



United States
Department of
Agriculture

Forest Service

Alaska Region

R10-TP-56

March 1995



Plant Community Ecology and Classification of the Yakutat Foreland, Alaska

in Cooperation with the Alaska Natural
Heritage Program, Environment and
Natural Resources Institute,
University of Alaska Anchorage



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A Report by
Michael E. Shephard
Vegetation and Landscape Ecologist

in Cooperation with the
Alaska Natural Heritage Program, Environment and
Natural Resources Institute,
University of Alaska Anchorage

707 "A" Street, Anchorage, Alaska 99501

for

USDA Forest Service, Chatham Area, Tongass National Forest
204 Siginaka Way, Sitka, Alaska 99835

March 1995

SUMMARY

The 134,280 ha (331,800 acres) Yakutat foreland is an area of recent (<6000 years) glacial and near-shore marine deposits. Glaciers occupied parts of the foreland as recently as 800 years ago; other areas have been affected subsequently by outburst floods. The foreland is located in one of the most tectonically active regions of the Pacific rim, resulting in periodic sudden uplift events. The region receives 3850 mm (151 in.) of precipitation annually. These factors have created a complex assemblage of plant communities on a variety of different-aged surfaces and soil types.

A plant community classification was developed for the Yakutat foreland based upon existing natural vegetation. Sampling was conducted in 530 stands, primarily during the 1991-1993 field seasons. This classification was a cooperative effort between the Alaska Natural Heritage Program and the Alaska Region of the USDA Forest Service.

TWINSpan and DECORANA were used to identify the community types and elucidate the relationships among them. Sixty community types were identified: 20 forest, 18 shrub, 12 graminoid, and 10 forb. During field work 380 vascular plant species were recorded: 5 trees, 31 shrubs, 98 graminoids, 231 forbs, and 15 ferns. Dichotomous keys, based on indicator species, are provided for field identification of the plant communities. For each plant community, a full description is provided, listing major species, successional status, site characteristics, and implications for natural resource management.

ACKNOWLEDGEMENTS

Financial and technical support was provided by the Chatham Area of the Tongass National Forest, the Alaska Natural Heritage Program (Environment and Natural Resources Institute, University of Alaska Anchorage), and The Nature Conservancy. Many people deserve thanks for their help with this project. Jon Martin (USFS), Randy West (USFS), Gerald Tande (AKNHP), Keith Boggs (AKNHP), Sue Trull (USFS), Rick Foster (USFS), Steve Paustian (USFS), Jere Christner (USFS), Greg Nowacki (USFS), and Terry Brock (USFS) provided technical reviews and advice to the project. Peter Neitlich, Brent Fagan, Einav Shochat, Brad Kriekhaus, Francisco Escobedo, and Todd Reinwald slogged around in the field with uncommon good humor during wet and very wet summer field seasons. The Yakutat Ranger District personnel, Don Stewart, Dorin Walter, Vince Harke, Julie Mossman, and Sherry Dugeon, provided logistical support. Carolyn Parker of the University of Alaska-Fairbanks Herbarium and John Delapp (AKNHP) assisted with field identification of vascular plants. Mary Stensvold (USFS) identified many of the grasses and sedges and Kitty LaBounty and Richard Andrus identified the mosses. Chiska Derr (USFS) identified the common lichens. John Rickers (USFS) and Ray Norman (AKNHP) provided GIS and computer support. Photographs were taken by the author, Peter Neitlich, and Sue Trull. The cover photograph is a view looking north toward Akwe Mountain, with the Akwe River in the foreground. The stake shown in plant community photographs is approximately 1.5 m (5 ft.) tall and the increments are 10 cm (4 in.).

CONTENTS

SUMMARY	i
ACKNOWLEDGEMENTS	ii
INTRODUCTION	1
PREVIOUS WORK	1
SETTING	3
STUDY AREA AND BEDROCK GEOLOGY	3
CLIMATE	5
HYDROLOGY	5
METHODS	8
FIELD METHODS	8
DATA ANALYSIS	9
ECOLOGICAL CONCEPTS AND TERMS	10
COMMUNITY TYPE CONCEPT	10
SUCCESSION AND ECOSYSTEMS	10
NOMENCLATURE	11
LANDSCAPE PROCESSES	12
TECTONIC PROCESSES	12
GLACIAL PROCESSES	13
WIND PROCESSES	17
FLUVIAL PROCESSES	20
LONGSHORE TRANSPORT PROCESSES	21
LANDSCAPE ECOLOGY	23
NATIONAL ECOLOGICAL CLASSIFICATION	23
LANDTYPE ASSOCIATION DESCRIPTIONS	23
MORAINES	24
Formation, location & relative age	24
Substrate	24
Drainage	24
Community Types	24
Soils	25
PROXIMAL AND DISTAL OUTWASH PLAINS	27
Formation, location & relative age	27
PROXIMAL OUTWASH PLAINS	27
Substrate	27
Drainage	27
Community Types	29
Soils	29

DISTAL OUTWASH PLAINS	29
Substrate	29
Drainage	30
Community Types	30
Soils	30
UPLIFTED TIDAL FLATS	32
Formation, location & relative age	32
Substrate	32
Drainage	32
Community Types	32
Soils	33
BEACH RIDGE COMPLEX	35
Formation, location & relative age	35
Substrate	35
Drainage	35
Community Types	35
Soils	36
FLOOD PLAINS	38
Formation, location & relative age	38
Substrate	38
Drainage	39
Community Types	39
Soils	39
OUTBURST FLOOD PLAINS	41
Formation, location & relative age	41
Substrate	42
Drainage	42
Community Types	42
Soils	42
KETTLE AND KAME LANDSCAPE	42
Formation, location & relative age	44
Substrate	44
Drainage	45
Community Types	45
Soils	45
ROLLING BEDROCK HILLS	46
Formation, location & relative age	46
Substrate	46
Drainage	47
Community Types	47
Soils	47
COMMUNITY TYPE DESCRIPTIONS	48
KEY TO COMMUNITY TYPES OF THE YAKUTAT FORELAND	50
INSTRUCTIONS	50
KEY TO GROWTH FORM GROUPS	51
KEY TO FOREST COMMUNITY TYPES	52
KEY TO SHRUB GROWTH FORM GROUPS	55

KEY TO ALDER COMMUNITY TYPES	56
KEY TO WILLOW COMMUNITY TYPES	57
KEY TO SWEETGALE COMMUNITY TYPES	58
KEY TO SUBSHRUB (HEATH) COMMUNITY TYPES	59
KEY TO HERBACEOUS GROWTH FORM GROUPS	60
KEY TO GRAMINOID COMMUNITY TYPES	60
KEY TO FORB COMMUNITY TYPES	63
 FOREST TYPES	 64
Mountain hemlock/blueberry	64
Mixed conifer/blueberry/skunk cabbage	67
Mixed conifer/blueberry	70
Western hemlock/blueberry-devil's club	73
Western hemlock/blueberry/shield fern	76
Western hemlock/blueberry	79
Sitka spruce/Sitka alder	82
Sitka spruce/devil's club-salmonberry	85
Sitka spruce/blueberry-devil's club	88
Sitka spruce/devil's club	91
Sitka spruce/blueberry	94
Sitka spruce/seral	97
Sitka spruce-black cottonwood/Sitka alder	99
Sitka spruce-black cottonwood/devil's club	102
Sitka spruce-black cottonwood/seral	105
Black cottonwood/willow	108
Black cottonwood/salmonberry	111
Black cottonwood/devil's club	113
Lodgepole pine/crowberry	115
Sitka spruce/peat moss	118
 SHRUB TYPES: ALDER AND SALMONBERRY	 120
<i>Alnus sinuata</i> / <i>Salix sitchensis</i> (Sitka Alder/Sitka Willow)	120
<i>Alnus sinuata</i> / <i>Malus fusca</i> (Sitka Alder/Crabapple)	123
<i>Alnus sinuata</i> / <i>Rubus spectabilis</i> (Sitka Alder/Salmonberry)	125
<i>Alnus sinuata</i> /Graminoid (Sitka Alder/graminoid)	127
<i>Rubus spectabilis</i> / <i>Athyrium filix-femina</i> (Salmonberry/Lady fern)	129
 SHRUB TYPES: WILLOW	 131
<i>Salix sitchensis</i> (Sitka willow)	132
<i>Salix hookeriana</i> (Hooker willow)	134
<i>Salix barclayi</i> / <i>Carex pluriflora</i> (Barclay willow/many-flowered sedge)	136
<i>Salix barclayi</i> / <i>Carex sitchensis</i> (Barclay willow/Sitka sedge)	138
<i>Salix barclayi</i> /mixed herb (Barclay willow/mixed herb)	140
<i>Salix barclayi</i> / <i>Fragaria chiloensis</i> (Barclay willow/beach strawberry)	142

SHRUB TYPES: SWEETGALE	144
<i>Myrica gale/Carex livida</i> (Sweetgale/livid sedge)	145
<i>Myrica gale/Carex sitchensis</i> (Sweetgale/Sitka sedge)	147
<i>Myrica gale/Carex pluriflora</i> (Sweetgale/many-flowered sedge)	149
<i>Myrica gale/Equisetum variegatum</i> (Sweetgale/variegat. scouring-rush) ..	151
SHRUB TYPES: SUBSHRUBS	153
<i>Empetrum nigrum/Carex pluriflora</i> (Crowberry/many-flowered sedge) ...	153
<i>Vaccinium uliginosum/Empetrum nigrum</i> (Bog blueberry/crowberry)	156
<i>Andromeda polifolia/Carex pluriflora</i> (Bog rosemary/many-flwd. sedge) ..	158
GRAMINOID TYPES	160
<i>Puccinellia pumila</i> (Dwarf alkali grass)	160
<i>Eleocharis palustris</i> (Spike rush)	162
<i>Carex lyngbyei</i> (Lyngbyei sedge)	164
<i>Carex saxatilis</i> (Russet sedge)	166
<i>Carex pluriflora/Carex lyngbyei</i> (Many-flowered sedge/lyngbyei sedge) ..	168
<i>Carex livida/Trichophorum caespitosum</i> (Livid sedge/tufted clubrush) ...	170
<i>Trichophorum caespitosum</i> (Tufted clubrush)	173
<i>Carex sitchensis/Oxycoccus palustris</i> (Sitka sedge/bog cranberry)	176
<i>Carex sitchensis/Equisetum fluviatile</i> (Sitka sedge/swamp horsetail)	179
<i>Calamagrostis canadensis/potentilla egedii</i> (Bluejoint/Pacific silverweed) .	181
<i>Elymus arenarius</i> (Beach rye grass)	183
<i>Calamagrostis canadensis</i> (Bluejoint)	185
FORB TYPES	187
<i>Nuphar polysepalum</i> (Pond lily)	187
<i>Myriophyllum alterniflorum</i> (Water-milfoil)	189
<i>Equisetum fluviatile</i> (Swamp horsetail)	191
<i>Equisetum variegatum</i> (Variegated scouring-rush)	193
<i>Menyanthes trifoliata/Equisetum variegatum</i> (Buckbean/variegated scouring-rush)	195
<i>Menyanthes trifoliata/Potentilla palustris</i> (Buckbean/marsh cinquefoil) ...	197
Mesic forb/ <i>Athyrium filix-femina</i> (Mesic forb/lady fern)	199
Mesic forb (Mesic forb)	201
<i>Lupinus nootkatensis/Salix setchelliana</i> (Nootka lupine/setchell willow) ..	203
<i>Fragaria chiloensis/Achillea borealis</i> (Beach strawberry/yarrow)	205
LITERATURE CITED	207

APPENDIX 1.	PLACEMENT OF COMMUNITY TYPES FROM THE YAKUTAT FORELAND, ALASKA, INTO THE ALASKA VEGETATION CLASSIFICATION (VIERECK et al. 1992)	A-1
APPENDIX 2.	COMPARISON OF WETLAND AND LAND CLASSIFICATION SYSTEMS BY VARIOUS AUTHORS	A-4
APPENDIX 3.	INDICATOR SPECIES FOR COMMUNITY TYPES OF THE YAKUTAT FORELAND	A-8
APPENDIX 4.	CONSTANCY (CON) AND AVERAGE CANOPY COVER (ACOV) OF VASCULAR SPECIES IN EACH COMMUNITY TYPE	A-10
APPENDIX 5.	SPECIES CODES, SCIENTIFIC NAMES, AND COMMON NAMES FOR VASCULAR AND NONVASCULAR FLORA IDENTIFIED FOR THE YAKUTAT FORELAND DURING THIS STUDY	A-44

TABLES

1	Selected climatology information for Yakutat, Alaska	6
2	Radiocarbon dates for the Yakutat foreland	15
3	Distribution of the 530 plots within the 60 community types across the 9 major landscapes of the Yakutat foreland	25
4	Community types, scientific abbreviations, and number of stands sampled on the Yakutat foreland	46
5	Plant communities of limited extent for the Yakutat foreland	49

FIGURES

1	Location of the Yakutat foreland in Southeast Alaska	4
2	Generalized geomorphic landscapes of the Yakutat foreland	18
3	Cross-sectional diagrams across the Yakutat foreland	19
4	Inferred successional chronosequence for the moraine and kettle-kame landscapes of the Yakutat foreland	27
5	Inferred successional chronosequence for proximal outwash of the Yakutat foreland	28
6	Inferred successional chronosequence for distal outwash of the Yakutat foreland	31
7	Inferred successional chronosequence for uplifted tidal flats of the Yakutat foreland	34
8	Inferred successional chronosequence for uplifted beach ridges of the Yakutat foreland	37
9	Inferred successional chronosequence for flood plains of the Yakutat foreland	40
10	Inferred successional chronosequence for outburst flood plains of the Yakutat foreland	43
11	Inferred successional chronosequence for rolling bedrock hills of the Yakutat foreland	48

INTRODUCTION

The Yakutat foreland is a mosaic of wetlands, shrublands, and forests with many different values. The palustrine wetlands serve as recharge and discharge areas for ground water (Siegel 1988). The shrub swamps are important browse areas for moose. Estuaries are productive rearing areas for salmon fry (Thedinga et al. 1993) and receive extensive use by geese and ducks during their spring and fall migrations (Peterson et al. 1981). The lakes and ponds of Yakutat are heavily used by trumpeter swans in both summer and winter. The uplands of Yakutat range from highly productive Sitka spruce forests to areas that have been recently deglaciated and are undergoing primary succession.

Classification is the purposeful grouping of similar objects and the separating of dissimilar objects (Nelson et al. 1978). A vegetation-based community type classification linked to site variables, such as soil type and wildlife habitat, enhances the ability of land managers to make land use decisions. This project has been designed to develop an ecological plant classification for the Yakutat foreland portion of the Yakutat Ranger District and to synthesize previously collected information into a comprehensive classification. No plant community work had been previously completed in the wetlands and shrublands of the Yakutat foreland. The Alaska Natural Heritage Program (AKNHP) will use this information to fill a void in the state community classification efforts. AKNHP will also use the information to identify rare and unique plant community types of the area. The Forest Service will use the information in natural resource planning and ecosystem management.

Since the 1960s, researchers have produced numerous plant association classifications, habitat type classifications, and plant community classifications. These classifications have been useful in forest management and research and, with their widespread use, they emphasize management of ecosystems rather than individual resources (Cooper et al. 1991). The Yakutat plant community classification was conducted under a challenge cost-share agreement between the Alaska Natural Heritage Program and the Alaska Region (Tongass National Forest, Chatham Area) of the USDA Forest Service. This report represents the results of the three-year study. The objectives of the project were to:

1. Define, describe, and classify the forest, shrub and herbaceous communities of the Yakutat foreland.
2. Develop ecological interpretations of the processes influencing the community types and their successional pathways; document soil, site, and vegetation relationships.
3. Develop management interpretations for each type.

PREVIOUS WORK

The first explorers to visit the Gulf Coast were with the Imperial Russian Expedition led by the Dane, Vitus Bering, in 1741. The first known exploration of Yakutat Bay was made in 1787 by Captain George Dixon (de Laguna 1972). Since then, Yakutat has been an area of numerous explorations seeking either furs or scientific information. The first person to make a serious

botanical collection was Frederick Funston, who spent a field season collecting about 3,000 specimens representing 154 species of plants (Coville 1895). One of the next "scientific trips" to visit Yakutat was the Harriman Expedition (1899), sponsored by the railroad tycoon E. H. Harriman, which had a ship full of many leading experts on glaciers and natural history (Goetzmann and Sloan 1982). Studies in this century have focused primarily on geology and botany. Some of the early geologic work concentrated on the effects of the 1899 earthquake and the glacial history (Tarr and Martin 1906; Blackwelder 1907, 1909; Tarr 1907). Most recently, work has focused on the Hubbard Glacier and potential effects on the Situk River if the glacier were to again dam Russell Fjord (see Mayo 1988). See the Landscape Processes section for other geologic work completed in the region.

Plant collections for the Yakutat foreland have been made by Stair and Pennell (1946), Hulten (1968), and Alaback (1975). Little work has been done concerning plant community ecology. Batten et al. (1978) described coastal wetlands for the area near the mouth of the Situk River. Peteet and Bolivar (1983) created a vegetation map for the Russell Fjord area and sampled 56 stands. Peteet (1983, 1986, 1991) studied the paleoecology of the foreland. Additionally, the National Wetlands Inventory (US Fish and Wildlife Service) has mapped the wetlands of Yakutat using the Cowardin et al. (1979) system. The Yakutat region has also been chosen as a Coast Watch site, where Oak Ridge National Laboratory is mapping Yakutat via Landsat satellite imagery (J. Dobson, pers. comm. 1993).

Various community ecology studies have been done adjacent to the Yakutat foreland. In the Dixon Harbor area (1977) and in the Lituya Bay area (1980), Worley conducted some primary ecological work 80 km (50 miles) to the south of Yakutat, along the outer coast of Glacier Bay National Park. Numerous studies have also been done in the Copper River Delta region, 240 km (150 miles) to the northwest of Yakutat, as summarized by Boggs (1994). Within the Tongass National Forest, three different plant association classifications are in various stages of completion. A forested plant association guide has been published for the Ketchikan Area (DeMeo et al. 1992) and the final forest plant association guides are nearing completion for the Stikine Area (Pawuk and Kissinger, in prep.) and the Chatham Area (Martin et al. 1995). The Yakutat effort is the first classification done on the Tongass focusing primarily on nonforested communities. On the Chugach National Forest, a similar cooperative effort is underway between the AKNHP and the USDA Forest Service to classify the plant communities of the Copper River Delta area (Boggs 1994). Heritage Program ecologists have been working together to ensure compatibility between classifications of Yakutat and the Copper River Delta and to develop a more regional understanding of wetland types.

Archeological work has also occurred in Yakutat; de Laguna (1972) completed three volumes about the foreland and Davis (in prep.) is completing work on several village sites near the mouth of the Situk River. The Situk River has also been a study site for numerous salmonoid studies by the National Marine Fisheries Service (see Thedinga et al. 1993).

SETTING

STUDY AREA AND BEDROCK GEOLOGY

The Yakutat foreland is located between the southeast panhandle of Alaska and the main body of Alaska (Figure 1). The 496,954 ha (1.227 million acres) Yakutat Ranger District, the northern limit of the Tongass National Forest, is sandwiched between Glacier Bay National Park to the south and Wrangell-Saint Elias National Park to the north.

The snow-capped peaks of the Saint Elias Range (2,400-5,400 m or 8,000-18,000 ft.) are the most prominent feature of the eastern Gulf of Alaska. Numerous glaciers snake their way toward the sea through these mountains. The Malaspina Glacier with its zigzag pattern of moraines is one of the most impressive glaciers along the coast and is just across Yakutat Bay from the town of Yakutat. The Hubbard Glacier, at the head of Disenchantment Bay (within Yakutat Bay), is the largest tidewater glacier on the continent. Seaward of the Saint Elias Mountains is the Brabazon Range, a northwest-southeast trending series of steep-fronted, 900-1,200 m (3,000-4,000 ft.) mountains, which have also been heavily glaciated.

Seaward of these mountains is the Yakutat foreland, a collage of glacial detritus transported by glaciers, rivers, and ocean currents (Figure 1). This coastal plain varies in width from 8-24 kilometers (5-15 miles). The surficial deposits are as thick as 215 m (700 ft.) in places (Yehle 1975). Other than a few bedrock-cored hills that escaped being buried by the glacial detritus, the foreland is of very low relief. The highest points are next to the mountains on glacial moraines at about 60 m (200 ft.) elevation.

Tectonics and bedrock geology have determined the basic physiographic provinces that make up this region of Alaska. Southeast Alaska is composed of many different terranes (blocks hundreds of kilometers long by tens of kilometers wide) thought to have originated far from North America in the Pacific Ocean (Figure 1). Three primary terranes of the Yakutat region are the Yakutat terrane (the Brabazon Range), the Chugach terrane (the Saint Elias Mountains), and the Pacific plate (Brew 1990). The two continental terranes are separated by the Fairweather Fault that runs parallel to the USA-Canada border between the Brabazon Range and the Saint Elias Mountains. The Novatak and Nunatak Glaciers flow along this fault. The Pacific Plate is moving north-northwest at a rate of 5-7 cm/year (2-2.8 in./yr.) relative to the North American Plate (Jacob 1986). It is this motion that controls the tectonics, seismicity, and much of the morphology of the Gulf of Alaska (Jacob 1986).

The Yakutat terrane is made of the Yakutat Group, a series of bedded siltstone, conglomerate, and other sedimentary and volcanic rocks (MacKevett and Plafker 1970). The Chugach terrane in this area consists of diverse metamorphic rocks (primarily amphibolite and greenschist) and large bodies of granite (MacKevett and Plafker 1970). There are also slate, some volcanics, and marble within this terrane.

There has been considerable vertical displacement between these terranes (Brew 1990). The Yakutat terrane has been depressed about three kilometers (1.9 mi.) in 25 million years, whereas the Chugach terrane has undergone about 14 kilometers (8.7 mi.) of uplift over the

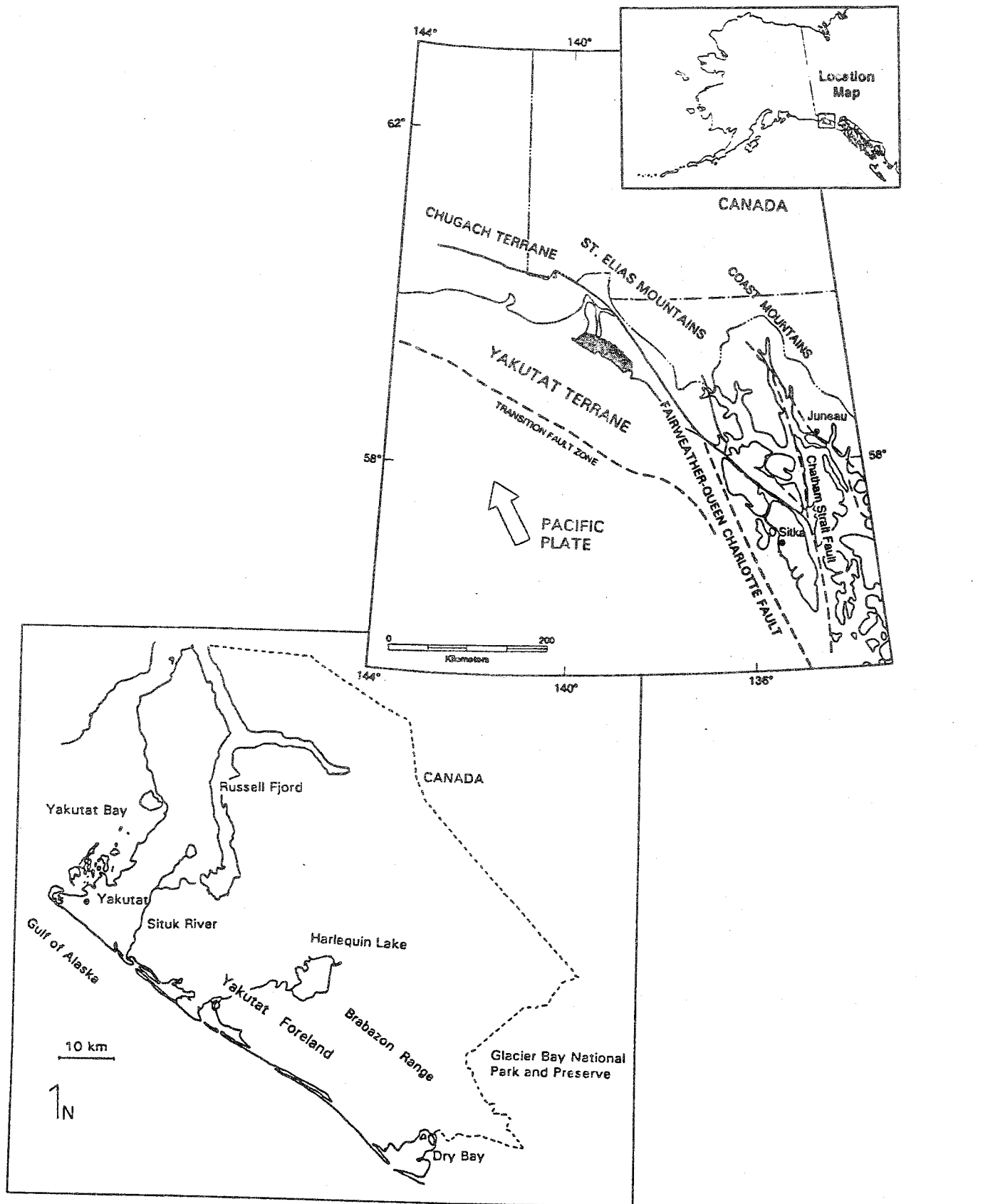


Figure 1. Location of the Yakutat foreland in Southeast Alaska. The central figure illustrates the major tectonic features (after Horner 1990). The arrow indicates relative motion between the Pacific and the North American plates.

same interval (Brew 1990). Movement along the Fairweather Fault is very common. It makes Yakutat one of the most tectonically active regions in the world (Jacob 1986). The region has had eight earthquakes of magnitude 7.4 or greater in the last 100 years (Molnia 1986).

CLIMATE

Yakutat falls within the humid temperate domain where moist temperate conditions prevail year-round (ECOMAP-USDA Forest Service 1994). The climate is predominantly cloudy, cool, and wet throughout the year (Table 1). The climate is moderated by the relatively warm waters offshore, as the Alaska current (part of the Kuroshio Drift) circulates counterclockwise up the coast from Washington (Johnson and Hartman 1969). Throughout the year, the average storm track aims frequent "Gulf Lows" directly at Yakutat (Curtis 1993). On average, these storms deposit 3850 mm (151 inches) of precipitation each year (based on the 30 year average 1961-1990, National Climatic Data Center 1993). This precipitation is distributed throughout the year, with June being the driest month (185 mm, 7.5 in.) and October the wettest (580 mm, 22.9 in.). On average, it rains (>0.25 mm or 0.01 in.) two out of every three days in Yakutat (National Climatic Data Center 1993). The average annual temperature is 3.8 °C (39 °F), the average number of cloudy days per year is 279, and the average relative humidity is about 90 percent (National Climatic Data Center 1993).

Compared to Yakutat, the two closest weather stations are drier. Gustavus, within Glacier Bay on the east side of the Saint Elias Mountains, has an annual precipitation of only 1400 mm (55 inches). Yakataga, north of Yakutat on the coast, is more similar to Yakutat with 2460 mm (97 inches) of precipitation (Farr and Hard 1987).

The Yakutat foreland has a precipitation/evapotranspiration ratio of eight (151/20 in. or 3850/503 mm); the potential evapotranspiration is 19.8 inches (503 mm; Table 1). This means that evapotranspiration is less than the precipitation for the area. The low evapotranspiration of the region is due to high humidity, continual cloud cover, and cool temperatures.

HYDROLOGY

A myriad of glacial and nonglacial streams cross the Yakutat foreland. Much of the water volume for these streams and rivers comes from ground-water flow and sheet flow (over the surface). Old Situk Creek, the former river that drained Russell Fjord (or more properly Russell Lake when it was dammed by the Hubbard Glacier), is now a ground-water fed stream (Clark and Paustian 1990). Likewise, the Situk River itself receives much of its water from nutrient-rich ground water, which is considered a primary factor contributing to the stream's rich fisheries (Thedinga et al. 1993).

The vegetation also responds to the nutrient-rich ground water, especially where it is within the rooting zone of plants. Ground-water well data collected in the last four years by the US Geological Survey (USGS) illustrates the perennially high water table over much of the distal outwash landscape. In a willow community near Old Situk Creek, the water table dropped as low as 161 cm (5.3 ft.) below the surface in July, but was also as high as the ground surface

Table 1. Selected climatology information for Yakutat, Alaska (Elevation 8.5 m [28 ft.]). Station located at the airport, 8 km (5 mi.) southeast from the town of Yakutat; averages are for the 30 year period from 1961 to 1990 (National Climatic Data Center 1993).

	METRIC	ENGLISH
Mean annual temperature	3.8 °C	39 °F
Mean temp. May-Sept.	9.7 °C	49.5 °F
Mean temp. June-Aug.	10.8 °C	51.4 °F
Mean temp. warmest month (July)	12 °C	53.6 °F
Mean temp. Nov.-Feb.	-2.3 °C	27.9 °F
Mean temp. coldest month (January)	-3.8 °C	25.1 °F
Mean number of days of frost	251	251
Mean frost-free period (days)	114	114
Mean number of months with mean monthly temp. greater than 10 °C (50 °F)	2	2
Mean number of months with mean monthly temp. below 0 °C (32 °F)	5	5
Mean total precipitation	3850 mm	151.2 in.
Mean total snowfall	518 cm	204 in.
Driest month: June		
Mean total ppt. June	185 mm	7.3 in.
Wettest month: October		
Mean total ppt. October	583 mm	23 in.
Mean number of days with measurable ppt.	234	234
Mean annual potential evapotranspiration (Thornthwaite method) (Patric and Black 1968)	503 mm	19.8 in.

in late May (Kemnitz et al. 1993). In other wells, the water table rarely dropped below 90 cm (3 ft.) in July, while in May was often about 40 cm (16 in.) below the ground surface (Kemnitz et al. 1993).

The water chemistry from these ground-water wells shows that the sites are minerotrophic fens. One sample each was taken from the ten wells monitored by the USGS in April of 1991. The average temperature was 4.0 °C; the average conductivity was 255 microsiemens/cm; the average pH was 7.6; and the average amount of dissolved calcium was 48 mg/liter (Lamke et al. 1992). These values are well within the range of nutrient content found in fen waters in various studies done in Canada (National Wetlands Working Group 1988).

The chemistry of the ground water also helps explain the distribution of bogs on the Yakutat foreland. Bogs are wetlands where peat accumulation has separated the peatland surface from the ground water (e.g., domed bog). They receive their mineral supply solely from atmospheric precipitation (National Wetlands Working Group 1988). *Sphagnum*-dominated ombrotrophic bogs are limited to areas where the nutrient-rich ground water does not move over and through the peat, since the general requirements for *Sphagnum* growth are an assured water supply with a low concentration of Ca^{2+} (Clymo and Hayward 1983). This explains why there are more bogs on the uplifted tidal flats. It lacks the areas of ground-water flow that are common on the 1-3% slopes of the distal outwash landscape because the landscape is essentially flat and water that runs through it has been channeled into old tidal sloughs.

The distribution of bogs and fens can therefore be partially explained by water flow and chemistry. One can think of the distal outwash landscape as a huge river, both broad and shallow; the middle of the river channel supports fens, whereas bogs are found in the back eddies and stagnant side channels. In the distal outwash landscape (see Landscape Ecology section), the many water-tracks where ground water is at or near the surface for long portions of the growing season support fens. The fen water-tracks are easily seen on aerial photographs. In areas where the ground water and surface water flow is restricted, as on the "downstream" side of a sand dune or old glacial outwash terrace, *Sphagnum* (peat moss) accumulates and forms bogs. This landscape patterning of vegetation simulating the shape of islands and river channels has also been documented for the peatlands of Minnesota and boreal Canada, where Glaser (1987) describes bog islands shaped like streamlined airfoils between minerotrophic water tracks.

METHODS

FIELD METHODS

Field work occurred from June through August in 1991-1993. The work was solely on the foreland portion of the Yakutat Ranger District, an area of about 134,280 hectares (331,800 acres or 520 square miles).

The sampling intensity (both the number of plots per unit area and the quality of data recorded) has a direct correlation to how useful the resulting classification will be for land managers (Cooper et al. 1991). In the original habitat type classification for northern Idaho, Daubenmire and Daubenmire (1968) sampled one plot per 200 sections. This was found too general for the ecological diversity encountered in their study area. Others have found a density of one plot per section more accurately describes the range of environments (Cooper et al. 1991). It was assumed that the sampling intensity of approximately one plot per section in this study (combined data set includes 530 stands) is probably sufficient to represent the ecological diversity found on the Yakutat foreland.

Field methods generally followed those developed by the USDA Forest Service in the Pacific Northwest and Alaska (Martin and Borchers 1991) with minor modifications for wetlands. The foreland was subdivided into nine different landscapes based on geomorphology (see Landscape Ecology section). Within each landscape, field reconnaissance and aerial photos were used to stratify the vegetation into stands of homogeneous vegetation. Selection of sampling site within these stands was similar to the approach termed "subjective sampling without preconceived bias" described by Mueller-Dombois and Ellenberg (1974). Site selection was based on homogeneous vegetation, range in natural variability, and successional status within each landscape, with no preconceptions as to placement within a classification. A plot was randomly placed at each site when the stand was large enough. In small stands, plots were centrally placed to avoid potential edge influences.

During 1991, a 500 m² (5,370 feet²) circular plot was used except where the size and configuration of the stand required a smaller plot. In the latter case, the plots were generally rectangular and corresponded to the configuration of the stand. During 1992 and 1993, the same plot size was used for forested stands, while a 5 by 10 m plot (538 feet²) was used for all nonforested stands.

Within the plots, percent cover was recorded for each species to the nearest 1 percent between 1 and 10 percent cover and in 5 percent cover classes thereafter. Species with <1 percent cover were recorded as trace and assigned 0.5 percent. Diameter at breast height (dbh, 1.4 meters or 4.5 feet above the ground) was collected for all living and dead stems over ten centimeters (4 in.) dbh. Height (in meters) and crown class were recorded for living trees, and decay class was determined for dead standing and down stems (see Martin and Borchers 1991). A representative tree was cored at breast height and the number of tree rings was recorded. Shrub height to the nearest 0.25 m was recorded. During the 1992 field season, shrub age was estimated for an average-sized shrub from each plot by counting the rings at the plant's base. The percent of stems browsed or dead was also recorded. Common mosses and

lichens were collected on a selection of plots. Additional biological information included notes on successional status and animal use of the area.

Environmental data collected included slope, aspect, percent of plot with standing water, general water table class, main source of water, associated water body, flooding condition, and microrelief.

A soil profile was described within each plot. The minimum amount of data recorded included rooting depth, depth to water table (measured from the ground surface), depth of organic matter, texture, and parent material. Full profile descriptions were completed for each plot when a soil scientist was with the vegetation crew (about 3/4 of the stands).

DATA ANALYSIS

Plot data were entered into PARADOX (Borland 1992). ECOAID ecology programs (Smith 1991) were used for the synthesis and association tables.

To determine the community types, the stands were initially divided by major growth forms. Percent canopy cover breaks by growth form followed Viereck et al. (1992). Specifically, canopy cover breaks of 10 percent and 25 percent were used; for example, all stands with greater than 10 percent canopy cover of trees were grouped as forest types (see key to growth form groups). After the initial growth form and major species breaks were made, TWINSpan (Hill 1979a) and DECORANA (Hill 1979b) were used to determine the community types within each growth form (i.e., alder types, sweetgale types, etc.).

For the analysis of each group of plots, the first three axes of the DECORANA output and the corresponding environmental data were used to separate the stands into different community types. In all analyses, DECORANA was run without modifying any of the parameters of the program. For example, no downweighting of rare species or changes in cut values were made. For TWINSpan runs, no modifications were made except for cut levels, which were set to 0, 2, 5, and 25, and the number of indicators, which was set to 5. Lichens and mosses were excluded from the community type analysis because they were only collected for some of the stands.

A dichotomous key was developed during this process, and was tested and revised during the third field season. The key appears to work on all but about 5% of the plots. These plots that slip through the cracks are generally those stands that are depauperate or community types that have not been described for Yakutat. Those in the latter category are briefly mentioned in the key in the Miscellaneous Unclassified Communities sections.

Descriptions for each community type include discussion of vegetation, soils, water table, and landscape. Where possible, an attempt has been made to infer successional trends for these types and to discuss their relationship to other community types (see the Community Type Descriptions section).

ECOLOGICAL CONCEPTS AND TERMS

COMMUNITY TYPE CONCEPT

A community type, in this report, means a variable assemblage of interacting plants and animals that share a common environment determined by environmental variables such as soils, hydrology, climate, and geomorphology. A plant community type is an abstract assemblage of all communities (stands) based on floristic and structural similarity in both overstory and understory layers (Padgett et al. 1989). These community types are repeated across the landscape where environmental factors are similar.

The term "community type" is used throughout the text and is abbreviated c.t. Community type names are abbreviated using the first three letters of the genus name and of the species epithet; e.g., *Salix commutata* becomes SALCOM. The more common practice of using only the first two letters from the genus name and species epithet was not used because several *Carex* species have the same abbreviations and it is cumbersome to use numbers to distinguish them. See Appendix 5 for plant names and codes.

Community types represent the existing structure and composition of the present vegetation. This is in contrast to plant associations based on the climax plant community and the physical characteristics that allow it to persist (Padgett et al. 1989). Other classifications have emphasized habitat types (Cooper et al. 1991). The habitat type is named after the plant association.

Although no two samples of a given community are identical, they have similar characteristics. Some communities have a wider range of variability than others. As this classification is refined in the future, some narrowly defined communities invariably will be expanded, and broadly defined communities may be split into two or more communities.

Plant communities form a complex mosaic, intergrading temporally and spatially. While classifying communities, it is necessary to draw artificial boundaries when, in reality, these boundaries often do not exist due to continually intergrading environmental conditions.

SUCCESSION AND ECOSYSTEMS

Whether one leans toward Clements' (1916) view that the community is an organism with its individual pieces functioning together, or toward Gleason's (1926) view that the community is simply a loose and varying association of species, communities change over time due to allogenic and autogenic factors. Also, if these stressors remain constant for decades, the plant community generally stabilizes and becomes self-perpetuating, and therefore may be considered a climax community.

In Yakutat, there exist land surfaces that vary in age from approximately 10,000 years to the present. With these different aged-surfaces, we can develop inferred chronosequences that might explain how community types change through time. However, there are inherent risks

in this since inferences made from the sites used to develop the chronosequence are subject to error unless each study site along the chronosequence has developed along similar successional pathways (Fastie 1990). I have attempted to treat the Yakutat foreland holistically and to discuss the development of the landscapes, soils, and community types in relation to the major stressors on the community types in the Landscape Ecology section.

NOMENCLATURE

Community type names are based on dominant (by percent cover) vascular plant species and indicator species. Each community type name is made up of one to three species names. Within the c.t. name, a slash (/) is used when the species are of different growth forms, and a dash (-) is used when they are of the same growth form.

The plant nomenclature primarily follows Hulten (1968) except where species are missing from his treatment, in which case the taxonomy follows Hitchcock and Cronquist (1973). Determination of *Vaccinium alaskensis* and *Vaccinium ovalifolium* proved difficult, hence, these two tall blueberry species were lumped as *Vaccinium* species. *Solidago lepida* and *S. multiradiata* were lumped as *S. lepida* and *Deschampsia caespitosa* and *D. beringensis* were lumped as *D. caespitosa*. Additionally, *Carex pachystachya*, *C. preslii*, and *C. macloviana* are considered differently by various taxonomists. I chose to lump them as *C. pachystachya*. The taxonomy of *Puccinellia pumila* vs. *Puccinellia nutkaensis* is also questionable. I chose to call the estuary *Puccinellia* type found in Yakutat *P. pumila*. However, until the taxonomy is finally resolved, this is tentative.

LANDSCAPE PROCESSES

A complete characterization of a landscape or landform must involve a description of the feature, the processes involved in its formation, and its development through time (Chorley et al. 1984). In this section the five primary processes (tectonism, glaciation, wind, fluvial processes, and longshore transport) important in determining the landscapes of Yakutat are discussed; specific landscape descriptions are located in a following section.

TECTONIC PROCESSES

Yakutat is very active tectonically. On a geologic time scale, this has had obvious effects on the arrangement of bedrock geology in the area. However, tectonism is also playing a role at present. The last major earthquake was in 1958 (7.9 on the Richter scale). Before 1958, there were four very large earthquakes (above 7.4), the largest being the great earthquake of Sept. 10, 1899, which had a magnitude of 8.5 (Yehle 1975). One common effect of earthquakes is the uplifting or subsidence of areas in relation to sea level (also see next section in relation to uplift and subsidence caused by glacial processes). Within Yakutat Bay, there are areas uplifted as much as 14 m (47 ft.) during the two 1899 earthquakes. When such uplifts occur, they allow colonization of former wave cut terraces, estuaries, and beaches by terrestrial plants. Some older wave cut terraces, of unknown age, are located along the side of the Brabazon Range near the Alsek River at around 15 m (50 ft.) and 60 m (200 ft.) elevation (Miller 1961).

An interesting landform that has developed on the saturated soils of the foreland is a circular mound of sand up to 6 m (20 ft.) across. These features are a result of fountains or "sand boils," when water and sand erupt like a geyser because of earthquake motion on fine-grained saturated soils (Davis and Sanders, 1960).

Ground motion in areas of alluvial and deltaic deposits may affect ground-water and stream flow. Effects such as increased hydrostatic pressure and lateral spreading of deposits can be temporary or permanent (Yehle 1975). These effects may then have temporary or lasting changes on the water table and the plant communities that occupy the area.

Tsunamis (seismic sea waves) are also commonly associated with coastal earthquakes. The largest historical wave at Yakutat was 5 m (15 ft.) high occurring on September 10, 1899 (Yehle 1975). Tsunamis have been very common further down the coast in Lituya Bay, where there have been five documented large tsunamis in the last 100 years (Jacob 1986).

Thus, tectonic activity has an effect on the Yakutat foreland on different time and spatial scales. Examples include the Brabazon Range's changing elevation on a million-year time scale, and the creation of circular sand mounds for plant colonization on a decade scale.

GLACIAL PROCESSES

Glaciation has probably exerted the most profound effect on the soils and plants of the foreland. Most of the Yakutat foreland is a geologically youthful landscape that has been above sea level for only 3,000 years (Molnia 1986). The tremendous amount of precipitation, the cool climate, and the abrupt rise of the coastal mountain range result in the largest area of glaciers in the northern hemisphere, excluding Greenland (Peteet 1991). The glaciers release a phenomenal amount of silt, sand and gravel, and this area is thought to have one of the highest rates of sediment accumulation in the world (Molnia 1986).

During the Little Ice Age, glaciers covered a larger part of this region than is covered today. The Little Ice Age was a period of worldwide cooling and glacial advance from the middle of the 13th through the late 19th century (Porter 1986). During this time, the alpine glaciers of Yakutat were at their most recent glacial maximums. The Ustay, Harlequin, Tanis, and Akwe Lake basins were ice-filled at least part of this period (based on tree growth ring counts, this study; Figure 2).

Beyond the lake basins, new moraines and another layer of outwash gravel were added to the already existing outwash plains, often burying forests and wetlands. Buried soil horizons visible in the banks of the Ahrnklin, Dangerous, Situk, and Tanis Rivers, with *in situ* stumps, attest to this event (pers. observ.). It seems likely there may have been at least two periods of glacial expansion during the Little Ice Age, based on these buried soil horizons. Along the Ahrnklin River buried wood was aged at 110 ± 60 yr. B.P. (before present), while two different layers along the lower section of the Dangerous River yielded C-14 corrected dates of 140 ± 70 yr. B.P. and 280 ± 50 yr. B.P. (Table 2). These dates seem to indicate that there were at least two, if not multiple, periods of outwash development and outburst floods from the glaciers originating in the Brabazon Range during the Little Ice Age.

The Hubbard Glacier and Nunatak Glacier are both tidewater glaciers that have blocked off Russell Fjord periodically in the last few thousand years. These two glaciers have not advanced at the same time as those descending out of the Brabazon Range. Indeed, tidewater glacier fluctuations seem to be less controlled by climate than non-tidewater glacier fluctuations (Mann 1986). Yakutat Bay was full of ice about 830 ± 160 yr. B.P. (Plafker and Miller 1958). Basal peat samples from near upper Tawah Creek (this study), upper Situk River (Peteet 1991), and the mouth of the Lost River (Holloway 1990) yield dates of 920 ± 110 yr. B.P., 880 ± 65 yr. B.P., and $1,090 \pm 80$ yr. B.P. respectively (Table 2). These sites are from the distal and uplifted tidal flat (Lost River) landscapes below the Yakutat Bay and Russell Fjord terminal moraines. Thus, this portion of the foreland seems to have been above sea level, out of reach of further glacial outwash inundation, and available for terrestrial plant colonization since approximately 900 yr. B.P. The soils and plant communities developed on the outwash and uplifted tidal flats are some of the oldest on these landscapes and provide a good reference point for developing inferred chronosequences on these surfaces.

In the last century the Hubbard Glacier has begun to readvance, and temporarily blocked off Russell Fjord for four months in 1986 (Mayo 1988). The lake that formed in the fjord basin raised 26 m (85 ft.) and threatened to overflow into the Situk River before it finally broke its ice dam (Mayo 1988). The flooding had a dramatic impact on the shoreline vegetation, killing much of the vegetation that was underwater for over a week.

The position of the shoreline has fluctuated widely in relation to sea level within the past several thousand years. One factor is the expansion and contraction of glaciers which affect sea levels throughout the world (Yehle 1975). Presently land is emerging in the Yakutat area, both by the tectonic processes mentioned above and via isostatic rebound. The area is rebounding because the weight of thick glacial ice depressed the land, and once the glaciers retreated, the land slowly rises (Yehle 1975). The rate of uplift (from tectonic processes and isostatic rebound) for the Yakutat foreland has been estimated at 0.5 cm (0.21 in.) per year, based on the tidal gage record (1940-1972) for Yakutat (Hicks and Crosby 1974).

These processes are causing the emergence of estuaries and beaches that are available for colonization by terrestrial plants. A comparison of the first available aerial photographs (1948) and more recent satellite imagery (1989) for the Seal Creek and Ahnklil River estuaries shows that much of what was the lower estuarine tidal flats is now supratidal and has been colonized by plants tolerant of brackish water.

Buried organic horizons are evident in the river banks of Lost River, Kunayosh Creek, and Seal Creek. In all three cases, they exhibit a fining upward sequence: at the base of each exposure is gravelly sand and sand, then the buried organic horizon, and on the top is approximately one meter (3 ft.) of silt and fine sands. This sequence suggests there had been a vegetated surface that dropped relative to sea level so that glacial marine silts and sands accumulated on top. This subsidence could have been gradual, due to weighing of nearby surfaces under ice, or sudden, such as via an earthquake. Isostatic rebound and possibly tectonic uplift are the processes that again have raised this landscape out of the sea.

The buried organic horizon from Seal Creek yielded a date of 340 ± 80 yr. B.P., while the Lost River buried organic horizon yielded a date of 820 ± 80 yr. B.P. (Table 2). The basal peat layers of the current organic surface both yielded modern ages. This suggests that these areas have been above the influence of the tides for only a short time (probably less than 150 yr.). Interestingly, the Lost River bog (muskeg) site, with its basal layer dated from $1,090 \pm 80$ yr. B.P., is only about one kilometer (0.6 mi.) upstream from the Lost River bank section.

Table 2. Radiocarbon dates for the Yakutat foreland (arranged by age of sample, oldest first, and by location when multiple samples were taken from one site).

Date (years B.P.)	Number/Laboratory	Location	Alt. (m)	Material	Reference
10,220 \pm 450	Slate Mesa RL1810	Slate Mesa E. of Russell Fjord	15	Peat (60 cm)	Peteet 1991
9,880 \pm 200 AMS radiocarbon dating	Pike Lakes AA4144	Pike Lakes N59°30' W139°10'	30	Pine (210-220 cm)	Peteet 1991
9,560 \pm 220	81-8 Beta-3632 Beta Analytic Inc. Coral Gables, FL	Slate Mesa N59°32' W139°10'	375	Peat	Molnia 1986
9,320 \pm 350	—	S end of Harlequin Lk.	50	Shells	L.A. Yehle, USGS, reported to Molnia, 1980
6,370 \pm 80	81-9 Beta-3633	Tenis Mesa N59°17' W138°34'	245	Peat	Molnia 1986
6,180 \pm 100	81-7 Beta-3631	N59°20' W138°52'	335	Peat	Molnia 1986
4,910 \pm 85	A-2 USGS-924	*Devils Elbow, Alsek R. N59°12' W138°30'	30	Peat	Molnia 1986
4,700 \pm 340	DE 35 Beta-3640	same as above	30	Peaty mud (706 cm)	Molnia 1986
2,560 \pm 80	Square Lk. USGS-1227	*Square Lake N58°55' W138°45'	20	Basal sediment (140-150 cm)	Molnia 1986
1,010 \pm 50	Square Lk. USGS-1226	same as above	20	(130-137 cm)	Molnia 1986
2,225 \pm 300	81-3 Beta-3627	W of Triangle Lk. N59°18' W138°59'	20	Peaty silt (120 cm)	Molnia 1986
1,090 \pm 80	Lost River "Muskeg" #1	N59°28' W139°36'	5	Blue-gray silt (26-29 cm)	R.G. Holloway, USDA FS, 1990

Table 2. (continued)

Date (years B.P.)	Number/Laboratory	Location	Alt. (m)	Material	Reference
430 ± 60	Lost River "Muskeg" #2	same as above	5	Fibrous peat/silt (15-18 cm)	Holloway 1990
280 ± 80	Lost River "Muskeg" #3	same as above	5	Peat	Holloway 1990
930 ± 80	81-1 Beta-3625	NE of Triangle Lk. N59°19' W138°53'	20	Silty peat (160 cm)	Molnia 1986
920 ± 110	Tawah Creek Beta-54384	N59°30' W139°43'	5	Wood (60 cm)	This study
880 ± 65	80-13 USGS-923	*Bog S of Russell Fjord N59°27' W139°40'	20	Peat	Molnia 1986
880 ± 65	Situk River USGS-923	W of Situk R. bridge	15	Peat (60 cm)	Peterson 1991
830 ± 160	—	Yakutat Bay moraine	20	Wood	Plafker and Miller 1958
820 ± 80 corrected C-13	Lost River #1 Beta-65331	N59°28'10" W139°36'50"	5	Peat (240 cm)	S.D. Davis, pers. comm. 1993
270 ± 50 corrected C-13	Lost River #2 Beta-65330	same as above	5	Wood (145 cm)	Davis 1993
103 ± 0.7% modern	Lost River #3 Beta-65329	same as above	5	Peat (20 cm)	Davis 1993
770 ± 110	81-2 Beta-3626	Ridge of Triangle Lk. N59°19' W138°56'	20	Peaty silt	Molnia 1986
340 ± 80	Seal Creek #1 Beta-66174	N59°25'30" W139°23'07"	5	Wood (115 cm)	This study
101 ± 0.9% modern	Seal Creek #2 Beta-66175	same as above	5	Peat (75 cm)	This study
280 ± 50 corrected C-13	Lower Dangerous R. #1 Beta-65949	N59°24'00" W139°12'30"	5	Wood (300 cm)	This study

Table 2. (concluded)

Date (years B.P.)	Number/Laboratory	Location	Alt. (m)	Material	Reference
140 \pm 70 corrected C-13	Lower Dangerous R. #2 Beta-65948	same as above	5	Wood (280 cm)	This study
270 \pm 70	81-4 Beta-3628	Ridge of Triangle Lk. N57°17' W138°56'	20	Peaty sand	Molnia 1986
<200	81-6 Beta-3630	2 km SE of Triangle Lk. N59°16' W138°55'	20	Sandy peat	Molnia 1986
<200 modern	M-1 USGS-927	N59°07' W138°38'	10	Peat (0-5 cm)	Molnia 1986
180 \pm 70	81-5 Beta-3629	SW of Triangle Lk. N59°17' W138°58'	10	Peat (150 cm)	Molnia 1986
170 \pm 70 corrected C-13	Upper Dangerous R. Beta-65950	Bank of Dangerous R. 4 mi. below bridge N59°26' W139°04'	25	Wood (450 cm)	This study
140 \pm 50 corrected C-13	Tanis River Beta-65951	N59°12' W138°42'	10	Wood	This study
110 \pm 60	Ahrnklin R. Beta-66173	Bank of Ahrnklin R. 1 mi. below Hwy. 10 N59°27' W139°07'	20	Wood (170 cm)	This study

*Location in question

WIND PROCESSES

Wind, or aeolian, processes also affected the formation of several landscapes. In sparsely vegetated areas wind-blown sand has formed dunes and filled old river channels and depressions. Along the present beach, there are small active dune fields, and stabilized, vegetated dunes exist further from the coast under a forest canopy. Where recent catastrophic floods have affected areas, such as along the Alsek and Dangerous Rivers, the wind has sculpted dunes from sand of flood deposits. The parabolic dune fields between Harlequin Lake and the coast are part of the outburst flood plain landscape. The active "blowouts" and coastal dunes of the current beach are part of the uplifted beach landscape. Stand level windthrow (tens of hectares or acres scale) with the resulting vegetative and soil disturbance is also a regular occurrence.

