Lake Clark National Park and Preserve

Landcover Classification

National Park Service
U.S. Department of the Interior

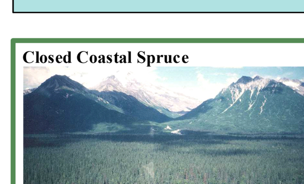
PROJECT DESCRIPTION

This project was undertaken by the National Park Service Inventory and Monitoring Program in cooperation with Pacific Meridian Resources. 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 SPOT satellite imagery, Alaska High Altitude Program (AHAP) color infra red aerial photography and field vegetation survey. The landcover classification provided through this project is important for addressing management and monitoring goals and 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.

Products and full documentation for this project can be found on the National Park Service Natural Resource Information Portal at https://irma.nps.gov/DataStore/Reference/Profile/2171668 .

Closed Coastal Spruce



Site Description:
Closed coastal spruce indicates stands of conifer with total crown cover generally greater than 60% on the coastal side of the Alaska Range. Sitka and white spruce (*Picea sitchensis* and *P. glauca*) are the dominant species, with a deciduous component less than 25% of total crown cover. Sitka spruce is more predominant south of Tuxedni Bay, with white spruce becoming predominant north of Tuxedni Bay. The deciduous species are balsam poplar south of the Big River, and a mixture of balsam poplar and paper birch from the Big River north. The understory consists of alder, devil's club, salmonberry, and a ground cover of mosses with scattered grasses and forbs.
These rich and productive forests are distributed in the major valleys and along the coastal plain of the east side of Lake Clark National Park and Preserve. Large closed conifer stands grow on the old outwash plain east of Crescent Lake, and scattered throughout the valley downstream, and along the coastal plain between the Red River and East Glacier Creek, and along the floodplain of West Glacier Creek. Stands of dense white spruce along Tuxedni Bay and north are becoming infested with spruce bark beetle.

Closed Interior Spruce



Site Description:
Closed Interior Spruce indicates dense spruce stands on the west side of the Alaska Range. Closed spruce stands generally run from 60% to 80% crown closure of tree species. White spruce is the predominant overstory in this type, with some scattered black spruce near boggy margins, and balsam poplar and birch making up less than 25% of the total crown cover. Understory consists of scattered alder, ferns and forbs, and ground cover is a layer of mosses.
Closed spruce forests occur in small patches along the north shore of Lake Clark, especially at the mouths of Kijik River and along Chulitna Bay, up Currant Creek on the south side of Lake Clark, some unburned riparian remnant stands along the Stony River, and scattered patches in the Necons River floodplain northeast of Two Lakes. This type may be spatially confused with open spruce stands, especially on steeper north facing slopes, and may have some spectral confusion with cloud shadows in the northwest portion of the classification.

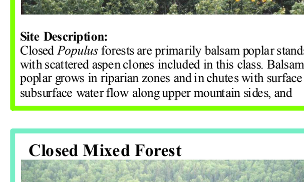
Closed Birch Forest



Site Description:
The closed birch forest type are dense stands of Kenai birch with crown closures of 60-100%. Balsam poplar is often mixed with birch, especially near upper altitudinal limits around Lake Clark and along riparian zones. Alder often fills in canopy openings and is a major component of the understory. Rose, highbush cranberry, grasses and forbs are common in the understory. Ground cover is sparse mosses and litter. Scattered white spruce make up less than 25% of the tree canopy.

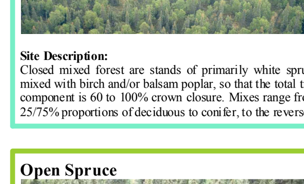
Closed birch stands are most commonly found along the shores and associated valleys of Lake Clark, and on the southeast facing slopes above the Stony River. Scattered stands of closed birch may occur at the east entrance to Lake Clark Pass, and down in the valley of West Glacier Creek. Birch seems to be rare to absent along the Cook Inlet coast between the Big River and the West Glacier Creek.

Closed *Populus* Forest



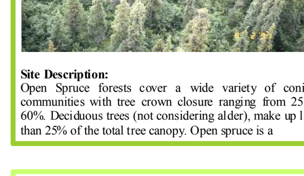
Site Description:
Closed *Populus* forests are primarily balsam poplar stands, with scattered aspen clones included in this class. Balsam poplar grows in riparian zones and in chutes with surface or subsurface water flow along upper mountain sides, and occasionally forms timberline stands on southerly facing steep slopes. Crown closure ranges from 60 to nearly 100%. Birch may be included in these stands, especially on upper slopes. Alder is a major component of these stands, filling in canopy openings and extending into the understory. White spruce may form up to 25% of the forest canopy, especially in mature riparian stands. Understory in dense balsam poplar stands is mostly alder, with scattered rose, some highbush cranberry, grasses, Forbs and ferns, and a ground cover primarily litter with scattered mosses.
Closed balsam poplar forests are primarily on the south facing slopes of Copper Mountain above Kontrashibuna Lake, the south facing slopes at the upper end of Lake Clark and the valleys of Miller Creek, the lower Tlikakila River, and the lower Kijik River. Small aspen clones occur in the valley of the Stony River, and very rarely, along the terraces above Lake Clark west of Port Alsworth.

