed rock. This class is common in subsections dominated by mountains including Barrier Range Mountains-North, Barrier Range Mountains-South, Kamishak River Hills, South Kejulik Mountains and Walatka Mountains (Table 2). The *sparse vegetation* landcover class covers 5.1% (210,407 acres) of Katmai.

Vegetation: Total vegetation cover ranges from 15 to 24%. It is dominated by dwarf shrubs, surface rock and exposed mineral soil. Dwarf shrub species include *Arctostaphylos alpina, Betula nana, Empetrum nigrum, Ledum decumbens, Luetkea pectinata, Phyllodoce aleutica, Rhododendron camtschaticum, Salix rotundifolia*, and *Vaccinium uliginosum*. Moss is common on sandbars and lichens are common at higher elevations. The class frequently occurs next to the *barren* and *dwarf shrub* classes.

Barren

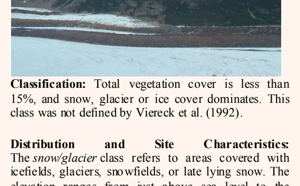


Classification: Total vegetation cover is less than 15%, and bare ground dominates. This class was not defined by Viereck et al. (1992).

Distribution and Site Characteristics: The *barren* class primarily occurs on steep upslope bedrock, unconsolidated rock, mountain peaks, jutting rock outcrops and talus slopes. It is also common in the region surrounding Novarupta including the Valley of Ten Thousand Smokes. The eruption of Novarupta in 1912 deposited approximately 20 km3 of air-fall tephra and 11 to 15 km3 of ash-flow tuff (Hildreth 1983). Much of the area surrounding Novarupta were blanketed in ash, while areas further from Novarupta were not as heavily impacted. Although pioneer species have invaded much of the ash-fall region, unstable deposits of exposed ash are still common.
The *barren* class also represents exposed alluvial deposits along rivers, especially those with wide outwash plains. Note that many of the silty rivers are misclassified as *barren*. In addition, this class represents the debris-covered surfaces of glaciers, typically increasing in cover toward a glacier's terminus. This class occupies the highest elevations in the Park. It dominates most of the mountain subsections. This is the second most common class in Katmai covering 16.9% (691,194 acres) of the Park.

Vegetation: The *barren* class is often found adjacent to the *sparse vegetation* and *dwarf shrub* landcover classes.

Snow/Glacier



Classification: Total vegetation cover is less than 15%, and snow, glacier or ice cover dominates. This class was not defined by Viereck et al. (1992).

Distribution and Site Characteristics: The *snow/glacier* class refers to areas covered with icefields, glaciers, snowfields, or late lying snow. The elevation ranges from just above sea level to the highest elevations in the Park. It dominates the Cape Douglas Mountains and Kejulik Mountains subsections. It also occurs in the higher elevations of most of the mountainous subsections. This class covers 6.2% (252,205 acres) of Katmai's total area.

Vegetation: This class is typically found adjacent to the *barren, sparse vegetation* and *dwarf shrub* landcover classes.