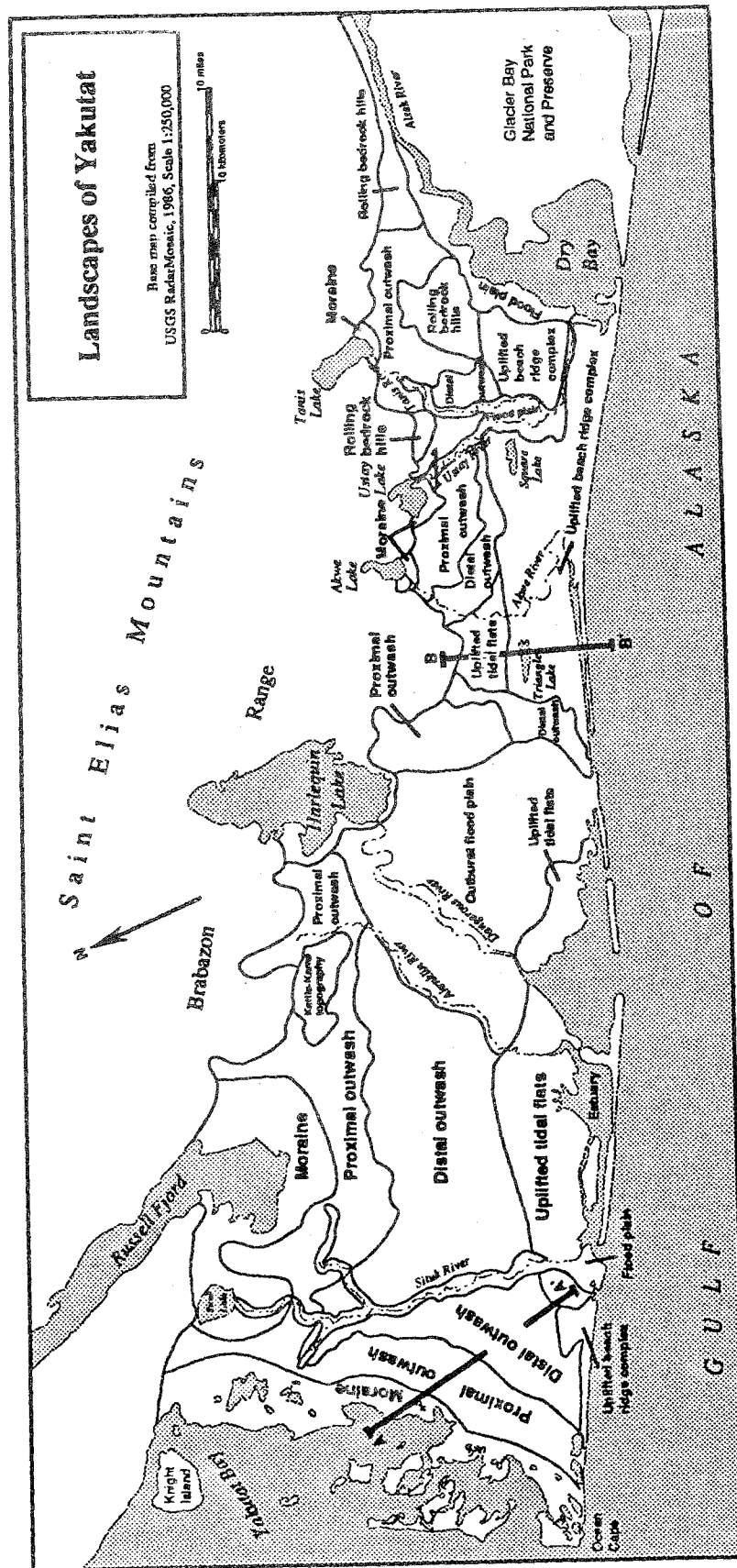


Figure 2. Generalized geomorphic landscapes of the Yakutat foreland (after Yehle 1975 and USFS Integrated Resource Inventory, 1989). See text for landscape descriptions. See Figure 3 for schematic cross-sections A and B.

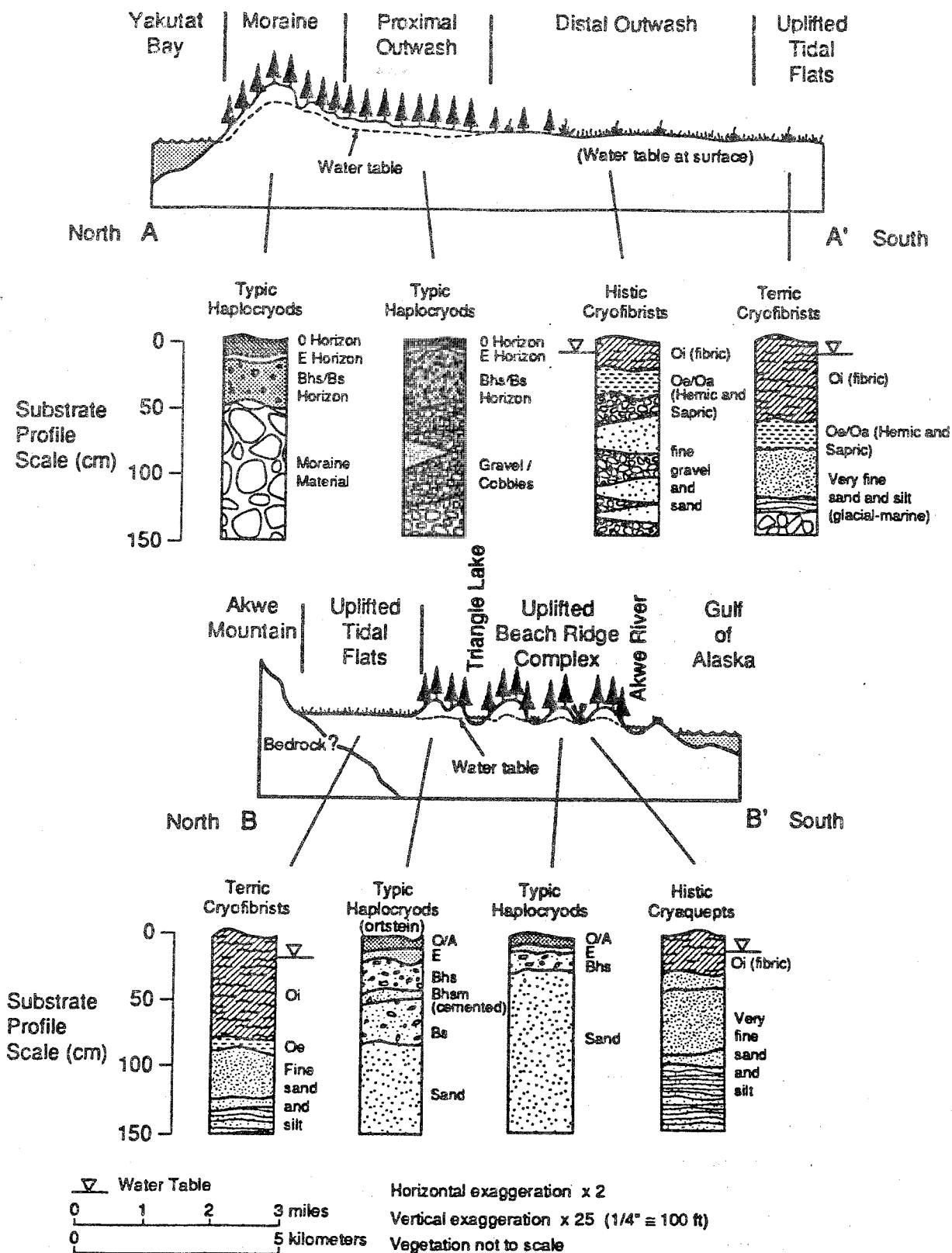


Figure 3. Cross-sectional diagrams across the Yakutat foreland (A-A', B-B'). The principle vegetation growth forms are illustrated in their relation to the landscapes, soils, and water table.

FLUVIAL PROCESSES

Fluvial, or moving water, processes have affected the formation of the flood plains, outburst flood plains, and outwash plains on the foreland. The movement of water creating these three landscapes has had different effects based on the volume of both water and sediment. In all cases, the fluvial processes sort and deposit material according to size and weight.

All the rivers of the Yakutat foreland experienced much larger flows or floods during the 19th century. This was due to outburst events (glacial dams breaking and releasing large volumes of water), or, in the case of the Situk, to reductions in stream water.

The Alsek River was dammed by the Lowell Glacier in the Yukon Territory at least four times in the last 500 years (Clague and Rampton 1982). The last outburst event occurred sometime between the middle and late 19th century (Clague and Rampton 1982).

Periodic glacial outburst floods can carry tremendous amounts of sediment in a short time. In some Icelandic systems, it was estimated that the average glacial outburst flood lasting for two weeks carried as much sand-sized sediment to the coast as 70-80 years of normal meltwater discharge (Nummedal et al. 1974, cited by Hine and Boothroyd 1978). These events can cause extensive progradation of the shoreline (movement of the shoreline seaward due to the deposition of sediment). They can also provide vast amounts of sand that can be reworked into beach ridges by longshore transport (Hine and Boothroyd 1978).

Russell Fjord was dammed by the Hubbard or Nunatak Glaciers for much of the last four centuries. The terminus of the Hubbard is thought to have been at the head of Yakutat Bay around 1700 A.D. (Plafker and Miller 1958). During this time, the flow of the Situk River would have been significantly greater than it is today. The actual flow rate would have been dependent on the location of the ice dam and the size of the drainage basin. Elders in Yakutat believe the last glacial dam broke around 1860 (de Laguna 1972), and this seems to be substantiated by the annual growth rings of trees on the former lake bed (Mayo 1988).

In active outwash systems, rivers are often called "overloaded" because of the abundance of sediment they carry (Davis 1983). On the proximal outwash plain, rivers are "braided" because of their inability to move the coarse component of their loads (Davis 1983). Therefore, individual river channels are constantly shifting across the outwash plain. Once the glacier has retreated, anastomosing channels affect both ground water and surface runoff and play a large role in the development of plant communities on outwash plains.

The rivers flowing over the Yakutat foreland today are not overloaded with material. They all have lakes at their headwaters into which gravel and coarse sand are being deposited. Therefore, most reaches of the rivers can be classified as meandering streams. These streams are generally single channels, and have fluvial deposits such as point bars (bars deposited on the inside of meanders) and levees (flood deposits of fine sands on the upper banks of the stream) (Davis 1983). However, portions of the Dangerous, Tanis, and Ustay Rivers are classified as braided streams (S. J. Paustian, pers. comm.).

LONGSHORE TRANSPORT PROCESSES

The last process to exert a significant influence on the landscapes of the Yakutat foreland is longshore transport, the movement of sand along the coast. The movement is the result of the dominant winds pushing waves into the beach at an angle (Chortley et al. 1984). This process can result in substantial amounts of sand being moved, depending on the inputs of material by marine currents, river sediment, etc. Longshore sand transport has been estimated at 140,000 m³/year (183,100 yd³/yr.) at Palm Beach, Florida and at 566,000 m³/year (740,300 yd³/yr.) at Madras, India (Chortley et al. 1984). The Copper River, a large glacial river like the Alsek, is estimated to move 97,000,000 metric tons/year of sediment into the ocean (Hampton et al. 1987). Although no figures are available for the Alsek, it is probably the main source for much of the sediment moved by longshore transport in the Yakutat area.

Long northwesterly sand spits have developed at the estuaries of all but the largest rivers in Yakutat (Thomas and Berryhill 1962). Longshore transport coupled with riverine processes and uplift (from tectonic activity and isostatic rebound) have formed the striking uplifted beach ridge landscape that covers much of the study area between the Alsek and Italo Rivers.

Piafker and others (1980) suggest that the progradation of the foreland near Icy Cape, northwest of Yakutat, is related to an increase in sediment output from the Guyot Glacier. However, because the glacier has retreated during this century, erosion along the shore has increased as the sediment supply has decreased. Similarly, along the Yakutat foreland shoreline, variations in sediment supply from the Alsek and other rivers have probably determined the rate of progradation. It is likely that the outburst floods coming down the Alsek were a main sediment source in the last millennia (cf. Clague and Rampton 1982).

On the youngest beach ridges, seven spruce trees cored at breast height had annual ring counts from 150-280. The specific age range is unknown for the intermediate and old beach ridges because the trees were too large to have ages determined with available equipment. However, based on the cores taken and the forest and soil structure, the forests are interpreted to be first generation. The inferred age for the entire chronosequence is approximately 200-700 years, although the dating and explanation of the beach ridges are beyond the scope of this report. Molnia (1986) has radiocarbon bulk dates from 180 ± 70 to 2560 ± 80 yr. B.P. for wetlands between several ridges that we sampled (Table 2). However, the radiocarbon-dated basal organics may be contaminated from outburst floods that deposited older organics on a younger surface. Thus, these data may not accurately predict the date of beach ridge formation and initial forest establishment (D. Peteet, pers. comm. 1993).

Tree ages have been determined for four successive beach ridges near Cape Yakataga. The trees on the youngest beach ridge were about 80 years old, while the trees on the oldest ridge were about 700 years old (Beavan et al. 1979).

The beach ridge just west of the Situk River has been undergoing rapid erosion since 1948, when the first aerial photographs were taken. Concurrently, the barrier spit to the east has pushed the Situk River mouth over 2.5 km (1.5 mi.) to the northwest (based on 1989 satellite imagery). This illustrates the rate at which longshore transport can build a spit on the Yakutat foreland. Fluvial processes probably played a larger role in maintaining the Situk River's mouth location before the Nunatak glacial dam broke about 110 years ago and reduced the water volume and sediment coming down the river (cf. Clark and Paustian 1990).

LANDSCAPE ECOLOGY

NATIONAL ECOLOGICAL CLASSIFICATION

Bailey (1983) defined ecoregions as "geographical zones that represent geographical groups or associations of similarly functioning ecosystems." This work has been continued and is now being expanded to develop a national hierarchical ecological classification system (ECOMAP). Hierarchy levels are nested; that is, Provinces occur within Divisions, Sections occur within Provinces, and so on down to the Landtype Association or Landscape scale. The USDA Forest Service spearheaded this effort in cooperation with other agencies. At the scale of this classification, it is most relevant to discuss landscapes, defined as Landtype Associations (scale of 1,000's to 100's of acres; Bailey et al. 1994). At the landscape scale, Landtype Associations were delineated based on glacial and coastal geomorphology and gross differences in natural vegetation, related to hydrologic gradients. The different scaled delineations for the Yakutat region are listed below (Bailey et al. 1994):

- Domain: Humid Temperate
- Division: Marine
- Province: Pacific Gulf Coast
- Section: Northern Gulf Forelands
- Subsection: Yakutat Bay Forelands (Coastal Plain)
- Landtype Associations (landscapes):
 - Moraine
 - Proximal Outwash
 - Distal Outwash
 - Beach Ridge Complex (uplifted beach ridges)
 - Uplifted Tidal Flats (glacial-marine deposits)
 - Flood Plains
 - Outburst Flood Plains
 - Rolling Bedrock Hills
 - Kettle and Kame Topography

LANDTYPE ASSOCIATION DESCRIPTIONS

The combination of the tectonic, glacial, fluvial, wind and longshore transport processes defines the nine major landscapes of the Yakutat foreland. These landscapes are moraine, proximal outwash (coarse-grained gravel), distal outwash (fine-grained gravel and sand), beach ridge complex, glacial-marine deposits (former estuarine areas), flood plains (active and inactive), outburst flood plains, rolling bedrock hills, and kettle and kame topography (Figure 2).

A combined geological and ecological approach (geo-ecological) is used in this section. Such an approach involves the disciplines of geomorphology, soils, hydrology, and plant community ecology. This holistic approach allows us to see more clearly the connections between the various processes and vegetation patterns that occur on the landscape (Matthews 1992).

MORAINES

Formation, location & relative age

Moraines form when glacial ice deposits material and/or pushes it to its sides and terminus. Most of the lakes near the mountains, such as the Situk, Akwe, Ustay, and Tanis Lakes, are ringed by moraine complexes. Moraines also border Yakutat Bay and Russell Fjord. Downslope and seaward of the moraines are located the outwash plains, the gravel and sands carried by the glacial meltwater.

Most of the moraines were formed during the Little Ice Age (1450-1900). The oldest moraine, on which the town of Yakutat is built, is about 830 ± 160 years old (Plafker and Miller 1958). However, glaciers have occupied the Harlequin, Akwe, Ustay, and Tanis lake basins much more recently. Increment cores taken from Sitka spruce and alder from the Harlequin, Akwe and Tanis Lake moraines suggest that all these glaciers were at their most recent glacial maximum in the last 150 years. Blackwelder (1907) described the youth of the Harlequin Lake moraine, "This moraine has every appearance of being a comparatively recent deposit." The Tanis Lake terminal moraine is probably the youngest moraine, approximately 75 years old based on black cottonwood and alder growth ring cores. These moraine deposits provide good locations to study inferred chronosequences, because the many, small, terminal moraines range in age from approximately 65 to 850 years. See the Glacial Processes section (above) for further discussion of formation and age of this landscape.

Substrate

The glacial moraines consist of unsorted material that range in size from boulders to silt-sized particles. Surfaces are relatively new, stable areas where soil development is dependent on age and drainage (Figure 3).

Drainage

The moraines are well drained in many places; however, drainage typically depends on the particular substrate. Kettles, locations where buried ice melts and leaves a depression, are often found on moraines. They commonly have basins sealed by silt and organic matter, and therefore contain small ponds, lakes, and bogs.

Community Types

On the well-drained sites on younger moraines, the community types are primarily various willow types such as *Salix barclayi*/*Fragaria chiloensis* (barclay willow/beach strawberry) and young cottonwood and/or Sitka spruce forests. On the poorly drained sites, *Carex saxatilis* (russet sedge), *Equisetum variegatum* (variegated scouring-rush) and open pools are common.

Well-drained sites on older moraines primarily support Sitka spruce and western hemlock community types such as *Picea sitchensis*/*Vaccinium-Echinopanax horridum* (Sitka spruce/blueberry-devil's club) and *Tsuga heterophylla*/*Vaccinium-Echinopanax horridum* (western hemlock/blueberry-devil's club) (Table 3). On the more poorly drained sites, community types range from *Nuphar polysepalum* (pond lily) to *Carex sitchensis*/*Oxycoccus palustris* (Sitka sedge/bog cranberry). As the organics build up through millennia, these surfaces may develop community types similar to what now occurs on the kettle-kame topography of the Pike Lakes

area, the oldest landscape on the Yakutat foreland. Geomorphically, the kettle-kame topography is similar to a moraine and supports vegetation similar to the bogs and fens that are common in the Alexander Archipelago (Figure 4).

Soils

On the younger moraines deglaciated for 200 years or less, Entisol soils (Typic Cryorthents) occur on the more well drained sites and Inceptisols (Histic Cryaquents) occur on the less well drained sites. The most common soils on the older, more well drained, upland moraines are Spodosols and Inceptisols (Typic Haplocryods and Oxyaquic Cryochrepts), while in the poorly drained depressions are soils with histic epipedons or Histosols (Figure 3).

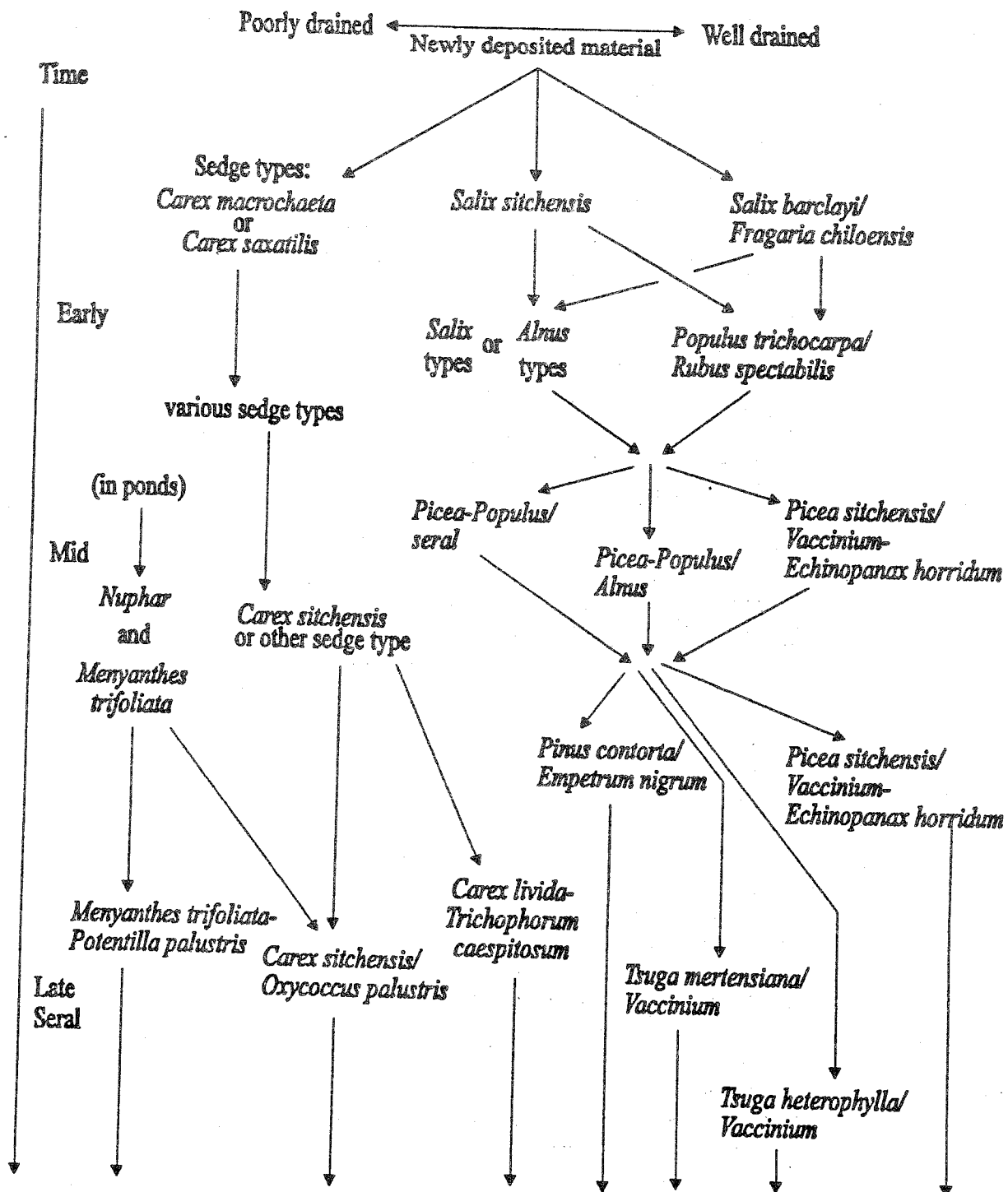
Table 3. Distribution of the 530 plots within the 60 community types across the nine major landscapes of the Yakutat foreland. GM=moraine; PO=proximal outwash; DO=distal outwash; UT=uplifted tidal flats; UB=uplifted beach ridge; FP=flood plain; OF=outburst flood plain; KK=kettle-kame topography; RB=rolling bedrock hills.

Community Type	GM	PO	DO	UT	UB	FP	OF	KK	RB
FORESTED C.T.S									
TSUMER/VACCIN	-	-	-	-	-	-	-	1	-
MIXED CON/VACCIN	1	2	2	-	-	-	-	2	1
MIXED CON/VACCIN/LYSAME	-	-	-	-	-	-	-	3	-
TSUHET/VACCIN-ECHHOR	2	1	-	-	-	-	-	-	-
TSUHET/VACCIN/DRYDIL	1	2	-	-	-	-	-	1	-
TSUHET/VACCIN	1	1	-	-	-	-	-	1	-
PICSIT/ALNSIN	2	-	5	2	3	4	-	-	1
PICSIT/ECHHOR-RUBSPE	1	4	1	3	7	6	1	-	2
PICSIT/VACCIN-ECHHOR	5	14	3	-	9	5	-	-	1
PICSIT/ECHHOR	1	4	3	-	12	5	-	-	1
PICSIT/VACCIN	1	9	5	1	3	3	-	1	-
PICSIT/SERAL	-	-	-	-	1	2	1	-	-
PICSIT-POPTRI/ALNSIN	1	1	-	-	-	1	3	-	-
PICSIT-POPTRI/ECHHOR	-	2	-	-	-	3	-	-	-
PICSIT-POPTRI/SERAL	2	-	-	-	-	2	3	-	-
POPTRI/SALIX	-	1	-	-	-	4	2	-	-
POPTRI/RUBSPE	1	1	-	-	-	3	6	-	-
POPTRI/ECHHOR	-	1	-	-	-	2	2	-	-
PINCON/SPHAGN	-	-	2	-	-	-	-	5	-
PICSIT/SPHAGN	-	-	2	4	-	-	-	1	-
SHRUB C.T.S									
RUBSPE/ATHFIL	-	-	-	-	-	-	-	-	2
ALNSIN-SALSIT	-	-	-	-	1	3	1	-	-
ALNSIN-MALFUS	-	-	-	-	-	-	-	-	5
ALNSIN-RUBSPE	1	-	1	1	-	1	5	-	5
ALNSIN/GRAMINOID	-	-	-	1	1	1	1	-	1
SALSIT	1	-	-	-	-	8	1	-	-
SALHOO	-	-	1	2	-	-	-	-	-
SALBAR/CARPLU	-	-	3	2	-	-	1	-	-
SALBAR/CARSIT	-	-	7	-	1	-	-	-	3
SALBAR/MIXED HERB	-	1	1	2	-	1	-	-	-

Table 3. (concluded)

Community Type	GM	PO	DO	UT	UB	FP	OF	KK	RB
SALBAR/FRACHI	2	6	2	-	-	2	3	-	-
MYRGAL/CARLIV	-	-	7	1	-	-	-	1	1
MYRGAL/CARSIT	-	-	8	4	-	-	-	-	4
MYRGAL/CARPLU	-	-	-	4	-	-	-	-	-
MYRGAL/EQUVAR	-	-	2	-	-	-	5	-	-
EMPNIG/CARPLU	-	-	5	-	-	-	-	-	-
VACULI-EMPNIG	2	-	4	-	-	1	1	-	-
ANDPOL/CARPLU	-	-	-	2	-	-	-	-	-
GRAMINOID C.T.S									
PUCPUM	-	-	-	1	-	-	-	-	-
ELEPAL	-	-	-	2	-	1	-	-	-
CARLYN	-	-	-	3	-	1	1	-	-
CARSAX	1	-	5	-	-	-	-	-	-
CARPLU-CARLYN	-	-	2	8	-	-	1	-	-
CARLIV-TRICAE	-	-	10	1	-	-	-	4	2
TRICAE	-	-	6	-	-	-	1	-	-
CARSIT/OXYPAL	2	-	8	9	-	-	-	-	-
CARSIT/EQUFLU	-	-	4	1	-	-	-	-	1
CALCAN/POTEGE	-	-	-	2	-	4	-	-	-
ELYARE	-	-	-	-	4	-	-	-	-
CALCAN	-	-	3	4	-	-	-	-	2
FORB C.T.S									
NUPPOL	1	-	-	-	-	-	-	-	-
MYRALT	-	-	2	1	-	-	-	-	-
EQUFLU	1	-	1	1	-	-	1	-	-
EQUVAR	-	-	-	-	-	2	4	-	-
MENTRI-EQUVAR	-	-	3	-	-	-	4	-	-
MENTRI-POTPAL	2	-	2	1	-	-	7	-	-
MESIC FORB/ATHFIL	1	-	-	-	-	2	-	-	1
MESIC FORB	1	1	1	1	-	1	-	-	3
LUPNOO/SALSET	1	-	-	-	-	2	1	-	-
FRACHI-ACHBOR	-	-	-	-	6	5	-	-	-

Figure 4. Inferred successional chronosequence for the moraine and kettle-kame landscapes of the Yakutat foreland.

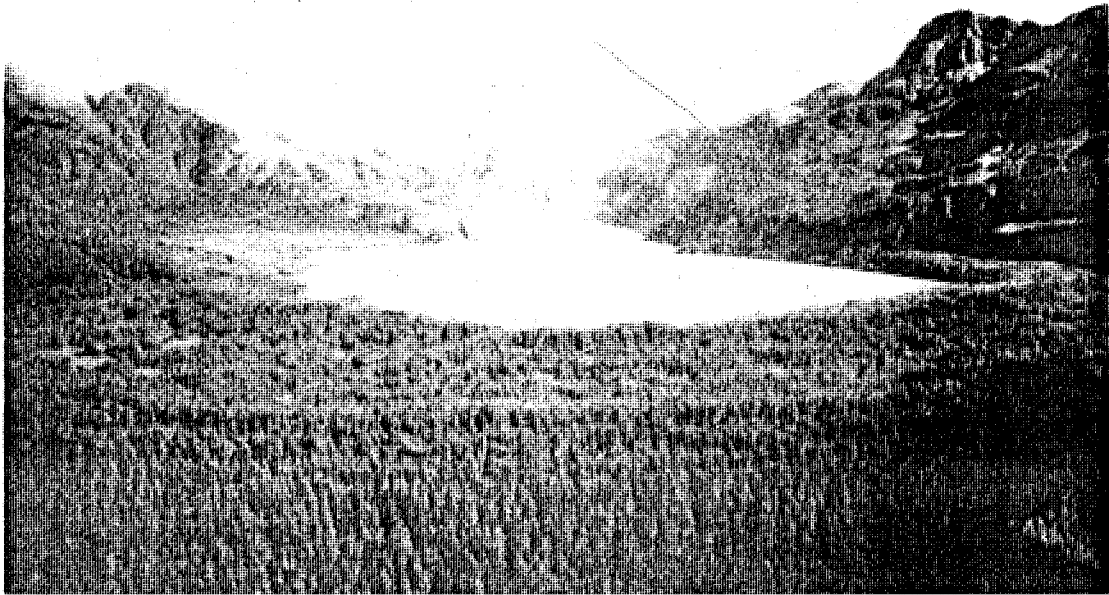


PROXIMAL AND DISTAL OUTWASH PLAINS

Formation, location & relative age

The outwash fans and plains are located beyond the terminal moraines. Coalescing outwash fans are often called sandur plains (Davis 1983). Outwash fans cover a large area of the foreland and are of very low relief (Figure 2). The proximal outwash is next to the moraines and grades into the distal outwash. The upper proximal outwash generally has a gradient up to 17 m/km (35 ft./mile), while the distal outwash has a gentler slope ranging from 1-5 m/km (2-10 ft./mile; Boothroyd and Ashley 1975). As with the moraines, most of the outwash plains were formed during the Little Ice Age. See the Glacial Processes and Fluvial Processes sections for further discussion of formation and age of these landscapes.

PROXIMAL OUTWASH PLAINS



View looking northeast over the proximal outwash fan created by the glacier that occupied the Akwe lake basin. A uniform Sitka spruce/blueberry-devil's club forest covers the proximal outwash in the foreground. The moraines on the edge of the lake are covered with various Sitka spruce or mixed Sitka spruce/black cottonwood communities depending on the age of the moraine.

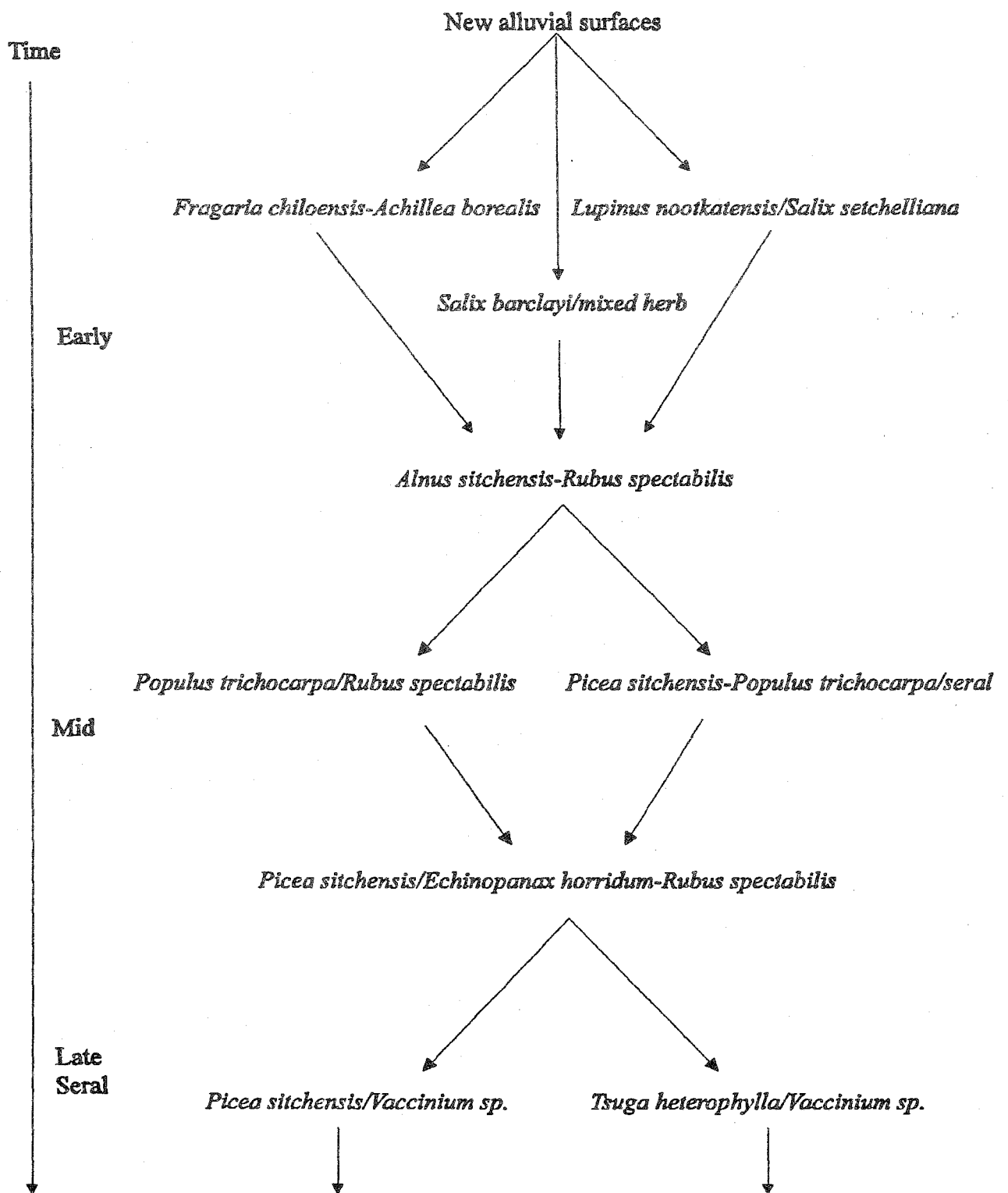
Substrate

Gravel and cobbles with lenses of coarse sand dominate the proximal outwash (Figure 3); rock fragments decrease in size with distance from the moraine (Boothroyd and Ashley 1975).

Drainage

These landscapes are generally well drained in most locations, with occasional ephemeral streams developed in old outwash channels.

Figure 5. Inferred successional chronosequence for proximal outwash of the Yakutat foreland.



Community Types

On the younger proximal outwash, the plant communities are primarily willow types, *Salix barclayi*/*Fragaria chiloensis* (barclay willow/beach strawberry) and young cottonwood and/or Sitka spruce forests. On the older outwash, the community types are primarily Sitka spruce and western hemlock communities. The most common forest type is *Picea sitchensis*/*Vaccinium-Echinopanax horridum* (Sitka spruce/blueberry-devil's club; Table 3). Near the transition between the well-drained proximal outwash and the poorly-drained distal outwash, the forest often has a high component of *Tsuga mertensiana* (mountain hemlock). See Figure 5 for an inferred chronosequence diagram for proximal outwash landscapes.

Soils

On the younger proximal outwash typically deglaciated for 200 years or less, the soils are generally Entisols (Oxyaquic Cryorthents and Typic Cryorthents). The most common soils on the older proximal outwash are Spodosols (Typic Haplocryods and Oxyaquic Haplocryods).

DISTAL OUTWASH PLAINS



View looking north over distal outwash. Proximal outwash and the south end of Russell Fjord are in the background. Sitka spruce/blueberry dominates along the larger streams. The dark bands of vegetation along the small channels are either barclay willow/Sitka sedge or sweetgale/Sitka sedge communities. Lighter toned areas are primarily *Sphagnum* (peat moss) dominated community types such as livid sedge/tufted clubrush and Sitka sedge/bog cranberry.

Substrate

The distal outwash is dominated by fine gravel and sands (Boothroyd and Ashley 1975).

Drainage

On this landscape, the drainage ranges from moderately well to very poorly drained in most locations. The best drained sites are generally along streams, on old outwash bars, or old sand dunes. Most other areas are poorly to very poorly drained.

Community Types

Young distal outwash sites are limited. Where found, the community types are primarily *Myrica gale/Equisetum variegatum* (sweetgale/variegated scouring-rush), *Trichophorum caespitosum* (tufted clubrush), or similar types. On the older distal outwash landscapes, a Sitka spruce type is the dominant community on the old sand dunes and higher gravel bars that dot across the outwash plain. Where subsurface water regularly flows and occasionally rises to the surface, community types such as *Salix barclayi/Carex sitchensis* (barclay willow/Sitka sedge) and *Myrica gale/Carex sitchensis* (sweetgale/Sitka sedge) are present. In shallow ephemeral channels, *Carex saxatilis* (russet sedge) occurs, and in deeper perennial channels, *Carex sitchensis/Equisetum fluviatile* (Sitka sedge/swamp horsetail) occurs (Table 3).

Poor fens or bogs form where subsurface water flow no longer interacts with the surface horizon, due to thick peat accumulation. In these locations are community types such as *Myrica gale/Carex livida* (sweetgale/livid sedge), *Carex livida-Trichophorum caespitosum* (livid sedge-tufted clubrush), and *Carex sitchensis/Oxycoccus palustris* (Sitka sedge/bog cranberry). Many more acidic communities appear to have formed initially behind small upland areas that act as "dams" to surface and subsurface flow, creating an environment more conducive to *Sphagnum* growth on the "downstream" side (see the Hydrology section).

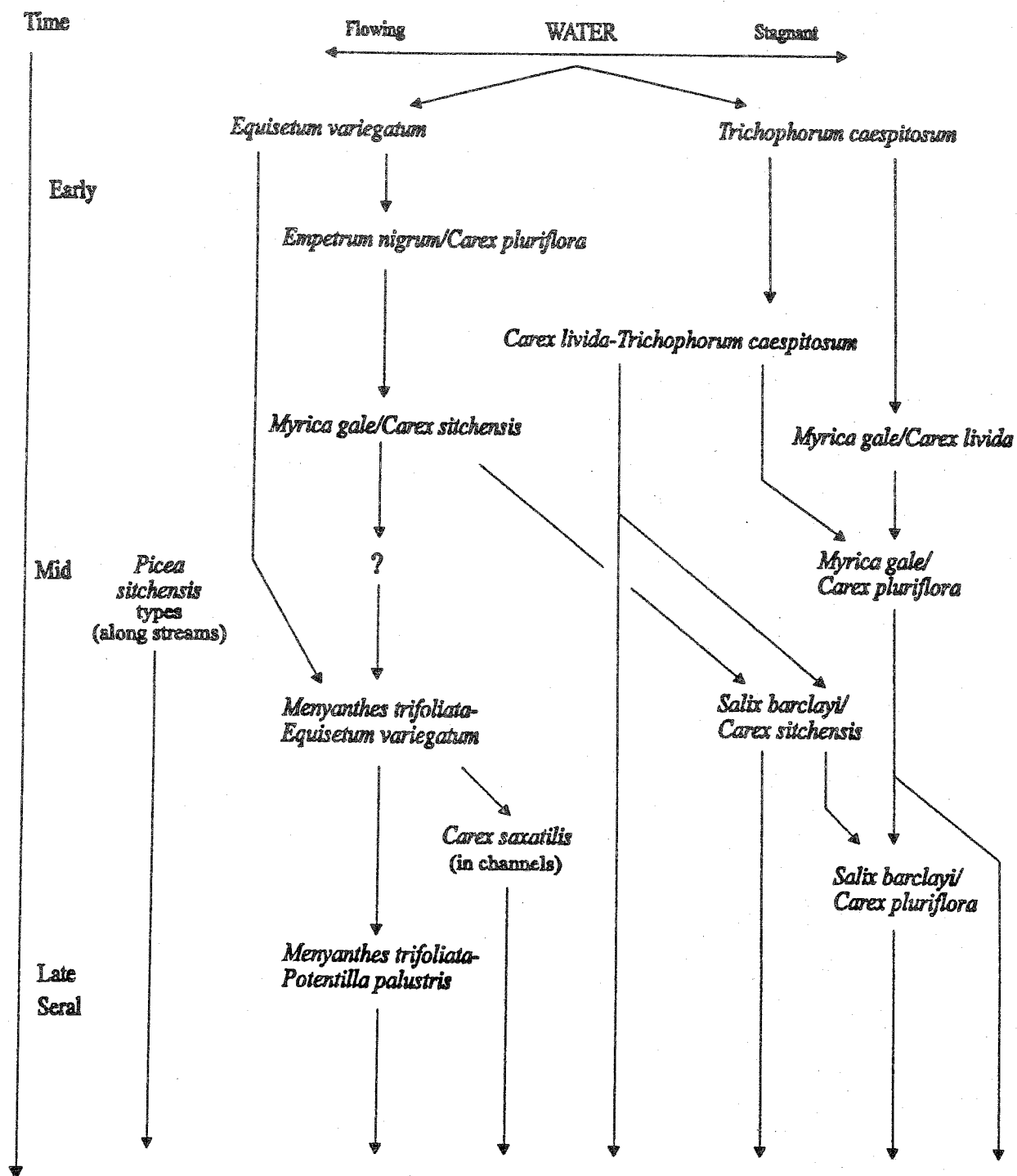
The grain size and the initial microtopography appear to largely determine initial community type development. Very complex community patterns occur, mainly due to the complicated hydrology within this landscape (especially the subsurface flow). Over time, these areas could develop expanses of lodgepole pine fens, similar to what now occurs on the oldest landscape on the Yakutat foreland, the Pike Lakes area. Successional pathways and rates of change can only be inferred at this time (Figure 6).

The successional status of wetland community types is difficult to gauge despite the landscape in which they exist, since these communities lack woody species used to determine the community's longevity. Successional status could best be determined by establishing long-term plots that can be monitored. However, an examination of the organic horizon, indicator species, and background information provides an idea of the community fidelity to a given site. This information is provided in the community type description section. Some surfaces have barely had time to be colonized by plants. Communities on other surfaces are on different pathways, proceeding at different rates toward a stable community. Some of these communities will probably never reach the stable "climax community" stage, because changing environmental factors preclude it.

Soils

Large quantities of ground water move through the moraine and proximal outwash landscapes onto the distal outwash landscape. Where the substrate is finer and the drainage is poor, Inceptisols with organic surfaces are the main soil order. Most of the soils are Histosols where drainage is further impeded, either initially by fine sands, or through the process of organic soil formation. Organic soils of the distal outwash landscape usually have a thick organic layer

Figure 6. Inferred successional chronosequence for distal outwash of the Yakutat foreland.



composed primarily of sedges and *Sphagnum* (peat) mosses. On younger sites a shallow organic mat (25-50 cm [10-20 in.]) overlays the mineral layer. The organic matter is typically dense and distinct, an interwoven root layer of sedges, shrubs, horsetails, and grasses that initially colonized the mineral deposit. After many years of growth, *Sphagnum* often gradually becomes the dominant plant, forming a spongy layer of *Sphagnum* peat (Figure 3).

Soils in ephemeral and perennial channels generally accumulate little organic matter and are classified as Typic Cryaquepts. The c.t.s that are rich fens, such as the willow/Sitka sedge types, are found on soils with moderately thick organic horizons (Histic Cryaquepts) while the more acidic types are on soils with organic horizons ranging from moderately thick (20-40 cm [8-16 in.]) to over 1m (3 ft.) deep (Histic Cryaquepts and Terric Cryohemists).

UPLIFTED TIDAL FLATS

Formation, location & relative age

This near-shore substrate is being uplifted gradually by isostatic rebound and is expanding its areal extent, forming the uplifted tidal flat landscape. Glacial marine sediment has been accumulating for the last several thousand years (Molnia 1986). The youngest areas of this landscape, such as those between the Dangerous River and Seal Creek estuaries, have been only recently free of saltwater inundation (Figure 2). See the Glacial Processes section for further discussion of formation and age of this landscape.

Substrate

The substrate is composed primarily of thinly bedded sands and silts (often called varves). These deposits generally correspond to the annual cycle of glacial meltwater rivers that transport more sediment during high flow in summer (depositing sand in estuaries) and less sediment during low flow in winter (primarily depositing silt).

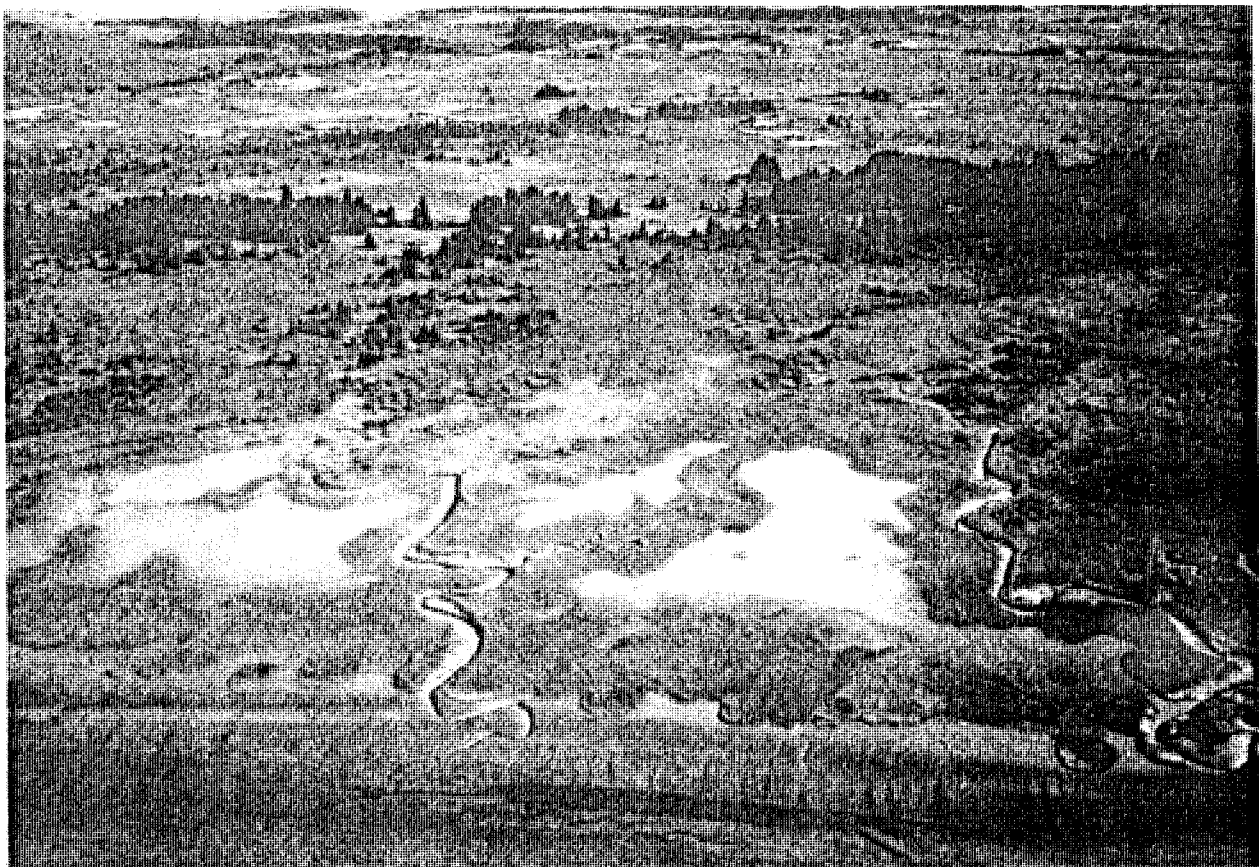
Drainage

The fine-grained substrate and the very low gradient of this landscape make it very poorly drained. Along sloughs or small incised stream channels, drainage is usually better. Fine sand and silt limit water movement through the soil compared to the outwash areas. Hence, water often runs in sheets over the entire area, and permanent stream channels are few. Sea water occasionally inundates adjacent areas during large storms.

Community Types

On the upper parts of the current tidal flat, *Carex lyngbyei* (lyngbyei sedge) and *Puccinellia pumila* (alkali grass) are the dominant brackish water types. Adjacent to the estuary, on the recently uplifted tidal flat landscape, *Calamagrostis canadensis*/*Potentilla egedii* (bluejoint/Pacific silverweed), *Calamagrostis canadensis* (bluejoint), *Myrica gale*/*Carex sitchensis* (sweetgale/Sitka sedge), and *Salix hookeriana* (Hooker willow) types are common (Table 3; Figure 7). Further landward from the current tidal flat, the fine-grained substrate and very low gradient make a prime location for *Sphagnum* to dominate. Domed bogs are commonly found, where *Sphagnum* accumulation has raised the entire surface above the initial one. Consequently the only water entering the system is from precipitation. Domed bogs are primarily dominated by *Carex sitchensis*/*Oxycoccus palustris* (Sitka sedge/bog cranberry) or *Picea sitchensis*/*Sphagnum* (Sitka

spruce/peat moss) c.t.s. Where drainage is better, as along sloughs or small stream channels, *Carex pluriflora*-*Carex lyngbyei* (many-flowered sedge-lyngbyei sedge) is the primary community type. On the oldest uplifted tidal flat landscape, the c.t.s are either *Sphagnum* dominated types, or, near creeks where the drainage is improved, riparian Sitka spruce c.t.s (Figure 7).

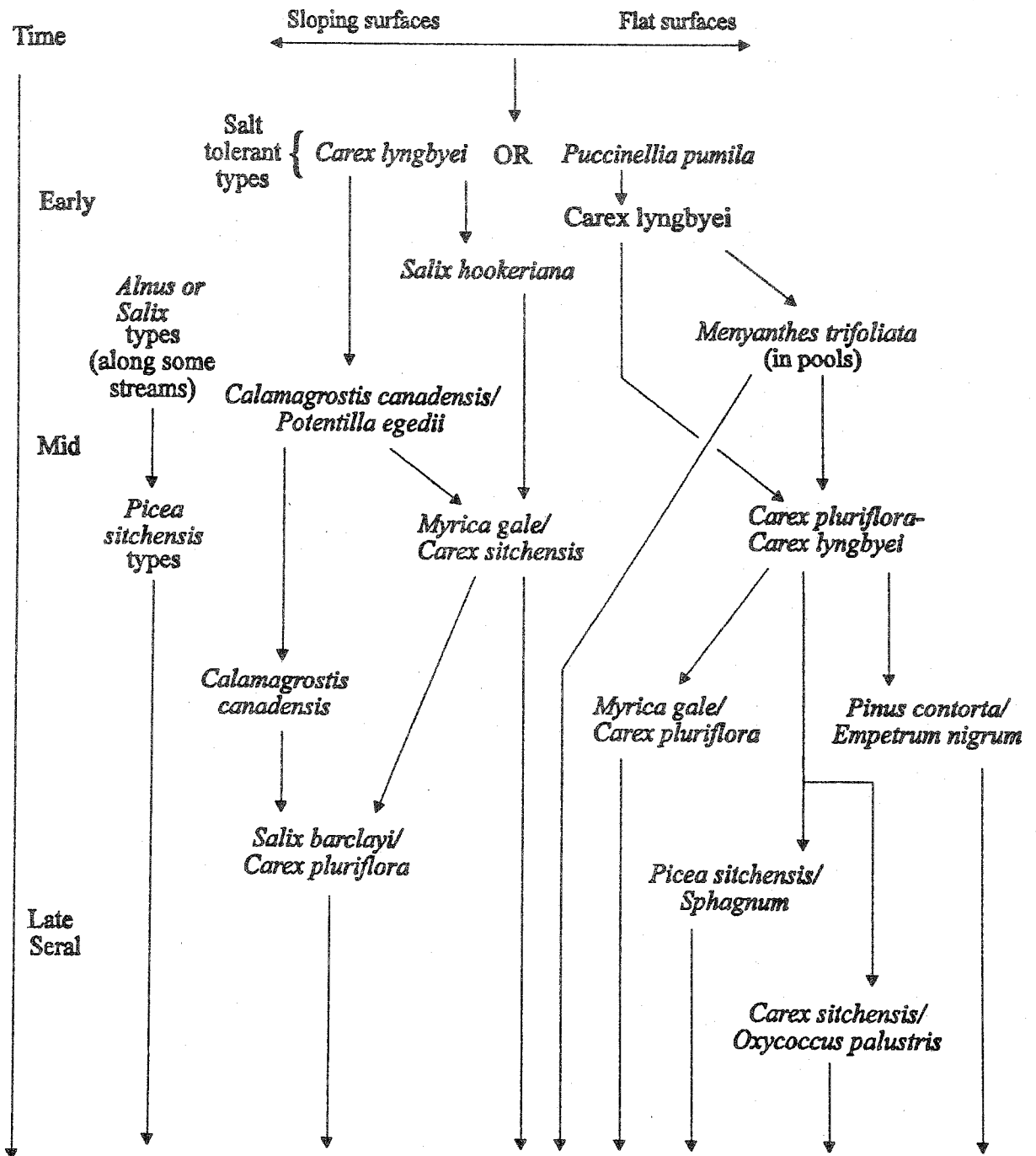


View looking northeast across the tidal flats and uplifted tidal flats between Situk River and Seal Creek. In the foreground are clones of lyngbyei sedge along the small tidal sloughs. Above the tidal influence are sweetgale types and scattered communities of hooker willow. Behind the small beach ridge (Sitka spruce/devil's club) are communities dominated by *Sphagnum* (peat moss) such as Sitka sedge/bog cranberry and sweetgale/many-flowered sedge.