Closed Mixed Forest



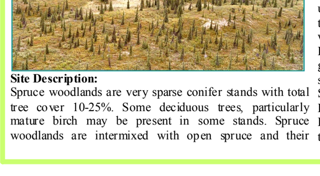
Site Description:
Closed mixed forest are stands of primarily white spruce mixed with birch and/or balsam poplar, so that the total tree component is 60 to 100% crown closure. Mixes range from 25/75% proportions of deciduous to conifer, to the reverse at 25/75% conifer to deciduous species. Openings in the overstory are often filled with alder, which extends to the understory of the stand. A wide variety of understory and ground cover communities are present, depending on the proportion of tree species and total crown closure.
Closed (and open) mixed forests are dominant along the shores of Lake Clark and the associated valleys of Miller Creek, Kijik River, Tlikakila and Chokotonk Rivers, Current Creek and the Tazimina and Kontrashibuna Lakes. Mix forest in the northern section of the park are in the upper reaches of the Stony River, around Tequaluana Lake, the floodplain of the Neacola River, and on the east side in the broad valleys of the North Fork and Big Rivers, lower Drift River and Crescent River and the north shore of Tuxedni Bay.

Open Spruce



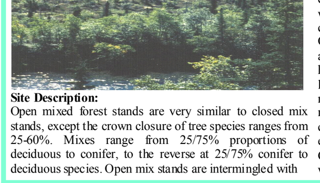
Site Description:
Open Spruce forests cover a wide variety of conifer communities with tree crown closure ranging from 25 to 60%. Deciduous trees (not considering alder), make up less than 25% of the total tree canopy. Open spruce is a dominant class in the lower elevations of Lake Clark National Park and Preserve. On the eastern Cook Inlet side of the Alaska Range, Sitka and white spruce form open stands, with alder understories and associated grass and forb ground cover. Extensive stands of open Sitka spruce are on the slopes above Cook Inlet from the valley of East Glacier Creek north to the Red River/Saddle Mountain. In the old floodplain of East Glacier Creek, open spruce stands are interspersed with small sedge and *Sphagnum* bogs. Open white spruce stands occur in the Crescent River valley and the north side of Tuxedni Bay. These stands have a more open understory of alder and willow, with forb and moss ground cover.
As this area is the southern extent of the interior taiga, some white spruce may mix into these stands. Open spruce stands in Lake Clark Pass are primarily white spruce with alder understory. The easternmost stands in this area are experiencing spruce bark beetle infestations. Extensive open black spruce stands grow on the flatter country.

Spruce Woodland



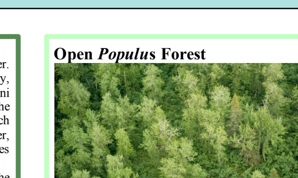
Site Description:
Spruce woodlands are very sparse conifer stands with total tree cover 10-25%. Some deciduous trees, particularly mature birch may be present in some stands. Spruce woodlands are intermixed with open spruce and their corresponding understory types, such as low shrub, alder or sedge and shrub bog meadow.
Spruce woodlands in the Stony River and Telaquana Lack country are usually black spruce with wetland and some low shrub understories. In the Mulchatna and Chilkadrotna drainages, stunted spruce stands have dwarf birch and willow understories with ericaceous shrubs and fruticose lichen/moss ground cover. Black spruce woodland in the Chulitna River country have sedge and shrub bog understories and frequent openings. Spruce woodland on the south and west shores of Lake Clark are growing on well-drained lateral moraines and glacial outwash plains. Here they are white spruce with lichen and ericaceous ground cover, interspersed with birch stands and small sedge and shrub bog meadows.
Spruce woodlands on the Cook Inlet side of the Alaska Range are concentrated in the outwash fans of the Red River, below Hickerson Lake, and the timberline reaches of the North Fork of the Crescent River.