Soils

The soils are Inceptisols or Histosols (Histic Cryaquepts and Terric Cryohemists) on the uplifted tidal flat landscape, depending on the thickness of the organic horizon. The soils on the present tidal flat are Entisols (Cryaquepts; Figure 3).

Figure 7. Inferred successional chronosequence for uplifted tidal flats of the Yakutat foreland.



BEACH RIDGE COMPLEX

Formation, location & relative age

Tectonic, glacial, and longshore transport processes working in combination have formed this landscape. It is gradually being uplifted by tectonics and from isostatic rebound due to the recent retreat of the glaciers. Therefore the areal extent of this substrate is expanding, providing new areas for plant colonization. See the Longshore Transport section for further discussion of formation and age of this landscape.

The present beach runs nearly the entire 70 kilometer (43 mi.) length of the Yakutat foreland. Uplifted beach ridges occur primarily along the coast on the southeast portion of the Yakutat foreland between Dry Bay and the Dangerous River, with some extending to the northwest of the Situk River. These ridges range from about 5 m (15 ft.) in elevation near the coast to 35 m (110 ft.) in elevation about 7 km (4.5 miles) inland.

Substrate

The beach ridge substrate is primarily sand with a few silt inclusions. Between the ridges, the substrate is primarily interbedded silt and fine sand. These inter-ridge areas are essentially inclusions of the uplifted tidal flat landscape within the uplifted beach ridge landscape.

Drainage

Many small streams and three major rivers run between and parallel to the elevated, very well drained, forested beach ridges. They affect the water table and drainage of this landscape. The streams and uplifted tidal flats occurring between the ridges are poorly drained, resulting in the development of fens and bogs.

Community Types

A striking and stable pattern occurs of linear, forested, remnant beach ridges surrounded by fens and bogs (Figure 3). The present nonforested beach, next to the ocean, is dominated by two community types. In the supratidal zone and on dunes, an *Elymus arenarius* (beach ryegrass) community type dominates, while landward and above this type is a *Fragaria chiloensis*-*Achillea borealis* (beach strawberry-yarrow) c.t. (Figure 8). Spruce seedlings become established in the *Fragaria-Achillea* backbeach meadow but generally do not survive, probably due to excessive salt spray. Further removed from the ocean, spruce seedlings can establish and will succeed here in the *Fragaria-Achillea* c.t. A young spruce forest with only a moss understory is an intermediate type before the *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) c.t. after about 130 years (based on tree ring counts).

The forest that develops on all the beach ridges is a remarkably homogeneous *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) c.t. (Table 3). In this type, the canopy cover of *Rubus spectabilis* (salmonberry) and *Alnus sinuata* (Sitka alder) is greater on the older beach ridges, probably due to canopy gaps on the older sites. One stand from an old ridge had an overstory dominated by *Tsuga heterophylla* (western hemlock) with very large Sitka spruce trees present.

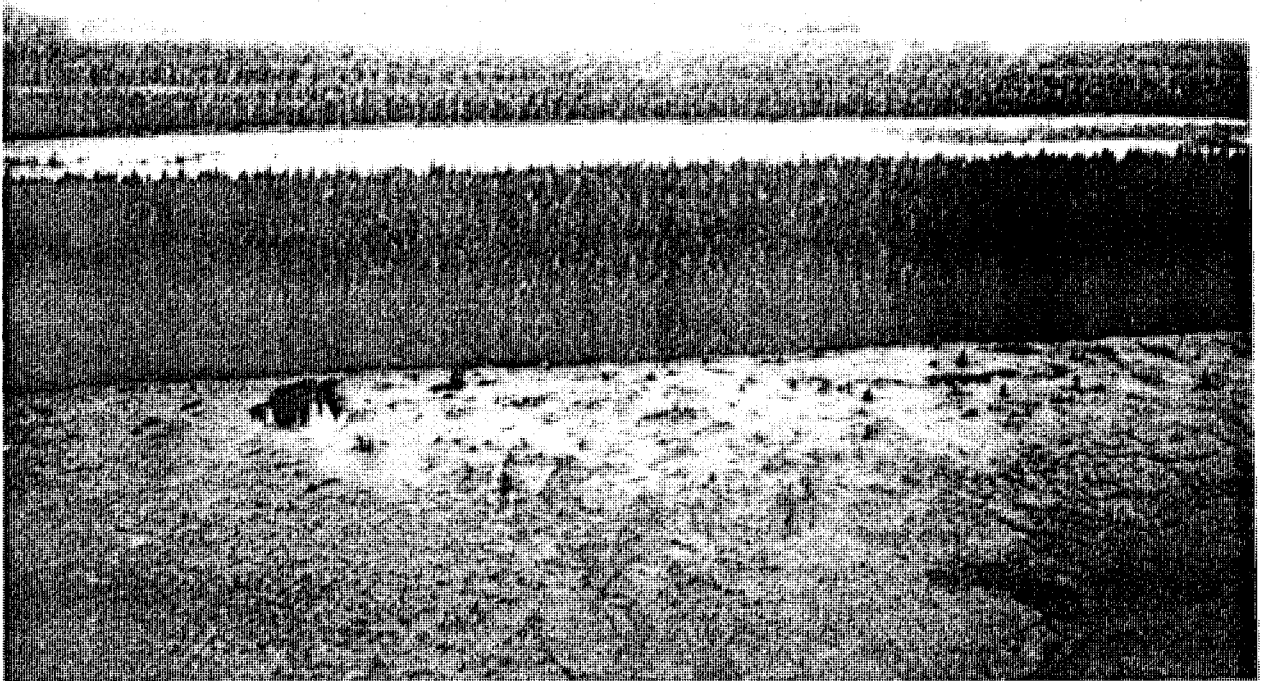
Structural trends between beach ridges showed an increase in mean spruce diameter at breast height (dbh) from 52 ± 22 cm (20 in.) on the young ridges to 69 ± 29 cm (27 in.) on the old ridges (Figure 3). Overall, less than 1% of the spruce tallied was greater than 90 cm (35 in.) dbh on the young ridges, while 24% of the spruce was greater than the 90 cm (35 in.) on the old ridges.

It appears the *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) type becomes established about 130 years after beach ridge formation, after which a forested community persists for several hundred years. Eventually *Tsuga heterophylla* (western hemlock) types may replace the nearly pure Sitka spruce communities. This change may be due to differences in the soils along the chronosequence or may be related to other factors such as changes in the amount of available light, germination and survival (Figure 8).

Soils

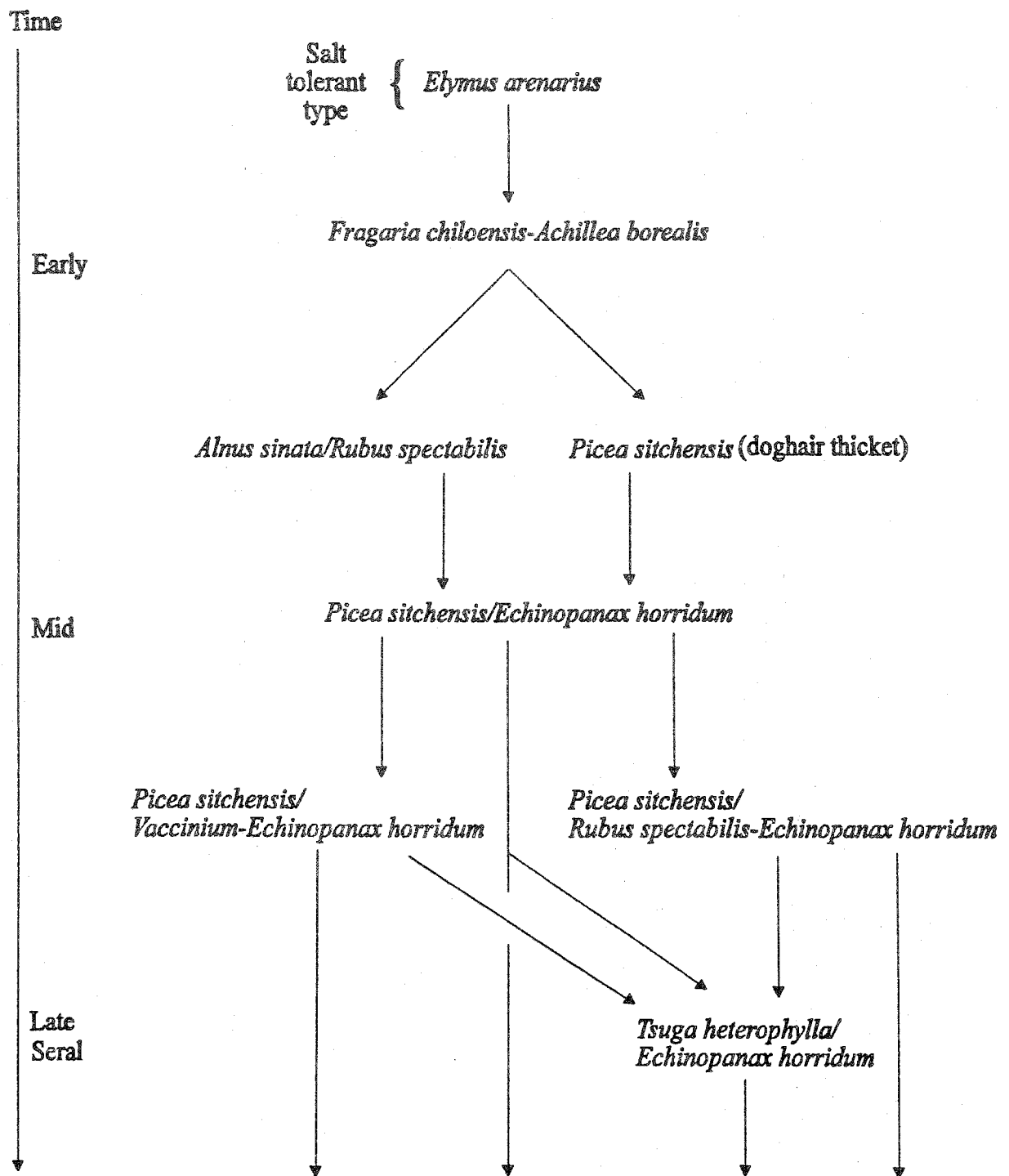
The soils on the beach ridges are primarily Spodosols, and follow a successional sequence across the ridges from immature soils on the youngest ridges (Spodic Cryopsamments) to well-developed Spodosols with an organic-sesquioxide cemented horizon on the oldest ridges (ortstein Typic Haplocryods). B horizon thickness averaged $25 \text{ cm} \pm 6.3$ (standard deviation; 9.8 in.) on the youngest beach ridges and increased to $75 \text{ cm} \pm 5.8$ (30 in.) on the oldest beach ridges. Likewise, the albic, or E horizon (a zone of eluviation where organics, iron and aluminum oxides have been leached out) averaged $3 \text{ cm} \pm 1.3$ (1.2 in.) when it occurred on the youngest beach ridges. It averaged $8 \text{ cm} \pm 5.1$ (3 in.) on the oldest beach ridges where it always was found.

The wetland soils between the uplifted beach ridges are Inceptisols or Histosols in the older bog areas. They are similar to those formed on the glacial marine sediments in the uplifted tidal flat landscape.



View looking southwest toward the Gulf of Alaska across the uplifted beach ridges and the inter-ridge uplifted tidal flats. Sitka spruce/devil's club dominates the uplifted beach ridges. Sweetgale/Sitka sedge, sweetgale/livid sedge, and similar communities dominate the foreground.

Figure 8. Inferred successional chronosequence for uplifted beach ridges of the Yakutat foreland.



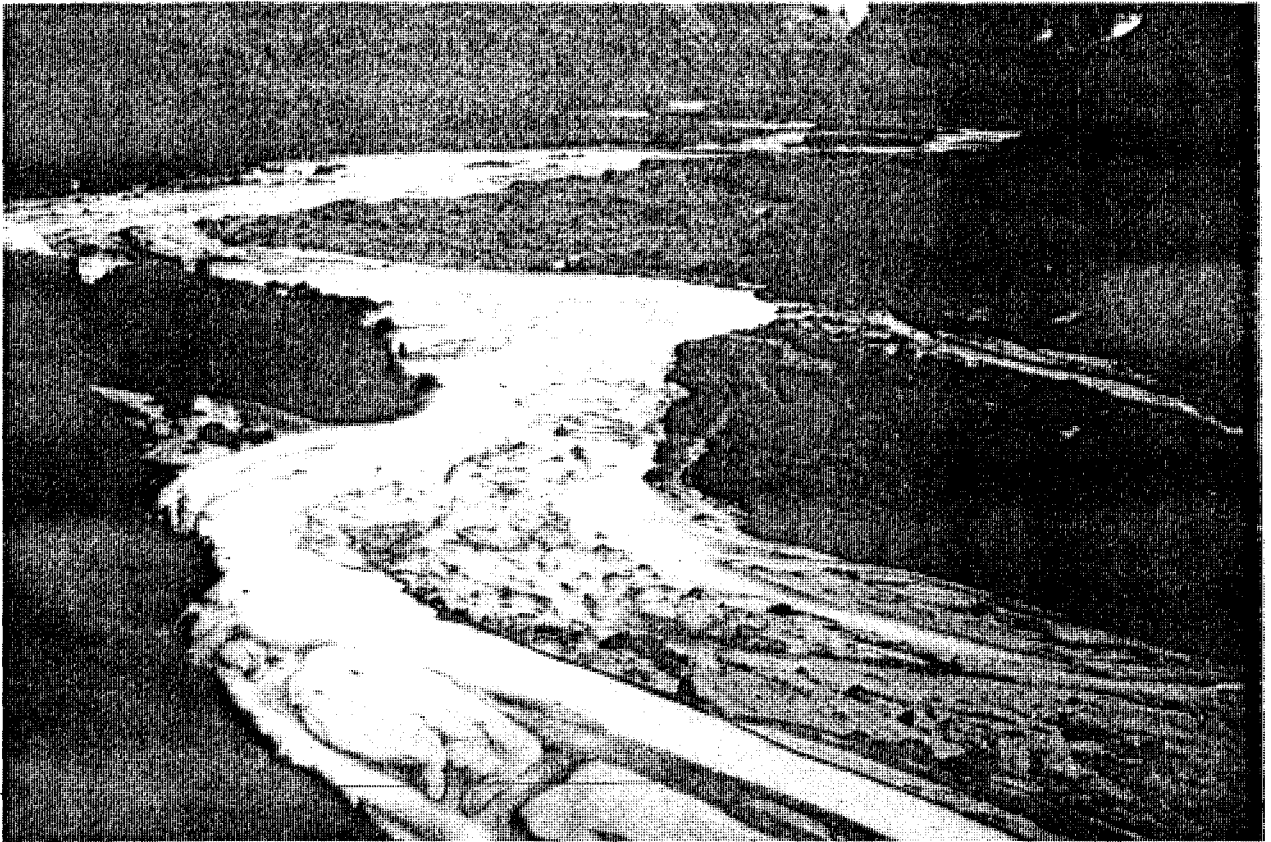
FLOOD PLAINS

Formation, location & relative age

Fluvial processes are the primary influence along the flood plains of the Yakutat foreland. There are seven major rivers on the foreland ranging from the Alsek, in which flows can exceed 100,000 ft.³ (2800 m³) per second (Deschu and Thompson 1993), to the Situk where present normal flows do not exceed 500 ft.³ (14 m³) per second (Kemnitz et al. 1993). Some parts of the flood plains are still actively reworked by rivers while others have been inactive for decades or centuries. See the Fluvial Processes section for further discussion of formation and age of this landscape.

Substrate

The substrate within the river corridors corresponds primarily to the substrate found in whatever landscape the river bisects. Within the proximal outwash, for example, stream corridors have deposits of gravel and coarse sands, while in the uplifted tidal flats, the stream corridors have deposits of fine sands and silts.



View looking north up the Ustay River flood plain. This photograph represents one end of the continuum between streams with a high bed load, such as this segment of the Ustay, and those with a single stable meandering channel, such as the Situk River. On the frequently disturbed gravel bars seen here, nootka lupine/setchell willow is a common community. Sitka willow, Sitka alder, and black cottonwood communities dominate the recently formed point bar in the background.

Drainage

Within this landscape, the soils are generally well drained near present channels. Further away from current channels the soils are often somewhat poorly drained because old overbank deposits restrict flow.

Community Types

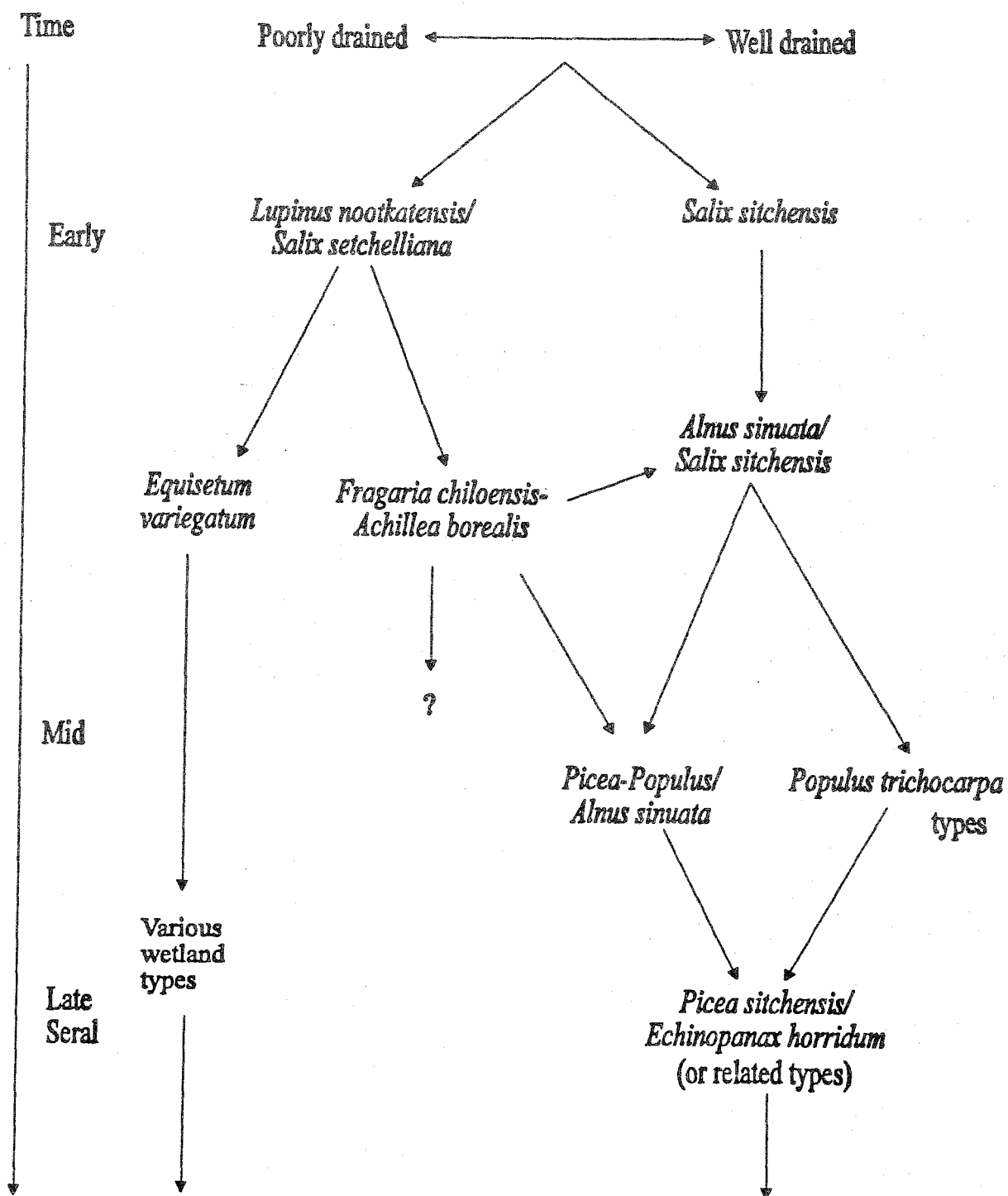
Directly adjacent to the rivers are c.t.s such as *Lupinus nootkatensis*/*Salix setchelliana* (nootka lupine/setchell willow), *Salix sitchensis* (Sitka willow), and *Alnus sinuata*-*Salix sitchensis* (Sitka alder-Sitka willow) that are occasionally subject to inundation. Along some of the larger rivers, such as the Alsek, there is also a *Fragaria chilensis*-*Achillea borealis* (beach strawberry-yarrow) c.t. on open sandy gravel bars that are not often flooded (Table 3).

On slightly raised terraces are found the first forested communities, such as the *Populus trichocarpa* (black cottonwood) types and the mixed *Picea sitchensis*-*Populus trichocarpa* (Sitka spruce-black cottonwood) types. On the older terraces *Picea sitchensis* (Sitka spruce) c.t.s. occur (Figure 9).

Soils

Soil development is dependent on surface age, material size, degree of material sorting, and disturbance periodicity. On better drained sites, mineral soils are either Entisols or Spodosols. Most soils are Entisols and are commonly classified as Oxyaquic Cryofluvents, Typic Cryorthents, and Typic Cryaquents.

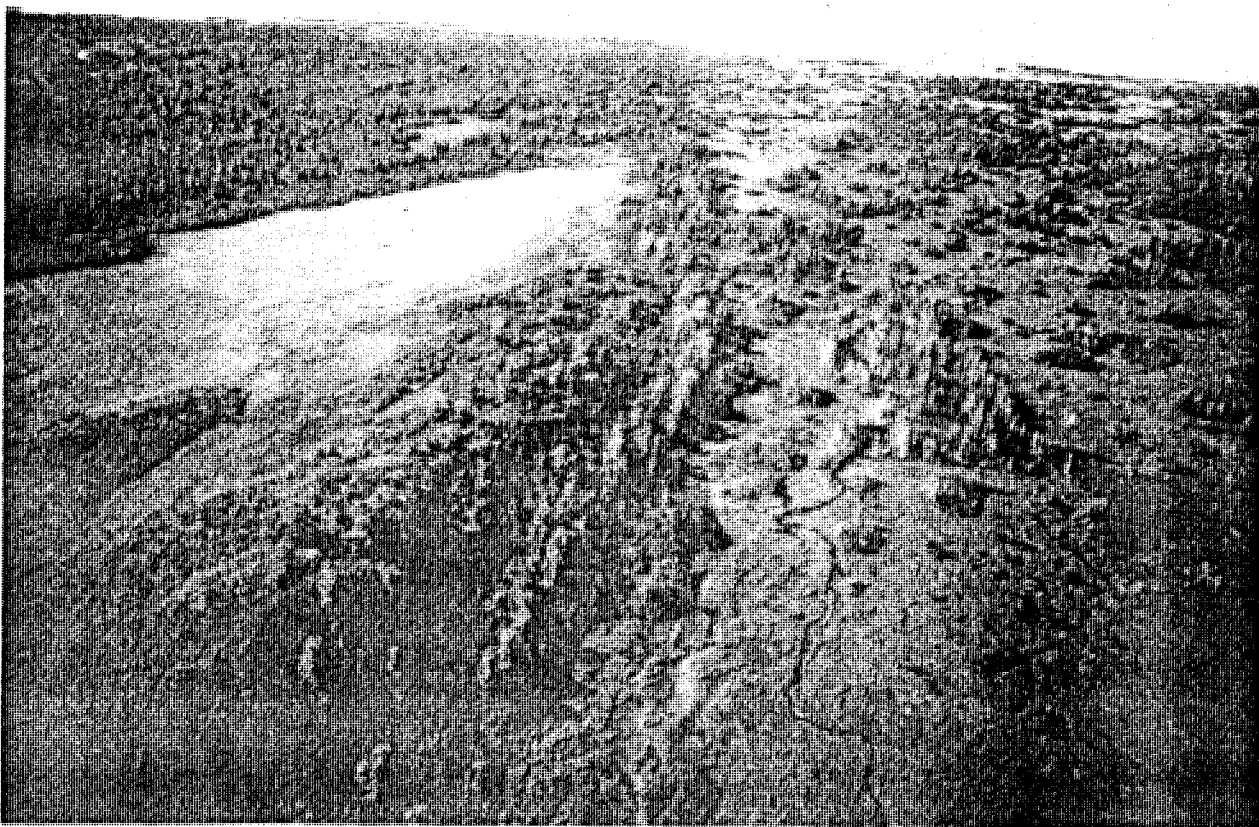
Figure 9. Inferred successional chronosequence for flood plains of the Yakutat foreland.



OUTBURST FLOOD PLAINS

Formation, location & relative age

Glacial, fluvial, and wind processes exert the primary influences on this landscape. An outburst flood plain found below Harlequin Lake probably represents one of the youngest landscapes, indicated by the presence of early successional community types (Table 3, and see Figure 10 for an inferred chronosequence diagram for this landscape). The Yakutat Glacier probably was slower to retreat than most of the other glaciers in Yakutat. The many channels within this landscape indicate glacial outburst floods (jökulhaups) have scoured this area during the last 200 years. On top of this landscape are parabolic dunes. These dunes, now covered in a jungle of alder and the occasional black cottonwood, were formed by winds blowing off the Gulf of Alaska. In places, however, the floodwaters of large glacial outbursts truncated the dune front. See the Glacial, Fluvial, and Wind Processes sections for further discussion of formation and age of this landscape.



View looking southeast toward the Gulf of Alaska over the lower portion of the outburst flood plain. The mouth of the Italo River is in the top left corner. In the left foreground is part of a large parabolic dune that has been streamlined by floods that have poured across this area. On the dunes are scattered black cottonwood in a dense thicket of Sitka alder-salmonberry. Between the two ridges of the parabolic dune (middle left), the drainage has been restricted, resulting in a floating buckbean/marsh five-finger community. Sweetgale communities dominate the right side of the photograph with scattered clones of alder and occasional black cottonwood and Sitka spruce.

Substrate

Gravel and sand, often arranged as diamond shaped gravel bars, are the most common deposits. The substrate is much the same as that found on the proximal and distal outwash landscapes, except that these outburst flood materials were deposited in a short period. The dunes scattered over this landscape are all composed of sand.

Drainage

Soils are well drained coarse gravel near Harlequin Lake, and grade into poorly drained sand and silts close to the ocean.

Community Types

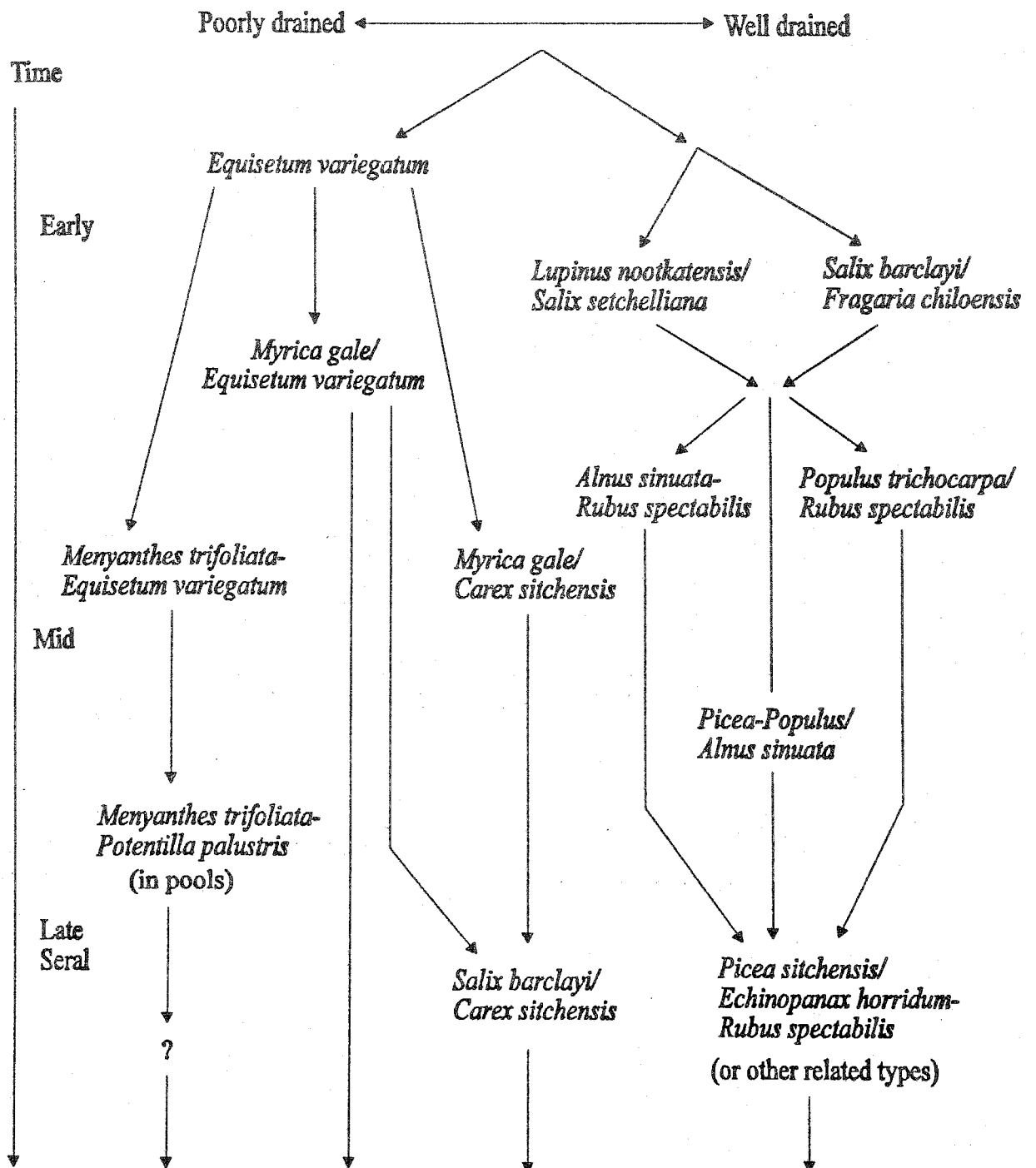
In well-drained coarser substrates, the forested communities are typically mixed *Picea sitchensis*-*Populus trichocarpa* (Sitka spruce-black cottonwood), or *Populus trichocarpa* (black cottonwood) types or a nonforested *Salix barclayi*/*Fragaria chiloensis* (barclay willow/beach strawberry) type. On the well drained sand dunes, the c.t.s are *Populus trichocarpa*/*Rubus spectabilis* (black cottonwood/salmonberry) and *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry).

Usually on the poorly drained areas with the silt and fine sand substrate, an *Equisetum variegatum* (variegated scouring-rush) c.t. occurs on the youngest surfaces, and a *Myrica gale*/*Equisetum variegatum* (sweetgale/variegated scouring-rush) c.t. occurs on older surfaces. A *Menyanthes trifoliata*-*Potentilla palustris* (buckbean-marsh cinquefoil) c.t. often occurs as a floating type behind old natural levees and in old river channels.

Soils

Soils on outburst flood plains vary according to the age, size, and degree of sorting of the deposited flood material. Huge outburst floods and other less catastrophic events have left a legacy of buried soils and multi-textured material. The resulting soils are highly variable, depending on drainage and development time since the last major event. In the drier shrub and forest portions of the landscape the soils are classified as Typic Cryorthents, while in the areas with a perennially wet mineral soil, the soils are classified as Typic Cryaquents. In the areas dominated by floating fens, the soils are generally Terric Cryofibrists.

Figure 10. Inferred successional chronosequences for outburst flood plains of the Yakutat foreland.



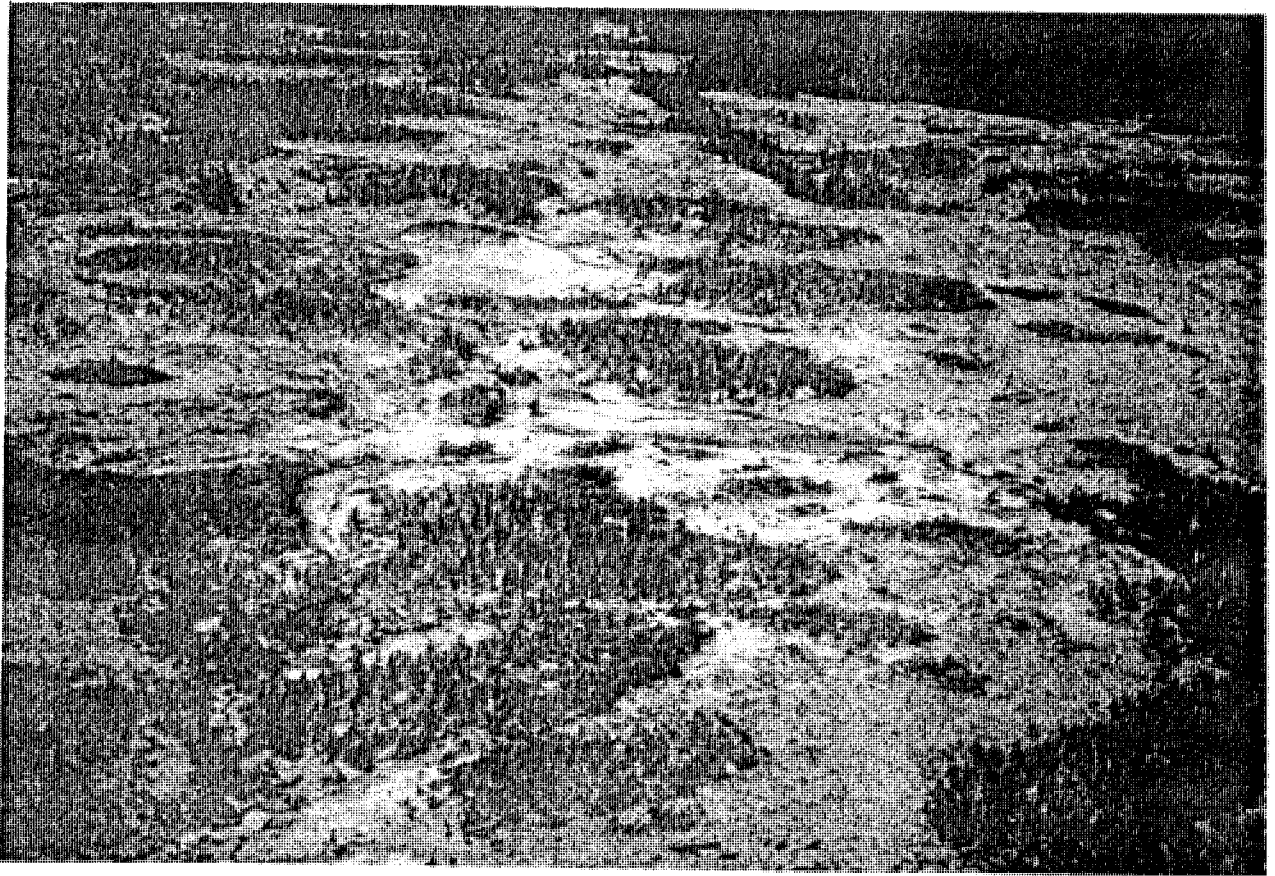
KETTLE AND KAME LANDSCAPE

Formation, location & relative age

The kettle-kame landscape is one of the oldest landscapes on the foreland. Located in the Pike Lakes area, it appears to have been an area of downwasting ice (similar substrate to a moraine) with many kettle lakes. A basal peat sample from near Pike Lakes was dated at 8930 ± 500 yr. B.P. (Peteet 1990). Because of its topographically higher position, this landscape escaped some glacial advances and flooding during the Little Ice Age (Figure 2). We chose to consider this landscape distinct from that of the moraines because it is a much older landscape than the ones that have formed in the last 1000 years.

Substrate

The kettle-kame landscape, much like moraines, consists of unsorted boulders to silt-sized particles that were directly deposited by glaciers (compact till and ablation till).



View looking east across the kettle and kame landscape. Poorly productive forested knolls emerge from a sea of peatlands. Till-covered knolls and sideslopes support the mixed conifer/blueberry type. More poorly drained areas, but which still support trees, are shore pine/sphagnum. Livid sedge/tufted clubrush is the most common peat-forming community type.

Drainage

The drainage is poor on much of this landscape because of the deep organic soils and compact till. Kettles, locations where buried ice melts and leaves a depression, often have basins sealed by silt. These areas contain small ponds, lakes, and bogs.

Community Types

On the somewhat poorly drained areas on the steeper slopes are communities such as mixed conifer/blueberry. In the poorly drained areas, often with organic soil, is the *Pinus contorta*/*Sphagnum* (lodgepole/peat moss) c.t. On the very gently sloping and flat surfaces, *Carex livida*-*Trichophorum caespitosum* (livid sedge-tufted clubrush) is the dominant plant community (Table 3). These community types may serve as successional endpoints for other landscapes of the Yakutat foreland, because they are thousands of years older than most of the c.t.s on the foreland. Generalizations of unidirectional successional trends are always difficult to prove. Climatic fluctuation is probably the primary controlling factor in determining successional pathways, with other important secondary factors being topography, landform, nutrient regime and local drainage patterns (Banner et al. 1986). See Figure 1 for an inferred chronosequence diagram for moraines and the kettle and kame landscape.

Soils

This landscape has the oldest and deepest organic soils (Histosols) in the Yakutat area. The tremendous rainfall and poor soil drainage have resulted in a blanket of *Sphagnum* moss that is several meters deep and covers most of the gently sloping portions of the kettle-kame landscape. However, on the steeper better drained sideslopes, Spodosols (Typic Cryaquods) occur.

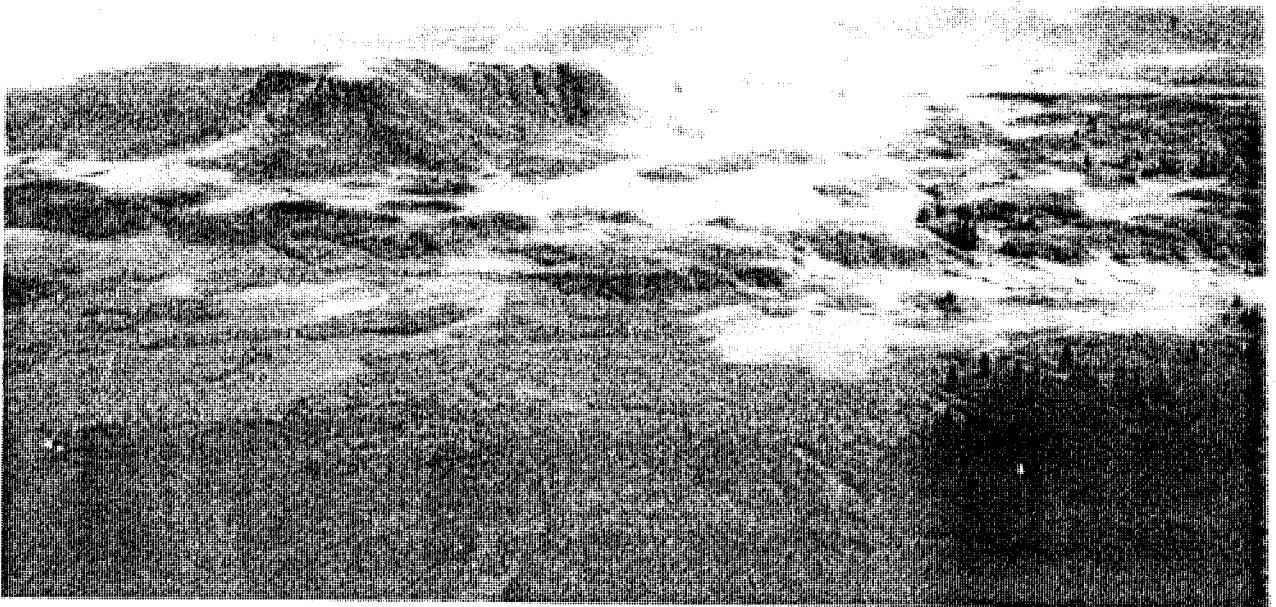
ROLLING BEDROCK HILLS

Formation, location & relative age

The rolling bedrock hills and kettle and kame landscapes are the oldest on the foreland. The rolling bedrock hills are located in the Tanis Mesa area (Figure 2). A basal peat core from the top of Tanis Mesa has been dated to $6,370 \pm 80$ yr. B.P. (Molnia 1986). Because these areas are raised above the rest of the foreland, they were probably free of ice and sea water before most areas on the foreland. The main process influencing this landscape is tectonics. Glacial processes during the Little Ice Age did not affect the landscape.

Substrate

The rolling bedrock hills are unique on the foreland. The bedrock outcrops are islands in a sea of wetland soils on surficial deposits. Some of these bedrock hills have till. Others seem to have been scoured clean by the Pleistocene glaciers. A bedrock hill of this shape, with the long axis oriented in the direction of past glacier movement, is often called a whale back or a *roche moutonnee*.



View looking north over the rolling bedrock hills. Tanis Mesa is in the middle right and the Brabazon Range is in the background. The bedrock knolls in the center of the photograph are covered with Sitka alder community types. The gentler slopes are peat-dominated communities such as sweetgale/Sitka sedge and livid sedge/tufted clubrush.

Drainage

The hill crowns in this landscape typically are moderately well drained to well drained, while the lower side slopes and lowlands are poorly drained.

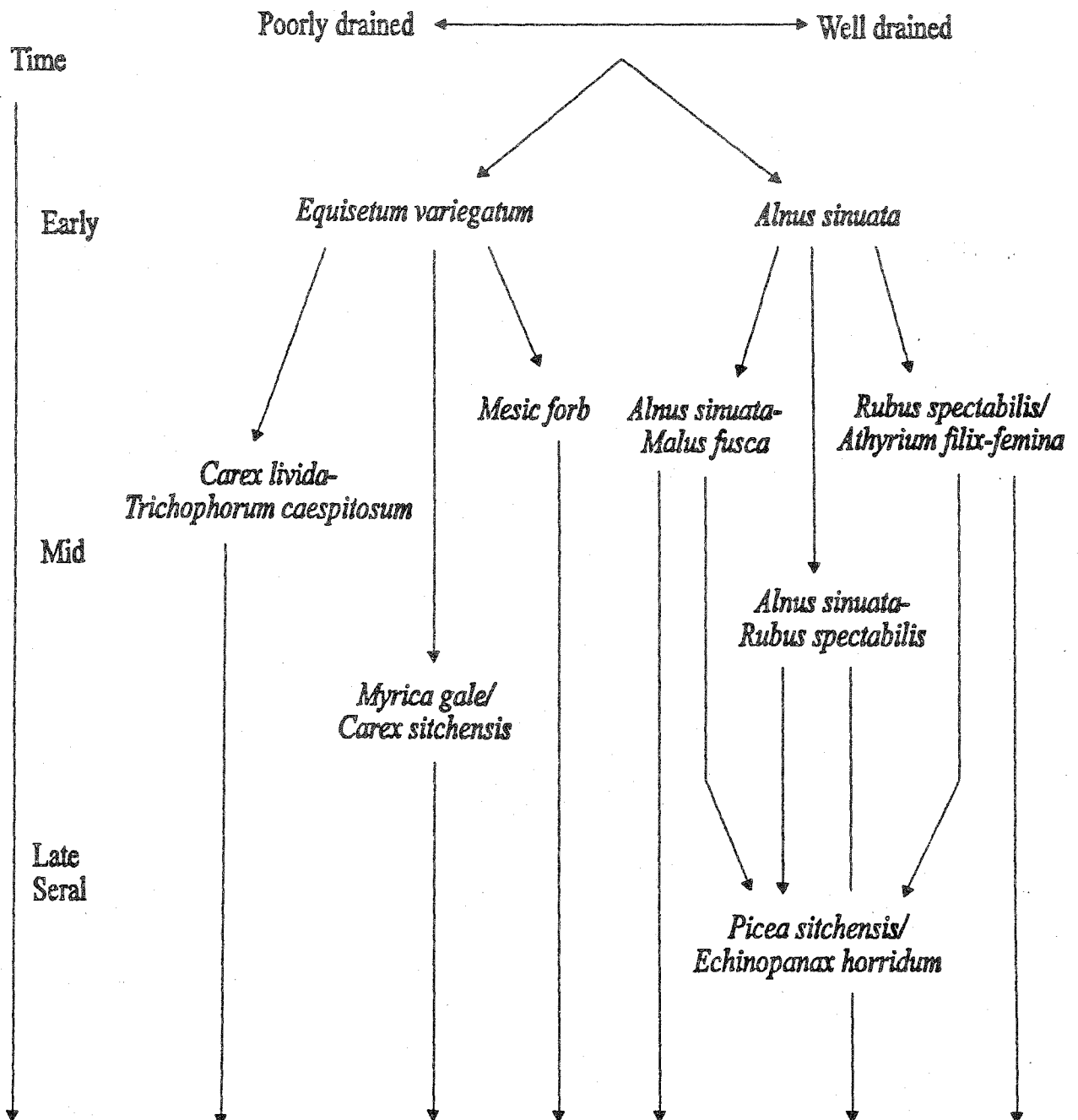
Community Types

Shrub community types such as *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) and *Alnus sinuata*-*Malus fusca* (Sitka alder-crabapple) dominate the bedrock knolls (Table 3). Some knolls are covered with a *Picea sitchensis* (Sitka spruce) forest type. On the steeper sideslopes, the plant communities are typically nutrient-rich meadow types such as *Calamagrostis canadensis* (bluejoint), mesic forb, and *Rubus spectabilis*/*Athyrium filix-femina* (salmonberry/lady fern). On the lowlands, *Sphagnum* moss has had a tremendous impact on community development. Common types are *Myrica gale*/*Carex sitchensis* (sweetgale/Sitka sedge), *Salix barclayi*/*Carex sitchensis* (barclay willow/Sitka sedge) and *Carex livida*-*Trichophorum caespitosum* (livid sedge-tufted clubrush; Figure 11).

Soils

The soils on the knolls of the hills are classified as Inceptisols or Spodosols (Lithic Cryochrepts and Oxyaquic Haplocryods). Deep Histosols (Typic Cryohemists and Typic Cryosaprists) predominate on the lower sideslopes and lowlands.

Figure 11. Inferred successional chronosequence for rolling bedrock hills of the Yakutat foreland.



COMMUNITY TYPE DESCRIPTIONS

(arranged by growth form)

Over the three years of the project, 401 stands were sampled: 78 in 1991, 152 in 1992, and 171 in the 1993 field season. Also, there were 129 plots added to the data set from 1987 and 1989 for a total of 530 plots.

Three hundred and eighty vascular plant species were recorded for the foreland. They included 5 trees, 18 tall shrubs, 13 low and subshrubs, 231 forbs, 98 graminoids, and 15 fern species (Appendix 5). Voucher specimens are deposited in the Tongass National Forest Herbarium in Sitka and the University of Alaska Herbarium in Fairbanks. Additionally, about 90 moss species have been identified. A small herbarium has also been set up at the Yakutat Ranger District.

Sixty communities on nine geomorphic landscapes have been identified (Figure 2). These include: 20 forest and woodland, 18 shrubland, 12 graminoid, and 10 forb communities (Table 4). These types, their scientific abbreviations, and the number of stands sampled are listed in Table 4. Community types of potentially limited distribution are listed in Table 5. The community types have also been classified using the Viereck et al. (1992) classification (Appendix 1) and compared with various wetland and land classification systems (Appendix 2). A complete constancy/cover table (constancy = percent of plots with that species present; cover = mean percent canopy coverage) for each community type is presented in Appendix 4.

Community types are arranged according to dominant growth forms: tree, shrub, graminoid, and forb types. A community type falls within the forested category when tree canopy cover is greater than 10%. Within each physiognomic group, the community types are arranged by dominant vegetation, roughly along a wet to dry gradient.

Table 4. Community types, scientific abbreviations, and number of stands sampled on the Yakutat foreland.

Tree Communities	Scientific Abbreviation	No. of Stands
Mountain hemlock/blueberry	TSUMET/VACCIN	1
Mixed conifer/blueberry/skunk cabbage	MIXED CON/VACCIN/LYSAME	3
Mixed conifer/blueberry	MIXED CON/VACCIN	8
Western hemlock/blueberry-devil's club	TSUHET/VACCIN-ECHHOR	3
Western hemlock/blueberry/shield fern	TSUHET/VACCIN/DRYDIL	4
Western hemlock/blueberry	TSUHET/VACCIN	3
Sitka spruce/Sitka alder	PICSIT/ALNSIN	17
Sitka spruce/devil's club-salmonberry	PICSIT/ECHHOR-RUBSPE	26
Sitka spruce/blueberry-devil's club	PICSIT/VACCIN-ECHHOR	39
Sitka spruce/devil's club	PICSIT/ECHHOR	28
Sitka spruce/blueberry	PICSIT/VACCIN	23
Sitka spruce/seral	PICSIT/SERAL	4
Sitka spruce-black cottonwood/Sitka alder	PICSIT-POPTRI/ALNSIN	6
Sitka spruce-black cottonwood/devil's club	PICSIT-POPTRI/ECHHOR	5
Sitka spruce-black cottonwood/seral	PICSIT-POPTRI/SERAL	8
Black cottonwood/willow	POPTRI/SALIX	8
Black cottonwood/salmonberry	POPTRI/RUBSPE	11
Black cottonwood/devil's club	POPTRI/ECHHOR	5
Lodgepole pine/peat moss	PINCON/SPHAGN	7
Sitka spruce/peat moss	PICSIT/SPHAGN	7
Shrub communities		
Salmonberry/lady fern	RUBSPE/ATHFIL	2
Sitka alder-Sitka willow	ALNSIN-SALSIT	5
Sitka alder-crabapple	ALNSIN-MALFUS	5
Sitka alder-salmonberry	ALNSIN-RUBSPE	14
Sitka alder/graminoid	ALNSIN/GRAMIN	5
Sitka willow	SALSIT	10
Hooker willow	SALHOO	3
Barclay willow/many-flowered sedge	SALBAR/CARPLU	6
Barclay willow/Sitka sedge	SALBAR/CARSIT	11
Barclay willow/mixed herb	SALBAR/MIXED HERB	5
Barclay willow/beach strawberry	SALBAR/FRACHI	16
Sweetgale/livid sedge	MYRGAL/CARLIV	10
Sweetgale/Sitka sedge	MYRGAL/CARSIT	16
Sweetgale/many-flowered sedge	MYRGAL/CARPLU	4
Sweetgale/variegated scouring rush	MYRGAL/EQUVAR	7
Crowberry/many-flowered sedge	EMPNI/ CARPLU	5
Bog blueberry-crowberry	VACULI-EMPNI	8
Bog rosemary/many-flowered sedge	ANDPOL/CARPLU	2

Table 4. (concluded)

Graminoid Communities	Scientific Abbreviation	No. of Stands
Alkali grass	PUCPUM	1
Spike rush	ELEPAL	3
Lyngbyei sedge	CARLYN	5
Russet sedge	CARSAX	6
Many-flowered sedge-lyngbyei sedge	CARPLU-CARLYN	12
Livid sedge-tufted clubrush	CARLIV-TRICAE	17
Tufted clubrush	TRICAE	7
Sitka sedge/bog cranberry	CARSIT/OXYPAL	17
Sitka sedge/swamp horsetail	CARSIT/EQUFLU	7
Bluejoint/Pacific silverweed	CALCAN/POTEGE	6
Beach-rye grass	ELYARE	4
Bluejoint	CALCAN	9
Forb Communities		
Pond lily	NUPPOL	1
Water-milfoil	MYRALT	3
Swamp horsetail	EQUFLU	4
Variegated scouring-rush	EQUVAR	6
Buckbean-variegated scouring-rush	MENTRI-EQUVAR	7
Buckbean-marsh cinquefoil	MENTRI-POTPAL	12
Mesic forb/lady fern	MESIC FORB/ATHFIL	4
Mesic forb	MESIC FORB	8
Nootka lupine/setchell willow	LUPNOO/SALSET	4
Beach strawberry-varrow	FRACHI-ACHBOR	11

Table 5. Plant communities of limited extent for the Yakutat foreland. (The communities on this list are locally uncommon; no work has been done to compare these types to others within the state).

Pinus contorta/Sphagnum - Lodgepole pine/peat moss

These stands contain the northernmost lodgepole pine in Alaska.

Lupinus nootkatensis/Salix setchelliana - Nootka lupine/setchell willow

Found only on pebble shores of glacial lakes and gravel bars of large glacial rivers

Alnus sinuata-Malus fusca - Sitka alder-crabapple

Found only on the rolling bedrock hills in the Tanis Mesa area

Salix hookeriana - Hooker willow

Located only on the uplifted tidal flats in small stands

Andromeda polifolia/Carex pluriflora - Bog rosemary/many-flowered sedge

Found only on the uplifted tidal flats in small stands

NOTES:

KEY TO COMMUNITY TYPES OF THE YAKUTAT FORELAND

INSTRUCTIONS

1. Use this key for identifying vegetation communities on the Yakutat foreland.
2. Locate a representative portion of the site in question. The vegetation and environment should be relatively homogeneous.
3. Estimate the canopy cover for all indicator species. The indicator species are those species used in the key (Appendix 3).
4. While in the plot, use the key to identify the community type. Start with the Key to Growth Form Groups, couplet number 1.
5. Use the written descriptions to validate identification. Some stands may not readily key out because of the depauperate nature of their floral cover. In this case, choose the community type (c.t.) that best fits the stand. If the written description and site characteristics are not compatible, some level of additional site data collection may be necessary.

KEY TO GROWTH FORM GROUPS:

(Moss and lichen communities are undescribed and areas with less than 10% plant cover are considered unvegetated.)

1. Mature trees (either greater than 8 meters [25 ft.] in height, or dwarf, less than 8 meters) combined canopy cover at least 10% 2
1. Mature trees (either overstory or dwarf) absent or combined canopy cover less than 10% 4
2. Mature trees mostly less than 8 meters (25 ft.) 3
2. Mature trees mostly over 8 meters (25 ft.) FOREST COMMUNITIES (PAGE 53)
3. *Pinus contorta* (lodgepole pine) with the greatest tree canopy cover
..... *Pinus contorta*/*Sphagnum* (lodgepole pine/peat moss) c.t. (PAGE 115)
3. *Picea sitchensis* (Sitka spruce) or *Tsuga mertensiana* (mountain hemlock) with the greatest tree canopy cover
..... *Picea sitchensis*/*Sphagnum* (Sitka spruce/peat moss) c.t. (PAGE 118)
4. Shrubs combined canopy cover at least 25% SHRUB COMMUNITIES (PAGE 56)
4. Shrubs combined canopy cover less than 25%; herbaceous species combined canopy cover at least 10% HERBACEOUS COMMUNITIES (PAGE 59)

KEY TO FOREST COMMUNITY TYPES

****Note:** This key to forested communities follows the plant association key for the island portions of the Chatham Area (Martin et al. 1995) for the hemlock types and some of the Sitka spruce types.

1. Conifer species dominate the overstory; *Populus trichocarpa* (black cottonwood) contributes less than 5% canopy cover 3
1. Conifer species alone do not dominate the overstory; *Populus trichocarpa* (black cottonwood) canopy cover at least 5% 2
2. *Populus trichocarpa* (black cottonwood) canopy cover dominates the overstory; conifer species canopy cover less than 15% 19
2. Both *Populus trichocarpa* (black cottonwood) and *Picea sitchensis* (Sitka spruce) codominate the overstory 17
3. *Tsuga mertensiana* (mountain hemlock) canopy cover at least 5% 4
3. *Tsuga mertensiana* (mountain hemlock) canopy cover less than 5% 7
4. *Tsuga mertensiana* (mountain hemlock) is the overstory dominant; *Tsuga heterophylla* (western hemlock) absent or present in only minor amounts
..... *Tsuga mertensiana*/*Vaccinium* (mountain hemlock/blueberry) c.t. (PAGE 64)
4. *Tsuga mertensiana* (mountain hemlock) not the sole overstory dominant; *Tsuga heterophylla* (western hemlock) and *Picea sitchensis* (Sitka spruce) codominate ... 5
5. *Lysichitum americanum* (skunk cabbage) canopy cover at least 5%
Mixed conifer/*Vaccinium*/*Lysichitum americanum* (Mxd. con./blueberry/sk. cabbage) c.t. (P. 67)
5. *Lysichitum americanum* (skunk cabbage) canopy cover less than 5% 6
6. *Vaccinium* (blueberry) is the sole understory dominant
..... Mixed conifer/*Vaccinium* (Mixed conifer/blueberry) c.t. (PAGE 70)
6. *Vaccinium* (blueberry) is not the sole understory dominant
..... MISCELLANEOUS UNCLASSIFIED MIXED CONIFER TYPES

The following is an uncommon MIXED CONIFER community within the Yakutat foreland region that presently has no written description:

Mixed conifer/Vaccinium/Fauria crista-galli (Mxd. conifer/blueberry/deer cabbage) c.t. (see Martin et al. 1995 for description)

7. *Picea sitchensis* (Sitka spruce) canopy cover at least 15% 11
7. *Picea sitchensis* (Sitka spruce) canopy cover less than 15%; *Tsuga heterophylla* (western hemlock) dominates the overstory 8
8. *Echinopanax horridum* (devil's club) canopy cover less than 5% 9
8. *Echinopanax horridum* (devil's club) canopy cover at least 5% 10

9. *Dryopteris dilatata* (shield fern) canopy cover at least 3%
Tsuga heterophylla/Vaccinium/Dryopteris dilatata (w. hemlock/blueberry/shield fern) c.t. (P. 76)
9. *Dryopteris dilatata* (shield fern) canopy cover less than 3%
..... *Tsuga heterophylla/Vaccinium* (western hemlock/blueberry) c.t. (PAGE 79)
10. *Vaccinium* sp. (blueberry) canopy cover at least 15% *Tsuga heterophylla/Vaccinium-Echinopanax horridum* (western hemlock/blueberry-devil's club) c.t. (PAGE 73)
10. *Vaccinium* sp. (blueberry) canopy cover less than 15%
..... MISCELLANEOUS UNCLASSIFIED WESTERN HEMLOCK TYPES

The following is an uncommon *Tsuga heterophylla* (western hemlock) community within the Yakutat foreland region that presently has no written description:
Tsuga heterophylla/Echinopanax horridum (western hemlock/devil's club) c.t.
(see Martin et al. 1995 for description)

11. *Alnus sinuata* (Sitka alder) canopy cover at least 5%
..... *Picea sitchensis/Alnus sinuata* (Sitka spruce/Sitka alder) c.t. (PAGE 82)
11. *Alnus sinuata* (Sitka alder) canopy cover less than 5% 12
12. *Echinopanax horridum* (devil's club) canopy cover at least 5%
Picea sitchensis/Echinopanax horridum (Sitka spruce/devil's club) - THREE PHASES 13
12. *Echinopanax horridum* (devil's club) canopy cover less than 5% 15
13. *Rubus spectabilis* (salmonberry) canopy cover at least 15% *Picea sitchensis/Echinopanax horridum-Rubus spectabilis* (S. spruce/devil's club-salmonberry) c.t. PHASE. (P. 85)
13. *Rubus spectabilis* (salmonberry) canopy cover less than 15% 14
14. *Vaccinium* sp. (blueberry) canopy cover at least 15% *Picea sitchensis/Vaccinium-Echinopanax horridum* (Sitka spruce/blueberry-devil's club) c.t. PHASE (PAGE 88)
14. *Vaccinium* sp. (blueberry) canopy cover less than 15%
Picea sitchensis/Echinopanax horridum (Sitka spruce/devil's club) c.t. PHASE (PAGE 91)
15. *Vaccinium* sp. (blueberry) canopy cover at least 15%
..... *Picea sitchensis/Vaccinium* (Sitka spruce/blueberry) c.t. (PAGE 94)
15. *Vaccinium* sp. (blueberry) canopy cover less than 15% 16
16. Tall shrubs (> 1 ft. tall) poorly represented in the understory; combined canopy cover less than 15% *Picea sitchensis/seral* (Sitka spruce/seral) c.t. (PAGE 97)
16. Tall shrubs (> 1 ft. tall) combined canopy cover at least 15%
..... MISCELLANEOUS UNCLASSIFIED SITKA SPRUCE TYPES

The following are uncommon *Picea sitchensis* (Sitka spruce) communities within the Yakutat foreland region that presently have no written descriptions:
Picea sitchensis/Vaccinium/Lysichitum americanum (S. spruce/blueberry/skunk cabbage) c.t.
Picea sitchensis/Echinopanax horridum/Lysichitum americanum (Sitka spruce/devil's club/skunk cabbage) c.t.
(see Martin et al. 1995 for descriptions)

17. *Alnus sinuata* (Sitka alder) canopy cover at least 5%; *Rubus spectabilis* (salmonberry) and *Echinopanax horridum* (devil's club) present *Picea sitchensis*-*Populus trichocarpa*/*Alnus sinuata* (Sitka spruce-black cottonwood/Sitka alder) c.t. (PAGE 99)
17. *Alnus sinuata* (Sitka alder) canopy cover less than 5% 18
18. *Echinopanax horridum* (devil's club) canopy cover at least 5% *Picea sitchensis*-*Populus trichocarpa*/*Echinopanax horridum* (Sitka spruce-cottonwood/devil's club) c.t. (P. 102)
18. *Echinopanax horridum* (devil's club) canopy cover less than 5% *Picea sitchensis*-*Populus trichocarpa*/seral (Sitka spruce-black cottonwood/seral) c.t. (P. 105)
19. *Salix* sp. (willow) canopy cover at least 15%; *Alnus sinuata* (Sitka alder) sometimes as a codominant with the willow *Populus trichocarpa*/*Salix* (black cottonwood/willow) c.t. (PAGE 108)
19. *Salix* sp. (willow) canopy cover less than 15% 20
20. *Rubus spectabilis* (salmonberry) canopy cover at least 25%; *Alnus sinuata* (Sitka alder) canopy cover at least 15% *Populus trichocarpa*/*Rubus spectabilis* (black cottonwood/salmonberry) c.t. (PAGE 111)
20. *Rubus spectabilis* (salmonberry) canopy cover less than 25% 21
21. *Echinopanax horridum* (devil's club) canopy cover at least 5%; other species such as *Sambucus racemosa* (red elderberry), *Athyrium filix-femina* (lady fern) common. *Populus trichocarpa*/*Echinopanax horridum* (black cottonwood/devil's club) c.t. (PAGE 113)
21. *Echinopanax horridum* (devil's club) canopy cover less than 5%; other species such as *Sambucus racemosa* (red elderberry), *Athyrium filix-femina* (lady fern) uncommon MISCELLANEOUS UNCLASSIFIED COTTONWOOD TYPES

KEY TO SHRUB GROWTH FORM GROUPS

1. *Alnus* (alder) and/or *Malus* (crabapple) with greater canopy cover than the combined canopy cover of all willow species ALDER TYPES (PAGE 56)
1. *Alnus* (alder) and/or *Malus* (crabapple) not dominating the overstory 2
2. *Salix* (tall willow) species combined canopy cover at least 25% (not *Salix setchelliana* [setchell willow], which is a subshrub) WILLOW TYPES (PAGE 57)
2. *Salix* (tall willow) species combined canopy cover less than 25% 3
3. *Myrica gale* (sweetgale) canopy cover at least 25% . SWEETGALE TYPES (PAGE 58)
3. *Myrica gale* (sweetgale) canopy cover less than 25% 4
4. *Andromeda*, *Empetrum*, *Vaccinium uliginosum*, *Oxycoccus palustris* (bog rosemary, crowberry, bog blueberry, bog cranberry) individually or combined, canopy cover at least 25% SUBSHRUB (HEATH) TYPES (PAGE 59)
4. *Andromeda*, *Empetrum*, *Vaccinium uliginosum*, *Oxycoccus palustris* (bog rosemary, crowberry, bog blueberry, bog cranberry), combined canopy cover less than 25% . 5
5. *Rubus spectabilis* (salmonberry) canopy cover at least 50%
 *Rubus spectabilis*/*Athyrium filix-femina* (salmonberry/lady fern) (PAGE 129)
5. *Rubus spectabilis* (salmonberry) canopy cover less than 50%
 Either undescribed shrub community or see herbaceous types key (PAGE 59)

KEY TO ALDER COMMUNITY TYPES

1. Graminoids dominating the understory, canopy cover at least 25%
 *Alnus sinuata*/graminoid (Sitka alder/graminoid) c.t. (PAGE 127)
1. Graminoids not dominating the understory 2
2. *Salix* (willow) species combined canopy cover at least 10%
 *Alnus sinuata*/*Salix sitchensis* (Sitka alder/Sitka willow) c.t. (PAGE 120)
2. *Salix* (willow) species combined canopy cover less than 10% 3
3. *Malus fusca* (crabapple) canopy cover at least 20%
 *Alnus sinuata*/*Malus fusca* (Sitka alder/crabapple) c.t. (PAGE 123)
3. *Malus fusca* (crabapple) canopy cover less than 20% 4
4. *Rubus spectabilis* (salmonberry) and *Sambucus racemosa* (red elderberry) canopy cover, individually or combined, at least 25%
 *Alnus sinuata*/*Rubus spectabilis* (Sitka alder/salmonberry) c.t. (PAGE 125)
4. *Rubus spectabilis* (salmonberry) and *Sambucus racemosa* (red elderberry) canopy cover, individually or combined, less than 25%
 MISCELLANEOUS UNCLASSIFIED SITKA ALDER TYPES

The following is an uncommon *Alnus sinuata* (Sitka alder) shrub community within the Yakutat foreland region that presently has no written description:
Alnus sinuata/mesic forb (Sitka alder/mesic forb) c.t.

KEY TO WILLOW COMMUNITY TYPES

1. *Salix sitchensis* (Sitka willow) dominating the tallest layer with canopy cover at least 25%; *Salix barclayi* (barclay willow) occasionally codominates *Salix sitchensis* (Sitka willow) c.t. (PAGE 132)
1. *Salix sitchensis* (Sitka willow) not dominating the tallest layer 2
2. *Salix hookeriana* (hooker willow) canopy cover greater than any other individual willow species *Salix hookeriana* (hooker willow) c.t. (PAGE 134)
2. *Salix hookeriana* (hooker willow) canopy cover not greater than any other individual willow species; *Salix barclayi* (barclay willow) and *Salix commutata* (undergreen willow) individually or combined with the greatest canopy cover 3
3. *Carex pluriflora* (many-flowered sedge) and *Carex lyngbyei* (lyngbyei sedge), individually or combined, with canopy cover at least 25%, often with *Myrica gale* (sweetgale) as a codominant in the understory *Salix barclayi/Carex pluriflora* (barclay willow/many-flowered sedge) c.t. (PAGE 136)
3. *Carex pluriflora* (many-flowered sedge) and *Carex lyngbyei* (lyngbyei sedge), individually or combined, with canopy cover less than 25% 4
4. *Carex sitchensis* (Sitka sedge) dominating the understory with canopy cover at least 25%, often with *Myrica gale* (sweetgale) as a codominant in the understory *Salix barclayi/Carex sitchensis* (barclay willow/Sitka sedge) c.t. (PAGE 138)
4. *Carex sitchensis* (Sitka sedge) not dominating the understory 5
5. *Angelica genuflexa* (bent-leaf angelica), *Equisetum arvense* (meadow horsetail), *Athyrium filix-femina* (lady fern), and *Calamagrostis canadensis* (bluejoint) canopy cover, individually or combined, at least 10% *Salix barclayi/mixed herb* (barclay willow/mixed herb) c.t. (PAGE 140)
5. *Angelica genuflexa* (bent-leaf angelica), *Equisetum arvense* (meadow horsetail), *Athyrium filix-femina* (lady fern), and *Calamagrostis canadensis* (bluejoint) canopy cover, individually or combined, less than 10% 6
6. *Fragaria chiloensis* (beach strawberry), *Lupinus nootkatensis* (nootka lupine), and *Achillea borealis* (yarrow) canopy cover individually or combined at least 10% *Salix barclayi/Fragaria chiloensis* (barclay willow/beach strawberry) c.t. (PAGE 142)
6. *Fragaria chiloensis* (beach strawberry), *Lupinus nootkatensis* (nootka lupine), and *Achillea borealis* (yarrow) canopy cover, individually or combined, less than 10% .. MISCELLANEOUS UNCLASSIFIED WILLOW TYPES

KEY TO SWEETGALE COMMUNITY TYPES

1. *Carex livida* (livid sedge), *Trichophorum caespitosum* (tufted clubrush), and *Menyanthes trifoliata* (buckbean), individually or combined, dominating the understory *Myrica gale/Carex livida* (sweetgale/livid sedge) c.t. (PAGE 145)
1. *Carex livida* (livid sedge), *Trichophorum caespitosum* (tufted clubrush), and *Menyanthes trifoliata* (buckbean) not dominating the understory 2
2. *Carex sitchensis* (Sitka sedge) canopy cover greater than any other sedge species *Myrica gale/Carex sitchensis* (sweetgale/Sitka sedge) c.t. (PAGE 147)
2. *Carex sitchensis* (Sitka sedge) canopy cover not greater than any other sedge species . 3
3. *Carex pluriflora* (many-flowered sedge) canopy cover greater than any other sedge species . *Myrica gale/Carex pluriflora* (sweetgale/many-flowered sedge) c.t. (PAGE 149)
3. *Carex pluriflora* (many-flowered sedge) canopy cover not greater than any other sedge species 4
4. *Equisetum variegatum* (variegated scouring-rush), *Sanguisorba stipulata* (Sitka burnet), *Lupinus nootkatensis* (nootka lupine), *Aster subspicatus* (Douglas' aster), or other forbs canopy cover, individually or combined, dominating the understory with canopy cover at least 20%
. . *Myrica gale/Equisetum variegatum* (sweetgale/variegated scouring-rush) c.t. (PAGE 151)
4. *Equisetum variegatum* (variegated scouring-rush), *Sanguisorba stipulata* (Sitka burnet), *Lupinus nootkatensis* (nootka lupine), *Aster subspicatus* (Douglas' aster) or other forbs canopy cover, individually or combined, not dominating the understory MISCELLANEOUS UNCLASSIFIED SWEETGALE SHRUB TYPES

The following are uncommon *Myrica gale* (sweetgale) shrub communities within the Yakutat foreland region that presently have no written descriptions.

Myrica gale/Empetrum nigrum (sweetgale/crowberry) c.t.

Myrica gale/Carex limosa (sweetgale/mud sedge) c.t.

KEY TO SUBSHRUB (HEATH) COMMUNITY TYPES

1. *Empetrum nigrum* (crowberry) dominating the tallest layer; *Vaccinium uliginosum* (bog blueberry) occasionally codominating
 . . . *Empetrum nigrum*/*Carex pluriflora* (crowberry/many-flowered sedge c.t.) (PAGE 153)
1. *Empetrum nigrum* (crowberry) not dominating the tallest layer 2
2. *Vaccinium uliginosum* (bog blueberry) dominating the tallest layer; *Eriophorum angustifolium* (cottongrass) often dominating the graminoid layer
 . . . *Vaccinium uliginosum*/*Empetrum nigrum* (bog blueberry/crowberry) c.t. (PAGE 156)
2. *Vaccinium uliginosum* (bog blueberry) not dominating the tallest layer 3
3. *Andromeda polifolia* (bog rosemary) dominating the tallest layer
 . *Andromeda polifolia*/*Carex pluriflora* (bog rosemary/many-flowered sedge) c.t. (PAGE 158)
3. *Andromeda polifolia* (bog rosemary) not dominating the tallest layer
 MISCELLANEOUS UNCLASSIFIED SUBSHRUB TYPES

The following is an uncommon subshrub community type within the Yakutat foreland region that presently has no written description.
Oxycoccus palustris (bog cranberry) c.t.

KEY TO HERBACEOUS GROWTH FORM GROUPS

1. *Carex*, *Eriophorum*, *Trichophorum*, *Eleocharis*, *Calamagrostis*, etc. (grasses and sedges) canopy cover, individually or combined, at least 25%
 GRAMINOID TYPES (PAGE 60)
1. *Carex*, *Eriophorum*, *Trichophorum*, *Eleocharis*, *Calamagrostis*, etc. (grasses and sedges) canopy cover, individually or combined, less than 25% 2
2. No individual forb canopy cover greater than any single graminoid species
 GRAMINOID TYPES (PAGE 60)
2. Individual forb canopy cover greater than any single graminoid species
 FORB TYPES (PAGE 62)

KEY TO GRAMINOID COMMUNITY TYPES

1. *Puccinellia pumila* (alkali grass) dominating the tallest layer
..... *Puccinellia pumila* (alkali grass) c.t. (PAGE 160)
1. *Puccinellia pumila* (alkali grass) not dominating the tallest layer 2
2. *Eleocharis palustris* (spike rush) dominating the tallest layer with canopy cover
at least 15% *Eleocharis palustris* (spike rush) c.t. (PAGE 162)
2. *Eleocharis palustris* (spike rush) not dominating the tallest layer 3
3. *Carex saxatilis* (russet sedge) dominating the tallest layer
..... *Carex saxatilis* (russet sedge) c.t. (PAGE 166)
3. *Carex saxatilis* (russet sedge) not dominating the tallest layer 4
4. *Carex pluriflora* (many-flowered sedge) canopy cover at least 20%; *Carex pluriflora*
(many-flowered sedge) and *Carex lyngbyei* (lyngbyei sedge) combined dominating the
tallest layer; *Sphagnum* (peat moss) common
.. *Carex pluriflora*/*Carex lyngbyei* (many-flowered sedge/lyngbyei sedge) c.t. (PAGE 168)
4. *Carex pluriflora* (many-flowered sedge) canopy cover less than 20% 5
5. *Carex lyngbyei* (lyngbyei sedge) canopy cover greater than any other sedge
..... *Carex lyngbyei* (lyngbyei sedge) c.t. (PAGE 164)
5. *Carex lyngbyei* (lyngbyei sedge) canopy cover not greater than any other
individual sedge 6
6. *Carex sitchensis* (Sitka sedge) dominating the tallest layer 9
6. *Carex sitchensis* (Sitka sedge) not dominating the tallest layer 7
7. *Trichophorum caespitosum* (tufted clubrush), *Carex livida* (livid sedge), and
Eriophorum angustifolium (cottongrass) individually or combined, dominating the
tallest layer 8
7. *Trichophorum caespitosum* (tufted clubrush), *Carex livida* (livid sedge), and
Eriophorum angustifolium (cottongrass) individually or combined, not
dominating the tallest layer; other graminoids dominating or codominating 11
8. On shallow organic soils; *Trichophorum caespitosum* (tufted clubrush) generally
dominating the tallest layer; other sedges and grasses such as *Carex flava* (yellow
sedge), *Deschampsia caespitosa* (hair grass) and *Carex capillaris* (hair-like grass) may
codominate *Trichophorum caespitosum* (tufted clubrush) c.t. (PAGE 173)
8. On deep organic soils; *Trichophorum caespitosum* (tufted clubrush), *Carex livida* (livid
sedge), *Eriophorum angustifolium* (cottongrass), and *Carex pauciflora* individually or
combined, dominating the tallest layer
Carex livida/*Trichophorum caespitosum* (livid sedge/tufted clubrush) c.t. (PAGE 170)

9. *Eriophorum angustifolium* (cottongrass) frequently codominating the tallest layer;
Oxycoccus palustris (bog cranberry), *Drosera rotundifolia* (round-leaf sundew) present
..... *Carex sitchensis*/*Oxycoccus palustris* (Sitka sedge/bog cranberry) c.t. (PAGE 176)
9. *Eriophorum angustifolium* (cottongrass) possibly present, but not codominating the
tallest layer 10
10. *Carex sitchensis* (Sitka sedge) dominating the tallest layer, canopy cover at least
50%; no other graminoid canopy cover greater than 10%; *Equisetum fluviatile*
(swamp horsetail) and/or *Potentilla palustris* (marsh cinquefoil) present
..... *Carex sitchensis*/*Equisetum fluviatile* (Sitka sedge/swamp horsetail) c.t. (PAGE 179)
10. *Carex sitchensis* (Sitka sedge) not dominating, canopy cover less than 50%; or other
graminoid species canopy cover greater than 10% 11
11. Generally located within a short distance (within 1 km [0.6 mi.]) of the ocean ... 12
11. Generally located away from the ocean 14
12. *Calamagrostis canadensis* (bluejoint), *Calamagrostis inexpansa* (northern reedgrass),
and/or *Deschampsia caespitosa* (hairgrass) combined canopy cover greater than any
other grass or sedge
..... *Calamagrostis canadensis*/*Potentilla egedii* (bluejoint/Pacific silverweed) c.t. (PAGE 181)
12. *Calamagrostis canadensis* (bluejoint), *Calamagrostis inexpansa* (northern reedgrass),
and/or *Deschampsia caespitosa* (hairgrass) combined canopy cover not greater than
any other grass or sedge 13
13. *Elymus arenarius* (beach-rye grass) dominating or codominating the tallest layer
..... *Elymus arenarius* (beach-rye grass) c.t. (PAGE 183)
13. *Elymus arenarius* (beach-rye grass) not dominating or codominating the tallest layer 14
14. *Calamagrostis canadensis* (bluejoint) or *Calamagrostis inexpansa* (northern reedgrass)
dominating (or codominating with *Carex sitchensis* [Sitka sedge]) the tallest layer ..
..... *Calamagrostis canadensis* (bluejoint) c.t. (PAGE 185)
14. *Calamagrostis canadensis* (bluejoint) or *Calamagrostis inexpansa* (northern reedgrass)
not dominating (or codominating with *Carex sitchensis* [Sitka sedge]) the tallest layer
..... MISCELLANEOUS UNCLASSIFIED GRAMINOID TYPES

The following are uncommon GRAMINOID communities within the Yakutat foreland region that presently have no written descriptions:

Carex rostrata/*Menyanthes trifoliata* (beaked sedge/buckbean) c.t.
Hordeum brachyantherum (meadow barley) c.t.
Carex macrochaeta (Alaska long-awn sedge) c.t.

KEY TO FORB COMMUNITY TYPES

1. *Nuphar polysepalum* (pond lily) dominating; often in over 1 m (3 ft.) of standing water *Nuphar polysepalum* (pond lily) c.t. (PAGE 187)
1. *Nuphar polysepalum* (pond lily) not dominating 2
2. *Myriophyllum alterniflorum* and *Myriophyllum spicatum* (water-milfoil) individually or combined dominating the tallest layer; often in over 1 m (3 ft.) of standing water *Myriophyllum alterniflorum* (water-milfoil) c.t. (PAGE 189)
2. *Myriophyllum alterniflorum* and *Myriophyllum spicatum* (water-milfoil) not dominating the tallest layer 3
3. *Equisetum fluviatile* (swamp horsetail) dominating the tallest layer, canopy cover at least 15% *Equisetum fluviatile* (swamp horsetail) c.t. (PAGE 191)
3. *Equisetum fluviatile* (swamp horsetail) not dominating the tallest layer, canopy cover less than 15% 4
4. *Equisetum variegatum* (variegated scouring-rush) dominating the tallest layer, canopy cover at least 25%. *Equisetum variegatum* (variegated scouring-rush) c.t. (PAGE 193)
4. *Equisetum variegatum* (variegated scouring-rush) not dominating the tallest layer, canopy cover less than 25% 5
5. *Menyanthes trifoliata* (buckbean) canopy cover at least 10% 6
5. *Menyanthes trifoliata* (buckbean) canopy cover less than 10% 7
6. *Equisetum variegatum* (variegated scouring-rush), *Equisetum palustris* (marsh horsetail), and *Myrica gale* (sweetgale) present; *Potentilla palustris* (marsh cinquefoil) canopy cover less than 5% *Menyanthes trifoliata*/
Equisetum variegatum (buckbean/variegated scouring-rush) c.t. (PAGE 195)
6. *Equisetum variegatum* (variegated scouring-rush) and *Myrica gale* (sweetgale) normally absent; *Potentilla palustris* (marsh cinquefoil) canopy cover at least 5% ... *Menyanthes trifoliata*/*Potentilla palustris* (buckbean/marsh cinquefoil) c.t. (PAGE 197)
7. *Athyrium filix-femina* (lady fern) canopy cover at least 20%
..... Mesic forb/*Athyrium filix-femina* (Mesic forb/lady fern) c.t. (PAGE 199)
7. *Athyrium filix-femina* (lady fern) canopy cover less than 20% 8
8. Located on sideslopes in the Tanis Mesa area; *Epilobium angustifolium* (fireweed), *Sanguisorba stipulata* (Sitka burnet), *Solidago canadensis* (goldenrod), and *Heracleum lanatum* (cow parsnip) dominate the tallest layer Mesic forb c.t. (PAGE 201)
8. Not located on sideslopes; other forbs dominate the tallest layer 9

9. Located on lake shores and river bars; *Epilobium latifolium* (dwarf fireweed), *Lupinus nootkatensis* (nootka lupine), and *Salix setchelliana* (setchell's willow) dominating the tallest layer
Lupinus nootkatensis/*Salix setchelliana* (nootka lupine/setchell's willow) c.t. (PAGE 203)
9. Not located on lake shores and river bars; *Epilobium latifolium* (dwarf fireweed), *Lupinus nootkatensis* (nootka lupine), and *Salix setchelliana* (setchell's willow) not dominating the tallest layer 10
10. Located on backdunes; *Fragaria chiloensis* (beach strawberry), *Astragalus alpinus* (alpine milk-vetch), *Achillea borealis* (yarrow), and *Rhinanthus minor borealis* (yellow rattle) dominating the tallest layer
... *Fragaria chiloensis*/*Achillea borealis* (beach strawberry/yarrow) c.t. (PAGE 205)
10. Not located on backdunes; *Fragaria chiloensis* (beach strawberry), *Astragalus alpinus* (alpine milk-vetch), *Achillea borealis* (yarrow), and *Rhinanthus minor borealis* (yellow rattle) not dominating the tallest layer
..... MISCELLANEOUS UNCLASSIFIED FORB TYPES

The following is an uncommon FORB community within the Yakutat foreland region that presently has no written description.
Hippuris vulgaris (common mare's-tail) c.t.

FOREST TYPES

Descriptions of the mountain hemlock, mixed conifer, western hemlock, and some Sitka spruce plant communities are from Martin et al. (1995), prepared for the island portion of the Chatham Area. Some information has been modified to better fit Yakutat conditions.

The following descriptions concentrate on the vascular plant differences among community types. However, the moss flora also changes as stands age. In most older forested stands, mosses carpet the ground and larger tree branches. Common species are: *Hylocomium splendens*, *Rhizomnium glabrescens*, *Rhizomnium nudum*, *Dicranium* sp., *Rhytidiadelphus loreus*, *Sphagnum girgensohnii*, *Climacium dendroides*, *Hypnum* sp., and *Plagiothecium undulatum*, while *Antitrichia curtipendula* is the most common species in the canopy. In younger, open canopy, stands the moss flora is often less diverse. Common species are *Hylocomium splendens*, *Dicranium* sp., *Rhytidiadelphus loreus*, *Rhytidiadelphus triquetrus*, *Rhytidiadelphus squarrosus*, *Ptilium crista-castrensis*, *Pleurozium schreberi*. Again *Antitrichia curtipendula* is a common canopy species.

Tsuga mertensiana/Vaccinium
Community Type
Mountain hemlock/blueberry:
TSUMER/VACCIN

Number of Stands Sampled: Yakutat-
1; Chatham Area-46



Other Studies:

This type, or closely related types, is common throughout Southeast Alaska, and has been described from the Ketchikan Area (DeMeo et al. 1992), Stikine Area (Pawuk and Kissinger in prep.), Chatham Area (Martin et al. 1995), and the outer coast of Glacier Bay National Park (Worley 1977). This community is classified at level IV as needleleaf, closed or open, mountain hemlock forest by Viereck et al. (1992). It was not classified as wetland by DeMeo and Loggy (1989), although in Yakutat, some stands may be wetlands.

Distribution:

This community is uncommon, with limited distribution on the kettle-kame topography in the Pike Lakes area, the lower mountain slopes of the Brabazon Range, and Knight Island.

Vegetation:

Tsuga mertensiana (mountain hemlock) dominates this moderately open forest type. *Picea sitchensis* (Sitka spruce) is common. *Tsuga heterophylla* (western hemlock) occurs in a narrow transition zone to western hemlock types on warmer sites. *Pinus contorta* (lodgepole pine) is always absent.

Vaccinium sp. (blueberry) is the dominant shrub. Mountain hemlock regeneration is common. *Rubus pedatus* (five-leaf bramble) and *Coptis asplenifolia* (fern-leaf goldthread) are the most common forbs. *Blechnum spicant* (deer fern) is the most common fern.

The following table lists the common species, their constancy, the average percent canopy cover, and range of cover values (Chatham Area data).

Species	Constancy	Average % Canopy Cover	Range
<i>Tsuga mertensiana</i>	100	38	15-65
<i>Vaccinium</i> sp.	100	54	15-85
<i>Rubus pedatus</i>	98	10	0-40
<i>Coptis asplenifolia</i>	80	5	0-38
<i>Blechnum spicant</i>	78	8	0-15

Stand Structure: (Chatham Area data)

Stand height is usually less than 23 m (75 ft.). Understory trees of all heights may be abundant, forming a multi-layered canopy. The overstory canopy is moderately open. Shrub cover is usually less than 70 percent. Forbs are abundant.

Environmental Factors (landscape, soils, and hydrology):

In Yakutat, this c.t. is found at much lower elevations than in other parts of the Chatham Area. On the islands, it usually occurs at lower elevations of the mountain hemlock zone although this varies with local conditions.

Soils are developed from bedrock weathered in place (residuum) or from till and are moderately shallow. In Yakutat, this type is found on both mineral and organic soils. Drainage is variable, generally well to moderately well drained.

Succession:

This is a late-seral community type.

Adjacent Communities:

Pinus contorta/*Empetrum nigrum* (lodgepole pine/crowberry) and mixed conifer/*Vaccinium* (mixed conifer/blueberry) are commonly associated types on the kettle-kame topography in the Pike Lakes area.

Management Implications:

Shallow soils and short growing seasons limit productivity. Windthrow of individual or small groups of trees is common.

Few sites are available to evaluate successional patterns. Several clearcut stands less than 20 years old occur along the White Alice radar site road behind the City of Hoonah. Mountain hemlock and spruce are abundant but slow to regenerate, and many seedlings are deformed, apparently from snow. Blueberry is also abundant. Some 100 year old blowdown stands were found that had a dense stock of mountain hemlock and spruce but little understory vegetation. On this type, canopy closure is likely to take longer than on warmer, more productive community types. Further plant succession work is needed.

Recreational and subsistence use of these sites is limited.

Mixed conifer/*Vaccinium* sp./*Lysichitum americanum* Community Type
Mixed conifer/blueberry/skunk cabbage: MIXED CON/VACCIN/LYSAME

Number of Stands Sampled: Yakutat-3; Chatham Area-63

Other Studies:

This type, or closely related types, is common throughout Southeast Alaska, and has been described from the Ketchikan Area (DeMeo et al. 1992), Stikine Area (Pawuk and Kissinger in prep.), Chatham Area (Martin et al. 1995), and from the outer coast of Glacier Bay National Park (Worley 1977). South of Yakutat, *Chamaecyparis nootkatensis* (yellow-cedar) codominates in the overstory, however, it is rarely seen on the Yakutat foreland. This community is classified at level IV as needleleaf, open, mixed conifer forest by Viereck et al. (1992) and as forested wetland by DeMeo and Loggy (1989). In the Cowardin et al. (1979) wetland classification system, this type is palustrine, forested, needle-leaved, evergreen wetland.

Distribution:

This c.t is uncommon. It is found primarily on the kettle-kame topography in the Pike Lakes area, but is also likely to be found along the Brabazon Range footslopes.



Vegetation:

A mix of tree species characterizes this moderately open community type. *Tsuga heterophylla* and *Tsuga mertensiana* (western and mountain hemlock) are the most common overstory trees. *Picea sitchensis* (Sitka spruce) may be a minor component.

Vaccinium sp. (blueberry) and *Menziesia ferruginea* (menziesia) are the dominant shrubs. Mountain and western hemlock regeneration occurs in most stands. Sitka spruce regeneration occurred in about two-thirds of the sampled stands. *Lysichitum americanum* (skunk cabbage) is the dominant forb.

The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	100	8	3-15
<i>Tsuga heterophylla</i>	100	23	10-30
<i>Tsuga mertensiana</i>	100	8	5-10
<i>Picea sitchensis</i> regen.	100	4	3-4
<i>Tsuga heterophylla</i> regen.	100	9	8-10
<i>Tsuga mertensiana</i> regen.	100	3	1-7
<i>Vaccinium</i> sp.	100	48	35-70
<i>Menziesia ferruginea</i>	100	6	1-10
<i>Rubus spectabilis</i>	100	7	3-15
<i>Cornus canadensis</i>	100	9	8-10
<i>Lysichitum americanum</i>	100	18	15-25
<i>Rubus pedatus</i>	100	17	15-20
<i>Gymnocarpium dryopteris</i>	100	10	5-15

Stand Structure:

Stand height is usually less than 15 m (46 feet). Understory trees of all heights are abundant, forming a multi-layered canopy. These stands are open.

Blueberry and menziesia are tall. Shrub cover approaches 100 percent in some stands. Forbs are abundant. Down logs are small. Snags are small but abundant.

Environmental Factors (landscape, soils, and hydrology):

This community type is common only on the kettle-kame topography. In other parts of its range further south, it occurs from sea level to near the mountain hemlock zone on benches or

gently sloping mountain and hill landforms. It is common along the edges of old alluvial fans and flood plains and at the base of footslopes.

The soils have an organic layer that averages 10 cm (4 in.). Several conditions cause poor soil drainage. Most commonly, compact till forms an impermeable layer that restricts water movement. On deep soils over colluvium or alluvium, excessive water received from neighboring slopes saturates the soil. Since the soils are mostly fine textured and/or organic, moisture is retained. These conditions vary depending on slope and precipitation zone.

The parent material is normally till or organics. Soils are usually well-developed Spodosols classified as Aquic Haplocryods.

Skunk cabbage provides a good indicator that the soil is wet within 50 cm (20 in.) of the surface throughout the growing season, at least within the microsites in which the plants occur. Although the water table is perennially near the surface, these stands do not appear to flood regularly. Pit-mound topography is characteristic of these sites.

Succession:

This type is late seral. On gentle slopes or in depressions, the site will continue to paludify slowly, and will be replaced by a bog. On steeper slopes, this type is thought to be stable (Banner et al. 1986).

Adjacent Communities:

This community is found next to *Tsuga mertensiana/Vaccinium* (mountain hemlock/blueberry) and other marginally productive forest types such as *Pinus contorta/Sphagnum* (lodgepole pine/peat moss).

Management Implications:

Productivity is low due to poor soil drainage. Windthrow potential is low due to the small stature of mature trees, open canopy, and wet soils. Soils are generally stable.

Western and mountain hemlock regeneration is abundant after clearcutting. Spruce regeneration may be common.

In this community, organic matter reduces the chance of exposing mineral soil during harvest. Usually, shovel yarding is not recommended on wet sites because of the risks of soil compaction, rutting, sediment release, or mineral soil exposure. However, to harvest these sites, shovel yarding with corduroy pathways has been used successfully on the Hoonah Ranger District (J. Russell, pers. comm. as cited in Martin et al. 1995).

Following clearcutting, shrub and skunk cabbage cover increases with the increased light. As tree cover increases, understory production is expected to decline. Canopy closure may occur in small patches but shrub-dominated gaps are expected to persist. The length of time to closure in the small patches will likely be much longer than on well drained sites.

Road and trail construction may require special treatment due to the deep, wet soils. If they cannot be relocated, trails should consist of boardwalks. Recreational use of these sites is limited. Subsistence uses include collection of skunk cabbage.

Mixed conifer/*Vaccinium* Community Type
Mixed conifer/blueberry: MIXED CON/VACCIN

Number of Stands Sampled: Yakutat-8; Chatham Area-51

Other Studies:

This community type appears throughout Southeast Alaska, and is described by DeMeo et al. (1992), Martin et al. (1995), and Pawuk and Kissinger (in prep.). South of Yakutat, *Chamaecyparis nootkatensis* (yellow-cedar) is common in this type; however, this tree species is rare in Yakutat. Viereck et al. (1992) classified this community type at level IV as needleleaf, open, mixed conifer forest.

Distribution:

This community is common in Yakutat. It occurs in a variety of areas such as the Brabazon Range lower mountain slopes, the kettle-kame topography at Pike Lakes, and the more poorly drained proximal outwash.



Vegetation:

This community type features a mix of overstory species. Because the type is found on sites with shallow soils, restricted drainage, or other low productivity conditions, trees do not grow well. *Tsuga heterophylla* (western hemlock) and *Tsuga mertensiana* (mountain hemlock) are the most common overstory trees. *Picea sitchensis* (Sitka spruce) may be a minor component.

Vaccinium sp. (blueberry) and *Menziesia ferruginea* (menziesia) are the dominant shrubs. *Echinopanax horridum* (devil's club) is more common in this type in Yakutat than it is on the Chatham Area islands. Western and mountain hemlock regeneration is abundant. *Cornus canadensis* (bunchberry) and *Rubus pedatus* (five-leaf bramble) are abundant. *Gymnocarpium dryopteris* (oak fern) is the most common fern in Yakutat for this type, while *Blechnum spicant* (deer fern) is the most common fern on the Chatham Area islands (Martin et al. 1995).

The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	88	27	10-40
<i>Tsuga heterophylla</i>	75	17	10-40
<i>Tsuga mertensiana</i>	100	18	5-50
<i>Picea sitchensis</i> regen.	100	3	1-10
<i>Tsuga heterophylla</i> regen.	88	5	1-10
<i>Tsuga mertensiana</i> regen.	88	2	1-5
<i>Echinopanax horridum</i>	88	10	1-30
<i>Menziesia ferruginea</i>	63	4	1-15
<i>Rubus spectabilis</i>	100	8	1-25
<i>Vaccinium</i> sp.	100	61	40-80
<i>Cornus canadensis</i>	100	9	3-30
<i>Listera cordata</i>	63	1	-
<i>Rubus pedatus</i>	100	19	10-30
<i>Streptopus amplexifolius</i>	88	2	1-5
<i>Tiarella trifoliata</i>	63	3	1-5
<i>Dryopteris dilatata</i>	88	2	1-5
<i>Gymnocarpium dryopteris</i>	100	7	3-15

Stand Structure:

Stand height is usually less than 21 m (70 ft.). The trees are generally very slow growing: one 66 cm (26 in.) dbh spruce had over 380 growth rings. Understory trees of all heights are abundant, forming a multi-layered canopy. Menziesia is usually 1.5 to 2.5 m tall (5-8 ft.), generally taller than blueberry.

These stands are open. Shrub cover approaches 100 percent in some stands. Forbs are abundant. Down logs and snags are small, less common than in more dense stands.

Environmental Factors (landscape, soils, and hydrology):

These stands are found on somewhat poorly drained soils where drainage is restricted either by a perennial high water table or an impermeable layer such as compact till. The normal water table is within one meter (3 ft.) of the surface. The soils vary from Entisols to Spodosols.

Succession:

This late-seral type appears to be stable on somewhat poorly drained sites.

Adjacent Communities:

Tsuga heterophylla (western hemlock) community types are found on better drained adjacent areas. On more poorly drained areas, mixed conifer/skunk cabbage or a nonforested wetland type such as *Carex livida*-*Carex pauciflora* (livid sedge-many-flowered sedge) is found.

Management Implications:

Productivity is low, limited by poor soils. Windthrow potential is low due to the small stature of mature trees and open canopy.

Regeneration of western and mountain hemlock and Sitka spruce is abundant. Growth rates are slow due to poor soils and, occasionally, dense blueberry and menziesia following clearcutting.

Following clearcutting, blueberry and menziesia may maintain dominance for at least 30 years.

As tree cover increases, understory production is expected to decline. Overall, the shrub sere persists longer than in more productive stands. Conifer growth is much slower than on well-drained sites.

Hikers, skiers, and hunters may use these open stands.

***Tsuga heterophylla/Vaccinium-Echinopanax horridum* Community Type**
Western hemlock/blueberry-devil's club: TSUHET/VACCIN-ECHHOR

Number of Stands Sampled: Yakutat-3; Chatham Area-48

Other Studies:

This type, or closely related types, is common throughout Southeast Alaska, and has been described from the Ketchikan Area (DeMeo et al. 1992), Stikine Area (Pawuk and Kissinger in prep.), Chatham Area (Martin et al. 1995), and the outer coast of Glacier Bay National Park (Worley 1977). This community is classified at level IV as needleleaf, closed, western hemlock forest by Viereck et al. (1992).

Distribution:

This community is common in Yakutat. It is found on the older moraines and proximal outwash, and probably occurs on the Brabazon Range footslopes.



Vegetation:

This community type is one of the most productive closed canopy forest types in northern Southeast Alaska. *Picea sitchensis* (Sitka spruce) is commonly a minor part of the overstory in late-seral forests. Other tree species rarely occur.

The shrub layer is dominated by *Vaccinium* sp. (blueberry) and *Echinopanax horridum* (devil's club). *Rubus spectabilis* (salmonberry) is rarely abundant in older stands. *Cornus canadensis* (bunchberry) and *Rubus pedatus* (five-leaf bramble) are common. Fern cover is often high.

The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Tsuga heterophylla</i>	100	55	45-70
<i>Picea sitchensis</i>	100	7	1-10
<i>Tsuga heterophylla</i> regen.	100	7	4-10
<i>Echinopanax horridum</i>	100	11	8-15
<i>Vaccinium</i> sp.	100	47	35-65
<i>Cornus canadensis</i>	100	5	1-11
<i>Rubus pedatus</i>	100	12	6-20
<i>Streptopus amplexifolius</i>	100	1	-
<i>Dryopteris dilatata</i>	100	6	4-8
<i>Gymnocarpium dryopteris</i>	100	6	4-8

Stand Structure:

Western hemlock heights range up to 31 m (95 feet). In contrast, trees on the islands of the Chatham Area range up to 46 m (150 feet) on the best sites. Canopy closure averages 60 percent. Hemlock seedlings, saplings, suppressed, and intermediate size trees are abundant, forming a multi-layered canopy. Devil's club often occurs in a layer above blueberry in canopy openings.

Environmental Factors (landscape, soils, and hydrology):

This c.t. is common throughout the Chatham Area. It occurs from near sea level to mid elevations, usually well below the mountain hemlock zone. The best examples occur on deep, well-drained, colluvial deposits on lower mountain and footslope landforms. This community is also common on steep, well-drained slopes with deep soils.

Soils are mostly mineral, moderately to well drained, and deep. In Yakutat, the soils in these stands were generally classified as Oxyaquic Haplocryods.

Flowing subsurface water is abundant in the rooting zone of this community type, as indicated by the presence of devil's club. This water and associated vegetation may be distributed in narrow drainages or may occur across the slope.

Succession:

This late-seral type appears to be stable on these sites.

Adjacent Communities:

This type often occurs adjacent to *Tsuga heterophylla/Vaccinium* (western hemlock/blueberry) and *Tsuga heterophylla/Vaccinium/Dryopteris dilatata* (western hemlock/blueberry/shield fern) on older moraines.

Management Implications:

This community is one of the most productive, as reflected by tree heights and volumes in late-seral stands.

Regeneration of western hemlock is fairly abundant but often patchy. Spruce regeneration is also common. Moderate brush competition occurs from salmonberry: if it is present in the stand prior to disturbance, it will greatly increase in abundance following windthrow or harvest. Well-drained microsites are abundant. Planting is not needed for adequate regeneration if the soils are not disturbed following timber harvest.

Blueberry cover remains high, devil's club cover declines, and salmonberry and fern cover increases for at least the first 25 years after clearcutting (DeMeo 1991). The decline in devil's club abundance is apparently related to the change in light availability and decreased humidity (Alaback 1984). Canopy closure and understory exclusion following timber harvest may be somewhat slower on devil's club sites.

Windthrow is common, albeit more frequent at the individual tree level than at the stand level. Examples of stand level windthrow are scattered throughout the landscape, and are often Sitka spruce-dominated. Due to the longevity of spruce, these stands will remain spruce-dominated for hundreds of years.

Subsurface flooding from upslope runoff, as indicated by devil's club, increases the potential risk of soil disturbances. These disturbances may lead to exposure of mineral soil and invasion of alder. This is likely to occur only in small localized patches. Cross slope roads will intercept more water in these areas of subsurface flooding and road and trail construction techniques may need to be altered.

Southeast Alaska natives use this c.t. for collection of devil's club wood for charcoal face paint and for carving fishing lures. Extensive medicinal use is made of inner bark for headache remedies, laxatives, and other uses. Devil's club is the most important plant in traditional Tlingit medicine.

Tsuga heterophylla/Vaccinium/Dryopteris dilatata Community Type
Western hemlock/blueberry/shield fern: TSUHET/VACCIN/DRYDIL

Number of Stands Sampled: Yakutat-4; Chatham Area-158

Other Studies:

This type, or closely related types, is common throughout Southeast Alaska, and has been described from the Ketchikan Area (DeMeo et al. 1992), Stikine Area (Pawuk and Kissinger in prep.) and Chatham Area (Martin et al. 1995). This community is classified at level IV as needleleaf, closed, western hemlock forest by Viereck et al. (1992).

Distribution:

This community is common and occurs on the older moraines and proximal outwash.



Vegetation:

This c.t. is one of the most productive, closed canopy forest types in northern Southeast Alaska. *Picea sitchensis* (Sitka spruce) may be a minor part of the overstory in late-seral forests. Other tree species are infrequent.

Vaccinium sp. (blueberry) and *Tsuga heterophylla* (western hemlock) dominate the understory. Common well-drained forest herbs, like *Cornus canadensis* (bunchberry) and *Rubus pedatus* (five-leaf bramble), are most abundant in canopy gaps. *Gymnocarpium dryopteris* and *Dryopteris dilatata* (oak and shield fern) are usually abundant. Shield fern, a primary indicator of this community, typically exceeds 3 percent cover.

The following table lists the species that occur in more than 50 percent of the stands (>50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Tsuga heterophylla</i>	100	55	40-60
<i>Tsuga heterophylla</i> regen.	100	8	1-25
<i>Echinopanax horridum</i>	100	3	1-4
<i>Vaccinium</i> sp.	100	64	30-80
<i>Cornus canadensis</i>	100	4	1-10
<i>Rubus pedatus</i>	100	25	15-40
<i>Dryopteris dilatata</i>	100	7	4-10
<i>Gymnocarpium dryopteris</i>	100	8	5-10

Stand Structure:

Western hemlock trees range up to 35 m (114 feet). In contrast to Yakutat, hemlocks over 46 m (150 feet) are common on the best sites on the islands of the Chatham Area. Canopy closure averages 60 percent. Hemlock seedlings, saplings, suppressed, and intermediate size trees are abundant, forming a multi-layered canopy.

Environmental Factors (landscape, soils, and hydrology):

This c.t occurs from near sea level to mid elevations. The best examples occur on deep, well-drained, proximal outwash deposits. Soils are mostly mineral, moderate to well drained, and deep. Over 90 percent of the 115 soil profiles sampled on the islands were classified as Spodosols. In Yakutat, they are generally Typic Humicryods.

Succession:

This late-seral type appears to eventually replace some Sitka spruce community types as sites age. In Yakutat, there are examples of large, 400+ year old, Sitka spruce stands being replaced by western hemlock forest types.

Adjacent Communities:

This type often occurs next to *Tsuga heterophylla/Vaccinium* (western hemlock/blueberry) and *Tsuga heterophylla/Vaccinium-Echinopanax horridum* (western hemlock/blueberry-devil's club) on older moraines.

Management implications:

This community is one of the most productive types, as reflected by tree height and volume in late-seral stands. Windthrow potential is high due to tree heights and shallow rooting systems. Soils are well developed and usually stable.

Regeneration of western hemlock is abundant and planting is not needed for adequate regeneration following disturbances that do not expose the mineral soil. Brush competition is low and well-drained microsites are abundant.

Blueberry cover remains high following clearcutting (DeMeo 1991) until canopy closure (i.e., stem exclusion stage). Closure and understory exclusion following timber harvest typically occur within 30 years (Alaback 1982).

Windthrow is common, primarily causing single or small group tree-falls. However, recent stand level disturbance examples occur throughout the landscape. Often, these areas are dominated by Sitka spruce. Due to the longevity of spruce, these stands will remain spruce-dominated for hundreds of years.

Hemlock and spruce snags may be common and are valuable for cavity nesters.

Soils are well suited for road and trail construction.

Subsistence and recreational uses include collection of shield fern, hemlock bark, and pitch for medicinal and food uses and blueberry picking. Due to the large trees, this c.t. may provide popular hiking spots.

Tsuga heterophylla/Vaccinium sp. Community Type
Western hemlock/blueberry: TSUHET/VACCIN

Number of Stands Sampled: Yakutat-3; Chatham Area-88

Other Studies:

This type, or closely related types, is common throughout Southeast Alaska, and has been described from the Ketchikan Area (DeMeo et al. 1992), Stikine Area (Pawuk and Kissinger in prep.), Chatham Area (Martin et al. 1995), and from the outer coast of Glacier Bay National Park (Worley 1977). This community is classified at level IV as needleleaf, closed, western hemlock forest by Viereck et al. (1992).