Open Mixed Forest



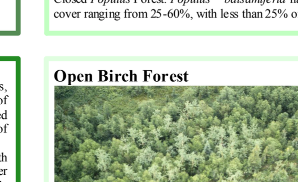
Site Description:
Open mixed forest stands are very similar to closed mix stands, except the crown closure of tree species ranges from 25-60%. Mixes range from 25/75% proportions of deciduous to conifer, to the reverse at 25/75% conifer to deciduous species. Open mix stands are intermingled with closed mix stands in broad swaths through the open slopes and valley bottoms of the study area. As in closed mix, the dominant conifer species is white spruce, and the deciduous species are birch and balsam poplar. Alder is a major component in the understory and canopy openings. Spruce mixes will have a understory with more moss and ericaceous ground cover, while deciduous mixes will have a wider variety of shrubs such as rose and highbush cranberry, with ferns, forbs and litter for ground cover.
Open mix is a common cover type throughout the country around Lake Clark and the valleys flowing into it. Stands higher on the slopes, especially north facing areas, have a little bare rock cliffs and stringers of white spruce in the narrow drainages. Birch in these regrowth areas seem to be major moose browse. Open mix on the Cook Inlet side is concentrated in the valley of Crescent Lake and River, especially at the juncture of the North Fork and Lake Fork, Crescent River. Understory in this area is willow and alder, with sparse grass and forb and litter ground cover.

Open *Populus* Forest



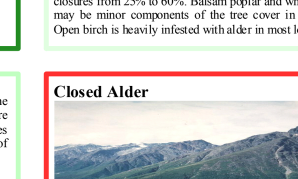
Site Description:
Open *Populus* Forest is almost exclusively balsam poplar, as most of the aspen clones seem to be mapped as Closed *Populus* Forest. *Populus balsamifera* has forest cover ranging from 25-60%, with less than 25% of the tree cover in conifer. Alder is a common understory and interstial species for this type. Open *Populus* grows primarily on floodplains and outwash fans, or occasionally, near timberline in areas with surface or subsurface drainages. Mature birch or white spruce may be mixed with balsam poplar. Often the large sparsely spaced trees are used as nest sites by eagles and other large raptors.
Open *Populus* forests are scarce on the western side of the Alaska Range in Lake Clark National Park and Preserve. Some stands occur at the mouth of the Kijik River and around Kijik Lake, on fans from streams draining into Tazimina and Kontrashibuna Lakes, scattered along the Stony River. Open *Populus* stands are more common on the eastern side of the study area in the large glacial valleys draining into Cook Inlet.

Open Birch Forest



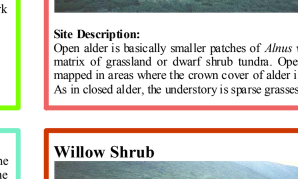
Site Description:
Open birch is dominated with Kenai birch with tree crown closures from 25% to 60%. Balsam poplar and white spruce may be minor components of the tree cover in this type. Open birch is heavily infested with alder in most locations, although dwarf shrub tundra may be the ground cover in the timberline ecotone. Open birch is intermingled with closed birch and mixed forest throughout the study area.
Open and closed birch forest on the north-facing slopes of Tanalian Mountain near Port Alsworth, are regrowth stands from a wildfire in the early 1950's. Other open birch stands are the upper limits of forest on many slopes around Lake Clark and valleys draining into it. Open birch stands also grow on south facing slopes above the Stony River floodplain. Open birch is uncommon on the Cook Inlet side of the Alaska Range. Scattered birch stands grow in the West Glacier Creek valley, then skip most of the coastline northward until the east entrance to Lake Clark Pass near Big River Lakes.

Closed Alder



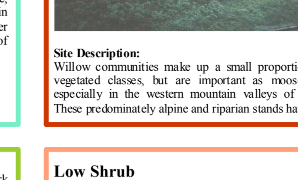
Site Description:
The closed alder type is a dense community with crown cover greater than 75% and generally 100%. Layers of alder overlap each other in impenetrable thickets, with occasional mountain ash or cow parsnip in the less dense spaces. Ground cover is primarily alder leaf litter with scattered grasses. The parasitic plant broomrape grows on alder roots. Alder thickets may form large patches surrounded by grassland or dwarf shrub tundra, or blanket the mountainsides for miles. Comparisons with historical records indicate that alder is spreading down across mountain valleys and closing off previous travel routes.
Alder is a nitrogen fixing species and is an early pioneer on recently exposed soils such as de-glaciated till. Alder grown on moderately drained to rocky sites from just about sea level to around 3500'. Open and closed alder together are the most extensive vegetated type in Lake Clark National Park and Preserve (second only to ice and snow). Even forested areas could be viewed as a dense alder layer with a few trees. This community pretty much rings the mountain regions from water to ice with openings for rivers and rocky cliffs, especially on the coastal side. On the western slope of the Alaska Range, closed alder grades from timberline deciduous forest to tundra types above 3500'.