Distribution:

This community is common on the proximal outwash and moraines.

Vegetation:

This moderately productive, closed canopy, forest type is dominated by *Tsuga heterophylla* (western hemlock). *Picea sitchensis* (Sitka spruce) is commonly a minor part of the overstory. *Tsuga mertensiana* (mountain hemlock) may occur in this community type near transitions to the mountain hemlock zone or to mixed conifer types.

Vaccinium sp. (blueberry) and *Tsuga heterophylla* (western hemlock) dominate the understory. Common well-drained forest herbs like *Cornus canadensis* (bunchberry) and *Rubus pedatus* (five-leaf bramble) are most abundant in canopy gaps. *Gymnocarpium dryopteris* and *Dryopteris dilatata* (oak and shield fern) are usually present. Shield fern may occur on well-drained open hummocks, but it is usually absent or less than 2 percent cover.



The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Tsuga heterophylla</i>	100	55	35-80
<i>Picea sitchensis</i>	100	8	3-10
<i>Tsuga heterophylla</i> regen.	100	12	2-25
<i>Vaccinium</i> sp.	100	63	45-80
<i>Cornus canadensis</i>	100	7	3-10
<i>Rubus pedatus</i>	100	25	10-40
<i>Gymnocarpium dryopteris</i>	100	2	1-2

Stand Structure:

Western hemlock trees range up to 30 m (100 feet). Canopy closure averages 60 percent. Seedlings, saplings, suppressed, and intermediate size trees are abundant, forming a multi-layered canopy.

Environmental Factors (landscape, soils, hydrology):

The western hemlock/blueberry community type is one of the most abundant forest types in northern Southeast Alaska.

Soils are mostly mineral, somewhat poorly to moderately well drained, and classified as Spodosols (usually Oxyaquic Haplocryods in Yakutat). On gentle slopes, soils are frequently deep, coarse textured colluvium, able to move excessive water vertically through the profile.

Succession:

This late-seral type appears stable on these sites.

Adjacent Communities:

This type often occurs adjacent to the better drained, more productive *Tsuga heterophylla*/*Vaccinium*/*Dryopteris dilatata* (western hemlock/blueberry/shield fern) and *Tsuga heterophylla*/*Vaccinium*-*Echinopanax horridum* (western hemlock/blueberry-devil's club) on older moraines.

Management Implications:

Based on tree heights and gross volumes, these sites are moderately productive. Limitations to tree productivity are largely due to less than optimum soil drainage conditions found either on shallow soils or wet, deeper soils. Windthrow potential is high due to tree heights and shallow soils.

Soils are generally stable and not disturbed by excessive subsurface ground-water flow or flooding.

Natural regeneration of western hemlock is abundant and planting is not needed following logging. Brush competition is low, and well drained microsites are abundant. Sitka alder will become established on exposed mineral soils. Blueberry cover remains high following clearcutting (DeMeo 1991) until canopy closure.

Subsistence uses include blueberry picking and collection of hemlock bark and pitch for medicinal, food, and dye uses.

***Picea sitchensis*/*Alnus sinuata* Community Type**
Sitka spruce/Sitka alder: PICSIT/ALNSIN

Number of Stands Sampled: Yakutat-17; Chatham Area-4

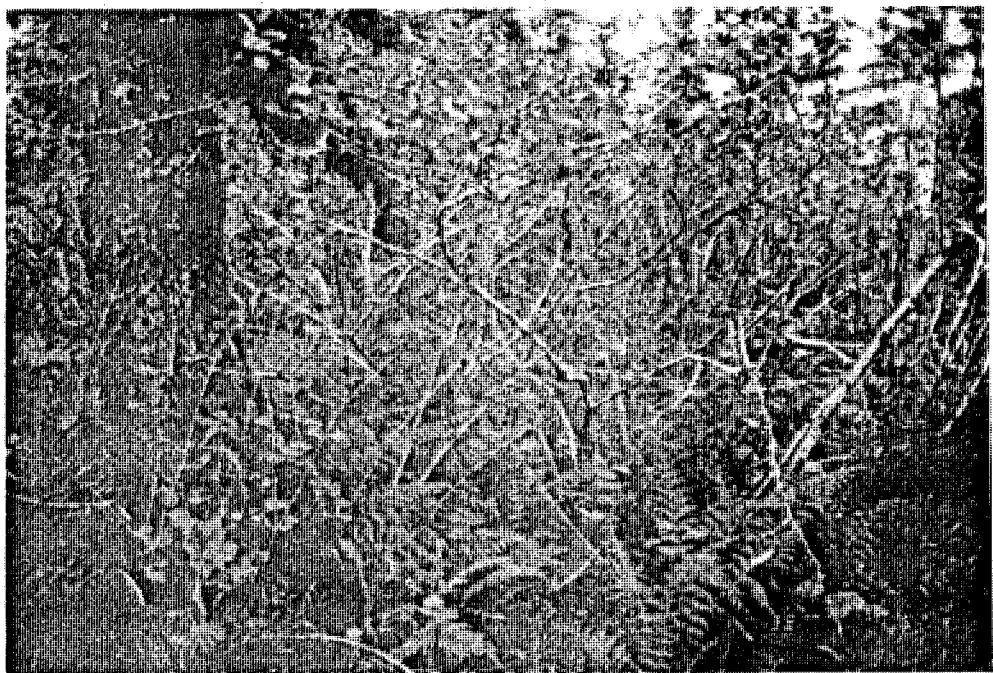
Other Studies:

Martin et al. (1995) described this c.t. for flood plains of the Chatham Area. Pawuk and Kissinger (in prep.) described a related type for the Stikine Area, and Worley (1977) described a related early-seral type for the outer coast of Glacier Bay National Park. This community type is classified at level IV as needleleaf, open, Sitka spruce forest by Viereck et al. (1992).

Nonwetland variant



Wetland variant



vided into nonwetland and wetland variants. It is a common nonwetland uplifted beach ridges, and other landscapes. It also occurs as a common tal outwash.

a spruce) dominates this moderately productive, open canopy, forest type. (western hemlock) is rarely present.

a alder), *Echinopanax horridum* (devil's club), and *Rubus spectabilis* are the understory. *Vaccinium* sp. (blueberry) is usually present in limited regeneration is common. *Dryopteris dilatata* (shield fern), *Gymnocarpium* and *Athyrium filix-femina* (lady fern) are generally present. In the wetland outwash, *Lysichitum americanum* (skunk cabbage) is also common.

lists the species that occur in more than 50 percent of the stands (> 50 , their constancy, the average percent canopy cover, and range of cover are the species occurs (Yakutat data).

	Constancy	Average % Canopy cover	Range
	100	41	15-75
gen.	59	12	1-30
	100	22	6-50
lum	88	19	1-80
	76	28	1-80
	76	12	1-50
	59	3	1-10
	59	3	1-5
	59	10	1-45
ifolius	82	2	1-6
	82	4	1-10
na	82	10	1-20
	65	6	1-15
opteris	71	5	1-20

Stand Structure:

Spruce trees averaged 27 m (90 ft.) on flood plain and uplifted beach ridge stands but only 15 m (50 ft.) on wetland sites. Sitka alder occurs primarily in clumps in openings in the spruce forest. Open grown spruce trees are common on the uplifted beach ridges and flood plains.

Down wood is sparse, often due to the young age of these stands. Salmonberry and devil's club cover in canopy gaps may be 100 percent with plants over 1.5 m (5 ft.) tall for the nonwetland sites.

Environmental Factors (landscape, soils, and hydrology):

As further ecological work is done, this type may be split into two different c.t.s, wetland and nonwetland. The nonwetland stands occur primarily on fine gravel to silt. On flood plains and uplifted beach ridges, these stands are generally on well drained soils. The water table is usually 1 m (3 ft.) or more below the surface.

On distal outwash, this community often has developed on poorly drained sites with a permanent high water table within 20 to 60 cm (8-24 in.) of the surface. For example, this type is often found on the wetter edges of better drained distal outwash sites where it is called "lagg forest." These stands would be classified as Sitka spruce swamps in the British Columbia classification (Banner et al. 1986).

On the better drained sites, the soils have only a thin organic layer and are typically classified as Oxyaquic Haplocryods. On the poorly drained surfaces, the depth of the organic layer ranges from 15 to 50 cm (6-20 in.), and the soils are often classified as Aquic Cryorthents.

Succession:

This community type's seral status is unknown and needs further study.

Adjacent Communities:

This type is often associated with *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) on uplifted beach ridges and with nonforested wetland types on distal outwash.

Management Implications:

Tree productivity is moderate due to lower stocking. Spruce regeneration is unevenly distributed, which can be attributed to the abundance of salmonberry and the lack of raised organic microsites. Dense salmonberry patches will exclude conifer establishment (Schrader 1992). Spruce regeneration is located predominantly on down logs and raised mineral or organic debris. Maintenance of large woody debris is critical for long-term conifer regeneration.

Complete alder removal is not recommended as a method to accelerate succession. Alder provides an important soil fertility function via nitrogen fixation and helps to stabilize active sites. Thinning alder immediately around spruce seedlings may improve spruce height growth.

Clearcut logging is not recommended for sites in this c.t. Selection harvest is an alternative that may help to maintain soil productivity. However, selection harvest may create windthrow problems. Landscape analysis of wind patterns should be included in planning for ecosystem sustainability.

Picea sitchensis/Echinopanax horridum-Rubus spectabilis Community Type
Sitka spruce/devil's club-salmonberry: PICSIT/ECHHOR-RUBSPE

Number of Stands Sampled: Yakutat-26; Chatham Area-5

Other Studies:

Martin et al. (1995) described this c.t. for flood plains of the Chatham Area; Boggs (1994) described related types for the Copper River Delta; and Worley (1977) described a related type for the outer coast of Glacier Bay National Park. This community is classified at level IV as needleleaf, closed or open, Sitka spruce forest by Viereck et al. (1992).

Distribution:

This community is abundant on uplifted beach ridges, proximal outwash, and flood plains.

Vegetation:

Large *Picea sitchensis* (Sitka spruce) dominates this productive, moderately open canopy, forest type. *Tsuga heterophylla* (western hemlock) is common in about 50 percent of the stands.

Echinopanax horridum (devil's club) and *Rubus spectabilis* (salmonberry) dominate the understory. *Vaccinium* sp. (blueberry) is less abundant and usually occurs on elevated organic microsites. Spruce and hemlock regeneration is common. *Tiarella trifoliata* (foam flower) and *Streptopus amplexifolius* (twisted stalk) are the most abundant forbs, but *Circaea alpina* (enchanter's nightshade) is abundant in some stands. *Athyrium filix-femina* (lady fern), *Gymnocarpium dryopteris* (oak fern), and *Dryopteris dilatata* (shield fern) are abundant.



The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	100	46	20-70
<i>Picea sitchensis</i> regen.	85	4	1-10
<i>Tsuga heterophylla</i> regen.	54	3	1-15
<i>Echinopanax horridum</i>	100	33	7-80
<i>Rubus spectabilis</i>	100	24	15-50
<i>Vaccinium</i> sp.	88	26	1-65
<i>Circaea alpina</i>	77	16	1-60
<i>Cornus canadensis</i>	54	4	1-10
<i>Rubus pedatus</i>	88	20	4-45
<i>Streptopus amplexifolius</i>	100	2	1-6
<i>Tiarella trifoliata</i>	92	9	2-30
<i>Athyrium filix-femina</i>	88	11	1-30
<i>Dryopteris dilatata</i>	92	9	1-20
<i>Gymnocarpium dryopteris</i>	81	10	2-20
<i>Thelypteris phegopteris</i>	58	3	1-10

Stand Structure:

Spruce vary in height up to 46 m (150 ft.). The trees tend to be taller on uplifted beach ridges and in the 22 to 32 m (70-105 ft.) range on other landscapes. Open grown spruce trees surrounded by salmonberry are common on the uplifted beach ridges. Devil's club and salmonberry cover in canopy gaps may be 100 percent with plants over 1.5 m (5 ft.) tall.

Environmental Factors (landscape, soils, and hydrology):

This community type is primarily found on well drained gravel and sand substrates on flood plain, proximal outwash, and uplifted beach ridge landscapes. The soils are usually young in the flood plains, such as Typic Cryofluvents. In the other landscapes, they are better developed, and often classified as Typic Haplocryods. The water table occasionally rises into the surface horizons in the flood plain stands. In the other stands, the water table is typically one meter (3 ft.) or more below the surface.

Succession:

Additional study is needed on this apparent mid-seral type that will eventually be replaced by a western hemlock-Sitka spruce dominated forest.

Adjacent Communities:

This c.t. often occurs adjacent to other Sitka spruce community types, such as *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) and *Picea sitchensis*/*Vaccinium-Echinopanax horridum* (Sitka spruce/blueberry-devil's club) on both uplifted beach ridges and proximal outwash.

Management Implications:

Tree productivity is high. Stocking is moderate and suitable tree-growing microsites are restricted to raised organic sites. Consequently, leaving large woody debris is important for future conifer regeneration.

Soils are very sensitive to disturbance. Easily exposed mineral soils are excellent sites for alder. Even if harvest occurs with full log suspension, natural disturbance from flooding will favor perpetuation of alder. Selection harvest is an alternative that may help to maintain soil productivity; however, it may increase stand windthrow.

Devil's club cover declines and salmonberry cover increases following clearcutting. Dense canopy patches of spruce develop 20 to 30 years following clearcut harvest. Spruce seedlings in the salmonberry patches are slow to establish. After 30 years, if the soil is not degraded due to poor logging practices, a mixed spruce, alder, and salmonberry stand will develop. After 50 to 80 years, alder will be replaced by spruce.

When the c.t. occurs near the coast, bald eagles use the largest spruce trees for nesting and roosting.

Fishermen and hikers may use this type when it occurs along streams. Subsistence uses include collection of salmonberries, devil's club, and spruce.

Picea sitchensis/*Vaccinium-Echinopanax horridum* Community Type
Sitka spruce/blueberry-devil's club: PICSIT/VACCIN-ECHHOR

Number of Stands Sampled: Yakutat-39; Chatham Area-17

Other Studies:

This type, or closely related types, occurs throughout Southeast Alaska. However, it seems to be more abundant on the Chugach National Forest than the Tongass. It has been described from the Ketchikan Area (DeMeo et al. 1992), Stikine Area (Pawuk and Kissinger in prep.) and Chatham Area (Martin et al. 1995). Worley (1977) described a related type for the outer coast of Glacier Bay National Park and Boggs (1994) described related types for the Copper River Delta. This community is classified at level IV as needleleaf, closed or open, Sitka spruce forest type by Viereck et al. (1992).

Distribution:

This community is abundant on uplifted beach ridges, proximal outwash, moraines, and flood plains.

Vegetation:

This productive forest type is dominated by large *Picea sitchensis* (Sitka spruce). Mature *Tsuga heterophylla* (western hemlock) trees are common in about 50 percent of the stands. Spruce and hemlock regeneration is common, with spruce regeneration more abundant than hemlock.

Vaccinium sp. (blueberry) and *Echinopanax horridum* (devil's club) dominate the understory with blueberry mainly on elevated organic microsites. *Rubus spectabilis* (salmonberry) occurs in many stands. *Rubus pedatus* (five-leaf bramble) and *Tiarella trifoliata* (foam flower) are common forbs. *Dryopteris dilatata* (shield fern) and *Gymnocarpium dryopteris* (oak fern) are common ferns.



The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	100	42	15-75
<i>Picea sitchensis</i> regen.	90	3	1-15
<i>Tsuga heterophylla</i> regen.	56	6	1-20
<i>Echinopanax horridum</i>	100	27	6-85
<i>Rubus spectabilis</i>	69	4	1-10
<i>Vaccinium</i> sp.	100	38	15-80
<i>Cornus canadensis</i>	90	3	1-10
<i>Listera cordata</i>	67	1	1-3
<i>Rubus pedatus</i>	100	25	6-70
<i>Streptopus amplexifolius</i>	82	1	1-4
<i>Tiarella trifoliata</i>	87	6	1-40
<i>Dryopteris dilatata</i>	82	6	1-30
<i>Gymnocarpium dryopteris</i>	90	5	1-20

Stand Structure:

Spruce heights vary up to 44 m (144 ft.). The trees tend to be taller on uplifted beach ridges and in the 20 to 30 m (65-100 ft.) range on other landscapes. Open grown spruce surrounded by salmonberry are common. Devil's club and salmonberry cover in canopy gaps may be 100 percent with plants over 1.5 m (5 ft.) tall.

Environmental Factors (landscape, soils, and hydrology):

This community type is primarily found on well-drained gravel and sand. The soils are usually young in the flood plains, such as Typic Cryorthents. In the other landscapes, they are better developed, often Typic Haplocryods. The water table occasionally rises into the surface horizons in the flood plain stands, while in most other stands, the water table is typically one meter (3 ft.) or more below the surface.

Succession:

This community may be a mid-seral type that will eventually be replaced by a western hemlock-Sitka spruce dominated forest. Additional study is needed.

Adjacent Communities:

Common adjacent c.t.s are other Sitka spruce community types, such as *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) and *Picea sitchensis*/*Echinopanax horridum*-*Rubus spectabilis* (Sitka spruce/devil's club-salmonberry) on uplifted beach ridges and proximal outwash.

Management Implications:

Tree productivity is high. Stocking is moderate and suitable tree-growing microsites are abundant. Alder is favored on mineral soils, which are easily exposed with ground disturbing logging practices.

Past tractor logging with significant soil disturbance caused changes in stream course, width, and hydrology, which altered sites from coniferous to deciduous forest in Fish Bay, Rodman Bay, Katlian, and Nakwasina drainages on Baranof Island. However, given the stream protection mandated under the 1990 Tongass Timber Reform Act, this situation is unlikely to be repeated. On these sites, shovel yarding is an alternative that may help to maintain soil productivity.

Following clearcutting, devil's club cover declines while salmonberry and blueberry cover increases. Shrub abundance varies with the intensity of disturbance, with greater disturbance favoring salmonberry and currant. Spruce and hemlock seedlings are abundant on organic microsites between dense salmonberry patches (Schrader 1992). Dense, closed canopy patches of spruce and hemlock develop 20 to 30 years following clearcut harvest. However, spruce seedlings in the competitive salmonberry patches are slow to establish and may be inhibited by salmonberry for some time. On some sites, immediate planting of spruce subsequent to clearcut may be effective. Small diameter slash should be removed from planting sites to enhance tree survival. If natural regeneration is desired, slash should be removed from best tree-growing microsites (Schrader 1992). Piling on salmonberry or depressed areas is recommended.

After 30 years, if the soil was not degraded by poor logging practices, a closed stand of spruce with some hemlock develops. Understory vegetation is nearly eliminated.

In riparian corridors, this community type is important as a source of coarse woody debris for anadromous fish stream habitat and for providing bear cover and feeding habitat. Brown bear sign is abundant, especially when this c.t. occurs along salmon streams. Devil's club berries are used by bear during the summer (Schoen and Beier 1990).

When this vegetation type occurs near the coast, bald eagles use the largest spruce trees for nesting and roosting. Soft-wooded spruce snags are valuable for cavity nesters.

Occasional flooding limits road and trail construction. Roads should be avoided in beach and riparian areas.

The type is highly valued for fishing, hiking, and outdoor appreciation. Subsistence uses include fishing, berry picking, and collection of spruce or devil's club.

***Picea sitchensis*/*Echinopanax horridum* Community Type**
Sitka spruce/devil's club: PICSIT/ECHHOR

Number of Stands Sampled: Yakutat-28; Chatham Area-20

Other Studies:

This type, or closely related types, occurs throughout Southeast Alaska. However, this type seems to be more abundant on the Chugach National Forest than the Tongass. It has been described from the Ketchikan Area (DeMeo et al. 1992), Stikine Area (Pawuk and Kissinger in prep.) and Chatham Area (Martin et al. 1995). Worley (1977) described a related type for the outer coast of Glacier Bay National Park and Boggs (1994) described this type for the Copper River Delta. This community is classified at level IV as needleleaf, closed or open, Sitka spruce forest by Viereck et al. (1992).

Distribution:

This c.t. is abundant on uplifted beach ridges, proximal outwash, and other well-drained landscapes.

Vegetation:

This productive forest type is dominated by large *Picea sitchensis* (Sitka spruce). Mature *Tsuga heterophylla* (western hemlock) trees are common in about 30 percent of the stands. Spruce regeneration is common.

Echinopanax horridum (devil's club) dominates the understory with scattered amounts of *Vaccinium* sp. (blueberry) and *Rubus spectabilis* (salmonberry) occurring in many stands. Sitka spruce regeneration is more abundant than western hemlock regeneration. *Rubus pedatus* (five-leaf bramble) and *Tiarella trifoliata* (foam flower) are common forbs. *Dryopteris dilatata* (shield fern), *Gymnocarpium dryopteris* (oak fern), and *Athyrium filix-femina* (lady fern) are common ferns.



The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	100	42	15-80
<i>Picea sitchensis</i> regen	89	4	1-15
<i>Echinopanax horridum</i>	100	47	6-90
<i>Rubus spectabilis</i>	82	5	1-14
<i>Vaccinium</i> sp.	89	6	1-14
<i>Cornus canadensis</i>	57	1	1-3
<i>Rubus pedatus</i>	100	26	1-65
<i>Streptopus amplexifolius</i>	100	1	1-3
<i>Tiarella trifoliata</i>	93	8	1-25
<i>Athyrium filix-femina</i>	82	6	1-40
<i>Dryopteris dilatata</i>	93	8	1-55
<i>Gymnocarpium dryopteris</i>	96	5	1-15

Stand Structure:

Spruce heights vary from 30 to 42 m (100-140 ft.). The trees tend to be taller on uplifted beach ridges and shorter on other landscapes. Open grown spruce trees surrounded by devil's club are common. Devil's club and salmonberry cover in canopy gaps may be 100 percent with plants over 1.8 m (6 ft.) tall.

Environmental Factors (landscape, soils, and hydrology):

This community type is found primarily on well-drained sand or gravel on uplifted beach ridges, flood plains, moraines, and proximal outwash. The soils are usually classified as Oxyaquic Haplocryods in the flood plains and as Typic Haplocryods in the other landscapes. The water table occasionally rises into the surface horizons in the flood plain stands, while in most other stands, the water table is typically one meter (3 ft.) or more below the surface.

On Chatham Area islands, the presence of devil's club usually indicates water movement on or near the soil surface. Devil's club also may indicate high nutrient availability, such as with loess-derived soils. In Yakutat, devil's club is very abundant on many sites with no subsurface water movement, and it is very robust on well-drained sandy soils, such as on uplifted beach ridges. Thus, it is probably indicating high nutrient availability rather than water movement.

Succession:

This community may be a mid-seral type that will eventually be replaced by a western hemlock-Sitka spruce dominated forest type. Additional study is needed.

Adjacent Communities:

This community type often occurs adjacent to other Sitka spruce community types, such as *Picea sitchensis/Vaccinium-Echinopanax horridum* (Sitka spruce/blueberry-devil's club) and *Picea sitchensis/Echinopanax horridum-Rubus spectabilis* (Sitka spruce/devil's club-salmonberry) on uplifted beach ridges and proximal outwash.

Management implications:

Tree productivity is high. Stocking is moderate and suitable tree-growing microsites are common. Maintenance of large organic material for future tree-growing sites is essential for long-term productivity.

Soils are sensitive to disturbance but less so than soils of the spruce/devil's club-salmonberry community type. Alder is favored on mineral soils if these are exposed by ground-disturbing logging practices. Due to this sensitivity of the soils, clearcutting is not recommended. Selection harvest is an alternative that may help to maintain soil productivity. However, selection harvest may increase the chance of stand-level windthrow. Landscape level analysis of wind and disturbance patterns should be considered in planning.

Following clearcutting, devil's club cover declines and salmonberry and fern cover increases. Salmonberry cover is positively correlated with degree of disturbance. Spruce and hemlock seedlings are abundant on organic microsites. If conifers are established immediately, salmonberry usually is not a regeneration problem. However, spruce seedlings in salmonberry patches are slow to establish and may be inhibited by salmonberry for some time. Immediate planting of spruce may be effective in some harvest units. Small diameter slash should be removed from planting sites to enhance seedling survival. If natural regeneration is desired, slash should be removed from best tree-growing microsites (Schrader 1992). Slash piling on salmonberry or depressed areas is recommended. Ferns may also cause some conifer seedling mortality due to blocking of light by dead fronds.

Dense, closed canopy patches of spruce and hemlock develop 20 to 30 years following clearcut harvest if the soil is not degraded due to poor logging practices. Understory vegetation is nearly eliminated after this period.

This type is important as a source of coarse woody debris for anadromous fish stream habitat, for stabilizing active alluvial areas, and for providing bear cover and feeding habitat. Brown bear sign is abundant, especially when this community type occurs along salmon streams. Devil's club berries are used by bear during the summer as a minor portion of the diet (Schoen and Beier 1990). When this type occurs near the coast, bald eagles use the largest spruce trees for nesting and roosting.

Picea sitchensis/Vaccinium sp. Community Type
Sitka spruce/blueberry: PICSIT/VACCIN

Number of Stands Sampled: Yakutat-23; Chatham Area-8

Other Studies:

This type, or closely related types, occurs throughout Southeast Alaska, and has been described from the Ketchikan Area (DeMeo et al. 1992), Stikine Area (Pawuk and Kissinger in prep.) and Chatham Area (Martin et al. 1995). Worley (1977) described a related type for the outer coast of Glacier Bay National Park and Boggs (1994) described a related type for the Copper River Delta. This community is classified at level IV as needleleaf, closed or open, Sitka spruce forest by Viereck et al. (1992).

Distribution:

This community is common on the proximal and distal outwash.

Vegetation:

This moderately productive forest type is dominated by *Picea sitchensis* (Sitka spruce). Mature *Tsuga heterophylla* (western hemlock) trees are common in about 60 percent of the stands. Spruce and western hemlock regeneration are common.

Vaccinium sp. (blueberry) and *Rubus spectabilis* (salmonberry) dominate the understory. *Rubus pedatus* (five-leaf bramble) and *Cornus canadensis* (bunchberry) are common forbs. *Dryopteris dilatata* (shield fern) and *Gymnocarpium dryopteris* (oak fern) are common ferns.



The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	100	46	15-70
<i>Tsuga heterophylla</i>	61	22	1-55
<i>Picea sitchensis</i> regen.	91	6	1-25
<i>Tsuga heterophylla</i> regen.	65	9	1-32
<i>Echinopanax horridum</i>	87	2	1-4
<i>Rubus spectabilis</i>	96	10	1-45
<i>Vaccinium</i> sp.	100	46	2-85
<i>Cornus canadensis</i>	87	7	1-20
<i>Listera cordata</i>	61	2	1-6
<i>Rubus pedatus</i>	91	26	2-50
<i>Streptopus amplexifolius</i>	57	3	1-10
<i>Tiarella trifoliata</i>	61	3	1-10
<i>Dryopteris dilatata</i>	65	5	1-8
<i>Gymnocarpium dryopteris</i>	87	5	1-15

Stand Structure:

Spruce heights vary up to 30 m (100 ft.). The overstory is typically open. Down logs are common.

Environmental Factors (landscape, soils, and hydrology):

This community type is found primarily on well-drained gravel on proximal and distal outwash. The soils are usually classified as Typic Haplocryods. The water table occasionally rises into the surface horizons in the distal outwash stands, while in most other stands the water table is one meter (3 ft.) or more below the surface.

Succession:

This community may be a mid-seral type that will eventually be replaced by a western hemlock-Sitka spruce dominated forest type. Additional study is needed.

Adjacent Communities:

This community often occurs adjacent to other Sitka spruce community types, such as *Picea sitchensis*/*Alnus sinuata* (Sitka spruce/Sitka alder) and *Picea sitchensis*/*Vaccinium-Echinopanax horridum* (Sitka spruce/blueberry-devil's club).

Management Implications:

Tree productivity is moderate and suitable tree-growing microsites are available. The abundant coarse woody debris serves as "nurse" logs and stumps for conifer regeneration, providing a rich, well-drained, and protected microsite. To maintain adequate woody debris, all unmerchantable material should remain on site. Flat to low slope gradients increase options for prescribing a wider array of harvest treatments. However, care must be used to avoid exposing extensive areas of mineral soil.

During the decades (1950s and 1960s) of extensive tractor (bulldozer) logging on Chatham Area islands, mineral soils on these flat sites were often exposed and alder established immediately after logging. Many of these sites are still dominated by alder. In the early 1900s, this community type was logged with low impact techniques near the mouth of Fish Bay, Baranof Island. These sites regenerated with spruce. Similarly, cable logging systems have shown to be less destructive to the soils than tractor logging. However, cable logging disturbs flat portions of the site when the logs are not suspended. Shovel yarding should be used in these cases.

Blueberry, spruce, and hemlock will dominate the understory for a short time (usually less than 25 years) following clearcutting. After 30 years, if the soil is not degraded by poor logging practices, a closed stand of spruce and western hemlock develops which excludes nearly all other species until the canopy matures. If mineral soil is exposed and a seed source nearby, alder will readily establish and dominate a site for 30 to 50 years.

This c.t. provides prime bald eagle habitat when it occurs near salt water (Sidle et al. 1986).

This type is important as a source of coarse woody debris to streams for resident and anadromous fish. Snags are not common but are valuable for cavity nesters.

Road and trail construction on this type is uncomplicated, but care should be taken to avoid exposing mineral soil. It may be necessary to consider flooding impacts on construction.

Picea sitchensis/Seral Community Type
Sitka spruce/Seral: PICSIT/SERAL

Number of Stands Sampled: 4

Other Studies:

This type, or closely related types, occurs throughout Southeast Alaska, and has been described from the outer coast of Glacier Bay National Park (Worley 1977 and 1980) and for the Copper River Delta (Boggs 1994). This community is classified at level IV as needleleaf, open or closed, Sitka spruce forest by Viereck et al. (1992).

Distribution:

This community is uncommon and occurs on uplifted beach ridges and flood plains.

Vegetation:

This community is often a closed canopy "doghair thicket" forest dominated by *Picea sitchensis* (Sitka spruce). Tall shrubs are very sparsely represented. Spruce regeneration is common.

Few forbs occur in this type. *Rubus pedatus* (five-leaf bramble), *Circaea alpina* (enchanter's nightshade) and *Pyrola* sp. (wintergreen) are normally present.



The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	100	56	30-80
<i>Picea sitchensis</i> regen.	75	8	1-20
<i>Circaea alpina</i>	75	3	1-6
<i>Pyrola secunda</i>	75	1	-
<i>Rubus pedatus</i>	100	3	1-5

Stand Structure:

Spruce heights vary up to 25 m (82 ft.). The spruce is generally growing rapidly. The overstory is typically closed. Down logs are rare, however, small diameter spruce snags are usually common. Based on counts of annual growth rings in tree cores, these stands are usually 50 to 120 years old (N=5).

Environmental Factors (landscape, soils, and hydrology):

This community type is primarily found on newly exposed, well-drained, gravel such as on active flood plains and recently uplifted beach ridges. Stands seem to develop in response to abundant spruce seed rain, light availability, and many germination sites.

Soils are usually classified as Typic Cryaquepts or Typic Cryopsamments. The water table occasionally rises into the surface horizons in flood plain stands, but typically is 100 cm (40 in.) or more below the surface.

Succession:

This is an early-seral type that will eventually be replaced by a *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) c.t. and other Sitka spruce types, as the canopy begins to open. It may then be replaced by *Tsuga heterophylla* (western hemlock) forest types.

Adjacent Communities:

This community often occurs adjacent to other early-seral forested community types, such as *Populus trichocarpa*/*Salix* (black cottonwood/willow) and *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on flood plains.

***Picea sitchensis*-*Populus trichocarpa*/*Alnus sinuata* Community Type**
Sitka spruce-black cottonwood/Sitka alder: PICSIT-POPTRI/ALNSIN

Number of Stands Sampled: 6

Other Studies:

Related types have been described for the Copper River Delta (Boggs 1994), for Dixon Harbor in Glacier Bay National Park (Worley 1977), and along the Stikine River (Pawuk and Kissinger in prep.). This community would be classified at level IV as mixed, open, Sitka spruce-black cottonwood forest in Viereck et al. (1992).

Distribution:

This community is common on outburst flood plains, moraines, and active flood plains.

Vegetation:

This open canopy forest type is dominated by *Picea sitchensis* (Sitka spruce) and *Populus trichocarpa* (black cottonwood). *Alnus sinuata* (Sitka alder) dominates the areas between the open grown trees. Spruce regeneration is common.

Rubus spectabilis (salmonberry) and *Echinopanax horridum* (devil's club) contribute to the dense shrub cover between trees. *Rubus pedatus* (five-leaf bramble), *Circaea alpina* (enchanter's nightshade), and *Pyrola* sp. (wintergreen) are common forbs.



The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	100	27	15-35
<i>Populus trichocarpa trichocarpa</i>	100	29	8-55
<i>Picea sitchensis</i> regen	100	14	1-30
<i>Alnus sinuata</i>	100	22	6-60
<i>Echinopanax horridum</i>	100	8	1-30
<i>Rubus spectabilis</i>	100	10	1-40
<i>Viburnum edule</i>	83	2	1-5
<i>Actaea rubra</i>	83	1	-
<i>Circaea alpina</i>	67	25	1-35
<i>Listera cordata</i>	67	2	1-3
<i>Pyrola asarifolia</i>	100	2	1-4
<i>Pyrola secunda</i>	83	5	1-10
<i>Rubus pedatus</i>	67	12	1-20
<i>Streptopus amplexifolius</i>	100	2	1-5
<i>Athyrium filix-femina</i>	83	2	1-5
<i>Dryopteris dilatata</i>	67	1	-

Stand Structure:

Spruce and cottonwood vary in height to 25 m (82 ft.). Generally, the spruce is still rapidly growing while the cottonwood growth has slowed. The overstory is typically open. Down logs are rare and are usually cottonwood. Based on counts of tree core annual growth rings, these stands are usually 80 to 120 years old.

Environmental Factors (landscape, soils, and hydrology):

This community type is primarily found on newly exposed, well-drained, gravel such as on outburst flood plains, young proximal outwash, and recently deglaciated moraines. The soils are usually classified as Oxyaquic Cryumbrepts and Oxyaquic Cryorthents. The water table occasionally rises into the surface horizons in flood plain and proximal outwash stands, but typically is 60 cm (24 in.) or more below the surface. Flooding is rare within most of these stands but occasionally does occur.

Succession:

This is an early-seral type that will eventually be replaced by a *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) c.t. and possibly then by a *Tsuga heterophylla* (western hemlock) forest type. See Figure 10 for an inferred chronosequence diagram for this community on the outburst flood plain.

Adjacent Communities:

This community often occurs adjacent to other early-seral forested community types, such as *Populus trichocarpa*/*Salix* (black cottonwood/willow) on outburst flood plains and *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on flood plains.

***Picea sitchensis*-*Populus trichocarpa*/*Echinopanax horridum* Community Type**
Sitka spruce-black cottonwood/devil's club: PICSIT-POPTRI/ECHHOR

Number of Stands Sampled: 5

Other Studies:

Related types have been described for the Copper River Delta (Boggs 1994), for Dixon Harbor in Glacier Bay National Park (Worley 1977), and along the Stikine River (Pawuk and Kissinger in prep.). This community would be classified at level IV as mixed, closed or open, Sitka spruce-black cottonwood forest in Viereck et al. (1992).

Distribution:

This community is common and occurs on flood plains and proximal outwash.

Vegetation:

The canopy in this forest type is more closed than that of the *Picea sitchensis*-*Populus trichocarpa*/*Alnus sinuata* (Sitka spruce/black cottonwood/Sitka alder) c.t. Generally, this type has twice as much *Picea sitchensis* (Sitka spruce) as *Populus trichocarpa* (black cottonwood) in the canopy. Spruce regeneration is common.

Echinopanax horridum (devil's club) and *Vaccinium* sp. dominate the shrub layer. *Rubus pedatus* (five-leaf bramble) and *Tiarella trifoliata* (foam flower) are common forbs.



The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	100	41	15-65
<i>Populus trichocarpa trichocarpa</i>	100	12	5-35
<i>Picea sitchensis</i> regen.	100	21	1-75
<i>Echinopanax horridum</i>	100	15	5-30
<i>Rubus spectabilis</i>	80	3	1-6
<i>Vaccinium</i> sp.	80	26	1-25
<i>Viburnum edule</i>	60	1	1-2
<i>Circaea alpina</i>	80	6	1-10
<i>Cornus canadensis</i>	100	2	1-3
<i>Listera cordata</i>	80	1	1-2
<i>Pyrola asarifolia</i>	60	1	-
<i>Pyrola secunda</i>	60	2	1-5
<i>Rubus pedatus</i>	100	31	15-40
<i>Streptopus amplexifolius</i>	80	1	-
<i>Tiarella trifoliata</i>	100	8	1-30
<i>Athyrium filix-femina</i>	80	3	1-10
<i>Dryopteris dilatata</i>	60	1	1-2

Stand Structure:

Spruce and cottonwood heights vary to 35 m (115 ft.). Generally the spruce is still growing while cottonwood height growth has ceased. Down logs are uncommon, and are usually cottonwood. Based on counts of tree core annual growth rings, these stands are usually 100 to 200 years old.

Environmental Factors (landscape, soils, and hydrology):

This community type is primarily found on newly exposed, well-drained, gravel on young proximal outwash and flood plains. The soils are usually classified as Typic Cryorthents. The water table occasionally rises into the surface horizons in the flood plain and proximal outwash stands, but typically it is 1 m (3 ft.) or more below the surface. Flooding is rare within most of these stands but does occasionally occur.

Succession:

This is an early-seral type that will eventually be replaced by a *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) c.t. and possibly then by a *Tsuga heterophylla* (western hemlock) forest type.

Adjacent Communities:

This community often occurs adjacent to early-seral forested community types, such as *Populus trichocarpa*/*Rubus spectabilis* (black cottonwood/salmonberry) and *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on flood plains.

Picea sitchensis-*Populus trichocarpa*/Seral Community Type
Sitka spruce-black cottonwood/seral: PICSIT-POPTRI/SERAL

Number of Stands Sampled: 8

Other Studies:

Related types have been described for the Copper River Delta (Boggs 1994), for Dixon Harbor in Glacier Bay National Park (Worley 1977), and along the Stikine River (Pawuk and Kissinger in prep.). This community would be classified at level IV as mixed, closed or open, Sitka spruce-black cottonwood forest type in Viereck et al. (1992).

Distribution:

This community is common and occurs on flood plains, outburst flood plains, and moraines.

Vegetation:

Picea sitchensis (Sitka spruce) and *Populus trichocarpa* (black cottonwood) dominate this forest type. Spruce regeneration is common.

A variety of shrubs such as *Echinopanax horridum* (devil's club) and *Salix* sp. (willow) occur. Common forbs include *Pyrola* sp. (wintergreen), *Lupinus nootkatensis* (nootka lupine), and *Rubus pedatus* (five-leaf bramble).



The following table lists the species that occur in more than 50 percent of the stands (>50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	100	36	15-90
<i>Populus trichocarpa trichocarpa</i>	100	15	5-40
<i>Picea sitchensis</i> regen.	100	16	1-50
<i>Echinopanax horridum</i>	71	2	1-4
<i>Salix sitchensis</i>	57	5	1-15
<i>Vaccinium</i> sp.	86	3	1-10
<i>Cornus canadensis</i>	57	12	1-25
<i>Fragaria chiloensis</i>	57	8	1-25
<i>Listera cordata</i>	86	1	1-3
<i>Lupinus nootkatensis</i>	57	13	2-40
<i>Pyrola asarifolia</i>	71	5	1-20
<i>Pyrola secunda</i>	100	3	1-4
<i>Rubus pedatus</i>	86	8	1-25
<i>Streptopus amplexifolius</i>	71	1	-
<i>Athyrium filix-femina</i>	57	2	1-4
<i>Gymnocarpium dryopteris</i>	57	6	1-20

Stand Structure:

Spruce and cottonwood heights vary to 20 m (65 ft.). Generally, height growth is still occurring in both spruce and cottonwood. Down logs are uncommon and are usually cottonwood. Based on counts of tree core annual growth rings, these stands are usually 40 to 100 years old.

Environmental Factors (landscape, soils, and hydrology):

This community type is found primarily on newly exposed, well-drained, gravel such as outburst flood plains, active flood plains, and recently deglaciated moraines. The soils are usually classified as Typic Cryorthents. The water table occasionally rises into the surface horizons in the flood plain stands, but typically it is 100 cm (40 in.) or more below the surface. Flooding is rare in most of these stands but does occasionally occur.

Succession:

This is an early-seral type that will eventually be replaced by a *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) c.t. and possibly then by a *Tsuga heterophylla* (western hemlock) forest type.

Adjacent Communities:

This community often occurs adjacent to other early-seral forested community types, such as *Populus trichocarpa*/*Rubus spectabilis* (black cottonwood/salmonberry) and *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on flood plains.

***Populus trichocarpa*/Salix Community Type**
Black cottonwood/willow: POPTRI/SALIX

Number of Stands Sampled: 8

Other Studies:

Related types have been described for the Copper River Delta (Boggs 1994) and along the Stikine River (Pawuk and Kissinger in prep.). This community is classified at level IV as either broadleaf, open forest, or woodland, black cottonwood type by Viereck et al. (1992).

Distribution:

This community is common and occurs on flood plains and outburst flood plains.

Vegetation:

This forest type is dominated by *Populus trichocarpa* (black cottonwood) with scattered *Picea sitchensis* (Sitka spruce) in the overstory and understory. Spruce regeneration is common.

Salix (willow) and *Alnus sinuata* (Sitka alder) dominate the areas between the widely-spaced black cottonwood trees. Common forbs include *Circaea alpina* (enchanter's nightshade), *Epilobium angustifolium* (fireweed), and *Pyrola sp.* (wintergreen).



The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	63	8	1-14
<i>Populus trichocarpa trichocarpa</i>	100	23	5-60
<i>Picea sitchensis</i> regen.	88	3	1-5
<i>Alnus sinuata</i>	75	46	5-80
<i>Rubus spectabilis</i>	63	8	1-20
<i>Salix barclayi</i>	88	12	2-30
<i>Salix sitchensis</i>	88	12	3-20
<i>Viburnum edule</i>	63	2	1-2
<i>Achillea borealis</i>	75	1	1-3
<i>Actaea rubra</i>	63	2	1-6
<i>Circaea alpina</i>	75	15	1-60
<i>Epilobium angustifolium</i>	63	4	1-8
<i>Pyrola asarifolia</i>	88	7	1-20
<i>Pyrola secunda</i>	75	3	1-8
<i>Rubus arcticus</i> spp. <i>stellatus</i>	63	6	1-20
<i>Streptopus amplexifolius</i>	75	1	1-2
<i>Trientalis europaea</i>	63	2	1-5

Stand Structure:

Cottonwood heights vary to 20 m (65 ft.). Cottonwood is generally small and still growing in height. Down logs are uncommon. Based on counts of tree core annual growth rings, these stands are usually 20 to 80 years old.

Environmental Factors (landscape, soils, and hydrology):

This community type is found primarily on newly exposed, well-drained, gravel such as outburst flood plains and active flood plains. The soils are usually classified as Oxyaquic Cryofluvents. The water table occasionally rises into the surface horizons in the flood plain stands, but typically is 80 cm (30 in.) or more below the surface. Flooding occurs seasonally or rarely in these stands.

Succession:

This is an early-seral type that will eventually be replaced by a *Picea sitchensis* (Sitka spruce) forest type and possibly then by a *Tsuga heterophylla* (western hemlock) forest type. However, this process may be quite slow, since spruce establishment is difficult due to competition with alder (Chapin et al. in press).

Adjacent Communities:

This c.t. often occurs adjacent to other early-seral forested community types such as *Picea sitchensis*-*Populus trichocarpa*/*Alnus sinuata* (Sitka spruce-black cottonwood/Sitka alder) and *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on flood plains.

Populus trichocarpa/*Rubus spectabilis* Community Type
Black cottonwood/salmonberry: POPTRI/RUBSPE

Number of Stands Sampled: 11

Other Studies:

Related types have been described for the Copper River Delta (Boggs 1994) and along the Stikine River (Pawuk and Kissinger in prep.). This community is classified at level IV as either broadleaf, open forest, or black cottonwood woodland by Viereck et al. (1992).

Distribution:

This community is common and occurs on outburst flood plains and active flood plains.

Vegetation:

This forest type is dominated by *Populus trichocarpa* (black cottonwood). Spruce and cottonwood regeneration are uncommon in the thick shrub cover.

Alnus sinuata (Sitka alder) and *Rubus spectabilis* (salmonberry) often form a nearly impenetrable thicket between the widely-spaced black cottonwood trees. Forbs are sparsely represented in this type; the most common species is *Circaea alpina* (enchanter's nightshade).



The following table lists the species that occur in more than 50 percent of the stands (>50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Populus trichocarpa trichocarpa</i>	100	23	7-35
<i>Alnus sinuata</i>	100	50	17-90
<i>Echinopanax horridum</i>	91	23	1-60
<i>Rubus spectabilis</i>	100	51	20-85
<i>Sambucus racemosa</i>	73	7	1-20
<i>Viburnum edule</i>	73	3	1-15
<i>Circaea alpina</i>	91	14	1-65
<i>Pyrola asarifolia</i>	64	4	1-10
<i>Streptopus amplexifolius</i>	82	1	1-2
<i>Calamagrostis canadensis</i>	55	2	1-5
<i>Athyrium filix-femina</i>	82	10	3-20

Stand Structure:

Cottonwood ranges in height to 20 m (65 ft.). The cottonwood is generally small and still growing. Down logs are uncommon. Based on tree and shrub annual ring counts, these stands are usually 40 to 80 years old. The alder is often about the same age as the cottonwood.

Environmental Factors (landscape, soils, and hydrology):

This community type is primarily found on newly exposed, well-drained, gravel such as outburst flood plains and flood plains, and on the parabolic and linear dunes on the outburst flood plains. The soils are usually classified as Oxyaquic Cryofluvents on the gravel and Typic Cryopsamments on the sand dunes. The water table occasionally rises into the surface horizons in flood plain stands, but typically is 80 cm (30 in.) or more below the surface. Flooding occurs seasonally to rarely in flood plain stands.

Succession:

This is an early-seral type that will eventually be replaced by a *Picea sitchensis* (Sitka spruce) forest type, and possibly then by a *Tsuga heterophylla* (western hemlock) forest type. However, this process may be quite slow, since spruce establishment is uncommon due to competition with alder (Chapin et al. in press).

Adjacent Communities:

This community often occurs adjacent to other early-seral forested community types, such as *Picea sitchensis*-*Populus trichocarpa*/*Alnus sinuata* (Sitka spruce-black cottonwood/Sitka alder) and *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on flood plains and outburst flood plains.

Populus trichocarpa/*Echinopanax horridum* Community Type
Black cottonwood/devil's club: POPTRI/ECHHOR

Number of Stands Sampled: 5

Other Studies:

Related types have been described for the Copper River Delta (Boggs 1994) and along the Stikine River (Pawuk and Kissinger in prep.). This community is classified at level IV as either broadleaf, open forest, or black cottonwood woodland by Viereck et al. (1992).

Distribution:

This community is common and occurs on the outburst and active flood plains.

Vegetation:

Populus trichocarpa (black cottonwood) dominates this forest type. Spruce and cottonwood regeneration are uncommon in the thick shrub cover.

Alnus sinuata (Sitka alder), *Echinopanax horridum* (devil's club), and *Sambucus racemosa* (red elderberry) often form a nearly impenetrable thicket between the widely-spaced black cottonwood trees. Forbs are sparsely represented in this type; the most common species is *Circaea alpina* (enchanter's nightshade). *Athyrium filix-femina* (lady fern) is a common fern.



The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Populus trichocarpa trichocarpa</i>	100	26	10-45
<i>Alnus sinuata</i>	100	44	10-70
<i>Echinopanax horridum</i>	100	22	1-40
<i>Ribes bracteosum</i>	80	1	1-2
<i>Rubus spectabilis</i>	100	7	2-15
<i>Sambucus racemosa</i>	80	13	1-23
<i>Actaea rubra</i>	80	1	-
<i>Circaea alpina</i>	100	13	3-30
<i>Heracleum lanatum</i>	60	2	1-5
<i>Streptopus amplexifolius</i>	80	1	1-2
<i>Athyrium filix-femina</i>	100	12	1-20

Stand Structure:

Cottonwood heights vary to 20 m (65 ft.). The cottonwood is generally 20 to 70 cm (8-30 in.) in diameter. Down logs are uncommon. Based on tree and shrub annual ring counts, these stands are usually 40 to 150 years old. The alder clones appear to be the same age as the cottonwood.

Environmental Factors (landscape, soils, and hydrology):

This community type is primarily found on newly exposed, well-drained, gravel such as outburst and active flood plains. The soils are usually classified as Typic Cryorthents. The water table occasionally rises into the surface horizons in flood plain stands, but typically is 80 cm (30 in.) or more below the surface. Flooding is rare.

Succession:

This is an early-seral type that will eventually be replaced by a *Picea sitchensis* (Sitka spruce) forest type and then possibly by a *Tsuga heterophylla* (western hemlock) forest type. However, this process may be quite slow, since spruce establishment is uncommon due to competition with alder (Chapin et al. in press).

Adjacent Communities:

This community often occurs adjacent to other early-seral forested community types such as *Picea sitchensis*-*Populus trichocarpa*/*Alnus sinuata* (Sitka spruce-black cottonwood/Sitka alder) and *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on active and outburst flood plains.

Pinus contorta/Sphagnum Community Type
Lodgepole pine/peatmoss: PINCON/SPHAGN

Number of Stands Sampled: 7

Other Studies:

Related types have been described for Southeast Alaska (Neiland 1971; Bosworth 1985; DeMeo et al. 1992; Martin et al. 1995; Pawuk and Kissinger in prep.). This community is classified at level IV as needleleaf woodland, lodgepole pine type by Viereck et al. (1992) and as forested wetland by DeMeo and Loggy (1989). In the Cowardin et al. (1979) system, this type is classified as palustrine needle-leaved, evergreen forested wetland.

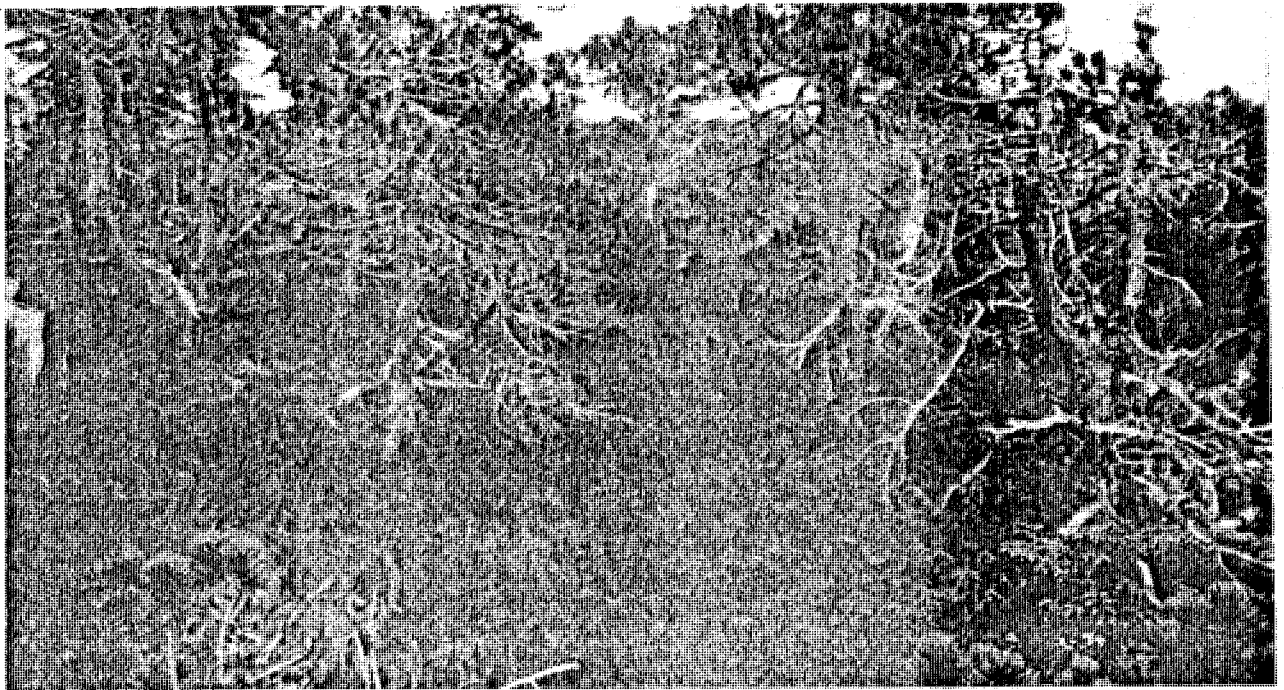
Distribution:

This is the northernmost extent of this community type within Southeast Alaska. The type is rare and occurs only on portions of the kettle-kame topography of the Pike Lakes area and in small scattered stands within the distal outwash and the uplifted tidal flats.

Vegetation:

Pinus contorta contorta (the lodgepole pine variety known as shore pine) dominates this woodland type. Limited regeneration is common for most conifer species, although only lodgepole grows to tree height.

Tall shrubs are uncommon. Subshrubs such as *Empetrum nigrum* (crowberry), *Oxycoccus palustris* (bog cranberry), and *Ledum groenlandicum* (Labrador tea) are well represented. Common forbs are *Cornus canadensis* (bunchberry) and *Sanguisorba menziesii* (menzies burnet). Sedges are well represented, such as *Carex sitchensis* (Sitka sedge) and *Trichophorum caespitosum* (tufted clubrush).



The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	57	1	-
<i>Pinus contorta contorta</i>	100	10	1-20
<i>Picea sitchensis</i> regen.	71	2	1-5
<i>Pinus contorta</i> regen.	100	10	1-15
<i>Tsuga heterophylla</i> regen.	57	1	1-3
<i>Menziesia ferruginea</i>	71	1	-
<i>Empetrum nigrum</i>	100	7	2-20
<i>Kalmia polifolia</i>	71	2	1-4
<i>Ledum groenlandicum</i>	86	5	2-15
<i>Oxycoccus palustris</i>	86	12	1-65
<i>Vaccinium uliginosum</i>	86	5	1-15
<i>Cornus canadensis</i>	100	2	1-4
<i>Dodecatheon jeffreyi</i>	57	1	-
<i>Drosera rotundifolia</i>	71	2	1-3
<i>Fauria crista-galli</i>	57	7	1-15
<i>Gentiana douglasiana</i>	71	2	1-4
<i>Geum calthifolium</i>	71	1	1-2
<i>Pedicularis parviflora</i>	71	1	-
<i>Platanthera dilatata</i>	86	1	-
<i>Sanguisorba menziesii</i>	71	12	10-15
<i>Calamagrostis canadensis</i>	71	1	1-4
<i>Carex pauciflora</i>	71	8	2-15
<i>Carex pluriflora</i>	71	9	1-40
<i>Carex sitchensis</i>	86	8	1-30
<i>Deschampsia caespitosa</i>	57	4	-
<i>Eriophorum angustifolium</i>	71	12	4-20
<i>Trichophorum caespitosum</i>	71	17	4-35

Stand Structure:

Lodgepole heights vary to 12 m (40 ft.), with most in the 3 to 5 m (9-15 ft.) range. The lodgepole is generally 8 to 35 cm (3-14 in.) in diameter. Down logs are uncommon.

Environmental Factors (landscape, soils, and hydrology):

This community type is found primarily on one of the oldest deglaciated landscapes on the Yakutat foreland, the kettle-kame topography in the Pike Lakes area (Peteet 1991). The soils are usually classified as Terric Cryosaprists or Typic Cryaquents (where the organic matter is <20 cm). They have an organic matter depth that averages 90 cm (35 in.) over the mineral horizon (glacial till or bedrock). The water table typically varies from 0 to 30 cm (0-12 in.) below the surface. It is often "perched" on top of well-decomposed peat horizons in the soil profile.

Succession:

This is a late-seral type that appears to have been self-perpetuating for thousands of years. See Figure 4 for an inferred chronosequence diagram for this c.t. on moraines and the kettle-kame topography.

Adjacent Communities:

This community often occurs adjacent to *Carex livida-Trichophorum caespitosum* (livid sedge-tufted clubrush) and *Tsuga mertensiana/Vaccinium* (mountain hemlock/blueberry) on the kettle-kame landscape.

Picea sitchensis/sphagnum Community Type
Sitka spruce/peat moss: PICSIT/SPHAGN

Number of Stands Sampled: 7

Other Studies:

Related types have been described for Dixon Harbor in Glacier Bay National Park (Worley 1977), and the Copper River Delta (Boggs 1994). This community is classified at level IV as scrub, dwarf tree, woodland, Sitka spruce bog by Viereck et al. (1992) and as palustrine needle-leaved, evergreen forested wetland by Cowardin et al. (1979).

Distribution:

This community is uncommon. It occurs as small scattered stands on distal outwash and uplifted tidal flats.

Vegetation:

This type is dominated by *Picea sitchensis* (Sitka spruce) or *Tsuga mertensiana* (mountain hemlock). Limited regeneration is common for both conifer species.

The tall shrub layer is dominated by *Myrica gale* (sweetgale) and *Vaccinium* sp. (blueberry). Common subshrubs are *Empetrum nigrum* (crowberry) and *Oxycoccus palustris* (bog cranberry). Common forbs are *Cornus canadensis* (bunchberry) and *Rubus arcticus* (nagoonberry). The two most common sedges are *Carex sitchensis* (Sitka sedge) and *Eriophorum angustifolium* (cotton grass).



The following table lists the species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs (Yakutat data).

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i>	71	10	2-15
<i>Picea sitchensis</i> regen.	86	7	1-20
<i>Myrica gale</i>	86	17	1-65
<i>Vaccinium</i> sp.	57	7	1-20
<i>Empetrum nigrum</i>	57	13	1-25
<i>Oxycoccus palustris</i>	57	11	3-25
<i>Cornus canadensis</i>	57	8	2-15
<i>Gentiana douglasiana</i>	57	1	-
<i>Platanthera dilatata</i>	57	2	1-5
<i>Rubus arcticus</i> spp. <i>stellatus</i>	86	2	1-5
<i>Streptopus amplexifolius</i>	71	1	1-2
<i>Carex sitchensis</i>	57	48	5-85
<i>Eriophorum angustifolium</i>	71	10	3-15

Stand Structure:

Tree heights vary to 12 m (40 ft.), with most in the 4 to 6 m (12-18 ft.) range. The spruce is generally 12 to 40 cm (5-16 in.) in diameter. Down logs are uncommon.

Environmental Factors (landscape, soils, and hydrology):

This uncommon community type is found primarily on distal outwash and uplifted tidal flats, although it is also found on older moraines. The soils are usually classified as Histic Cryaquepts and Terric Cryofibrists. They have an average organic matter depth of 41 cm (16 in.) over the mineral horizon (fine gravel to silt). The water table is typically between 0 and 30 cm (0-12 in.) of the surface.

Succession:

This is a late-seral type that appears to be stable on these sites. See Figure 7 for an inferred chronosequence diagram for this community on uplifted tidal flats.

Adjacent Communities:

This type often occurs adjacent to *Myrica gale*/*Carex sitchensis* (sweetgale/Sitka sedge) and *Picea sitchensis*/*Vaccinium* (Sitka spruce/blueberry) on the distal outwash and uplifted tidal flats.

SHRUB TYPES: ALDER AND SALMONBERRY

Ecological Setting and Management Interpretations:

In general, alder community types are found on mineral soils in upland locations. They are most common along rivers on old terraces, along newly uplifted beaches, on stabilized sand dunes, and on the rolling bedrock hills of the Tanis Mesa area.

Alnus sinuata (Sitka alder) was considered a seral species that facilitated the growth of conifers by increasing soil fertility through nitrogen fixation and then succumbing to competition from later successional species (Lawrence 1951). More recent work (Schrader 1992; Chapin et al. in press) suggests that Sitka alder, once established, has strong competitive abilities and inhibits spruce seedling germination. Therefore, some alder communities may be much slower to succeed to Sitka spruce types than previously thought. Indeed, many *Alnus sinuata* (Sitka alder) c.t.s on stabilized sand dunes and along high river terraces may be stable community types for many decades. This is further supported by the *Alnus sinuata-Malus fusca* (Sitka alder-crabapple) and *Alnus sinuata-Rubus spectabilis* (Sitka alder-salmonberry) types that appear to be quite long-lived community types on the bedrock hills of the Tanis Mesa area.

Another common alder species in Southeast Alaska, *Alnus rubra* (red alder), has been found on the Yakutat foreland, but was not seen during this three year study. However, *Alnus rubra* (red alder) is a common species in some community types reported for Lituya Bay (Worley 1980), just 80 km (50 miles) down the coast from Yakutat. Therefore, the species appears to have reached its northern limit along this stretch of the Gulf Coast.

Alnus sinuata-Salix sitchensis Community Type Sitka alder-Sitka willow: ALNSIN-SALSIT

Number of Stands Sampled: 5

Other Studies:

A *Salix barclayi-Salix sitchensis-Alnus sinuata* (barclay willow-Sitka willow-Sitka alder) community type was described by Batten et al. (1978) for the Yakutat area. This *Alnus sinuata-Salix sitchensis* (Sitka alder-Sitka willow) type is classified at level IV as tall scrub, closed, alder-willow by Viereck et al. (1992).

Distribution:

This community is uncommon. It is found primarily on flood plains along river channels, but also on outburst flood plains and occasionally on uplifted tidal flats.

Vegetation:

Alnus sinuata (Sitka alder) and *Salix sitchensis* (Sitka willow) form a 4 m (13 ft.) tall closed canopy. The basal diameter for both species is generally 8 to 9 cm (3-3.5 in.) with ages 20 to 30 years. Underneath are plants that can tolerate yearly flooding and competition for nutrients and light with the tall shrubs. Bryophytes are generally sparse.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Alnus sinuata</i>	100	52	25-65
<i>Rubus spectabilis</i>	80	27	1-40
<i>Salix sitchensis</i>	100	21	5-45
<i>Sambucus racemosa</i>	60	2	1-4
<i>Viburnum edule</i>	80	1	-
<i>Angelica genuflexa</i>	60	5	1-9
<i>Circaea alpina</i>	80	12	2-25
<i>Equisetum arvense</i>	80	5	1-15
<i>Geum macrophyllum</i>	60	8	5-15
<i>Heracleum lanatum</i>	60	22	2-50
<i>Stellaria crispa</i>	60	1	-

Environmental Factors (landscape, soils, and hydrology):

This type is located on point bars along rivers and other locations where the water table is within 1 meter (3 ft.) of the surface and moving through the soil. The soils are young, typically formed from sandy alluvium, and have little or no organic horizon development. The soils are classified as Oxyaquic Cryofluvents. These stands are flooded yearly, commonly in the summer along glacial rivers and in autumn along nonglacial rivers.

Succession:

This type falls in a sequence of types that develop on older gravel and sandbars of foreland rivers. See Figure 9 for an inferred chronosequence diagram for this community on flood plains. *Salix sitchensis* (Sitka willow) is the shrub type closest to the river. This *Alnus sinuata*-*Salix sitchensis* (Sitka alder-Sitka willow) type occurs on slightly higher surfaces. *Picea sitchensis*-*Populus trichocarpa*/*Alnus sinuata* (Sitka spruce-black cottonwood/Sitka alder) or *Populus trichocarpa*/*Rubus spectabilis* (black cottonwood/salmonberry) are found on older terraces.

Adjacent Communities:

The *Salix sitchensis* (Sitka willow), *Picea sitchensis*-*Populus trichocarpa*/*Alnus sinuata* (Sitka spruce-black cottonwood/Sitka alder), and *Populus trichocarpa*/*Rubus spectabilis* (black cottonwood/salmonberry) types are the most common associated types.

Alnus sinuata-*Malus fusca* Community Type
Sitka alder-crabapple: ALNSIN-MALFUS

Number of Stands Sampled: 5

Other Studies:

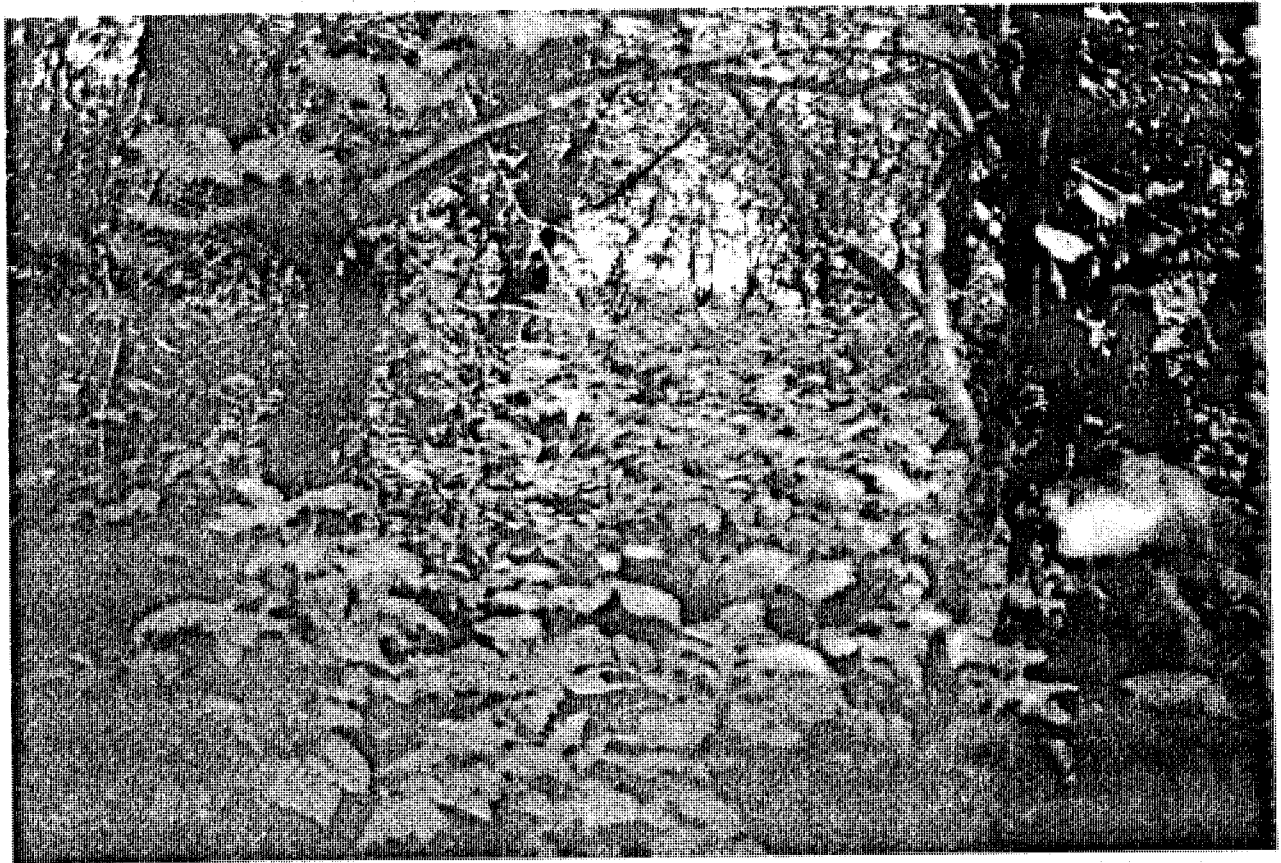
Although undescribed in the literature, related types may occur in other parts of Southeast Alaska. The most similar type in Viereck et al. (1992) at level IV is tall scrub, closed, alder.

Distribution:

This community is rare, and is found only on the rolling bedrock hills in the Tanis Mesa area.

Vegetation:

The overstory is dominated by *Alnus sinuata* (Sitka alder) and *Malus fusca* (crabapple) while a lower tier of *Rubus spectabilis* (salmonberry) forms an almost impenetrable thicket. *Athyrium filix-femina* (lady fern) is common. The herb, graminoid, and bryophyte layers are sparse under the dense shrub cover. *Malus fusca* (crabapple) is about 5 m tall (16 ft.), while *Alnus sinuata* (Sitka alder) is generally 4 m (13 ft.) tall. Ages of two crabapple trees in these stands were 65 and 110 years. The average dbh was 10 cm (4 in.) for the crabapples. The alder has smaller stems, about 7 cm (3 in.) dbh. Ages of two alder cored at the base were 28 and 38 years.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Alnus sinuata</i>	100	42	20-60
<i>Malus fusca</i>	100	36	10-60
<i>Rubus spectabilis</i>	100	58	20-80
<i>Boschniakia rossica</i>	80	1	-
<i>Circaea alpina</i>	80	2	1-3
<i>Epilobium angustifolium</i>	60	1	1-2
<i>Heracleum lanatum</i>	60	1	1-3
<i>Maianthemum dilatatum</i>	60	8	2-20
<i>Streptopus amplexifolius</i>	80	1	-
<i>Veratrum viride</i>	100	1	1-2
<i>Viola epipsila</i>	60	1	-
<i>Calamagrostis canadensis</i>	80	4	1-10
<i>Athyrium filix-femina</i>	100	22	8-40
<i>Gymnocarpium dryopteris</i>	60	1	-
<i>Thelypteris phegopteris</i>	60	5	1-10

Environmental Factors (landscape, soils, and hydrology):

This type occurs only on the knolls in the rolling bedrock hills. This landscape is one of the oldest on the Yakutat foreland (basal peat core of Tanis Mesa yielded a date of over 6,000 years B.P., Molnia 1986). Therefore, the soils are relatively well-developed Inceptisols and Spodosols over bedrock or till. These types are generally well drained except where the soils are quite shallow to bedrock.

Succession:

The dense vegetation of this type appears to render establishment of tree species very difficult. Hence, the type appears stable and may have occupied these sites for hundreds of years. See Figure 11 for an inferred chronosequence diagram for this c.t. on the rolling bedrock hills.

Adjacent Communities:

Alnus sinuata-*Rubus spectabilis* (Sitka alder-salmonberry) is a c.t. that also is common on the bedrock knolls. On the lowland areas between the knolls, *Myrica gale*/*Carex sitchensis* (sweetgale/Sitka sedge) dominates on the 1 to 2 m (40-80 in.) deep organic soils.

Alnus sinuata-Rubus spectabilis Community Type
Sitka alder-salmonberry: ALNSIN-RUBSPE

Number of Stands Sampled: 14

Other Studies:

This type is common in avalanche and landslide chutes in many parts of Southeast Alaska. It has been described for the flood plains of the Copper River Delta (Boggs 1994) and from the outer coast of Glacier Bay National Park (Worley 1977). This type has also been described for other locations around the state (See Viereck et al. 1992). This type is classified at level IV as tall scrub, closed, alder by Viereck et al. (1992).

Distribution:

This community is abundant. It is found on the lower mountain slopes of the Brabazon Range, on the bedrock hills of the Tanis Mesa area, on early successional sites such as portions of the outburst flood plains, and on active flood plains.

Vegetation:

Alnus sinuata (Sitka alder) shrubs in the older, stable communities on bedrock have 10 to 25 cm (4-10 in.) basal diameters. Three large alder cored at the base had ages of 55 to 75 years. In seral alder stands, stem size and age of the alders are typically lower. The average combined shrub canopy cover is frequently over 150%. Most other species, including bryophytes, are sparsely distributed. *Equisetum arvense* (meadow horsetail) is sometimes common on stabilized sand dunes.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Alnus sinuata</i>	100	76	50-99
<i>Echinopanax horridum</i>	57	11	1-25
<i>Rubus spectabilis</i>	100	56	15-95
<i>Sambucus racemosa</i>	79	11	1-25
<i>Circaea alpina</i>	86	5	1-25
<i>Athyrium filix-femina</i>	100	15	1-60

Environmental Factors (landscape, soils, and hydrology):

This c.t. is an early successional type on the outburst flood plains (especially on the stabilized dunes) and along the active flood plains. It is a stable type on the Tanis Mesa bedrock hills and on the Brabazon Range footslopes. In these locations, it occurs on well-developed Inceptisols or Spodosols (Lithic Cryumbrepts and Typic Haplocryods). On the active and outburst flood plains, the parent material is generally fine sand to sand. Soils are Cryofluvents in the flood plains and Cryopsammets on the stabilized sand dunes of the outburst flood plains. The soils are well drained with the water table generally below 1 meter (3 ft.), except on flood plains. These latter sites flood yearly.

Succession:

This successional community type occurs on many better drained landscapes. See Figures 10 and 11 for inferred chronosequences for this community on rolling bedrock hills and outburst flood plains. On other landscapes, this type seems quite stable. Worley (1977) describes this type as the dominant shrub type of avalanche chutes and landslide tracks. These areas do not appear to be changing in composition or structure and are in biotic equilibrium with their environment.

On the flood plains and sand dunes, this type will eventually be succeeded by a seral Sitka spruce community and then *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club). However, this may take many decades as it is difficult for spruce seedlings to establish in alder communities (Schrader 1992; Chapin et al. in press). In his work on primary succession in Glacier Bay, Fastie (1994) noted that alder thickets are associated with reduced spruce density.

Adjacent Communities:

Alnus sinuata-*Malus fusca* (Sitka alder-crabapple) is a commonly associated type on the Tanis Mesa bedrock hills. *Populus trichocarpa*/*Rubus spectabilis* (black cottonwood/ salmonberry) is an associated seral type on the outburst flood plain sand dunes and on active flood plains.

Alnus sinuata/Graminoid Community Type
Sitka alder/graminoid: ALNSIN/GRAMIN

Number of Stands Sampled: 5

Other Studies:

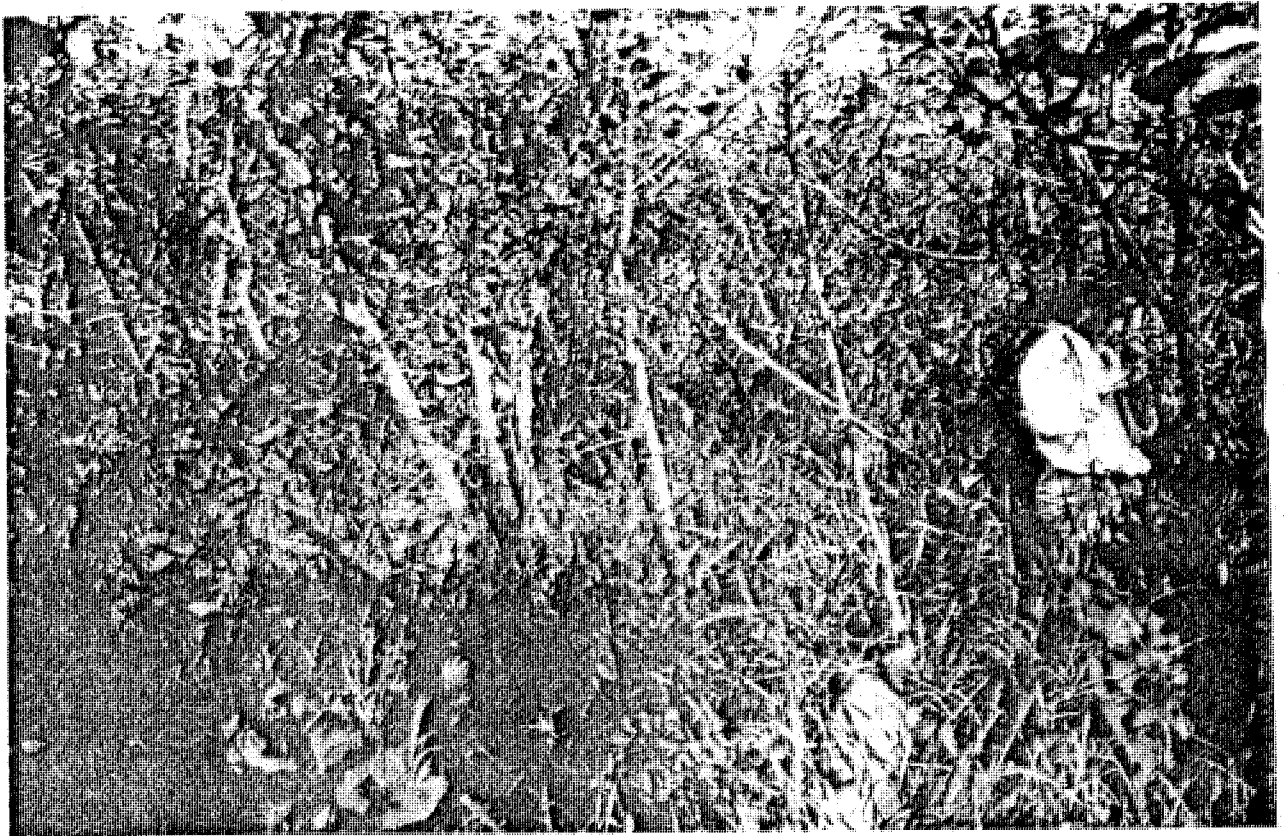
A closely related type, *Alnus sinuata*/*Carex sitchensis* (Sitka alder/Sitka sedge), was described by Boggs (1994) for flood plains of the Copper River Delta. See Viereck et al. 1992 for other closely related types. This type is classified at level IV as tall scrub, closed, shrub swamp, alder by Viereck et al. (1992) and as palustrine, scrub-shrub, broad-leaved deciduous wetland by Cowardin et al. (1979).

Distribution:

This c.t. is uncommon. It occurs on early successional locations, such as outburst flood plains and along streams and rivers.

Vegetation:

The sampled stands were all young with small-stemmed shrubs. For example, basal stem diameters of 25 year old alder averaged 6 cm (2.4 in.). The alder canopy height is about 4 meters (12 ft.). The understory is quite variable with some stands having high canopy cover of *Scirpus microcarpus* (small-fruit bulrush), *Calamagrostis canadensis* (bluejoint), or *Deschampsia caespitosa* (hairgrass). Bryophyte cover is generally less than 40 percent, with *Rhytidiadelphus* species dominating.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Alnus sinuata</i>	100	66	20-90
<i>Salix barclayi</i>	80	10	2-30
<i>Achillea borealis</i>	60	5	1-15
<i>Angelica genuflexa</i>	60	7	1-10
<i>Lysichitum americanum</i>	60	14	1-30
<i>Calamagrostis canadensis</i>	60	9	1-20
<i>Deschampsia caespitosa</i>	60	18	3-45

Environmental Factors (landscape, soils, and hydrology):

These stands occur on flood plains, uplifted tidal flats, and outburst flood plains. Water tables fluctuate widely but are frequently within 20 to 60 cm (8-24 in.) of the surface. Most of the soils are young and composed of fine sand to sand (Typic Cryaquents and Oxyaquic Cryumbrepts).

Succession:

These stands will probably be replaced by willows and sedges if the water table remains close to the surface. However, if the water table is typically below 50 cm (20 in.) and flooding is brief, this type will gradually be succeeded by *Picea sitchensis* (Sitka spruce).

Adjacent Communities:

In adjacent areas with higher water tables, *Salix barclayi*/*Carex sitchensis* (barclay willow/Sitka sedge) is common. On flood plains, *Lupinus nootkatensis*/*Salix setchelliana* (nootka lupine/setchell willow) is common.

Rubus spectabilis/*Athyrium filix-femina* Community Type
Salmonberry/lady fern: RUBSPE/ATHFIL

Number of Stands Sampled: 2

Other Studies:

Although it seems to occur throughout Southeast Alaska in small patches, this community is not reported in the literature.

Distribution:

This community is uncommon. It occurs on the lower mountain slopes of the Brabazon Range and on the rolling bedrock hills in the Tanis Mesa area.

Vegetation:

The combined cover of *Rubus spectabilis* (salmonberry) and *Athyrium filix-femina* (lady fern) is generally near 100 percent and seems to limit the growth of many other species. Hence, species diversity is low.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Echinopanax horridum</i>	100	3	1-4
<i>Rubus spectabilis</i>	100	80	70-90
<i>Cardamine umbellata</i>	100	1	-
<i>Circaea alpina</i>	100	2	1-2
<i>Heracleum lanatum</i>	100	3	-
<i>Stellaria crispa</i>	100	28	15-40
<i>Streptopus amplexifolius</i>	100	1	-
<i>Veratrum viride</i>	100	3	2-3
<i>Calamagrostis canadensis</i>	100	5	1-10
<i>Athyrium filix-femina</i>	100	15	1-60

Environmental Factors (landscape, soils, and hydrology):

This type occurs on shallow, loamy soils (Inceptisols) over bedrock. Ground water commonly moves through the soil and the water table is generally less than one meter (3 ft.) below the surface.

Succession:

The dense shrub and fern cover precludes establishment of many other species. Therefore, these types are probably quite stable.

Adjacent Communities:

This type is often adjacent to *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on knoll sideslopes of the rolling bedrock hills, and mesic forb stands on nutrient-rich slopes.

SHRUB TYPES: WILLOW

Ecological Setting and Management Interpretations:

There are five tall willow species on the study area: *Salix alaxensis* (felt-leaf willow), *Salix barclayi* (barclay willow), *Salix commutata* (undergreen willow), *Salix hookeriana* (hooker willow), and *Salix sitchensis* (Sitka willow). Some communities formed by these species are early-seral types that will eventually be replaced by conifer communities. Other communities appear to be late-seral within very moist to wet, moderately productive sites. Evidence suggests that once willows have established, they may hinder natural regeneration and growth of conifers (Klinka 1989).

The willow species occupy sites with a specific nutrient/water gradient that determines their distribution. *Salix alaxensis* (felt-leaf willow) was most commonly found in newly vegetated areas, such as on well-drained outwash gravels just south of Harlequin Lake and near the Alsek River. *Salix hookeriana* (hooker willow) was found in much wetter conditions, occurring commonly near the coast along tidally influenced streams and in seasonally inundated shrublands. Over the extent of its range, it is generally restricted to very moist to wet soils (Klinka 1989). *Salix sitchensis* (Sitka willow) is the most common riparian species and is generally found on flood plains with moderate nitrogen availability (Klinka 1989). This species dominates along the river banks of the Situk River. *Salix barclayi* (barclay willow) and *Salix commutata* (undergreen willow) are the most widely distributed species and are normally found together. They have wide ecological amplitude and are found associated with *Salix alaxensis* (felt-leaf willow) in 2 to 3 m (6-9 ft.) tall stands on well drained outwash gravels and in diminutive form in *Sphagnum*-dominated peatlands.

Browsing by moose was noted on all five tall willow species. The most heavily browsed species are *Salix alaxensis* (felt-leaf willow) and *Salix hookeriana* (hooker willow). *Salix barclayi* (barclay willow) is the most commonly browsed species because it is the most widely distributed willow on the foreland. *Salix sitchensis* (Sitka willow) was lightly browsed. It often grows in riparian corridors in dense thickets that may be too dense for moose to normally penetrate. However, moose are known to use the Situk River as a corridor to reach the willows along the banks (D. Walter pers. comm. 1994). *Salix commutata* (undergreen willow) was browsed the least. This willow is shorter, perhaps making browsing less energy efficient in heavy snow years.

Moose prune many willow types to snow height. An exception occurs where willows are very dense or are intermixed with alder. In such mixed alder-willow community types, the density of alder stems may preclude moose access during the winter. More specific work is needed on different community types to assess the quality and quantity of winter browse for moose on the Yakutat foreland.

***Salix sitchensis* Community Type**
Sitka willow: SALSIT

Number of Stands Sampled: 10

Other Studies:

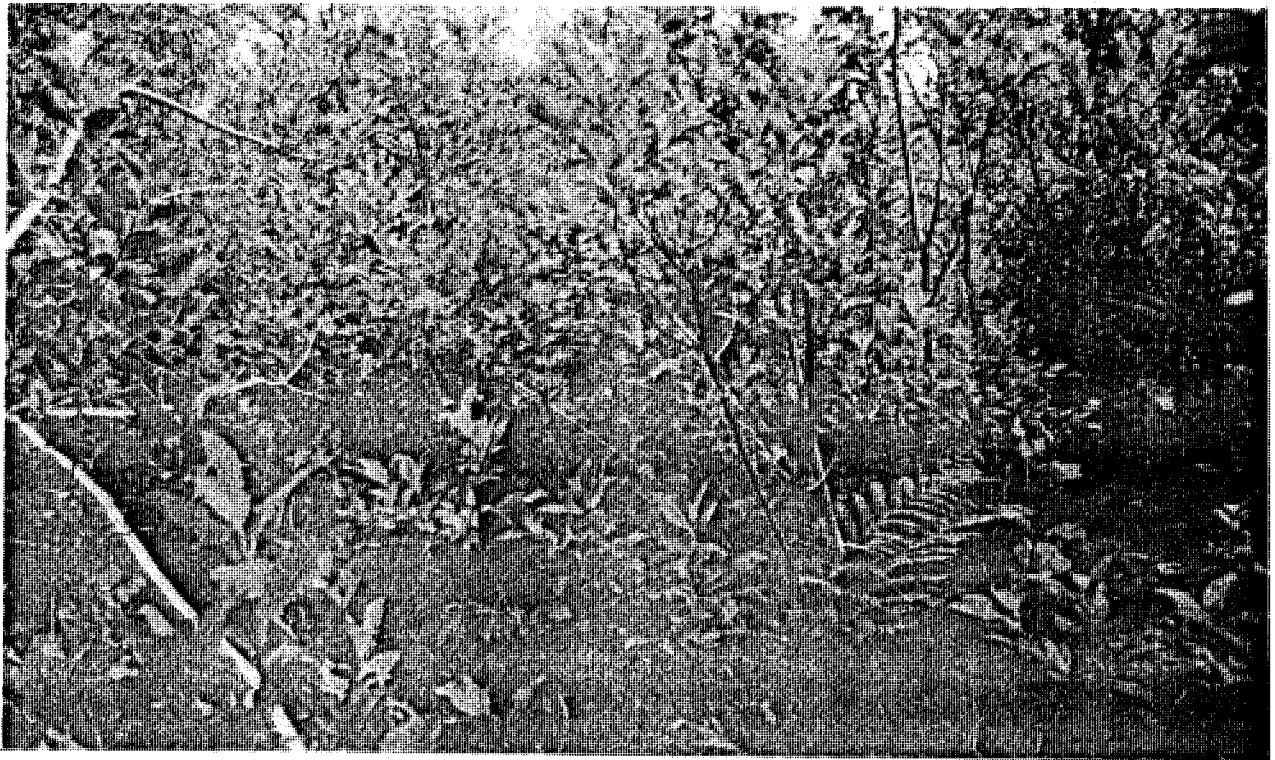
This type was described on the Copper River Delta (Boggs 1994). This type is classified at level IV as tall scrub, closed or open, willow by Viereck et al. (1992). Some stands are wetlands, and are classified as palustrine, scrub-shrub broad-leaved deciduous wetlands by Cowardin et al. (1979).

Distribution:

The community is common on flood plains of the foreland. It is especially prevalent along the Situk River, where it is the main shrub community on the banks. It can also occur in other early-seral sites, such as on moraines.

Vegetation:

The total shrub canopy cover ranges from 40 percent to greater than 100 percent. Shrub canopy height ranges from 2 to 6 meters (6-20 ft.). Younger stands generally have a more open, shorter canopy than older stands. *Salix sitchensis* (Sitka willow) appears to be reproducing from rhizomes or by rooting of recumbent branches. The understory is variable, often consisting of a few species with high canopy cover, such as *Circaea alpina* (enchanter's nightshade), *Equisetum arvense* (meadow horsetail), or *Athyrium filix-femina* (lady fern). There are also other species with low canopy cover scattered through the understory. Bryophytes are uncommon on the ground, although common on the lower stems of willow and alder.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Rubus spectabilis</i>	60	25	8-70
<i>Salix barclayi</i>	70	15	2-40
<i>Salix sitchensis</i>	100	57	30-80
<i>Angelica genuflexa</i>	60	1	1-3
<i>Circaea alpina</i>	70	6	1-20
<i>Equisetum arvense</i>	60	20	1-70
<i>Streptopus amplexifolius</i>	60	1	-
<i>Calamagrostis canadensis</i>	60	7	1-25

Environmental Factors (landscape, soils, and hydrology):

This type is found primarily on fine to coarse sand within active flood plains. The soils are typically young, with only a thin organic layer, and are classified as Oxyaquic Cryofluvents and Aquic Cryumbrepts. The water table is variable but generally within 60 to 100 cm (24-40 in.) of the surface. Sitka willow seems to outcompete the other willow species on these sites where the water is moving and aerated. Many of these stands experience annual flooding.

Succession:

On new river bars, this community is usually the first tall shrub community able to grow close to the river or water table. This type seems to be seral to *Alnus sinuata-Salix sitchensis* (Sitka alder-Sitka willow) and then to the late-seral *Picea sitchensis/Echinopanax horridum* (Sitka spruce/devil's club) c.t. See Figure 9 for an inferred chronosequence diagram for these community types on flood plains.

Adjacent Communities:

Lupinus nootkatensis/Salix setchelliana (nootka lupine/setchell willow) often occurs adjacent to this type on open gravel bars. *Alnus sinuata-Salix sitchensis* (Sitka alder-Sitka willow) is a common neighboring type on drier and older surfaces. *Picea sitchensis-Populus trichocarpa/Echinopanax horridum* (Sitka spruce-black cottonwood/devil's club) is often adjacent on higher river terraces.

***Salix hookeriana* Community Type**
Hooker willow: SALHOO

Number of Stands Sampled: 3

Other Studies:

Boggs (1994) describes two hooker willow types for the Copper River Delta: *Salix hookeriana-Myrica gale* (hooker willow-sweetgale) and *Salix hookeriana/Equisetum arvense* (hooker willow/meadow horsetail). The Copper River Delta and the Yakutat foreland are the only places hooker willow types have been described for Alaska. This *Salix hookeriana* (hooker willow) community is classified at level IV as tall scrub, closed or open, willow by Viereck et al. (1992). Some stands are classified as palustrine, scrub-shrub broad-leaved deciduous wetlands by Cowardin et al. (1979).

Distribution:

This community is rare, occurring primarily along the coast on uplifted tidal flats and occasionally on distal outwash.

Vegetation:

The open canopy of this type is generally 2 to 3 m (6-9 ft.) tall. Hooker willow seems be long-lived; larger stems' basal diameters range from 10 to 22 cm (4-9 in.). An 8 cm (3 in.) diameter stem was 20 years old while a 13 cm (5 in.) diameter stem was 18 years old. Foliose lichens and mosses such as *Antitrichia curtipendula* often cover stems. Adventitious roots are occasionally found growing into the moss on the hooker willow stems. Other willow species such as *Salix barclayi* (barclay willow) and *Salix commutata* (undergreen willow) are often present and may codominate.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Rubus spectabilis</i>	100	21	1-60
<i>Salix hookeriana</i>	100	48	45-50
<i>Angelica genuflexa</i>	100	3	1-5
<i>Caltha palustris asarifolia</i>	67	1	-
<i>Circaea alpina</i>	67	5	2-8
<i>Conioselinum chinense</i>	67	1	-
<i>Equisetum arvense</i>	67	25	10-40
<i>Fritillaria camschatcensis</i>	67	1	1-2
<i>Geum macrophyllum</i>	67	2	1-3
<i>Heracleum lanatum</i>	67	2	1-3
<i>Solidago lepida</i>	67	1	-
<i>Streptopus amplexifolius</i>	67	1	-
<i>Thalictrum sparsiflorum</i>	67	1	-
<i>Trientalis europaea</i>	67	3	1-5
<i>Calamagrostis canadensis</i>	67	10	1-20
<i>Athyrium filix-femina</i>	100	6	5-7

Environmental Factors (landscape, soils, and hydrology):

This type is never extensive, but is generally clustered on the more recently uplifted tidal flats. Soils are composed of fine sands and silt (Oxyaquic Cryorthents). The water table is between 60 and 80 cm (24-31 in.) of the surface. Occasionally this type occurs on organic soils.

Succession:

The successional pathway of this type is poorly understood. It appears to be a late-seral community type. See Figure 7 for an inferred chronosequence diagram for this c.t. on uplifted tidal flats.

Adjacent Communities:

Other types often adjacent to this community are *Calamagrostis canadensis* (bluejoint) on recently uplifted tidal flats and *Carex pluriflora*-*Carex lyngbyei* (many-flowered sedge-lyngbyei sedge) on older uplifted tidal flats.

***Salix barclayi*/*Carex pluriflora* Community Type**
Barclay willow/many-flowered sedge: SALBAR/CARPLU

Number of Stands Sampled: 6

Other Studies:

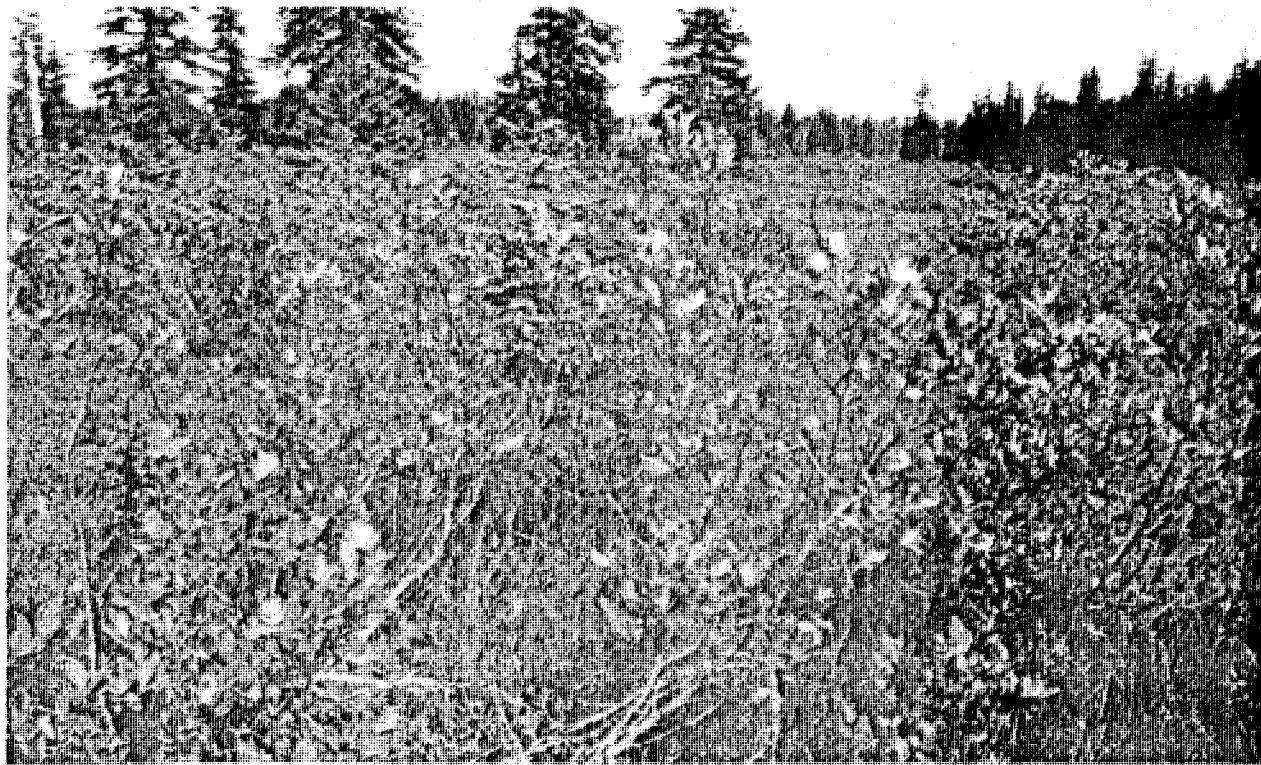
This type is not recorded in the literature, although related barclay willow types have been described. Boggs (1994) described a barclay willow type for the Copper River Delta, and other types have been described for the Knik Arm outside Anchorage (Ritchie et al. 1981 cited in Viereck et al. 1992). This community is classified at level IV as tall scrub, closed or open, willow by Viereck et al. (1992) and as palustrine, scrub-shrub broad-leaved deciduous wetland by Cowardin et al. (1979).

Distribution:

This community is common, and occurs on uplifted tidal flats and distal outwash.

Vegetation:

Willows in this type range from 1.5 to 3 m (4-9 ft.) in height, and are often browsed by moose. Stem basal diameter ranges from 2 to 6 cm (0.8-2.4 in.). Ages of larger stems ranged from 18 to 26 years. These stands are composed of mature willow, generally with 15 percent of the stems being dead. Usually the understory is dominated by *Carex pluriflora* (many-flowered sedge) or *Carex lyngbyei* (lyngbyei sedge). Other species that may codominate are *Equisetum arvense* (meadow horsetail) and *Calamagrostis canadensis* (bluejoint). A blanket of mosses, often with a predominance of peat mosses, occurs beneath the forb layer. Common bryophyte species include *Sphagnum squarrosum*, *S. teres*, *Rhytidiadelphus triquetrus*, and *R. squarrosus*.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Salix barclayi</i>	100	26	5-50
<i>Salix commutata</i>	83	28	20-40
<i>Equisetum arvense</i>	67	12	1-30
<i>Platanthera dilatata</i>	67	1	-
<i>Potentilla palustris</i>	83	3	1-5
<i>Rubus arcticus stellatus</i>	83	1	1-2
<i>Trientalis europaea</i>	67	1	-
<i>Calamagrostis canadensis</i>	83	12	1-40
<i>Carex pluriflora</i>	100	31	3-60

Environmental Factors (landscape, soils, and hydrology):

These stands grow on fine sand or silt. The soil organic layer averages 30 cm (12 in.) deep. Soils are classified as Histic Cryaquepts when the organic layer is <40 cm (16 in.) thick and as Terric Cryohemists when the organic layer is ≥40 cm thick. The drainage is very poor, generally with the water table within 25 cm (10 in.) of the surface.

Succession:

On a continuum of willow types from flowing water to stagnant water, this community type is at the stagnant end. The willows of this c.t. are generally the lowest in stature and have the most open canopy of any of the willow types. The seral status of this c.t. is not well understood, although it seems likely that these stands will be maintained for long periods provided the water table does not stagnate further. See Figures 6 and 7 for inferred chronosequence diagrams for this c.t. on distal outwash and uplifted tidal flats.

Adjacent Communities:

This type often occurs adjacent to *Myrica gale*/*Carex sitchensis* (sweetgale/Sitka sedge) on apparently more aerated, nutrient-rich sites and *Carex pluriflora*-*Carex lyngbyei* (many-flowered sedge-lyngbyei sedge) on more acidic, anaerobic sites.

***Salix barclayi*/*Carex sitchensis* Community Type**
Barclay willow/Sitka sedge: SALBAR/CARSIT

Number of Stands Sampled: 11

Other Studies:

This community type is not recorded in the literature, although related barclay willow types have been described. Boggs (1994) described a related barclay willow type for the Copper River Delta. Ritchie et al. (1981 cited in Viereck et al. 1992) described a *Salix barclayi*-*Salix glauca*/*Calamagrostis canadensis* (barclay willow-grayleaf willow/bluejoint) c.t. and a *Salix barclayi*-*Salix glauca*/*Carex lyngbyei* (barclay willow-grayleaf willow/lyngbyei sedge) c.t. for the Knik arm area outside Anchorage. Sparks et al. (1977) described a *Salix barclayi*/*Calamagrostis canadensis* (barclay willow/bluejoint) type for the Stikine River Delta. This *Salix barclayi*/*Carex sitchensis* (barclay willow/Sitka sedge) community is classified at level IV as tall scrub, closed or open, willow by Viereck et al. (1992) and as palustrine, scrub-shrub broad-leaved deciduous wetland by Cowardin et al. (1979).

Distribution:

This community is abundant, and occurs on distal outwash and gently sloping portions of the rolling bedrock hills near Tanis Mesa.

Vegetation:

Willows range from 1 to 2 m (3-6 ft.) in height, and are often browsed by moose. Basal stem diameters range from 2 to 5 cm (0.8-2 in.). Ages of larger stems ranged from 15 to 28 years. These stands are composed of mature willow, generally with 10 percent of the stems being dead. The understory is dominated by *Carex sitchensis* (Sitka sedge) and occasionally codominated by *Calamagrostis canadensis* (bluejoint). At the willow stem bases, moss species such as *Rhytidiadelphus triquetrus*, *R. squarrosus*, and *Hylocomium splendens* are common. In the lower area between roots are peat mosses such as *Sphagnum squarrosum* and *S. teres*.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Myrica gale</i>	55	32	1-40
<i>Salix barclayi</i>	100	45	15-80
<i>Angelica genuflexa</i>	91	3	1-10
<i>Equisetum palustre</i>	73	1	1-2
<i>Potentilla palustris</i>	55	6	1-10
<i>Rubus arcticus stellatus</i>	73	2	1-7
<i>Trientalis europaea</i>	91	1	1-3
<i>Calamagrostis canadensis</i>	73	9	1-50
<i>Carex sitchensis</i>	100	60	35-90

Environmental Factors (landscape, soils, and hydrology):

This type is generally found on finer textured substrates in the distal outwash and uplifted tidal flats. The soils are classified as Histic Cryaquepts and Fluvaquentic Cryohemists and have an organic layer that averages 65 cm (25 in.) thick over the mineral horizon. The water table is generally within 20 cm (8 in.) of the surface, and is commonly at the surface.

Succession:

The successional pathway of this type is poorly understood, but it appears to be late seral. This c.t. is often located in intermediate positions along a continuum of communities from relatively well drained alder types to very wet *Myrica gale*/*Carex sitchensis* (sweetgale/Sitka sedge) types. See Figure 6 for an inferred chronosequence diagram for this community on distal outwash.

Adjacent Communities:

This c.t. often occurs adjacent to *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on nearby upland sites and *Myrica gale*/*Carex sitchensis* (sweetgale/Sitka sedge) on wetter sites.

***Salix barclayi*/mixed herb Community Type**
Barclay willow/mixed herb: SALBAR/MIXED HERB

Number of Stands Sampled: 5

Other Studies:

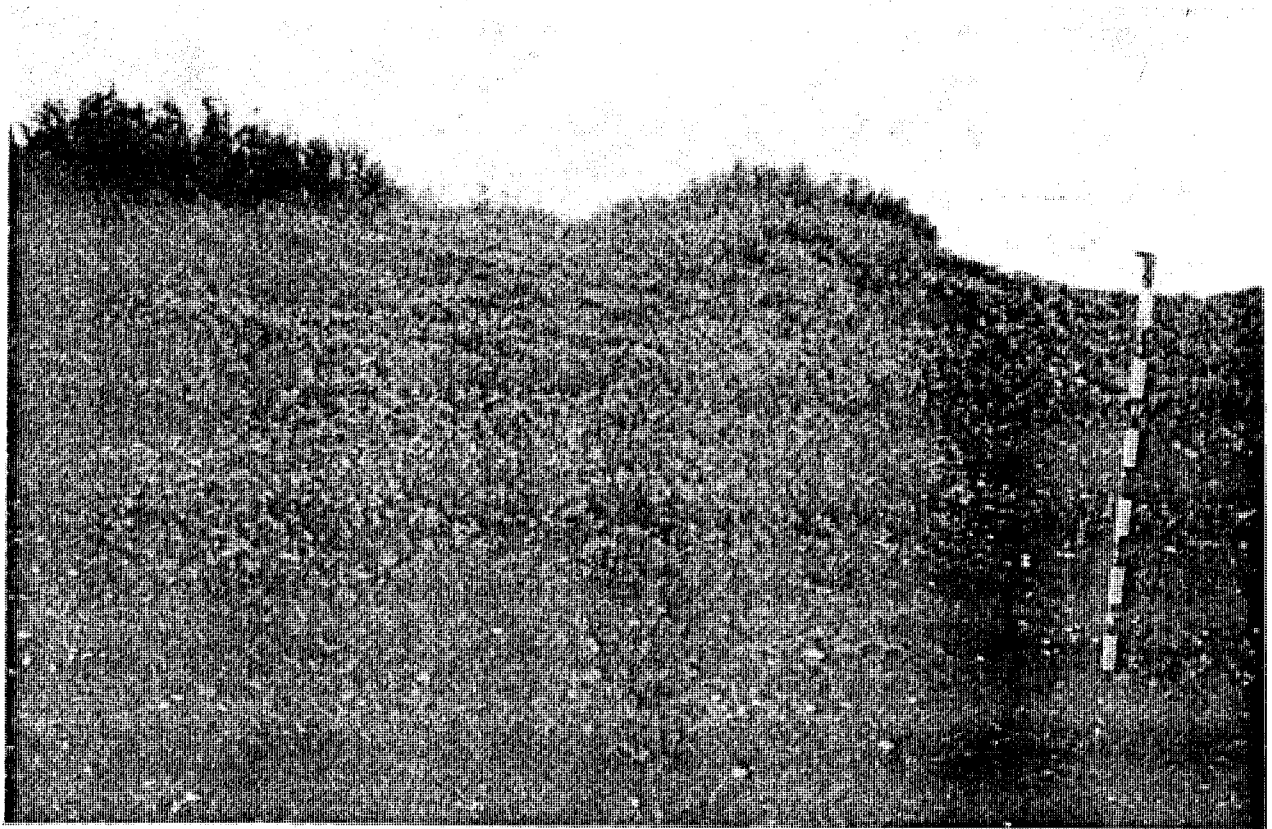
Boggs (1994) described a related barclay willow type for the Copper River Delta. Ritchie et al. (1981 cited in Viereck et al. 1992) described two barclay willow types for the Knik arm area outside Anchorage. Bosworth (1985) described a related type for the Gustavus outwash plain. This community is classified at level IV as tall scrub, closed or open, willow by Viereck et al. (1992).

Distribution:

This community is uncommon, and scattered over flood plains, distal outwash, and uplifted tidal flats.