Open Alder



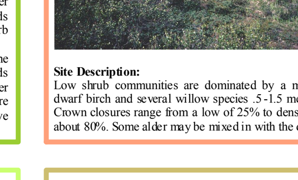
Site Description:
Open alder is basically smaller patches of *Alnus viridis* in a matrix of grassland or dwarf shrub tundra. Open alder is mapped in areas where the crown cover of alder is 25-75%. As in closed alder, the understory is sparse grasses and forbs with leaf litter for ground cover. The grassland component is primarily *Calmagrostis* with rich variety of forbs: fireweed, *Veratrum*, *Valeriana*, monkshood and ferns. Open alder on the Cook Inlet side and some slopes in the extreme western part of the study area are mixed with grasslands. Open alder on the western side of the mountains down through the big lake country is usually mixed with dwarf shrub tundra. This has low growing dwarf birch, blueberry, cranberry, mossberry (crowberry), Labrador tea, and has a ground cover of mosses and lichens.
Open alder generally occurs at the upper edges of the alder zone where shrubs are grading into tundra types. As such, it is on most of the upper mountain slopes throughout the park and preserve. The only vegetated areas of the study area without substantial alder are the Stony River valley south over the Telaquana Highlands into the Fishtrap Lake valley, and the Chulitna lowlands.

Willow Shrub



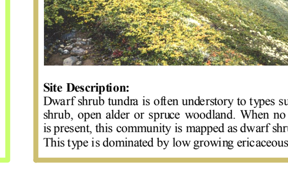
Site Description:
Willow communities make up a small proportion of the vegetated classes, but are important as moose habitat, especially in the western mountain valleys of the park. These predominately alpine and riparian stands have been hand edited to separate them from the willow stands which are part of the low shrub type.
Willow stands are dominated by Salix alaxensis and S. glauca growing one to over two meters high. They commonly grow on recently deglaciated moraines such as those in upper Currant Creeks or on active floodplains of flashy mountain streams. Scattered alder are often mixed with these willow stands. Ground cover is primarily rocks and dry habitat mosses. In some areas these stands are also important habitat for beaver.

Low Shrub



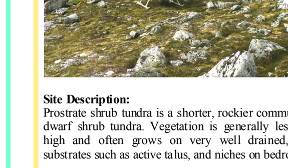
Site Description:
Low shrub communities are dominated by a mixture of dwarf birch and several willow species .5-1.5 meters high. Crown closures range from a low of 25% to densest stands about 80%. Some alder may be mixed in with the dwarf birch and willow in this community. A low growing ericaceous layer Labrador tea, blueberry, cranberry, and mossberry lies under the taller shrubs and in openings between patches. Ground cover is mosses with patches of fruticose lichens on dryer locations.
The low shrub type is concentrated in the center of the western lake country; west of Telaquana and south to the Lachbuna lake valley, along the southwestern coast of Lake Clark and Lower Tazamina Lake.

Dwarf Shrub Tundra

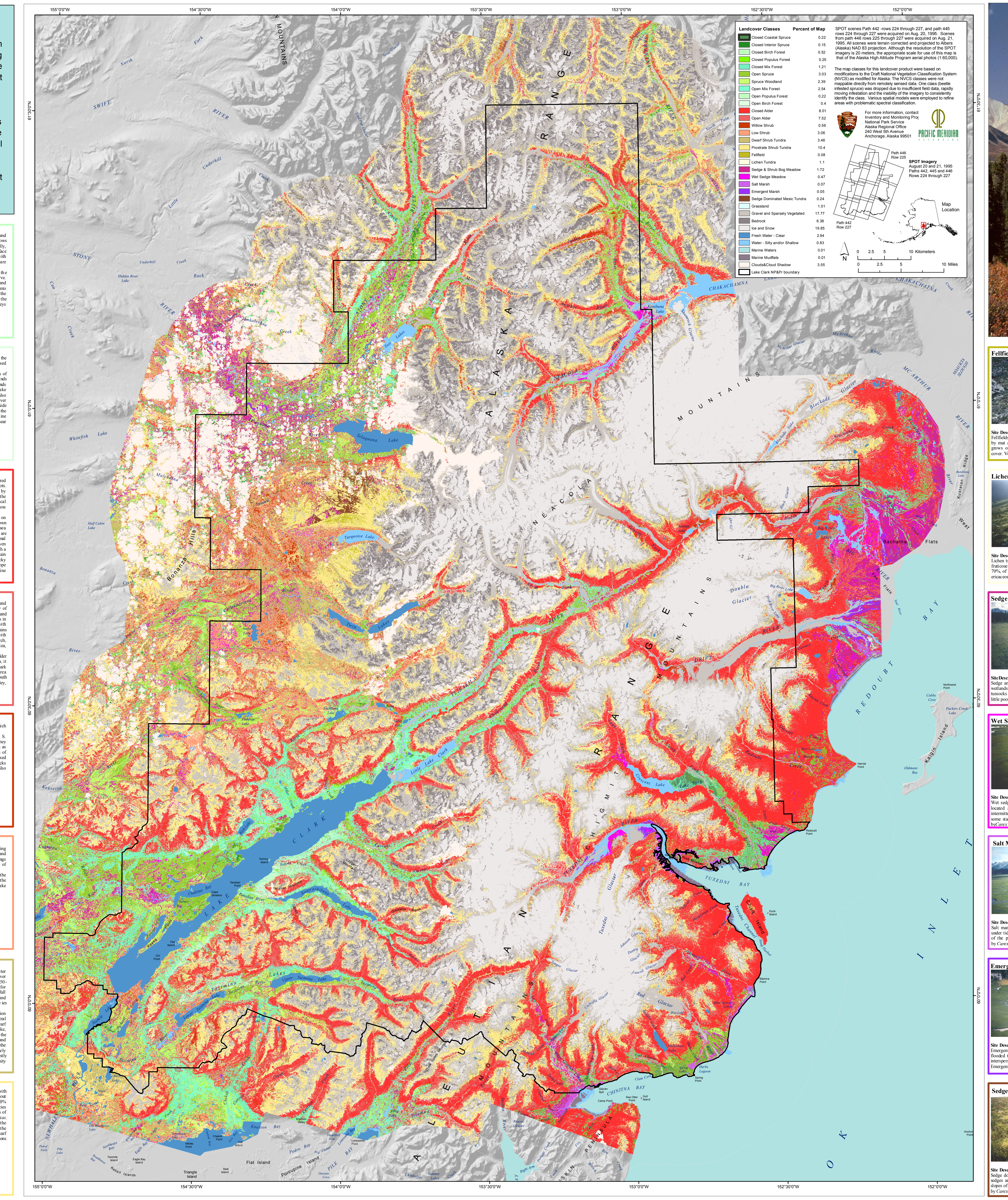


Site Description:
Dwarf shrub tundra is often understory to types such as low shrub, open alder or spruce woodland. When no overstory is present, this community is mapped as dwarf shrub tundra. This type is dominated by low growing ericaceous shrubs, dwarf birch and occasionally willow; all less than .33 meter high. Dwarf shrub tundra has a minimum vegetative cover of 25%, but more commonly has vegetative cover of 50-90%. This type is often a good berry producer for blueberries, cranberries and mossberries, thus providing fall and winter food for bears, ptarmigan and voles. Ground cover is mosses and lichens, mostly fruticose lichen species commonly called reindeer moss, and foliose *Peltigeras*.
Most of the dwarf shrub tundra is distributed in association with low shrub tundra and spruce woodland in the central lake country on the west side of the Alaska Range. Dwarf shrub tundra is common in the valley east of Fishtrap Lake, the upper reaches of what would be the south fork of the Chilikadrotna River, the drainages west of Twin Lakes and Turquoise Lake, and mixed with mesic sedge tundra on the Telaquana Highlands. Dwarf shrub tundra is widely scattered throughout the remainder of the study area, mostly in patches on mountain slopes above the alder community and grading into rock and talus.

Prostrate Shrub Tundra

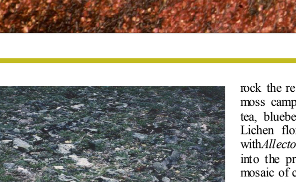


Site Description:
Prostrate shrub tundra is a shorter, rockier community than dwarf shrub tundra. Vegetation is generally less than 6" high and often grows on very well drained, unstable substrates such as active talus, and niches on bedrock. Prostrate shrub tundra is a micro-patchy community with tundra patches consisting of at least 50% cover throughout the unit. Actual tundra patches have more than 70% vegetative cover, usually mountain avens, dwarf species willow, mossberry, buleberry, cranberry, several species of heather, and fruticose lichens like *Cladinas* and *Cladonias*. Prostrate shrub tundra is the predominant tundra type in the alpine zone of the study area. It is distributed through the mountains and rolling uplands above the alder and dwarf shrub tundra, and into the rock and talus and glacier regions over 4000'.