Vegetation:

Willows range from 1.5 to 4 m (4-20 ft.) in height, and are often browsed by moose. Basal stem diameters normally range from 3 to 8 cm (1-3 in.). Ages of the larger stems ranged from 18 to 24 years. Many stands are composed of mature willow with about 15 percent of the stems being dead. The understory is dominated by a variety of species such as *Circaea alpina* (enchanter's nightshade) and *Athyrium filix-femina* (lady fern). On the soil surface, moss species such as *Rhytidiadelphus triquetrus*, *R. loreus*, and *R. squarrosus* are common.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Salix barclayi</i>	100	64	40-80
<i>Salix commutata</i>	60	11	3-20
<i>Sambucus racemosa</i>	60	4	1-10
<i>Viburnum edule</i>	80	1	1-2
<i>Angelica genuflexa</i>	80	3	1-5
<i>Angelica lucida</i>	60	7	2-10
<i>Circaea alpina</i>	60	19	1-40
<i>Equisetum arvense</i>	100	6	1-15
<i>Geum macrophyllum</i>	80	3	1-10
<i>Heracleum lanatum</i>	60	3	2-4
<i>Pyrola asarifolia</i>	60	1	-
<i>Rubus arcticus stellatus</i>	60	2	1-4
<i>Sanguisorba stipulata</i>	60	1	-
<i>Streptopus amplexifolius</i>	60	1	-
<i>Trientalis europaea</i>	80	1	1-3
<i>Calamagrostis canadensis</i>	100	3	1-5
<i>Athyrium filix-femina</i>	80	21	1-70

Environmental Factors (landscape, soils, and hydrology):

This type is found on more recent deposits of fine to coarse sand. The soil organic layer depth averages 5 cm (2 in.) over the mineral horizon. Soils are typically classified as Oxyaquic Cryorthents or Aquic Cryofluvents. The water table is generally between 30 and 80 cm (12-31 in.) of the surface.

Succession:

This type is an early-seral community and will gradually be replaced by a coniferous community. However, if the water table remains high, a shrub state may persist for many years.

Adjacent Communities:

This c.t. often occurs adjacent to *Salix barclayi*/*Fragaria chiloensis* (barclay willow/beach strawberry) on younger, drier sites, and *Myrica gale*/*Carex sitchensis* (sweetgale/Sitka sedge) on older, moister sites.

***Salix barclayi*/*Fragaria chiloensis* Community Type**
Barclay willow/beach strawberry: SALBAR/FRACHI

Number of Stands Sampled: 16

Other Studies:

This community type is not reported in the literature, although related barclay willow types have been described. Boggs (1994) described a barclay willow type for the Copper River Delta. This *Salix barclayi*/*Fragaria chiloensis* (barclay willow/beach strawberry) type is classified at level IV as tall scrub, closed or open willow by Viereck et al. (1992).

Distribution:

This community is common, and occurs on new, relatively well drained surfaces on the proximal outwash, outburst flood plains, and moraines.

Vegetation:

Willows range from 1 to 2.5 m (3-8 ft.) in height, and typically are heavily browsed by moose. Basal stem diameters range from 1-3.5 cm (0.3-1.5 in.). Ages of larger stems ranged from 7 to 17 years. Many of these stands are composed of mature willow, generally with 20 percent of the stems being dead. The understory is dominated by a variety of forb species such as *Achillea borealis* (yarrow) and *Epilobium angustifolium* (fireweed). Beneath the forb layer is a moss carpet. Common moss species are *Ptilium crista-castrensis*, *Pleurozium schreberi*, *Rhytidiadelphus triquetrus*, *R. loreus*, and *R. squarrosus*.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Salix barclayi</i>	100	35	2-85
<i>Salix commutata</i>	75	21	1-65
<i>Achillea borealis</i>	100	6	2-25
<i>Epilobium angustifolium</i>	63	8	1-35
<i>Fragaria chiloensis</i>	81	12	1-45
<i>Lupinus nootkatensis</i>	81	10	1-35
<i>Rubus arcticus stellatus</i>	88	3	1-7
<i>Solidago lepida</i>	69	3	1-10
<i>Trientalis europaea</i>	75	1	1-5
<i>Deschampsia caespitosa</i>	69	3	1-10
<i>Festuca rubra</i>	63	3	1-5

Environmental Factors (landscape, soils, and hydrology):

This type is found on new deposits of coarse sand to gravel. The soils have an average organic layer depth of only 4 cm (1.5 in.) over the mineral layer and are generally classified as Oxyaquic Cryorthents and Oxyaquic Cryofluvents. A USGS ground-water monitoring point checked periodically for the last four years occurs in this community. These data indicate the water table generally is between 20 and 100 cm (8-40 in.) below the ground surface, fluctuating with general precipitation patterns and rising to the surface during major storms.

Succession:

This type is successional to Sitka spruce dominated communities. However, on sites flooded more often, and probably for longer periods, spruce invasion is restricted and the c.t. persists.

Adjacent Communities:

This community often occurs adjacent to *Populus trichocarpa*/*Echinopanax horridum* (black cottonwood/devil's club) and *Populus trichocarpa*/*Salix* (black cottonwood/willow) on drier sites that are slowly being colonized by Sitka spruce.

SHRUB TYPES: SWEETGALE

Ecological Setting and Management Interpretations (including ATVs):

Myrica gale (sweetgale) is an actinorrhizal nitrogen-fixing shrub. Dense stands can fix substantial amounts of nitrogen (24 to 34 kg N/ha/year; Schwintzer and Lancelle 1983). This ability, and its ability to reproduce clonally, allows *Myrica gale* (sweetgale) to compete in peatland areas where nitrogen is generally limiting (Bond 1951). The plant exhibits considerable phenotypic plasticity in response to moisture and aeration levels, a valuable adaptation for fluctuating water levels (Schwintzer and Lancelle 1983). These qualities give *Myrica gale* wide ecological amplitude: it thrives in many plant community types in the large peatland complexes of the distal outwash and uplifted tidal flats. It is also a common shrub on the 6,000 to 9,000 year old peatlands of the kettle-kame and rolling bedrock hills landscapes.

Pollen analysis from a peatland core taken near the mouth of the Lost River on the uplifted tidal flats shows that *Myrica* abundance increased dramatically in the last 400 years (Holloway 1990). Similarly, *Myrica gale* (sweetgale) pollen abundance increased toward the top of the 2.5 m (8 ft.) peat section extracted from a bog in the Pike Lakes area (Peteet 1991). Hence, it is likely that there are more *Myrica gale* types present on the Yakutat foreland today than were present several hundred years ago.

Thilenius (1990), in a study on the Copper River Delta, found the average height of the *Myrica gale* to be about 80 cm (31 in.) and that the shrub is occasionally browsed by moose and snowshoe hare.

All terrain vehicle (ATV) traffic has increased over the last twenty years all across the foreland. Management concerns related to ATVs are twofold:

- 1) ATV use has direct impacts on vegetation, by damaging or killing plants. Many of these species are perennial and will recover from damage if left undisturbed after the initial ATV traffic. However, continued frequent traffic—i.e., more than once or twice per summer—tends to destroy vegetation. This is problematic, considering the number of sensitive species that occur in nonforested areas. Persistent multiple trail scars are readily seen from the air in wetlands on the distal outwash near the Situk River, and across the outburst flood plains between the Dangerous River bridge and the mouths of the Italio and Akwe Rivers.

- 2) ATV use has indirect impacts on wetlands by changing their hydrology. ATV tracks channelize water, and, like ditches, these channels lower the water table next to the trail. Although the actual water table change is slight, it can significantly change the vegetation. In the youngest wetlands (in mineral soils), such as on the outburst flood plains, these tire tracks may alter the rate of change or the successional pathway. In older wetlands such as bogs (in organic soils), the channelized water can affect the vegetation by altering the water chemistry. These tracks may introduce high pH, nutrient rich water into bogs that have developed in low pH, nutrient poor water, thereby slowly causing a change in the nearby vegetation.

Repeated hiker, skier, and snow machine traffic can have similar vegetation effects to ATV traffic, however, thus far most of the resource damage seems to be caused by ATV use. Resource damage will undoubtedly increase as more people purchase four-wheel drive ATVs.

Potential ways to reduce the resource damage are:

- 1) Intensive ATV user education by the Forest Service, alone or with other organizations such as the Yak-Tat Kwaan;
- 2) Limiting ATVs to certain trails or beaches;
- 3) Constructing boardwalk segments of existing ATV trails to protect wetlands;
- 4) Limiting ATV use to certain seasons of the year.

***Myrica gale/Carex livida* Community Type**
Sweetgale/livid sedge: MYRGAL/CARLIV

Number of Stands Sampled: 10

Other Studies:

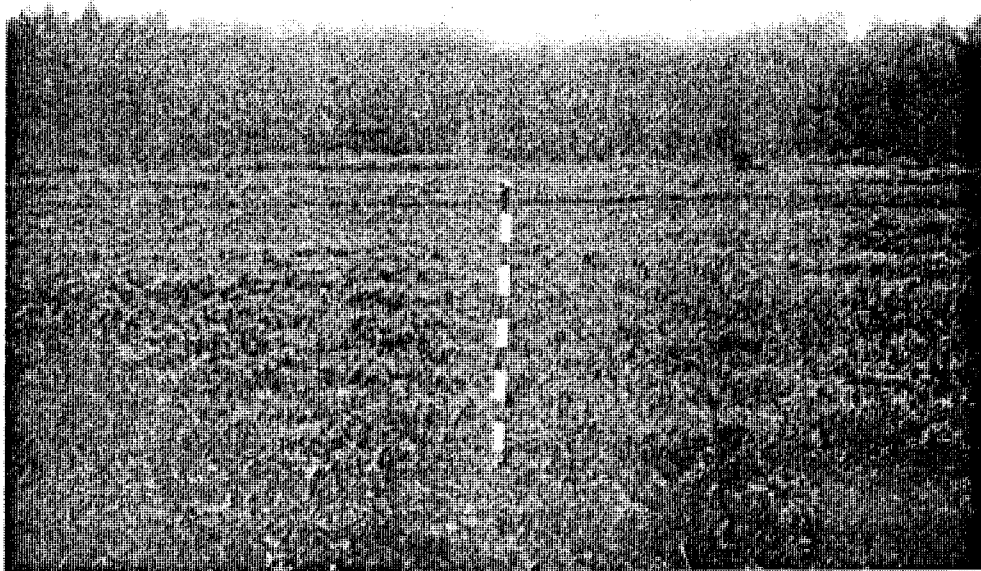
Boggs (1994) described three sweetgale types for the Copper River Delta. Hogan and Tande (1983 cited in Viereck et al. 1992) described two sweetgale types for wetlands near Anchorage. Nieland (pers. comm. to Viereck 1992) described one sweetgale type for Southeast Alaska. This type is classified at level IV as low scrub, open, sweetgale-graminoid bog by Viereck et al. (1992) and as palustrine, scrub-shrub, broad-leaved deciduous wetland by Cowardin et al. (1979).

Distribution:

This community is abundant, and occurs on distal outwash, kettle-kame topography in the Pike Lakes area, and occasionally on rolling bedrock hills in the Tanis Mesa area.

Vegetation:

Myrica gale (sweetgale) ranges from 40 to 100 cm (16-40 in.) in height with 25-75 percent canopy cover. The understory is dominated by bog plants such as *Carex livida* (livid sedge), *Eriophorum angustifolium* (cottongrass), and *Trichophorum caespitosum* (tufted clubrush). Beneath the sedge layer is a moss carpet, commonly including *Drepanocladus revolvens*, *Dicranium* sp., and *Sphagnum papillosum*.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Myrica gale</i>	100	47	25-80
<i>Oxycoccus palustris</i>	60	2	1-5
<i>Equisetum palustre</i>	80	2	1-7
<i>Erigeron peregrinus</i>	60	1	1-2
<i>Menyanthes trifoliata</i>	80	19	1-65
<i>Platanthera dilatata</i>	60	1	-
<i>Tofieldia glutinosa</i>	60	1	1-2
<i>Carex livida</i>	80	15	1-40
<i>Deschampsia caespitosa</i>	60	2	1-6
<i>Eriophorum angustifolium</i>	80	10	2-30
<i>Trichophorum caespitosum</i>	60	23	1-40

Environmental Factors (landscape, soils, and hydrology):

This type is found on older surfaces, some of which have been dated from 9,000 years B.P. (Peteet 1991). Soils of this type have a thick peat layer. The average organic layer depth is 70 cm (28 in.) over the mineral horizon, and the soils are generally classified as Histic Cryaquepts and Terric Cryohemists. The water table ranges between 0 and 30 cm (0-12 in.) below the surface, but can also be 10 cm (4 in.) or more over the surface during large storms.

Succession:

The successional sequence is poorly understood for many peatland types. This type seems to be a late-seral community that occurs on more nitrogen-poor soils than the *Myrica gale/Carex sitchensis* (sweetgale/Sitka sedge) c.t. See Figure 6 for an inferred chronosequence diagram for this c.t. on distal outwash.

Adjacent Communities:

This c.t. often occurs adjacent to *Carex livida-Trichophorum caespitosum* (livid sedge-tufted clubrush) on nutrient-poor sites, and *Menyanthes trifoliata/Equisetum variegatum* (buckbean/variegated scouring-rush) on more nutrient-rich sites.

Myrica gale/*Carex sitchensis* Community Type
Sweetgale/Sitka sedge: MYRGAL/CARSIT

Number of Stands Sampled: 16

Other Studies:

Boggs (1994) described three sweetgale types for the Copper River Delta. Hogan and Tande (1983 cited in Viereck et al. 1992) described two sweetgale types for wetlands near Anchorage. Nieland (pers. comm. to Viereck 1992) described one sweetgale type for Southeast Alaska. This type is classified at level IV as open low scrub, sweetgale-graminoid bog by Viereck et al. (1992) and as palustrine, scrub-shrub, broad-leaved deciduous wetland by Cowardin et al. (1979).

Distribution:

This community is abundant, and occurs on the distal outwash, lowland portions of the rolling bedrock hills in the Tanis Mesa area, and the uplifted tidal flats.

Vegetation:

Myrica gale (sweetgale) ranges from 40 to 100 cm (16-40 in.) in height with 35 to 85 percent canopy cover. *Carex sitchensis* (Sitka sedge) dominates the understory. Other graminoids such as *Carex pluriflora* (many-flowered sedge) and *Deschampsia caespitosa* (hairgrass) are occasionally common. Beneath the graminoid layer is a moss carpet dominated by peat moss species. Common species are *Sphagnum squarrosum*, *S. warnstorffii*, and *S. riparium*.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Myrica gale</i>	100	52	35-85
<i>Potentilla palustris</i>	56	10	1-55
<i>Rubus arcticus stellatus</i>	94	2	1-3
<i>Trientalis europaea</i>	69	1	1-3
<i>Carex sitchensis</i>	100	45	15-80
<i>Deschampsia caespitosa</i>	75	4	1-10

Environmental Factors (landscape, soils, and hydrology):

This type typically is found on older surfaces, some of which have been dated from 9,000 years B.P. (Peteet 1991). The soils are composed primarily of peat with an average organic layer depth of 84 cm (33 in.) over the mineral layer. They are classified as Histic Cryaquepts when the organic layer is <40 cm (16 in.); as Typic Cryohemists when the organic layer is 40 to 130 cm (16-51 in.); and as Typic Cryohemists when the organic layer is ≥130 cm (51 in.). The water table ranges between 0 and 30 cm (0-12 in.) below the surface but can also be 10 cm (4 in.) or more over the surface during large storms.

Succession:

The successional sequence is poorly understood for many peatland types. However, this type seems to occur on more nitrogen-rich soils than the *Myrica gale*/*Carex livida* (sweetgale/livid sedge) c.t. See Figures 6 and 7 for inferred chronosequence diagrams for this c.t. on distal outwash and uplifted tidal flats.

Adjacent Communities:

This c.t. often occurs adjacent to *Salix barclayi*/*Carex sitchensis* (barclay willow/Sitka sedge) on apparently better aerated sites and *Menyanthes trifoliata*-*Potentilla palustris* (buckbean-marsh cinquefoil) on nutrient-rich, ground-water fed sites.

***Myrica gale*/*Carex pluriflora* Community Type**
Sweetgale/many-flowered sedge: MYRGAL/CARPLU

Number of Stands Sampled: 4

Other Studies:

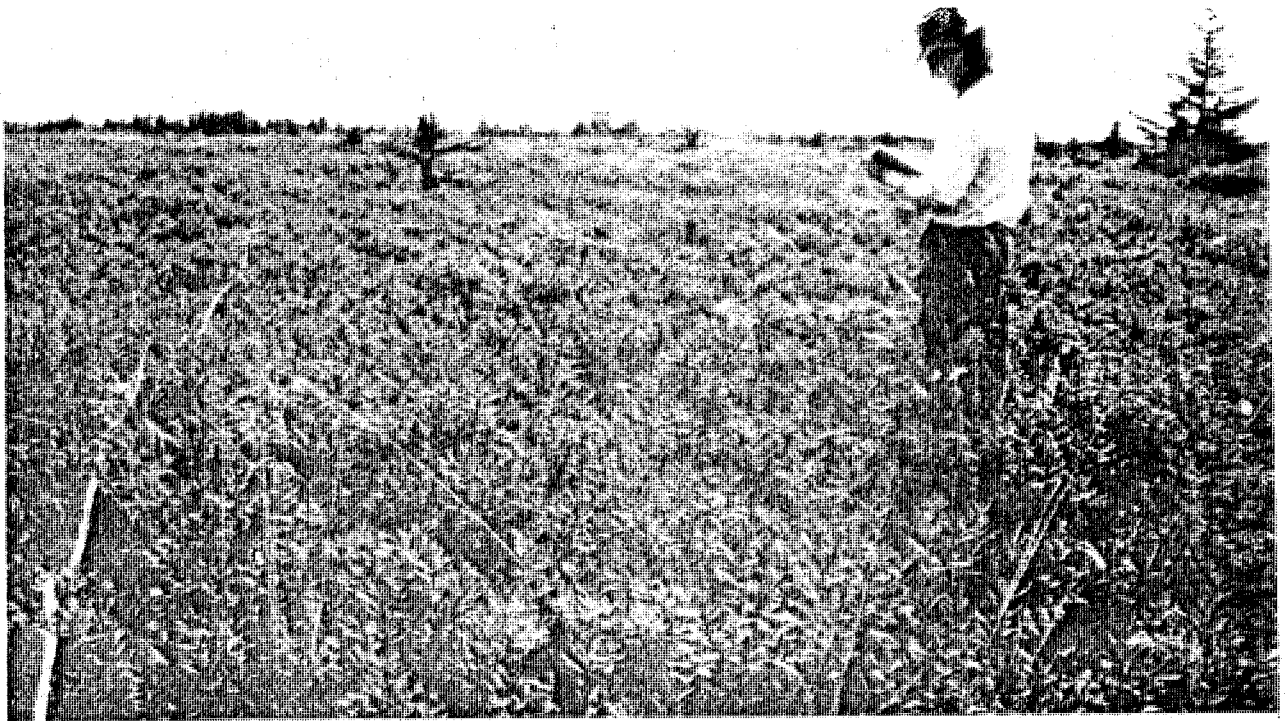
Boggs (1994) described three sweetgale types for the Copper River Delta. Hogan and Tande (1983 cited in Viereck et al. 1992) described two sweetgale types for wetlands near Anchorage. Nieland (pers. comm. to Viereck 1992) described one sweetgale type for Southeast Alaska. This type is classified at level IV as low scrub, open, sweetgale-graminoid bog by Viereck et al. (1992) and as palustrine, scrub-shrub, broad-leaved deciduous wetland by Cowardin et al. (1979).

Distribution:

This community is common, and occurs only on the uplifted tidal flats.

Vegetation:

Myrica gale (sweetgale) ranges from 40 to 100 cm (16-40 in.) in height, and 4 to 70 percent in canopy cover. *Carex pluriflora* (many-flowered sedge) dominates the understory. Other sedges such as *Carex livida* (livid sedge) and *Carex lyngbyei* (lyngbyei sedge) are occasionally common. *Menyanthes trifoliata* (buckbean) is the only forb that occurs with a canopy cover greater than 10 percent. Beneath the graminoid layer is a moss carpet dominated by peat moss species. Common moss species are *Sphagnum squarrosum*, *S. riparium* and *Aulacomium palustre*.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Myrica gale</i>	100	58	40-70
<i>Oxycoccus palustris</i>	75	3	1-8
<i>Angelica genuflexa</i>	75	2	1-4
<i>Polemonium acutiflorum</i>	100	3	1-5
<i>Potentilla palustris</i>	100	2	1-2
<i>Rubus arcticus stellatus</i>	100	2	1-3
<i>Agrostis alaskana</i>	100	2	1-3
<i>Carex pluriflora</i>	100	45	30-70
<i>Deschampsia caespitosa</i>	100	4	1-10
<i>Luzula multiflora</i>	75	1	1-2

Environmental Factors (landscape, soils, and hydrology):

This type is typically found on older portions of the uplifted tidal flats. The soils have an average organic layer depth of 54 cm (21 in.) over the mineral layer and are generally classified as Terric Cryohemists. The water table ranges between 0 and 30 cm (0-12 in.) below the surface, but can also be 10 cm (4 in.) or more above the surface during large storms.

Succession:

The successional sequence is poorly understood for many peatland types. However, a probable sequence of communities would be: an estuarine community of *Carex lyngbyei* (lyngbyei sedge), a *Calamagrostis canadensis* (bluejoint) c.t., and then a transition to a *Myrica gale*/*Carex pluriflora* (sweetgale/many-flowered sedge) c.t. See Figure 7 for an inferred chronosequence diagram for this c.t. on uplifted tidal flats.

Adjacent Communities:

This c.t. often occurs adjacent to *Salix barclayi*/*Carex pluriflora* (barclay willow/many-flowered sedge) on more nutrient-rich sites and *Carex pluriflora*-*Carex lyngbyei* (many-flowered sedge-lyngbyei sedge).

***Myrica gale/Equisetum variegatum* Community Type**
Sweetgale/variegated scouring-rush: MYRGAL/EQUVAR

Number of Stands Sampled: 7

Other Studies:

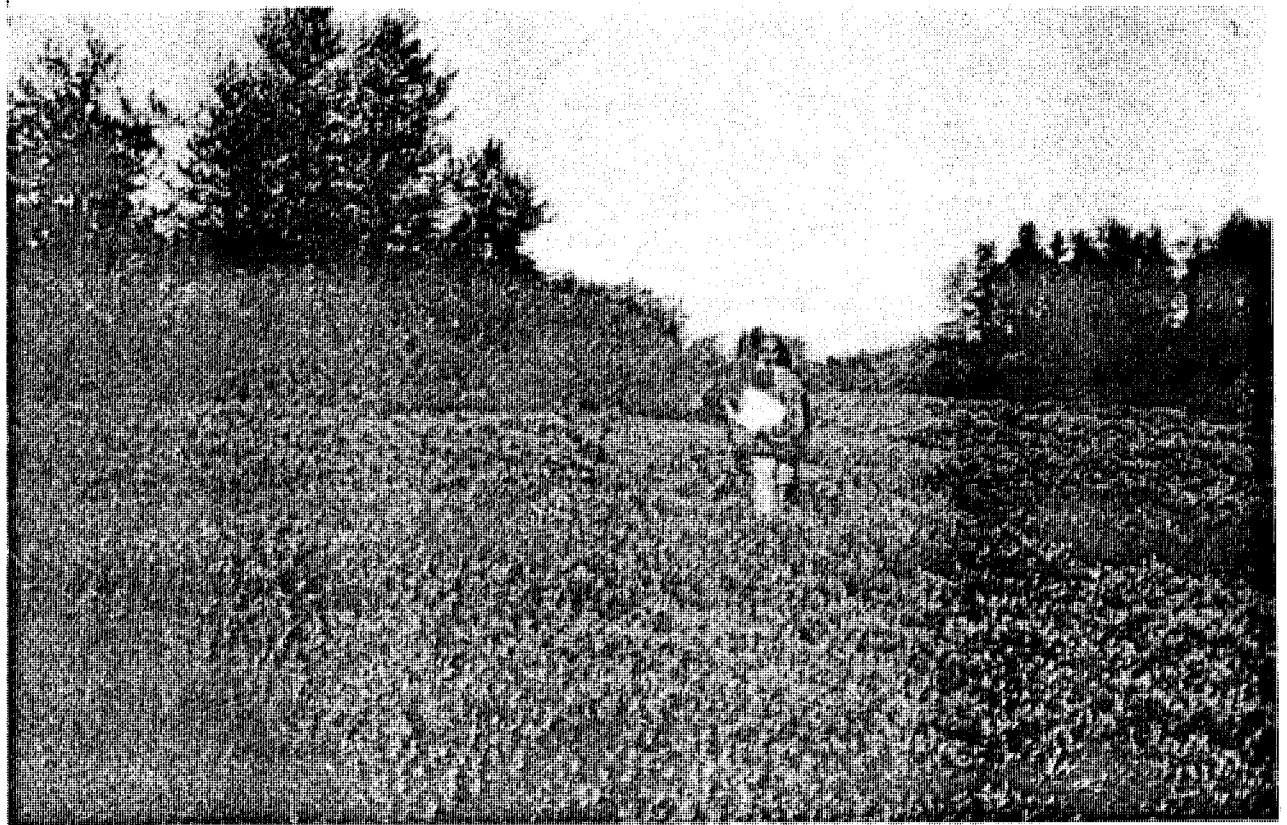
Boggs (1994) described several related types for the Copper River Delta. Hogan and Tande (1983 cited in Viereck et al. 1992) described one sweetgale type for wetlands near Anchorage. This type is most closely classified at level IV with the other sweetgale types as low scrub, open, sweetgale-graminoid bog (Viereck et al. 1992). However, it is not a bog, and this type may warrant its own class as a sweetgale-horsetail fen. This type is classified as palustrine, scrub-shrub broad-leaved deciduous wetland by Cowardin et al. (1979).

Distribution:

This community is common, and occurs on wetter areas of the outburst flood plains.

Vegetation:

Myrica gale (sweetgale) ranges from 40 to 100 cm (16-40 in.) in height and 35 to 90 percent in canopy cover. The understory is a mixture of different forbs and graminoids, with the primary dominant being *Equisetum variegatum* (variegated scouring-rush). Other common species include *Carex flava* (yellow sedge) and *Lupinus nootkatensis* (Nootka lupine). Beneath the horsetail layer is a sparse bryophyte layer with species such as *Campylium stellatum* and *Rhytidiadelphus squarrosus*.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Myrica gale</i>	100	56	35-90
<i>Salix barclayi</i>	86	2	1-5
<i>Salix commutata</i>	71	1	-
<i>Achillea borealis</i>	57	1	-
<i>Aster subspicatus</i>	86	4	1-10
<i>Conioselinum chinense</i>	57	1	-
<i>Equisetum variegatum</i>	86	20	1-60
<i>Parnassia palustris</i>	71	1	1-2
<i>Potentilla egedii grandis</i>	71	4	1-8
<i>Sanguisorba stipulata</i>	57	5	1-15
<i>Tofieldia glutinosa</i>	57	1	1-2
<i>Calamagrostis canadensis</i>	57	2	1-3
<i>Carex flava</i>	71	5	1-15
<i>Carex livida</i>	57	5	1-10
<i>Deschampsia caespitosa</i>	86	5	1-15

Environmental Factors (landscape, soils, and hydrology):

This community type is most often found in young ephemeral channels. The soils have an average organic layer depth of only 10 cm (4 in.) over a sandy mineral layer and are classified as Typic Cryaquents. The water table is generally between 0 and 20 cm (0-8 in.) below the surface, but it can also be 10 cm (4 in.) or more over the surface during large storms, when sheetflow is occurring.

Succession:

This type was probably an *Eleocharis palustris* (creeping spikerush) c.t. or other related type before uplift reduced the salinity of the stands. In the better drained portions, alder and willow species will invade, while those areas most frequently inundated will remain dominated by *Equisetum* and sedges. See Figure 10 for an inferred chronosequence diagram for this c.t. on outburst flood plains.

Adjacent Communities:

This c.t. often occurs adjacent to *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on upland sites, and *Equisetum variegatum* (variegated scouring-rush) in channels.

SHRUB TYPES: SUBSHRUBS

Ecological Setting and Management Interpretations:

Subshrub community types occupy predominantly wet sites. *Empetrum nigrum*/*Carex pluriflora* (crowberry/many-flowered sedge) type is probably the driest, with a water table that normally ranges between 20 and 60 cm (8-24 in.) of the surface. The water table in this type and the related *Vaccinium uliginosum*-*Empetrum nigrum* (bog blueberry-crowberry) c.t. fluctuates with the yearly precipitation pattern. The *Andromeda polifolia*/*Carex pluriflora* (bog rosemary/many-flowered sedge) c.t. is a perennially saturated peatland type, more closely related to peatland types than to the other subshrub types. It is the least common of the three subshrub types, and is found intergrading with peatland types on uplifted tidal flats. Wildlife use of these community types is uncertain.

All terrain vehicle (ATV) traffic occurs in many nonforested community types; see the *Myrica gale* (sweetgale) section for a discussion of impacts.

Empetrum nigrum/*Carex pluriflora* Community Type Crowberry/many-flowered sedge: EMPNIG/CARPLU

Number of Stands Sampled: 5

Other Studies:

Boggs (1994) described an *Empetrum nigrum*/*Carex pluriflora* (crowberry/many-flowered sedge) c.t. for the Copper River Delta. An *Empetrum nigrum*/*Carex pluriflora*-*Carex macrochaeta*/*Cladonia* spp. c.t. was described by several authors (see Viereck et al. 1992). This *Empetrum nigrum*/*Carex pluriflora* (crowberry/many-flowered sedge) type is classified at level IV as low scrub, open, ericaceous shrub bog, crowberry tundra by Viereck et al. (1992) and as palustrine, scrub-shrub, needle-leaved evergreen wetland by Cowardin et al. (1979).

Distribution:

This community is uncommon, and occurs on distal outwash. It may also be found on uplifted tidal flats, although it has not been seen there.

Vegetation:

Empetrum nigrum (crowberry) canopy cover ranges between 20 and 70 percent. The understory is a mixture of forbs and graminoids common to bog conditions. Primary understory species are *Oxycoccus palustris* (bog cranberry) and *Carex pluriflora* (many-flowered sedge). Beneath these low growing forbs and shrubs is a thriving population of mosses which includes species such as *Sphagnum fuscum*, *S. papillosum*, *Pleurozium schreberi*, and *Aulacomium palustre*.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i> regen.	80	1	-
<i>Empetrum nigrum</i>	100	34	20-70
<i>Oxycoccus palustris</i>	100	5	2-10
<i>Vaccinium uliginosum</i>	60	12	5-25
<i>Drosera rotundifolia</i>	100	3	1-10
<i>Tofieldia glutinosa</i>	80	1	-
<i>Trientalis europaea</i>	60	1	-
<i>Carex pluriflora</i>	100	18	1-30
<i>Carex sitchensis</i>	80	9	1-20
<i>Eriophorum angustifolium</i>	80	7	1-20

Environmental Factors (landscape, soils, and hydrology):

Organic layer depth averages 52 cm (20 in.) over the mineral horizon (fine gravel and soils are generally classified as Histic Cryaquepts and Terric Cryofibrists. The water table fluctuates between 20 and 60 cm (8-24 in.) of the surface, but it can reach the surface during large storms. The water table in this type and the related *Vaccinium uliginosum-Empetrum nigrum* (bog blueberry-crowberry) c.t. fluctuates with yearly precipitation patterns.

Succession:

Successional sequence is poorly understood for subshrub types. However, this community and the closely related *Vaccinium uliginosum-Empetrum nigrum* (bog blueberry-crowberry) seem to occur where the water table fluctuates widely. During drier years, Sitka spruce occasionally becomes established but grows very slowly (the annual growth ring widths are two mm or less). If drainage conditions stay the same, these sites may slowly develop into conifer overstory of low productivity. However, this type will probably develop into peatland if peat accumulation reduces the contact between ground water and atmosphere. The *Vaccinium uliginosum-Empetrum nigrum* (bog blueberry-crowberry) c.t. has a slightly higher water table than the *Empetrum nigrum/Carex pluriflora* (crowberry/many-flowered sedge) type.

Communities:

This community often occurs adjacent to *Vaccinium uliginosum-Empetrum nigrum* (bog blueberry-crowberry) and *Salix barclayi/Carex pluriflora* (barclay willow/many-flowered sedge).

***Vaccinium uliginosum*-*Empetrum nigrum* Community Type**
Bog blueberry-crowberry: VACULI-EMPNI

Number of Stands Sampled: 8

Other Studies:

Boggs (1994) described a *Vaccinium uliginosum*-*Empetrum nigrum* (bog blueberry-crowberry) c.t. for the Copper River Delta. A *Vaccinium uliginosum*-*Empetrum nigrum*-*Ledum decumbens*/*Cladonia* spp. type was described by Steigers et al. (1983 cited in Viereck et al. 1992). Related types have been described for the state (see Viereck et al. 1992). This *Vaccinium uliginosum*-*Empetrum nigrum* (bog blueberry-crowberry) type is classified at level IV as low scrub, open, ericaceous shrub bog, *Vaccinium* tundra by Viereck et al. (1992) and as palustrine, scrub-shrub, broad-leaved deciduous wetland by Cowardin et al. (1979).

Distribution:

This community is uncommon, but occurs on a variety of landscapes. It is most common on distal outwash and moraines.

Vegetation:

Scattered *Salix barclayi* and *Salix commutata* (barclay and undergreen willow) overtop the subshrub layer at 0.5-1.5 m (1.6-5 ft.). *Vaccinium uliginosum* (bog blueberry) and *Empetrum nigrum* (crowberry) are the dominants. Common graminoids are *Eriophorum angustifolium* (cottongrass) and *Carex sitchensis* (Sitka sedge). Common mosses are *Pleurozium schreberi*, *Sphagnum squarrosum*, and *Rhytidiadelphus loreus*.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Salix barclayi</i>	88	4	1-8
<i>Salix commutata</i>	75	3	1-5
<i>Empetrum nigrum</i>	100	28	1-60
<i>Vaccinium uliginosum</i>	100	37	15-80
<i>Equisetum arvense</i>	63	1	-
<i>Platanthera dilatata</i>	63	1	1-2
<i>Polygonum viviparum</i>	75	5	1-20
<i>Rubus arcticus stellatus</i>	88	2	1-5
<i>Deschampsia caespitosa</i>	88	3	1-5
<i>Eriophorum angustifolium</i>	75	15	1-30

Environmental Factors (landscape, soils, and hydrology):

The soil organic layer depth ranges from very thin to 40 cm (16 in.). The average organic matter depth is 22 cm (9 in.) over the mineral horizon (fine gravel and sand). The soils are generally classified as Typic Cryaquents (shallow organic) and Histic Cryaquepts (deeper organics). Generally, the water table is between 20 and 60 cm (8-24 in.) of the surface, but it can reach the surface during large storms. The water table in this type fluctuates with yearly precipitation patterns.

Succession:

This community and the closely related *Empetrum nigrum*/*Carex pluriflora* (crowberry/many-flowered sedge) c.t. both seem to occur where the water table fluctuates widely. During drier years, Sitka spruce occasionally becomes established, but grows very slowly (the annual growth ring widths are often two mm or less). If the drainage conditions stay the same, these sites may slowly develop a conifer overstory of low productivity. However, this type will probably develop into a raised peatland if peat accumulation reduces the contact between the ground water and vegetation. The *Vaccinium uliginosum*-*Empetrum nigrum* (bog blueberry-crowberry) c.t. probably has a slightly higher water table than the *Empetrum nigrum*/*Carex pluriflora* (crowberry/many-flowered sedge) type.

Adjacent Communities:

This community often occurs adjacent to *Empetrum nigrum*/*Carex pluriflora* (crowberry/many-flowered sedge) and *Salix barclayi*/*Carex pluriflora* (barclay willow/many-flowered sedge).

***Andromeda polifolia*/*Carex pluriflora* Community Type**
Bog rosemary/many-flowered sedge: ANDPOL/CARPLU

Number of Stands Sampled: 2

Other Studies:

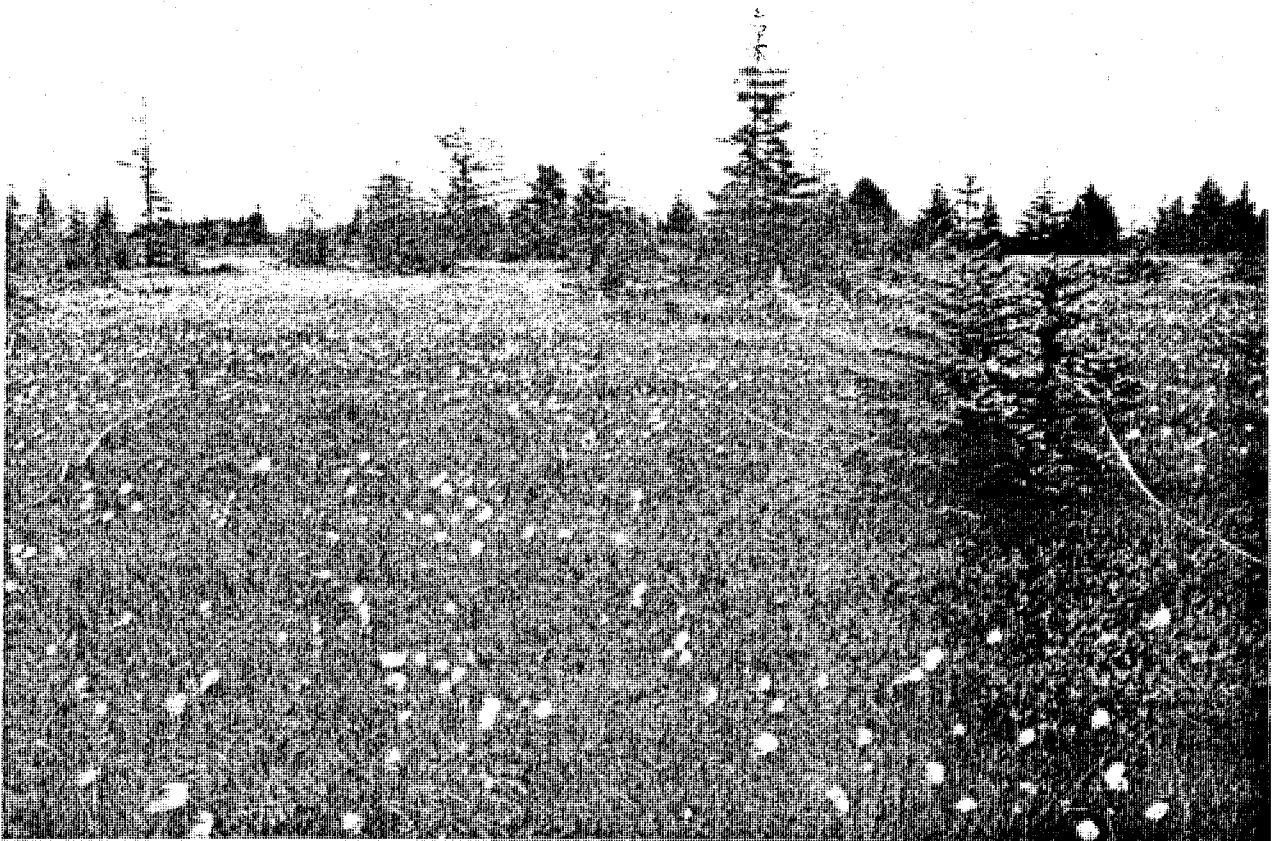
Boggs (1994) described the same community for the Copper River Delta. This type fits best within the Viereck et al. (1992) classification at level IV as low scrub, open, ericaceous bog, crowberry tundra. This type is classified as palustrine, scrub-shrub needle-leaved evergreen wetland by Cowardin et al. (1979).

Distribution:

This community is rare, and has been found only on the uplifted tidal flats.

Vegetation:

Andromeda polifolia (bog rosemary) is the clear visual dominant. The most common graminoids are *Carex pluriflora* (many-flowered sedge) and *Carex lyngbyei* (lyngbyei sedge). Common mosses include *Sphagnum angustifolium* and *Aulacomium palustre*.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Andromeda polifolia</i>	100	25	-
<i>Empetrum nigrum</i>	100	2	1-2
<i>Oxycoccus palustris</i>	100	8	5-10
<i>Vaccinium uliginosum</i>	100	7	5-8
<i>Drosera rotundifolia</i>	100	2	1-4
<i>Equisetum palustre</i>	100	6	1-10
<i>Gentiana douglasiana</i>	100	1	-
<i>Platanthera dilatata</i>	100	1	-
<i>Carex lyngbyei</i>	100	13	10-15
<i>Carex pluriflora</i>	100	23	15-30
<i>Eriophorum russeolum</i>	100	6	1-10

Environmental Factors (landscape, soils, and hydrology):

Soil organic layer depths average 67 cm (26 in.) over the mineral horizon (very fine sand and silt). They are generally classified as Terric Cryohemists. Usually, the water table is between 10 and 30 cm (4-12 in.) of the surface, but it rises to the surface during large storms. This type may persist on organic soils developed on the uplifted tidal flats.

Succession:

This type is more closely related to some peatland types such as *Myrica gale*/*Carex livida* (sweetgale/livid sedge) and *Carex pluriflora*-*Carex lyngbyei* (many-flowered sedge-lyngbyei sedge) than to the other subshrub types. Although its successional setting is poorly understood, it is probably a late-seral type of limited extent that intergrades with other peatland types and persists on uplifted tidal flats for many centuries.

Adjacent Communities:

This community often occurs adjacent to *Myrica gale*/*Carex livida* (sweetgale/livid sedge) and *Menyanthes trifoliata*-*Potentilla palustris* (buckbean-marsh cinquefoil).

GRAMINOID TYPES

Ecological Setting and Management Interpretations:

Graminoid community types occupy a spectrum of sites from well drained, such as an *Elymus arenarius* (beach-rye grass) community on beach dunes, to wet, such as a *Carex lyngbyei* (lyngbyei sedge) community on tidal flats or *Carex livida-Trichophorum caespitosum* (livid sedge-tufted clubrush) and *Carex sitchensis* (Sitka sedge) communities on perennially saturated peatlands. With a few exceptions, these types are divided by their tolerance of brackish water and their ability to grow on acidic, nutrient-poor peatlands.

In the spring and fall, some tidal flat community types are important sources of food for trumpeter swans, dusky Canada geese, tule white-fronted geese, lesser snow geese, and canvasback ducks (Petersen et al. 1981). During this study, I noted heavy browsing by waterfowl within tidal flat types on *Carex lyngbyei* (lyngbyei sedge) and *Puccinellia pumila* (dwarf alkali grass).

All terrain vehicle (ATV) traffic occurs in many nonforested community types; see the *Myrica gale* (sweetgale) section for a discussion of impacts.

Puccinellia pumila Community Type Dwarf alkali grass: PUCPUM

Number of Stands Sampled: 1

Other Studies:

Batten et al. (1978) described a similar type for Yakutat, and Boggs (1994) described a *Puccinellia pumila* (dwarf alkali grass) c.t. for the Copper River Delta. Other *Puccinellia* types have been described for many coastal areas of Alaska (Viereck et al. 1992). This type is classified at level IV as herbaceous, graminoid, wet, halophytic grass wet meadow by Viereck et al. (1992) and as estuarine, intertidal, persistent emergent wetland by Cowardin et al. (1979).

Note: The taxonomic difference between *Puccinellia pumila* and *Puccinellia nutkaensis* is in doubt. Consult the Alaska Natural Heritage Program Botanist or the Forest Service Regional Botanist for information.

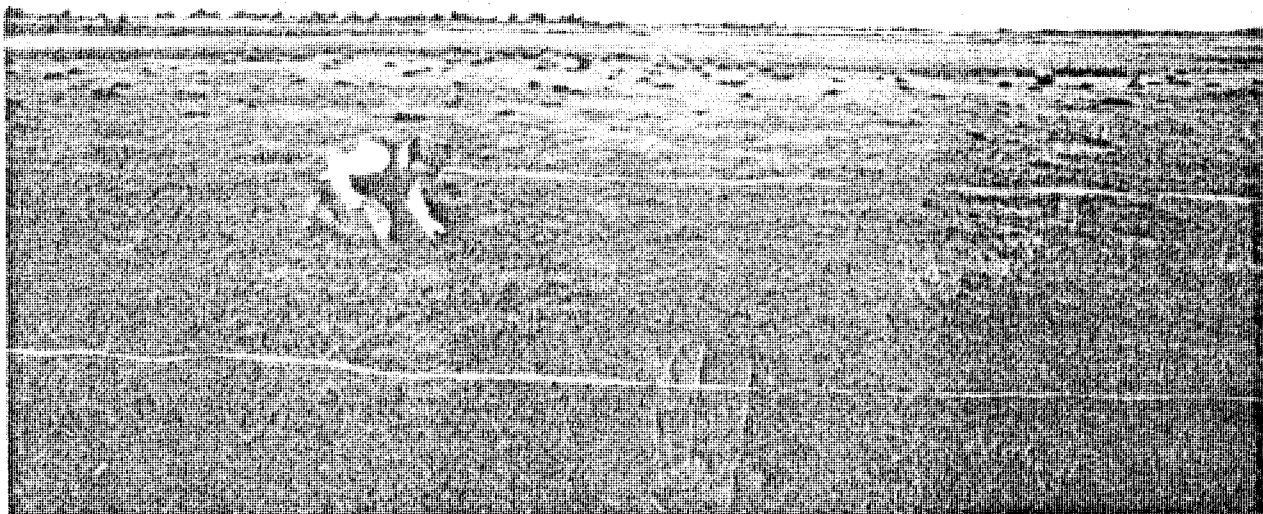
Distribution:

This community was undersampled. It is uncommon, and occurs only on supratidal flats.

Vegetation:

Much of the following discussion about vegetation and environmental factors is taken from Boggs (1994), because this type is much more extensive on the Copper River Delta.

Puccinellia pumila (dwarf alkali grass) dominates the community. Total cover for all species is low, rarely exceeding 60 percent. Species diversity is low because few species can tolerate the tide flat conditions. No bryophytes occur.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Ranunculus cymbalaria</i>	100	1	-
<i>Triglochin maritimum</i>	100	5	-
<i>Puccinellia pumila</i>	100	50	-

Environmental Factors (landscape, soils, and hydrology):

Soils have no organic layer, and the mineral horizon consists of silt with lenses of very fine sand (varves). The soils are generally classified as Typic Cryaquents. The water table is generally at or near the surface. Tide water covers this type daily to a few times each month.

Succession:

This type is probably an edaphic late-seral type on the larger tidal flat surfaces. As the area continues to uplift and the input of brackish water is eliminated, other community types such as *Calamagrostis canadensis* (bluejoint) and *Myrica gale*/*Carex sitchensis* (sweetgale/Sitka sedge) will probably displace this c.t. See Figure 7 for an inferred chronosequence diagram for this c.t. on tidal flats and uplifted tidal flats.

Adjacent Communities:

This type often occurs adjacent to *Carex lyngbyei* (lyngbyei sedge) along salt water sloughs and *Calamagrostis canadensis*/*Potentilla egedii* (bluejoint/silverweed) in some former tidal flat surfaces recently removed from tidal influence.

Eleocharis palustris Community Type
Spike rush: ELEPAL

Number of Stands Sampled: 3

Other Studies:

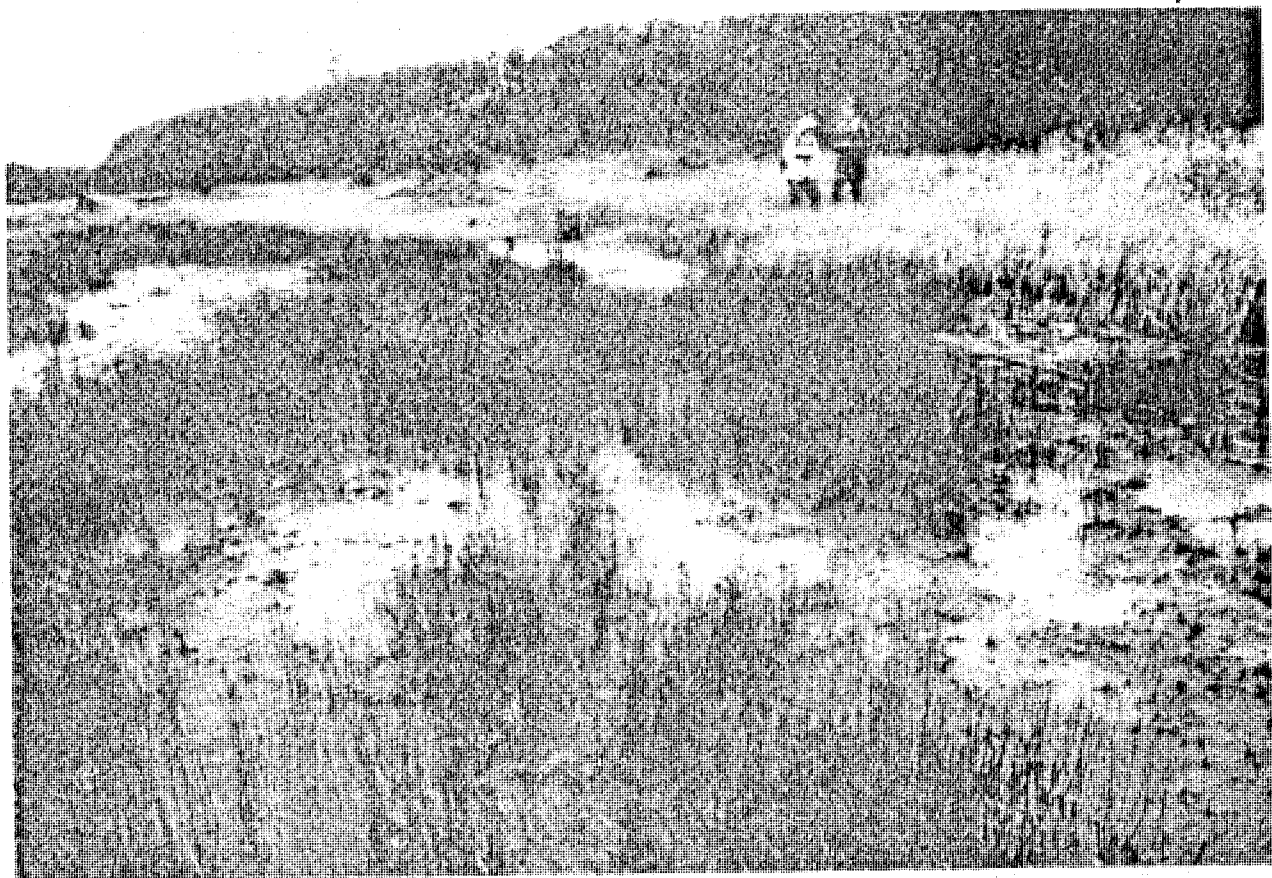
Eleocharis palustris (spike rush) types are described for the Copper River Delta (Boggs 1994) and for the Stikine River Delta (Sparks et al. 1977). *Eleocharis palustris* types have been described for other coastal areas of Alaska as well (Vioreck et al. 1992). This type is classified at level IV as herbaceous, graminoid, wet, fresh sedge meadow by Vioreck et al. (1992) and as palustrine or estuarine, persistent emergent wetland by Cowardin et al. (1979).

Distribution:

This community is uncommon. It occurs only on portions of recently uplifted tidal flats and on the higher reaches of current tidal flats.

Vegetation:

The vegetative cover is often sparse, ranging from 20 to 80 percent. Other than *Eleocharis palustris* (spike rush), common species include *Potentilla egedii* (Pacific silverweed) and *Ranunculus cymbalaria* (seaside buttercup). Bryophytes are rare.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Potentilla egedii grandis</i>	67	4	3-4
<i>Ranunculus cymbalaria</i>	67	2	-
<i>Deschampsia caespitosa</i>	67	2	-
<i>Eleocharis palustris</i>	100	48	15-80
<i>Juncus bufonius</i>	67	3	1-5
<i>Puccinellia nutkaensis</i>	67	1	1-2

Environmental Factors (landscape, soils, and hydrology):

This community type is found on sandy substrates. Sometimes the soils have an organic layer, but often do not. They are generally classified as Typic Cryaquents or Histic Cryaquepts. The water table is frequently at the surface or above the surface by 10 to 20 cm (4-8 in.). Some of these stands are covered by fresh water backed up by tidal water several times a year.

Succession:

This type is fairly stable on inundated uplifted tidal flats with a sandy substrate. However, as these sites continue to uplift, the water table may drop, and other types such as *Equisetum variegatum* (variegated scouring-rush) and *Myrica gale/Equisetum variegatum* (sweetgale/variegated scouring-rush) will displace this community type.

Adjacent Communities:

This community often occurs adjacent to *Carex lyngbyei* (lyngbyei sedge) along estuary sloughs, and *Equisetum variegatum* (variegated scouring-rush) in some former tidal flat surfaces recently removed from tidal influence.

***Carex lyngbyei* Community Type**
Lyngbyei sedge: CARLYN

Number of Stands Sampled: 5

Other Studies:

Carex lyngbyei (lyngbyei sedge) types have been described for many coastal areas of Alaska (Viereck et al. 1992), and are a common halophytic sedge type in Alaska. Batten et al. (1978) described a type for Yakutat; Boggs (1994) described three types for the Copper River Delta; and Watson (1981) described types for the Sitka Sound area. This *Carex lyngbyei* (lyngbyei sedge) c.t. is classified at level IV as herbaceous, graminoid, wet, halophytic or subarctic sedge wet meadow by Viereck et al. (1992) and as estuarine low, marsh, and shallow basin marsh wetland by Cowardin et al. (1979).