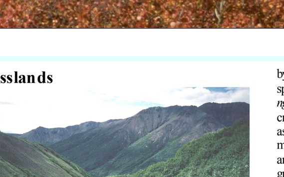


Fellfield



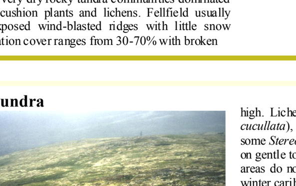
Site Description:
Fellfields are very dry rocky tundra communities dominated by mat and cushion plants and lichens. Fellfield usually grows on exposed wind-blasted ridges with little snow cover. Vegetation cover ranges from 30-70% with broken rock the remainder. Common species are mountain avens, moss campion, *Diapensia* and prostrate growing Labrador tea, blueberry, cranberry, dwarf willows, and mossberry. Lichen flora is rich in crustose lichens on the rocks, with *Allectoria* spp, *Cetrarias*, and some *Cladinas* woven into the prostrate vegetation. These areas form a micro-mosaic of communities with pockets of frost fracturing and snowbank accumulation zones.
Fellfield is concentrated on the exposed moraines on the south side of the Telaquana Highlands and the corresponding moraines that wrap around the mountain to the south of Turquoise Lake.

Grasslands



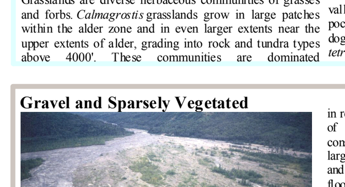
Site Description:
Grasslands are diverse herbaceous communities of grasses and forbs. *Calmagrostis* grasslands grow in large patches within the alder zone and in even larger extents near the upper extents of alder, grading into rock and tundra types above 4000'. These communities are dominated by *Calmagrostis* with many large forbs. Primary forb species are fireweed, *Veratrum*, monkshood, *Valeriana*, *Angelica* and ferns. Scattered mountain ash or highbush cranberry may be present. *Calmagrostis* grasslands grow in association with open alder at the upper ends of large mountain valleys, especially the Tuxedni, Crescent, Drift and Tlikakila River drainages. Smaller patches of grasslands ring the mountains north of Lake Clark.
Another important grassland type is the *Elymus* community that grows along the marine shore just above the high tide line. *Elymus* grows in sand and is subject of occasional salt water flooding or splashing. It is crucial for holding beach lands against wave and tidal erosion. *Elymus* is the dominant species, with cow parsnip, beach pea. A minor but unusual component of the grassland type is a late snowbank forb community which grows in small patches on valley slopes of avalanche runout zones and snowbank pockets. Prominent species are *Veratrum*, geranium, dogwood, saxifrage and buttercup, with *Cassiope tetragona* as ground cover.

Lichen Tundra



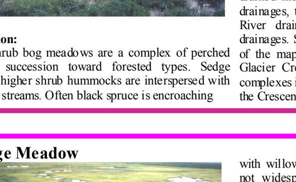
Site Description:
Lichen tundra is alpine tundra that is dominated by a rich fruticose lichen flora. Total vegetation cover is greater than 70%, of which 50-70% is lichen cover. Vascular plants are ericaceous shrubs and dwarf birch, generally less than 6" high. Lichens are mats of *Cetrarias* (*C. Islandica, nivalis, cucullata*), *Thamnolia*, *Cladonias* and *Cladinas* with some *Stereocaulon* on unstable sites. Lichen tundra grows on gentle to moderately steep, well drained slopes. As these areas do not accumulate deep snow, they are available for winter caribou forage.
Lichen tundra is sparsely distributed in the mostly unglaciated mountains in the southwestern part of Lake Clark Park and Preserve, and in the mountains north of Neacola River/Telaquana Lake. Lichen tundra is nearly absent in alpine regions on the eastern side of the study area.

Gravel and Sparsely Vegetated



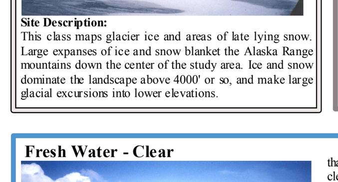
Site Description:
Gravel and sparsely vegetated is widely distributed through the study area in a variety of forms. Unstable talus forms debris cones off steep bedrock ridges. Around glaciers the gravel is unsorted till in a variety of moraines on the ice and in recently deglaciated areas. These areas may have patches of prostrate shrub tundra attempting to colonize the constantly moving surfaces. Active streams and rivers have large areas of alluvially deposited gravel. Balsam poplar and willow seedlings are sparse on portions of the floodplains which have not been subject to recent severe flooding. Coastal beach sands may be mapped as gravel on the Cook Inlet shore. And finally, volcanic ash deposits from recent eruptions of Mts Redoubt, Spurr and older Iliamna ash deposits are mapped as sparse vegetation where the shrub and tundra communities are colonizing the downwind ashfall areas.

Sedge and Shrub Bog Meadow



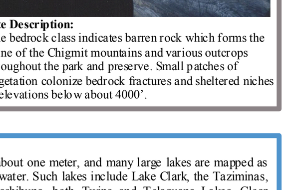
Site Description:
Sedge and shrub bog meadows are a complex of perched wetlands in succession toward forested types. Sedge tussocks and higher shrub hummocks are interspersed with little pools or streams. Often black spruce is encroaching around the edges. Sedge tussocks are cottongrass in wetter sites, and *Carex* on higher locations with cloudberry, horsetails, sundew and bog rosemary. Shrub hummocks have willow, shrubby cinquefoil or *Myrica gale* with sedges and various forbs. Ground cover in these wetlands is mosses, usually *Sphagnum* spp. and litter. Soils are wet to saturated peat.
Sedge and shrub bog meadows are intermixed with open and woodland black spruce in the lowlands on the western side of the park and preserve. These bogs are common in the Stony and Necons River valleys, scattered in the poorly drained morainal pockets in the Chilikadrotna Mulchatna drainages, then are common further south in the Chulitna River drainage and lower Lake Clark and Tazimina drainages. Sedge and shrub bog meadows on the east side of the mapping area are on large river valleys of West Glacier Creek, outwash of Red River, old beaver pond complexes in the Johnson River, and large open wetlands in the Crescent River and Polly Creek drainages.

Ice and Snow



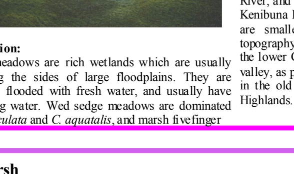
Site Description:
This class maps glacier ice and areas of late lying snow. Large expanses of ice and snow blanket the Alaska Range mountains down the center of the study area. Ice and snow dominate the landscape above 4000' or so, and make large glacial excursions into lower elevations.

Bedrock



Site Description:
The bedrock class indicates barren rock which forms the spine of the Chigmit mountains and various outcrops throughout the park and preserve. Small patches of vegetation colonize bedrock fractures and sheltered niches at elevations below about 4000'.

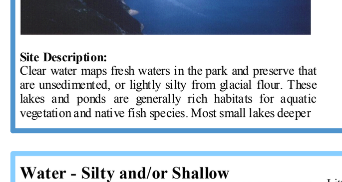
Wet Sedge Meadow



Site Description:
Wet sedge meadows are rich wetlands which are usually located along the sides of large floodplains. They are intermittently flooded with fresh water, and usually have some standing water. Wed sedge meadows are dominated by *Carex utriculata* and *C. aquatalis*, and marsh fivefinger with willow in the slightly better drained areas. Although not widespread or extensive, these areas are very rich wildlife habitat zones, especially for moose, bear, swans and other water fowl and beaver.

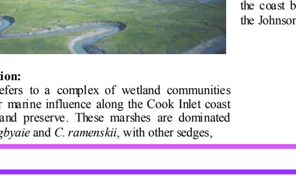
Moderately large wet sedge meadows are found on the large rivers draining the east side of the study area: the outwash fan of the Tuxedni Glacier in the Tuxedni River floodplain, in the maze of drainages and beaver ponds at the upper end of Crescent Lake and upper North Fork Crescent River, and along the Neacola River and depositional area of Kenibuna Lake. On the western side, wet sedge meadows are smaller and scattered in areas with wet micro topography. Wet sedge meadows are scattered throughout the lower Chulitna River, west of Snipe Lake, Stony River valley, as pocket wetlands west of Twin Lakes, and perched in the old moraines on the south side of the Telaquana Highlands.

Fresh Water - Clear



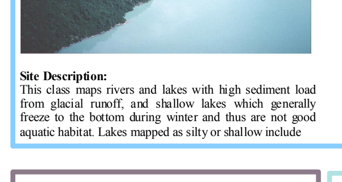
Site Description:
Clear water maps fresh waters in the park and preserve that are unsedimented, or lightly silty from glacial flour. These lakes and ponds are generally rich habitats for aquatic vegetation and native fish species. Most small lakes deeper than about one meter, and many large lakes are mapped as clear water. Such lakes include Lake Clark, the Taziminas, Kontrashibuna, both Twins and Telaquana Lakes. Clear water streams generally did not get mapped in this classification.

Salt Marsh



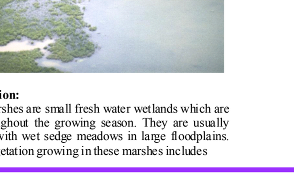
Site Description:
Salt marsh refers to a complex of wetland communities under tidal or marine influence along the Cook Inlet coast of the park and preserve. These marshes are dominated by *Carex lyngbyaie* and *C. ramenskii*, with other sedges, forbs and grasses. See work by Jerry Tande and Alan Bennett (Tande, 1996) for more detailed community descriptions and mapping detail of the salt marshes along the Cook Inlet coast. The salt marshes are vital habitat for brown bears, especially in the spring before salmon and berries are available.
Prominent salt marsh areas are the heads and side shores of Tuxedni and Chinitna Bays and the lagoons behind coastal beaches at Spring Point, the fan of the Red River, and along the coast between Silver Salmon Creek and the mouth of the Johnson River.

Water - Silty and/or Shallow



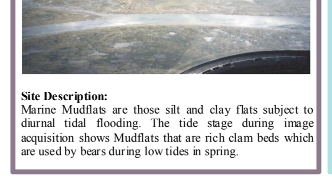
Site Description:
This class maps rivers and lakes with high sediment load from glacial runoff, and shallow lakes which generally freeze to the bottom during winter and thus are not good aquatic habitat. Lakes mapped as silty or shallow include Little Lake Clark, Turquoise and Two Lakes, shallow portions of the Caribou Lakes and Crescent Lake. Large braided glacial rivers were also mapped as silty waters, including Tuxedni, Tlikakila, Drift, North Fork Big, and Neacola Rivers. Sedimented plumes at the mouths of these rivers into Cook Inlet are also mapped as extra silty.

Emergent Marsh



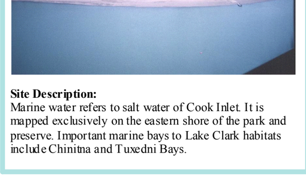
Site Description:
Emergent marshes are small fresh water wetlands which are flooded throughout the growing season. They are usually interspersed with wet sedge meadows in large floodplains. Emergent vegetation growing in these marshes includes horsetail, bog buckbean, aquatic sedges, and water lilies. These marshes are also rich wildlife habitat, especially for moose and nesting sites for waterfowl.
Emergent marshes are mapped in the lower Tuxedni River, and as scattered pockets at the mouth of Silver Salmon Creek and along the sides of West Glacier Creek. Emergent marshes fill the old river sloughs of the Stony River.

Marine Mudflats



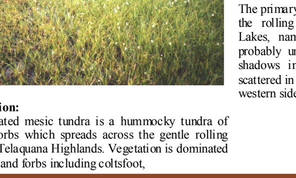
Site Description:
Marine Mudflats are those silt and clay flats subject to diurnal tidal flooding. The tide stage during image acquisition shows Mudflats that are rich clam beds which are used by bears during low tides in spring.

Marine Waters (Marine Water)



Site Description:
Marine water refers to salt water of Cook Inlet. It is mapped exclusively on the eastern shore of the park and preserve. Important marine bays to Lake Clark habitats include Chinitna and Tuxedni Bays.

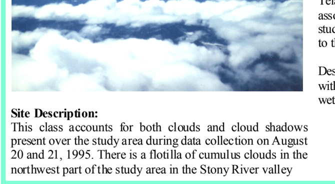
Sedge Dominated Mesic Tundra



Site Description:
Sedge dominated mesic tundra is a hummocky tundra of sedges and forbs which spreads across the gentle rolling slopes of the Telaquana Highlands. Vegetation is dominated by *Carex* spp and forbs including coltsfoot, *Sedum*, *Arnica* sp., dwarf monkshood, and *Selaginella* and foliose lichen *Peltiergia* spp. Some dwarf shrubs are present, including blueberry, dwarf birch and dwarf willows. Subtle drainages in the area are slightly wetter with cottongrass as the sedge component. Mosses and litter make up the ground cover.

The primary location of sedge dominated mesic tundra is on the rolling uplands between Telaquana and Turquoise Lakes, named the Telaquana Highlands. This type is probably under mapped in the region due to clouds and shadows in the area. Other mesic tundra patches are scattered in valley bottoms throughout the mountains on the western side of the Alaska Range divide.

Cloud and Cloud Shadow



Site Description:
This class accounts for both clouds and cloud shadows present over the study area during data collection on August 20 and 21, 1995. There is a flotilla of cumulus clouds in the northwest part of the study area in the Stony River valley west of Telaquana and Turquoise Lakes, scattered cumulus in the upper valleys of Current Creek, Tlikakila River, upper Kijik River, and both sides of upper Twin Lake. A dense valley-filling fog clogs the entire drainage of the Telaquana River between the lake and Telaquana Pass, and lays along the front of the mountain slope between Telaquana and Turquoise Lakes. Several con trails and their associated shadows traversed the southwest portion of the study area, but have been largely edited out and remapped to their appropriate landcover type.

Despite rigorous hand-editing, some confusion may remain with prostrate shrub tundra, talus/sparsely vegetated and wetland classes.