Distribution:

This community is common on current tidal flats, and occasionally on uplifted tidal flats and distal outwash.

Vegetation:

Often the vegetative cover is only a single layer, a mixture of *Carex lyngbyei* (lyngbyei sedge) and a sparse assortment of other graminoids and forbs. Bryophytes are uncommon.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Carex lyngbyei</i>	100	78	55-95
<i>Deschampsia caespitosa</i>	60	3	1-4

Environmental Factors (landscape, soils, and hydrology):

This community type is found on sandy to silty substrates. Sometimes the soils have an organic layer, but often they do not. They are generally classified as Typic Cryaquents or Histic Cryaquepts. The water table is typically at or near the surface. In some stands, the water table can be above the surface by 10 to 20 cm (4-8 in.). Some stands are covered by brackish water (or fresh water pushed by tidal water) on a daily basis, while other stands are flooded less often. A *Carex lyngbyei* type is occasionally found many miles from the coast, in which case the species diversity is higher.

Succession:

This type is fairly stable on inundated uplifted tidal flats with sandy substrates. However, as the area continues to uplift, the water table may drop. Then other community types such as *Equisetum variegatum* (variegated scouring-rush) and *Myrica gale/Equisetum variegatum* (sweetgale/variegated scouring-rush) will probably displace this c.t. See Figure 7 for an inferred chronosequence diagram for this c.t. on tidal flats and uplifted tidal flats.

Adjacent Communities:

This community often occurs adjacent to *Eleocharis palustris* (spike rush) and *Puccinellia pumila* (dwarf alkali grass) on tidal flat pools and flats respectively, and *Myrica gale/Carex sitchensis* (sweetgale/Sitka sedge) on recently uplifted tidal flat sites.

Carex saxatilis Community Type
Russet sedge: CARSAX

Number of Stands Sampled: 6

Other Studies:

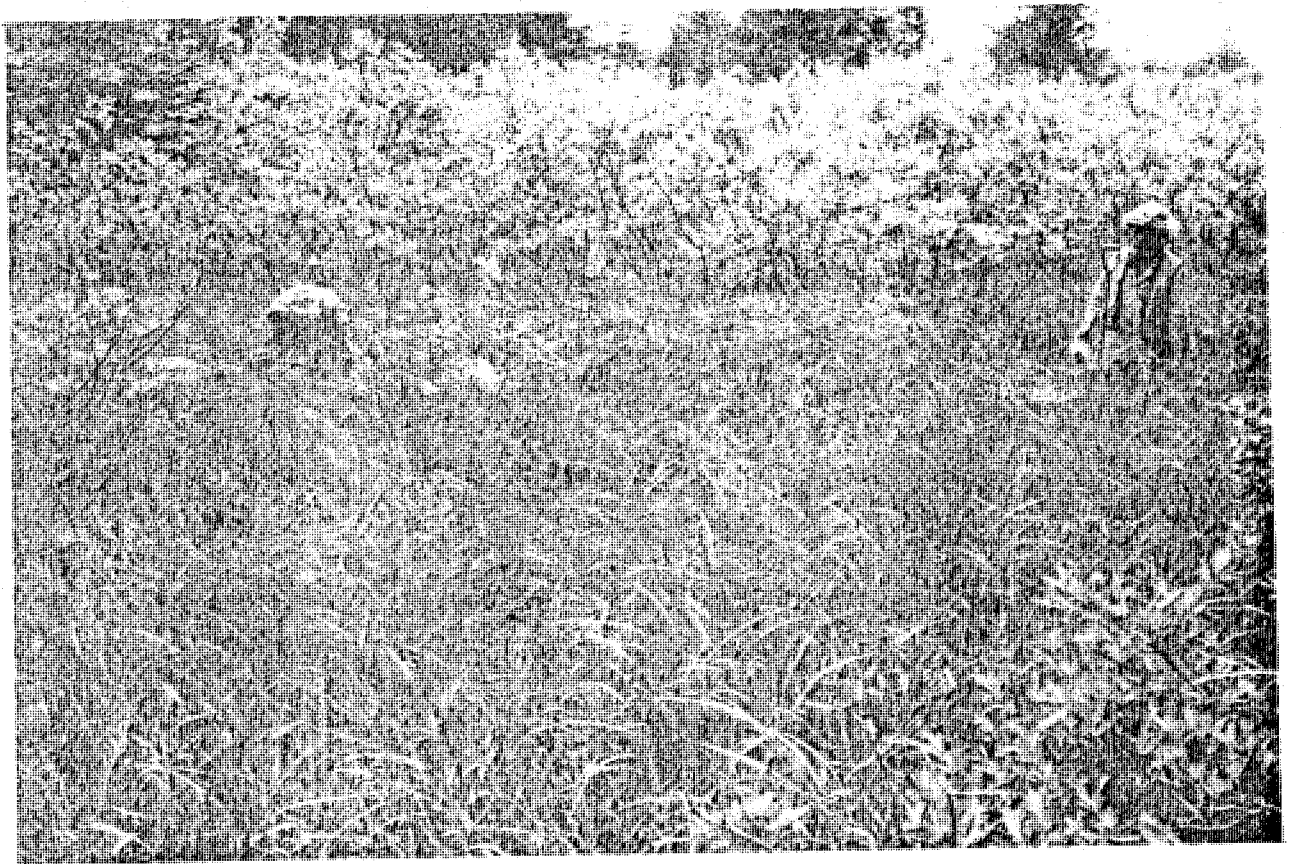
This type has been described for the Kenai lowlands (Rosenburg 1986 cited in Viereck et al. 1992); the Kuskokwim River Delta (Drury 1956); and the Copper River Delta (Boggs 1994). This type is classified at level IV as herbaceous, graminoid, wet, subarctic lowland sedge, wet meadow by Viereck et al. (1992) and as palustrine, persistent emergent wetland by Cowardin et al. (1979).

Distribution:

This community is uncommon. It occurs most often on distal outwash and occasionally on other landscapes.

Vegetation:

Often the vegetative cover is only a single layer, a mixture of *Carex saxatilis* (russet sedge) and a sparse assortment of other sedges and forbs. *Scorpidium scorpioides* is one of the few bryophytes found.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Equisetum variegatum</i>	67	2	1-3
<i>Carex saxatilis</i>	100	63	20-90

Environmental Factors (landscape, soils, and hydrology):

This type is most often found in areas where the ground water is between 20 and 60 cm (8-24 in.) of the surface, but some dry periods and some very wet periods occur. This community can be characterized as an ephemeral channel type. Fry of Coho salmon and other anadromous fish frequent this type when it is accessible during periods of high water. *Scorpidium scorpioides* is indicative of high pH and high calcium bicarbonate (Vitt and Chee 1990). The soils of this type have an average organic layer depth of 15 cm (6 in.) over the mineral horizon (coarse sand to fine gravel) and are generally classified as Typic Cryaquents and Histic Cryaquepts.

Succession:

This type primarily occurs in ephemeral channels where ground water comes to the surface, and occasionally along lake shores. It appears stable in these locations, as long as the hydrologic conditions remain the same. See Figure 6 for an inferred chronosequence diagram for this c.t. on distal outwash.

Adjacent Communities:

This type often occurs adjacent to *Salix barclayi*/*Carex sitchensis* (barclay willow/Sitka sedge) on more upland sites and *Equisetum fluviatile* (swamp horsetail) on sites with perennially high water tables such as along channels and lakeshores.

Carex pluriflora-*Carex lyngbyei* Community Type
Many-flowered sedge-lyngbyei sedge: CARPLU-CARLYN

Number of Stands Sampled: 12

Other Studies:

This type has been described for the Kenai lowlands (Rosenburg 1986 cited in Viereck et al. 1992). This type is classified at level IV as herbaceous, graminoid, wet, halophytic sedge, or subarctic lowland sedge wet meadow by Viereck et al. (1992) and as palustrine, persistent emergent wetland by Cowardin et al. (1979).

Distribution:

This community is common. It occurs on uplifted tidal flats and occasionally on distal outwash.

Vegetation:

Carex pluriflora (many-flowered sedge) dominates the sedge layer, sometimes with *Carex lyngbyei* (lyngbyei sedge) codominating. The most common forbs are *Iris setosa* (wild iris) and *Drosera rotundiflora* (round-leaf sundew). Common mosses are *Sphagnum squarrosum*, *S. lindbergii*, *Rhytidiadelphus squarrosus*, and *Aulacomium palustre*.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i> regen.	58	1	1-7
<i>Oxycoccus palustris</i>	58	6	1-15
<i>Drosera rotundifolia</i>	67	4	1-15
<i>Iris setosa</i>	58	13	1-60
<i>Platanthera dilatata</i>	67	1	1-3
<i>Rubus arcticus stellatus</i>	75	2	1-4
<i>Trientalis europaea</i>	67	1	-
<i>Carex lyngbyei</i>	67	18	1-30
<i>Carex pluriflora</i>	100	30	15-60
<i>Deschampsia caespitosa</i>	58	5	1-20
<i>Eriophorum russeolum</i>	67	7	1-15
<i>Luzula multiflora</i>	58	3	1-10

Environmental Factors (landscape, soils, and hydrology):

This community type is found primarily along coastal sloughs and as an ecotone between graminoid types found on the youngest uplifted surfaces and acidic bogs on the older uplifted surfaces. The soils have an average organic layer depth of 38 cm (15 in.) over the mineral horizon (very fine sand and silt). They are generally classified as Histic Cryaquepts and Terric Cryofibrists. The water table is usually between 5 and 30 cm (2-12 in.) of the surface, but it also rises over the surface during storms.

Succession:

This type is closely related to some peatland types such as *Myrica gale*/*Carex livida* (sweetgale/livid sedge). Although its seral setting is uncertain, it is probably an intermediate type between the *Calamagrostis canadensis*/*Potentilla egedii* (bluejoint/silverweed) type found on the young uplifted tidal flats and the *Carex livida*-*Trichophorum caespitosum* (livid sedge-tufted clubrush) and related types found on the older peat-dominated surfaces within the uplifted tidal flats. See Figure 7 for an inferred chronosequence diagram for this c.t. on uplifted tidal flats.

Adjacent Communities:

This community often occurs adjacent to *Myrica gale*/*Carex pluriflora* (sweetgale/many-flowered sedge) and *Carex sitchensis*/*Oxycoccus palustris* (Sitka sedge/bog cranberry) on older uplifted tidal flats.

Carex livida-Trichophorum caespitosum Community Type
Livid sedge-tufted clubrush: CARLIV-TRICAE

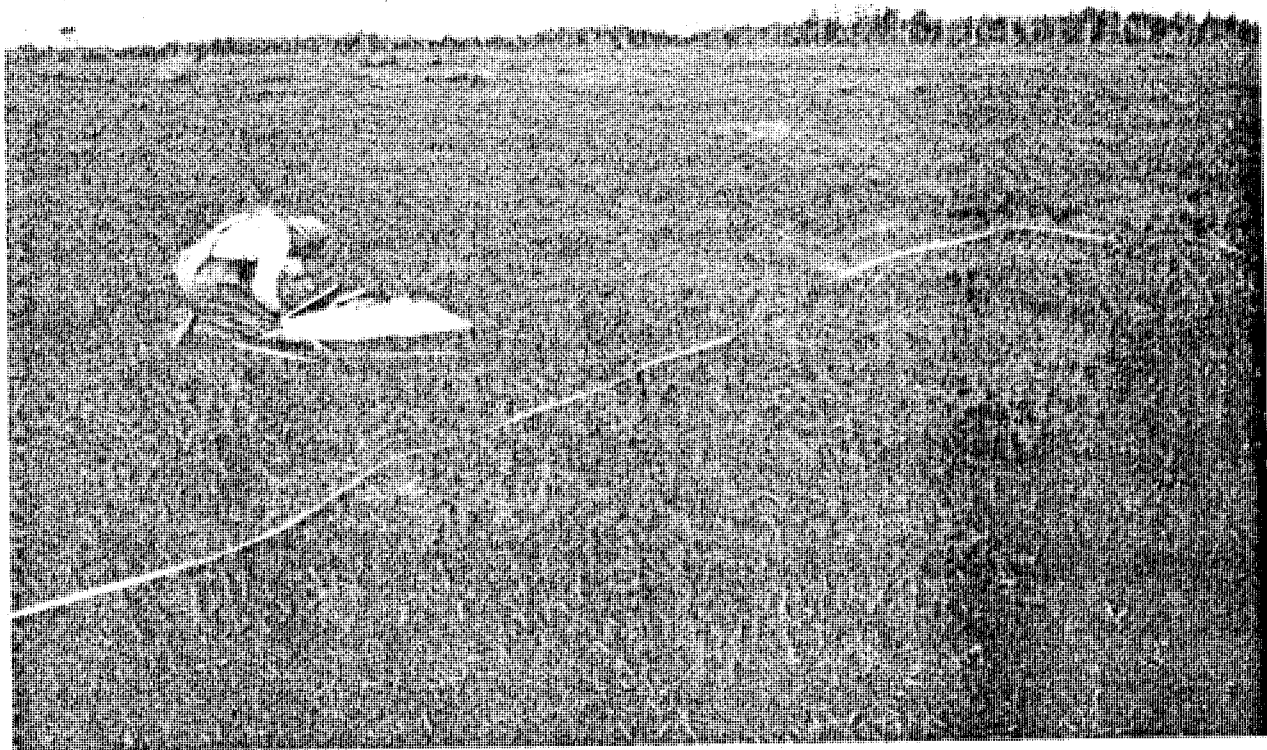
Number of Stands Sampled: 17

Other Studies:

Related types have been reported for the Kenai lowlands (Rosenburg 1986 cited in Viereck et al. 1992); for Dixon Harbor in Glacier Bay National Park (Worley 1977); for Southeast Alaska (Neilland 1971); and for Mitkof Island near Petersburg (Sjors 1985). See Viereck et al. (1992) for other related types in the state. This type is classified at level IV as herbaceous, graminoid, wet, subarctic lowland sedge wet meadow, or sedge bog meadow by Viereck et al. (1992) and as palustrine, persistent emergent wetland by Cowardin et al. (1979).

Distribution:

This community is abundant. It covers large areas of distal outwash and lowlands of both the rolling bedrock hills near Tanis Mesa and the kettle-kame topography near Pike Lakes.



Vegetation:

This community type is a common blanket bog type on the foreland where sphagnum moss accumulation covers undulating flats and gentle slopes, as in the lowlands of the Pike Lakes area. *Carex livida* (livid sedge), *Eriophorum angustifolium* (cotton grass), and *Trichophorum caespitosum* (tufted clubrush) codominate the sedge layer. The most common subshrubs and forbs are *Oxycoccus palustris* (bog cranberry) and *Drosera rotundiflora* (round-leaf sundew). Shallow pools (normally 3-10 cm deep [1-4 in.]) and *Sphagnum* hummocks are scattered across this type. These microtopographic features determine distribution of many species. For example, *Drosera anglica* occurs almost solely along the edges of these small pools, *Utricularia intermedia* (bladderwort) occurs in the pools, and occasional stunted Sitka spruce (or shore pine) occur on the drier hummocks formed by *Sphagnum fuscum*. The two dominant mosses are *Sphagnum papillosum* and *S. lindbergii*. Other common species include *S. fuscum*, *Pleurozium schreberi*, and *Aulacomium palustre*.

The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Andromeda polifolia</i>	59	1	1-3
<i>Empetrum nigrum</i>	88	3	1-10
<i>Oxycoccus palustris</i>	100	2	1-5
<i>Coptis trifolia</i>	53	2	1-3
<i>Drosera anglica</i>	59	5	2-15
<i>Drosera rotundifolia</i>	94	4	1-25
<i>Gentiana douglasiana</i>	82	2	1-5
<i>Pedicularis parviflora</i>	94	1	1-5
<i>Platanthera dilatata</i>	71	1	1-2
<i>Tofieldia glutinosa</i>	82	1	1-2
<i>Agrostis aequivalvis</i>	53	2	1-3
<i>Carex livida</i>	94	12	1-25
<i>Carex pauciflora</i>	65	15	1-60
<i>Eriophorum angustifolium</i>	82	16	2-50
<i>Trichophorum caespitosum</i>	76	11	1-40

Environmental Factors (landscape, soils, and hydrology):

Soils are typically classified as Histic Cryaquepts and Terric Crychemists. They have an organic layer depth averaging 83 cm (33 in.) over the mineral horizon, generally sand and fine gravel. The water table varies between 5 and 30 cm (2-12 in.) of the surface, but also rises over the surface during storms. In the deeper organic soils, the water table is often perched in the first 30 cm (12 in.; Kemnitz et al. 1993). Below this level, the peat is usually drier and contains less free water.

Succession:

This type is closely related to peatland types such as *Myrica gale/Carex livida* (sweetgale/livid sedge) and *Carex sitchensis/Oxycoccus palustris* (Sitka sedge/bog cranberry). This type is not commonly domed. It probably receives limited nutrient input from overland surface flow during large storms and from some mineral soil input. This type is late seral and will intergrade with other peatland types on distal outwash for many centuries. See Figure 6 for an inferred chronosequence diagram for this c.t. on distal outwash.

Adjacent Communities:

This type often occurs adjacent to *Myrica gale/Carex livida* (sweetgale/livid sedge) and *Carex sitchensis/Oxycoccus palustris* (Sitka sedge/bog cranberry), although the specific ecological relationships between these *Sphagnum*-dominated peatland types are not known.

Trichophorum caespitosum Community Type
Tufted clubrush: TRICAE

Number of Stands Sampled: 7

Other Studies:

A related type (*Trichophorum caespitosum*-*Eriophorum* spp.-*Rhynchospora alba*/Sphagnum) has been reported for the Dixon Harbor area of Glacier Bay National Park (Streveler et al. 1973). See Viereck et al. (1992) for related community types. This *Trichophorum caespitosum* (tufted clubrush) type is classified at level IV as herbaceous, graminoid, wet, subarctic lowland sedge wet meadow by Viereck et al. (1992) and as palustrine, persistent emergent wetland by Cowardin et al. (1979).

Distribution:

This community is common. It occurs on distal outwash and occasionally on outburst flood plains.

Vegetation:

Scattered willows, sweetgale, and subshrubs overtop the dominant *Trichophorum caespitosum* (tufted clubrush). *Rubus arcticus stellatus* (nagoonberry) and *Swertia perennis* (swertia) are common forbs. Shallow pools (normally 3-10 cm deep [1-4 in.]) are scattered across this type. *Drepanocladus revolvens*, *Pleurozium schreberi*, *Racomitrium lanuginosum*, *Sphagnum warnstorffii* and *Tomentypnum nitens* are common mosses.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Myrica gale</i>	57	9	1-20
<i>Salix barclayi</i>	57	2	1-5
<i>Salix commutata</i>	71	2	1-5
<i>Empetrum nigrum</i>	86	5	1-10
<i>Oxycoccus palustris</i>	86	1	1-3
<i>Vaccinium uliginosum</i>	71	4	1-8
<i>Achillea borealis</i>	57	2	1-3
<i>Coptis trifolia</i>	57	2	1-4
<i>Equisetum arvense</i>	57	1	-
<i>Geum calthifolium</i>	57	1	1-2
<i>Lupinus nootkatensis</i>	57	4	1-8
<i>Pinguicula vulgaris</i>	57	1	-
<i>Platanthera dilatata</i>	86	1	1-2
<i>Polygonum viviparum</i>	86	2	1-5
<i>Rubus arcticus stellatus</i>	86	3	1-15
<i>Sanguisorba stipulata</i>	57	2	1-2
<i>Swertia perennis</i>	86	5	1-8
<i>Tofieldia glutinosa</i>	100	1	1-4
<i>Trientalis europaea</i>	57	1	1-3
<i>Carex flava</i>	57	2	1-3
<i>Deschampsia caespitosa</i>	71	4	1-10
<i>Festuca rubra</i>	57	2	1-3
<i>Trichophorum caespitosum</i>	100	31	3-55

Environmental Factors (landscape, soils, and hydrology):

This community type occurs primarily on distal outwash, but also on wetter portions of outburst flood plains. Soils are commonly classified as Typic Cryaquents. They have an organic layer depth that averages 11 cm (4 in.) over the mineral horizon, generally sand and fine gravel. Two plots were placed near ground-water monitoring points checked by the USGS periodically over the last four years. Data from these points indicate the water table typically fluctuates between 25 and 90 cm (10-36 in.) below the ground surface. The water table also appears to fluctuate with general precipitation patterns and to rise to the surface during major storms. Sheet flow over this community type is an important source of nutrients.

Succession:

The moss flora indicates the frequent through-flow of calcium-rich ground water (D. Andrus pers. comm. 1994). Seral status is uncertain. On better drained sites, this c.t. will probably slowly become a drier shrub type. In wetter areas where peat is accumulating, these sites may gradually acidify and existing vegetation will be replaced by *Sphagnum* dominated communities. See Figure 6 for an inferred chronosequence diagram for this c.t. on distal outwash.

Adjacent Communities:

This community often occurs adjacent to types where *Sphagnum* is more dominant, such as *Carex livida-Trichophorum caespitosum* (livid sedge-tufted clubrush) in large wetland complexes on distal outwash.

Carex sitchensis/Oxycoccus palustris Community Type
Sitka sedge/bog cranberry: CARSIT/OXYPAL

Number of Stands Sampled: 17

Other Studies:

This type was reported earlier for the Yakutat foreland by Rigg (1914). A related type (*Eriophorum angustifolium*-*Carex livida* c.t.) was reported for the Kenai lowlands (Rosenburg 1986 cited in Viereck et al. 1992). See Viereck et al. (1992) for related community types. This *Carex sitchensis/Oxycoccus palustris* (Sitka sedge/bog cranberry) type is classified at level IV as herbaceous, graminoid, wet, subarctic lowland sedge bog meadow by Viereck et al. (1992) and as palustrine, persistent emergent wetland by Cowardin et al. (1979).

Distribution:

This community is abundant, and occurs frequently on distal outwash and uplifted tidal flats.



Vegetation:

Raised bogs (where sphagnum moss accumulation at the center of the bog is greater than at its edges) seem to be composed primarily of this community type. *Carex sitchensis* (Sitka sedge), *Eriophorum angustifolium* (cotton grass), and *Carex pluriflora* (many-flowered sedge) codominate the sedge layer. *Carex sitchensis* (Sitka sedge) height is reduced, averaging 30 to 50 cm (12-20 in.). *Oxycoccus palustris* (bog cranberry) and *Drosera rotundiflora* (round-leaf sundew) are common subshrubs and forbs. Shallow pools (normally 3-10 cm deep [1-4 in]) with *Menyanthes trifoliata* (buckbean) are scattered across this type. When it occurs as a domed bog, these small pools may be meters deep. *Sphagnum fuscum* hummocks also are scattered across these sites. Microtopographic features determine the distribution of many species. For example, *Drosera anglica* (long-leaf sundew) occurs almost solely along the edges of these small pools, and occasional stunted Sitka spruce (or shore pine) occur on the drier hummocks formed by *Sphagnum fuscum*. *Sphagnum papillosum*, *S. lindbergii*, *S. angustifolium*, *S. fuscum*, *S. riparium* and *Aulacomium palustre* are common mosses.

The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average %t Canopy cover	Range
<i>Empetrum nigrum</i>	59	3	1-8
<i>Oxycoccus palustris</i>	94	4	1-20
<i>Vaccinium uliginosum</i>	59	3	1-15
<i>Drosera rotundifolia</i>	82	3	1-10
<i>Menyanthes trifoliata</i>	53	3	1-4
<i>Platanthera dilatata</i>	71	1	-
<i>Carex pluriflora</i>	71	9	2-25
<i>Carex sitchensis</i>	94	33	15-60
<i>Eriophorum angustifolium</i>	82	13	1-40

Environmental Factors (landscape, soils, and hydrology):

This community type is found primarily on distal outwash and uplifted tidal flats, but is also found on older moraine complexes. Soils are generally classified as Histic Cryaquepts, Typic Crychemists or Terric Cryofibrists. They have an organic layer depth that averages 78 cm (31 in.) over the mineral horizon, generally sand and fine gravel in the distal outwash, and very fine sand and silt in the uplifted tidal flats. The water table is generally between 5 and 30 cm (2-12 in.) of the surface, but also rises over the surface during storms. Nutrient input for this c.t. seems to be primarily by rain. This c.t. seems to be most frequently found where there is no upgradient water input (see hydrology section).

Succession:

This type is closely related to other peatland types such as *Myrica gale*/*Carex livida* (sweetgale/livid sedge) and *Carex livida-Trichophorum caespitosum* (livid sedge-tufted clubrush). This community type is probably late-seral and will be found intergrading with other peatland types on distal outwash and uplifted tidal flats for many centuries. See Figure 6 for an inferred chronosequence diagram for this c.t. on distal outwash.

Adjacent Communities:

This type often occurs adjacent to other *Sphagnum*-dominated types, such as *Carex livida-Trichophorum caespitosum* (livid sedge-tufted clubrush) in large wetland complexes in the distal outwash and uplifted tidal flats.

Carex sitchensis/Equisetum fluviatile Community Type
Sitka sedge/swamp horsetail: CARSIT/EQUFLU

Number of Stands Sampled: 7

Other Studies:

This type has not been described in Alaska, although several *Carex sitchensis* (Sitka sedge) types have been described (see Viereck et al. 1992). This type seems to be best classified at level IV as herbaceous, graminoid, wet, subarctic lowland sedge wet meadow by Viereck et al. (1992) and as palustrine, persistent emergent wetland by Cowardin et al. (1979).

Distribution:

This community is uncommon, and occurs primarily on distal outwash.

Vegetation:

This community type is located in areas that have standing water for at least part of the growing season. *Carex sitchensis* (Sitka sedge) is the clear dominant, while *Equisetum fluviatile* (swamp horsetail) and *Potentilla palustris* (marsh cinquefoil) are often present. *Carex sitchensis* (Sitka sedge) is very robust, ranging in height from 50 to 110 cm (20-43 in.). *Brachythecium hylotapetum*, *Sphagnum warnstorffii*, and *Rhytidiadelphus squarrosus* are common bryophytes.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Caltha palustris asarifolia</i>	57	6	1-10
<i>Equisetum fluviatile</i>	86	5	1-10
<i>Potentilla palustris</i>	71	5	2-10
<i>Carex sitchensis</i>	100	71	50-90

Environmental Factors (landscape, soils, and hydrology):

This community type is found primarily on distal outwash, but also occurs on other landscapes. Soils have an average organic layer depth of 60 cm (24 in.) over the mineral horizon, usually sand and silt. They are generally classified as Terric Cryohemists. The water table ranges from 35 cm (14 in.) above the surface to 20 cm (8 in.) below the surface.

Succession:

This type occurs primarily along pond shores and perennial channels. Although the specific successional status is uncertain, it appears to be a late-seral type in these locations, as long as the hydrologic conditions remain the same.

Adjacent Communities:

This community often occurs adjacent to *Menyanthes trifoliata*-*Potentilla palustris* (buckbean-marsh cinquefoil) found as a floating mat in shallow pools, and *Salix barclayi*/*Carex sitchensis* (barclay willow/Sitka sedge) found in perennially saturated sites.

***Calamagrostis canadensis*/*Potentilla egedii* Community Type**
Bluejoint/Pacific silverweed: CALCAN/POTEGE

Number of Stands Sampled: 6

Other Studies:

Boggs (1994) described several *Calamagrostis* community types for the Copper River Delta. Batten et al. (1978) described an "inner marsh" community type for coastal areas of Yakutat. Stone (1993) described a coastal forb meadow type for the Juneau area. Other *Calamagrostis canadensis* types have been described for many areas of coastal Alaska (see Viereck et al. 1992). This *Calamagrostis canadensis*/*Potentilla egedii* (bluejoint/Pacific silverweed) c.t. is classified at level IV as herbaceous, graminoid, mesic, bluejoint-herb meadow by Viereck et al. (1992) and as palustrine, persistent emergent wetland by Cowardin et al. (1979).

Distribution:

This community is uncommon, and occurs on current tidal flats and uplifted tidal flats.

Vegetation:

Scattered forbs such as *Heracleum lanatum* (cow parsnip), *Angelica genuflexa* (bent-leaved angelica), and *Rumex fenestratus* (dock) overtop the dominant *Calamagrostis* species (bluejoint) and *Potentilla egedii* (Pacific silverweed). Other forbs and graminoids such as *Lupinus nootkatensis* (nootka lupine) and *Deschampsia caespitosa* (hairgrass) are common.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Achillea borealis</i>	83	6	1-15
<i>Conioselinum chinense</i>	67	4	1-5
<i>Epilobium glandulosum</i>	67	3	2-5
<i>Lathyrus palustris</i>	67	6	4-10
<i>Lupinus nootkatensis</i>	83	21	2-80
<i>Potentilla egedii grandis</i>	100	12	2-20
<i>Rumex fenestratus</i>	83	1	1-2
<i>Calamagrostis canadensis</i>	83	31	10-60
<i>Deschampsia caespitosa</i>	83	9	5-15
<i>Festuca rubra</i>	67	2	1-5
<i>Hordeum brachyantherum</i>	67	4	1-10
<i>Poa eminens</i>	67	3	1-7

Environmental Factors (landscape, soils, and hydrology):

This community type has been found primarily in the transition zone between current tidal flats and uplifted tidal flats. Soils have an average organic layer depth of 10 cm (4 in.) over the mineral horizon, usually sand, but occasionally silt. They are generally classified as Typic Cryaquents. The water table generally fluctuates between 20 and 60 cm (8-24 in.) below the ground surface, but rises to the surface during major storms.

Succession:

This community type appears to be early seral. It will be replaced by types such as *Myrica gale/Carex sitchensis* (sweetgale/Sitka sedge) and then by *Carex pluriflora-Carex lyngbyei* (many-flowered sedge-lyngbyei sedge) and other related late-seral types as the surfaces continue to be uplifted. However, this type will continue to occur with other tidal flat and uplifted tidal flat types as new sites become available. See Figure 7 for an inferred chronosequence diagram for this c.t. on uplifted tidal flats.

Adjacent Communities:

This community often occurs adjacent to *Myrica gale/Carex sitchensis* (sweetgale/Sitka sedge) on nearby uplifted tidal flat surfaces, and *Carex lyngbyei* (lyngbyei sedge) on tidal flat sites.

Elymus arenarius Community Type
Beach-rye grass: ELYARE

Number of Stands Sampled: 4

Other Studies:

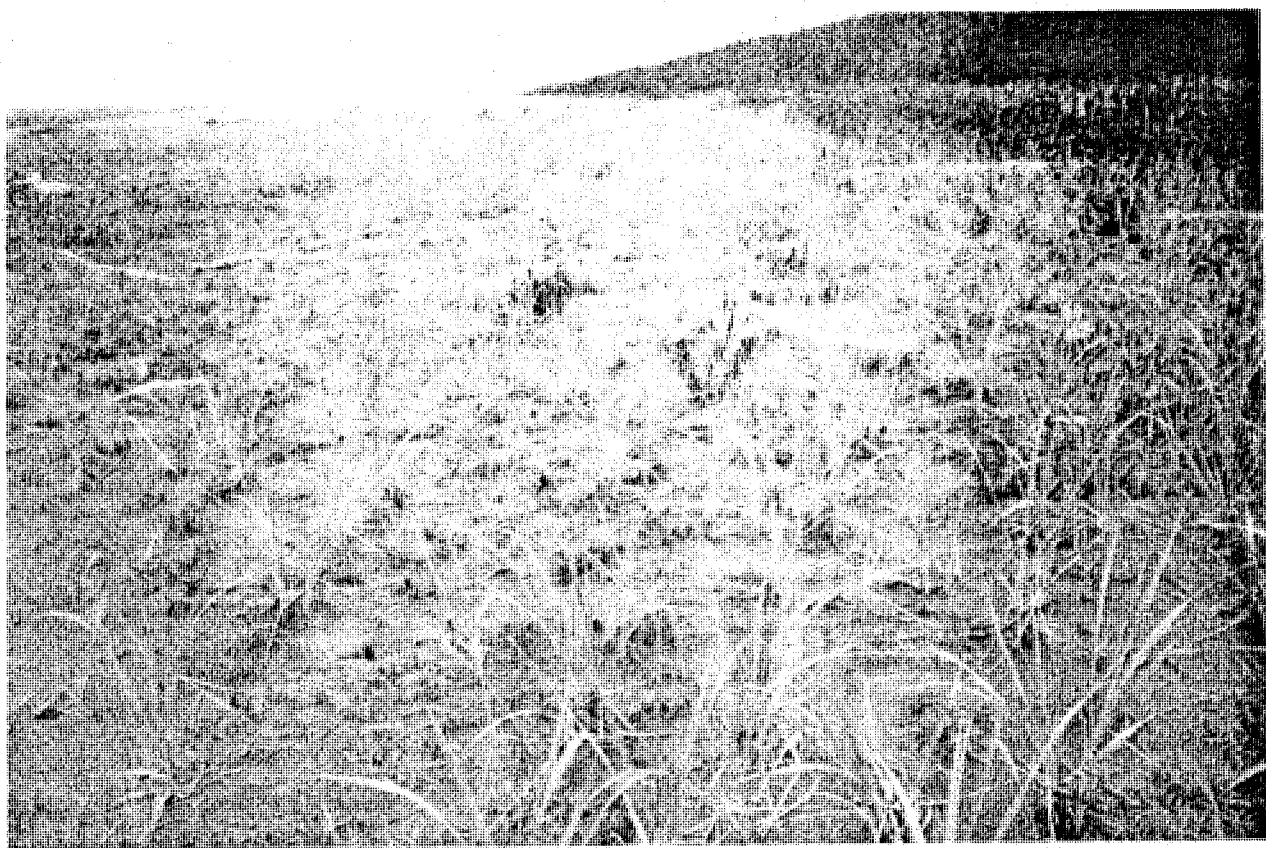
Boggs (1994) described two *Elymus* community types for the Copper River Delta and Batten et al. (1978) described an *Elymus* dune community for coastal areas of Yakutat. Related *Elymus arenarius* types have been described for many other coastal areas of Alaska (see Viereck et al. 1992). This *Elymus arenarius* (beach-rye grass) c.t. is classified at level IV as herbaceous, graminoid, dry, *Elymus* type by Viereck et al. (1992).

Distribution:

This community is common, and extends 80 km (50 miles) along the coast of the Yakutat foreland on dunes and storm beaches.

Vegetation:

Scattered salt tolerant graminoids and forbs make up this ubiquitous beach community type. Several species such as *Senecio pseudo-arnica* (sneezeweed) and *Honckenya peploides* (seabeach sandwort) are found only on the sandy substrate in the supratidal zone. Species diversity within this type is low.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Glehnia littoralis</i>	75	2	1-5
<i>Lathyrus maritimus</i>	75	8	2-15
<i>Elymus arenarius</i>	100	40	20-90

Environmental Factors (landscape, soils, and hydrology):

Soils of this type have no organic layer over the mineral horizon (beach sand). They are classified as Typic Cryopsamments and are somewhat excessively drained. The water table is typically one meter (3 ft.) or more below the ground surface, but occasionally major storms inundate this c.t. with brackish water or salt spray.

Succession:

This community type is stable if the processes of longshore transport, uplift, and erosion are in balance. On most of the beach surfaces of Yakutat, however, this c.t. is an early-seral type. It will be replaced by community types such as *Fragaria chiloensis*-*Achillea borealis* (beach strawberry-yarrow) and *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) as the surfaces continue to be supplied with an abundance of sand by longshore transport and uplift continues. See Figure 8 for an inferred chronosequence diagram for this c.t. on beaches and uplifted beach ridges.

Adjacent Communities:

This type often occurs adjacent to unvegetated beach seaward and *Fragaria chiloensis*-*Achillea borealis* (beach strawberry-yarrow) on back beach meadows further removed from salt water.

***Calamagrostis canadensis* Community Type**
Bluejoint: CALCAN

Number of Stands Sampled: 9

Other Studies:

Boggs (1994) described several *Calamagrostis* types for the Copper River Delta. *Calamagrostis canadensis* types have been described for many areas of Southcentral and Southwestern Alaska (see Viereck et al. 1992). This *Calamagrostis canadensis* (bluejoint) type is classified at level IV as herbaceous, graminoid, mesic, bluejoint meadow by Viereck et al. (1992). Some of these stands are classified as palustrine, persistent emergent wetlands by Cowardin et al. (1979), while others are upland stands.

Distribution:

This community is common, and occurs on distal outwash, uplifted tidal flats, and rolling bedrock hills of the Tanis Mesa area.

Vegetation:

Robust *Calamagrostis species* (bluejoint) and *Carex sitchensis* (Sitka sedge), 100 to 150 cm (39-60 in.) tall, dominate this type. Forbs and graminoids such as *Angelica genuflexa* (bent-leaved angelica), *Iris setosa* (wild iris), and *Deschampsia caespitosa* (hairgrass) are also common.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Angelica genuflexa</i>	78	5	1-15
<i>Galium trifidum</i>	56	3	1-5
<i>Iris setosa</i>	67	4	1-10
<i>Trientalis europaea</i>	56	2	1-5
<i>Calamagrostis canadensis</i>	100	44	15-
<i>Carex sitchensis</i>	78	31	1-70
<i>Deschampsia caespitosa</i>	56	21	2-45

Environmental Factors (landscape, soils, and hydrology):

The soils of this type have an average organic layer depth of 13 cm (5 in.) over the mineral horizon (usually sand or silt). They are generally classified as Typic Cryaquents. The water table varies widely, usually fluctuating between 20 and 60 cm (8-24 in.) below the ground surface, but rising to the surface during storm.

Succession:

Seral status of this type is uncertain. However, it is likely a successional type, with shrubs such as *Myrica gale* (sweetgale) and *Salix* (willow) slowly invading. See Figure 7 for an inferred chronosequence diagram for this c.t. on uplifted tidal flats.

Adjacent Communities:

This community often occurs adjacent to *Salix barclayi*/*Carex sitchensis* (barclay willow/Sitka sedge) and *Myrica gale*/*Carex sitchensis* (sweetgale/Sitka sedge).

FORB TYPES

Ecological Setting and Management Interpretations:

In Yakutat, forb communities occupy a moisture gradient from the wettest areas to the driest. The wettest communities occur in ponds and lakes (*Nuphar polysepalum* [pond lily] and *Myriophyllum alterniflorum* [alternate-flower water-milfoil]) or on pond edges or floating in ponds (*Equisetum fluviatile* [swamp horsetail] and *Menyanthes trifoliata*-*Potentilla palustris* [buckbean-marsh cinquefoil]). Several community types are early seral (*Fragaria chiloensis*-*Achillea borealis* [beach strawberry-yarrow], *Lupinus nootkatensis*/*Salix setchelliana* [nootka lupine/setchell willow] and *Equisetum variegatum* [variegated scouring-rush]). Others are mid seral (*Menyanthes trifoliata*-*Equisetum variegatum* [buckbean-variegated scouring-rush] and mesic forb/*Athyrium filix-femina* [mesic forb/lady fern]).

Moose and bear use forb communities. During the summer, moose commonly browse on *Menyanthes trifoliata* (buckbean) leaves in many wet forb community types, while bear were observed browsing in several different wet meadow types. Bear seem to prefer the genus *Angelica* (umbel family). In the spring, there was abundant evidence of bear eating the base stock of *Angelica lucida* (sea coast angelica). Later in the summer, they preferentially ate the flowering umbels of *Angelica genuflexa* (bent-leaved angelica). Additionally, the early summer bear scat always seemed to contain plant parts recognizable from this family.

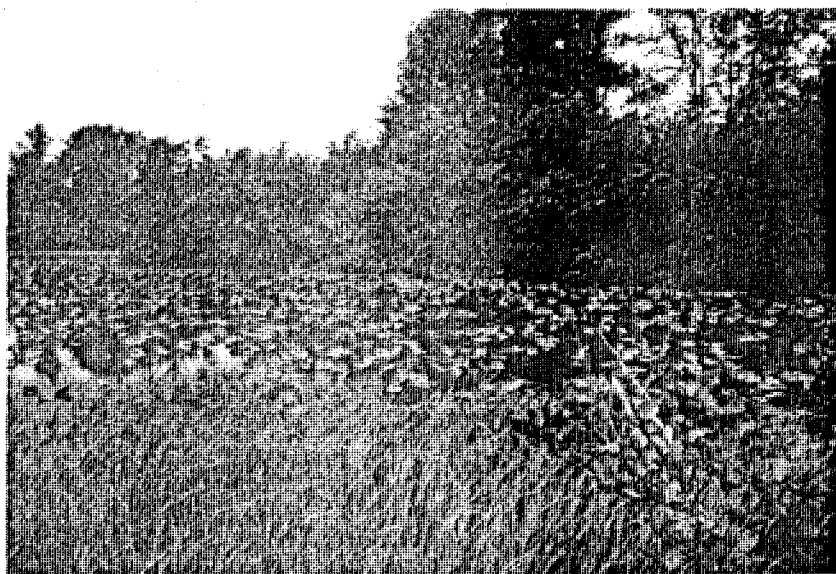
All terrain vehicle (ATV) traffic occurs in many nonforested community types; see the *Myrica gale* (sweetgale) section for a discussion of impacts.

Nuphar polysepalum Community Type Pond lily: NUPPOL

Number of Stands Sampled: 1

Other Studies:

This type has been described by Tande (1983 cited in Viereck et al. 1992) for the Anchorage area and by Boggs (1994) for the Copper River Delta. It has also been described from around Alaska (see Viereck et al. 1992). This community is classified at level IV an herbaceous, aquatic, freshwater, pond lily type by Viereck et al. (1992) and as palustrine, aquatic bed, floating-leaved vascular wetland by Cowardin et al. (1979).



Distribution:

Although this type was sampled only once, it is a common community, found in shallow ponds on uplifted tidal flats and distal outwash.

Vegetation:

Nuphar polysepalum (lily-pad) is the dominant species of this open water type. Scattered *Menyanthes trifoliata* (buckbean), *Sparganium angustifolium* (bur-reed), and *Chara* spp. (macro-alga) are occasionally present depending on the water depth.

The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Menyanthes trifoliata</i>	100	1	-
<i>Nuphar polysepalum</i>	100	40	-
<i>Sparganium angustifolium</i>	100	1	-

Environmental Factors (landscape, soils, and hydrology):

This aquatic community type occurs most often in shallow ponds and along slow-moving streams on outburst flood plains and distal outwash, and in shallow kettle ponds on moraines. Water depth varies from 0.5 to 2 meters (2-6 ft.). This type typically occurs with mineral substrates.

Succession:

This floating-leaved aquatic community colonizes open water. In time, herbaceous wetland species such as *Menyanthes trifoliata* (buckbean) and *Carex limosa* (mud sedge) invade the open water. This series of changes follows the classic pond infilling and is based on water depth. For example, on the moraines, this c.t. appears to be an early-seral type that slowly invades shallow kettle ponds and then is gradually replaced by *Menyanthes trifoliata*-*Potentilla palustris* (buckbean-marsh cinquefoil). As the organic mat continues to accumulate, these types appear to be replaced by *Sphagnum*-dominated types. A raised bog may eventually develop as the vegetation loses contact with the ground water and gets nutrients only from precipitation.

Adjacent Communities:

This community often occurs adjacent to *Menyanthes trifoliata*-*Potentilla palustris* (buckbean-marsh cinquefoil) along pond edges, and *Sphagnum*-dominated types on uplifted tidal flats and distal outwash.

***Myriophyllum alterniflorum* Community Type**
Water-milfoil: MYRALT

Number of Stands Sampled: 3

Other Studies:

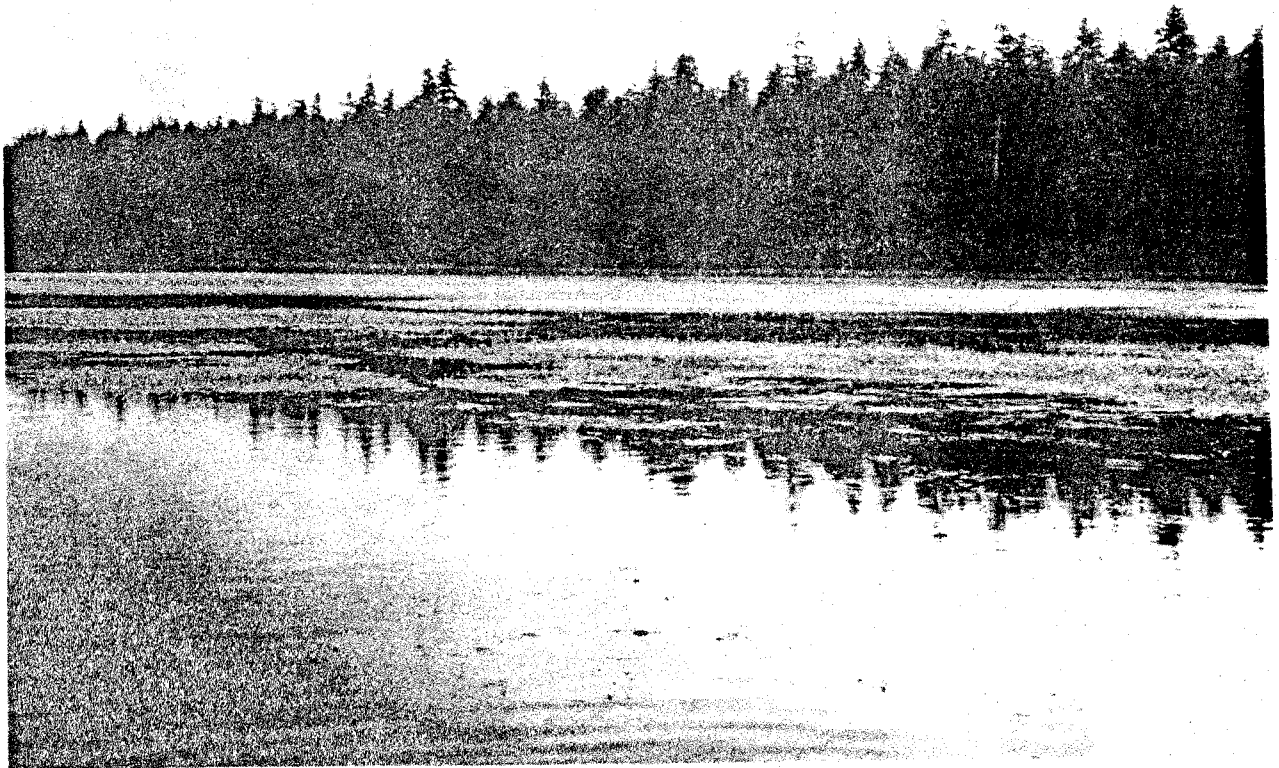
Boggs (1994) described a water-milfoil community type for the Copper River Delta. Related types have been described for other locations in Alaska (see Viereck et al. 1992). This community is classified at level IV as herbaceous, aquatic, freshwater, water milfoil type by Viereck et al. (1992) and as palustrine, aquatic bed, rooted vascular wetland by Cowardin et al. (1979).

Distribution:

This community is uncommon, found in ponds and lakes such as Summit and Square Lakes.

Vegetation:

Myriophyllum alterniflorum (alternate-flower water-milfoil) or *Myriophyllum spicatum* (Eurasian water-milfoil) dominates, while *Chara* spp. (macro-alga), *Potamogeton pectinatus* (sago pondweed), and *Ranunculus confervoides* are often represented.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Myriophyllum alterniflorum</i>	67	73	50-95
<i>Myriophyllum spicatum</i>	67	25	10-40
<i>Potamogeton pectinatus</i>	67	10	1-20
<i>Ranunculus confervoides</i>	67	6	2-10

Environmental Factors (landscape, soils, and hydrology):

The soil is organic muck over sands and silt. The water table ranges from 50 to 150 cm (20-60 in.) above the organic surface.

Succession:

This type occurs primarily in shallow lakes and ponds. It appears stable in these locations, as long as the water level remains stable.

Adjacent Communities:

This type often occurs adjacent to *Equisetum fluviatile* (swamp horsetail), *Menyanthes trifoliata*-*Potentilla palustris* (buckbean-marsh cinquefoil), and *Chara* spp. and *Hippurus vulgaris* (mare's tail) along shallow margins of lakes, and *Nuphar polysepalum* (pond lily) in several meters of water.

Equisetum fluviatile Community Type
Swamp horsetail: EQUFLU

Number of Stands Sampled: 4

Other Studies:

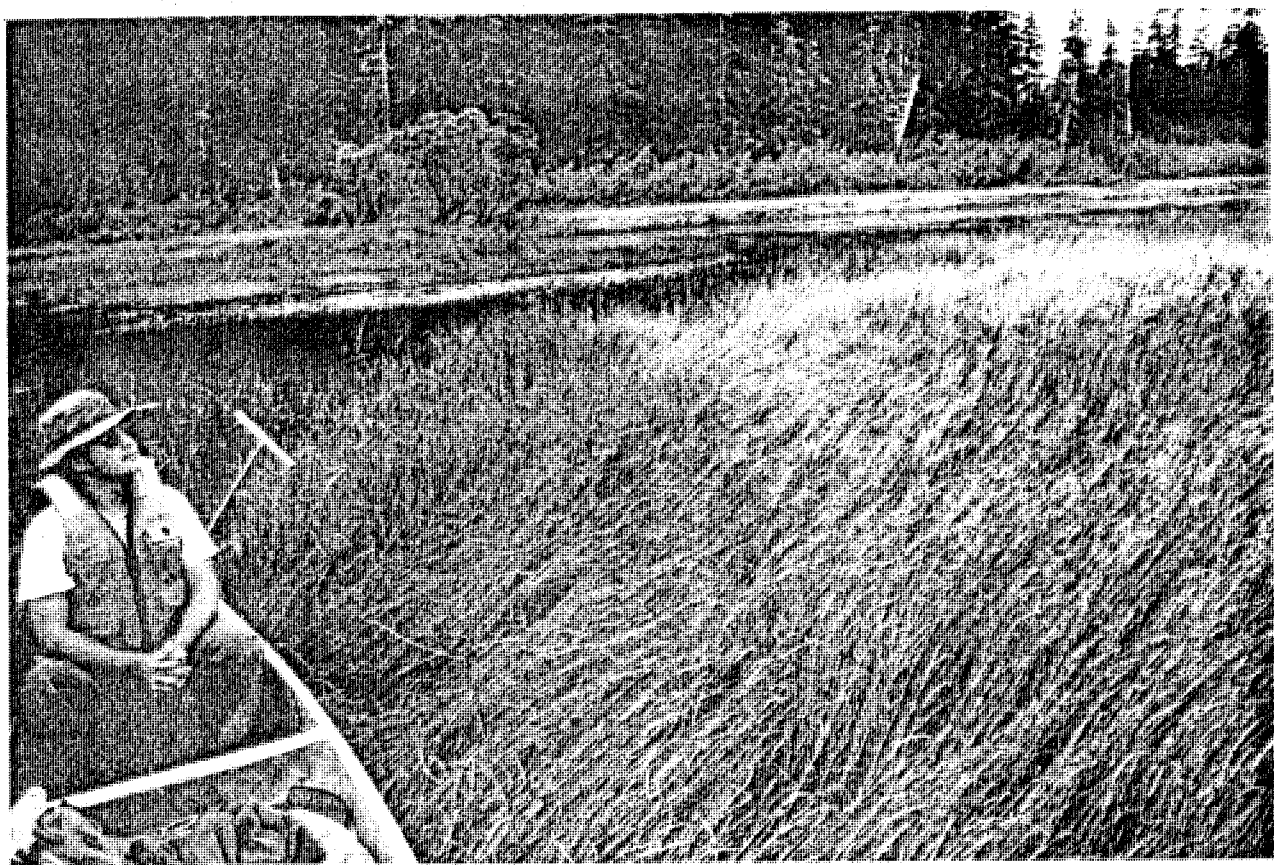
Boggs (1994) described a similar community for the Copper River Delta. Related types have been described for other locations in Alaska (see Viereck et al. 1992). This type is classified at level IV as herbaceous, forb, wet, fresh herb marsh by Viereck et al. (1992) and as palustrine, persistent emergent wetland by Cowardin et al. (1979).

Distribution:

This community is uncommon, occurring in shallow ponds, lakes, and perennial water courses.

Vegetation:

Equisetum fluviatile (swamp horsetail) is quite robust, and ranges from 100 to 200 cm (40-80 in.) tall, depending on water depth. In deeper water, more aquatic species occur in the stand. In shallower water, more emergent vascular species occur.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Equisetum fluviatile</i>	100	38	20-80

Environmental Factors (landscape, soils, and hydrology):

The soil is generally organic muck over sands and silt. The water table ranges from 40 to 110 cm (16 to 43 in.) above the organic surface. Some shallow water sites occasionally go dry during very dry years, such as 1993, when one site had a water table 15 cm (6 in.) below the ground surface.

Succession:

This type primarily occurs in shallow lakes and ponds and appears to be a late-seral type in these locations, as long as the water table does not shift drastically.

Adjacent Communities:

This community often occurs adjacent to *Menyanthes trifoliata*-*Potentilla palustris* (buckbean-marsh cinquefoil) found along shallow margins of lakes and with *Nuphar polysepalum* (pond lily) found in several meters of water.

***Equisetum variegatum* Community Type**
Variegated scouring-rush: EQUVAR

Number of Stands Sampled: 6

Other Studies:

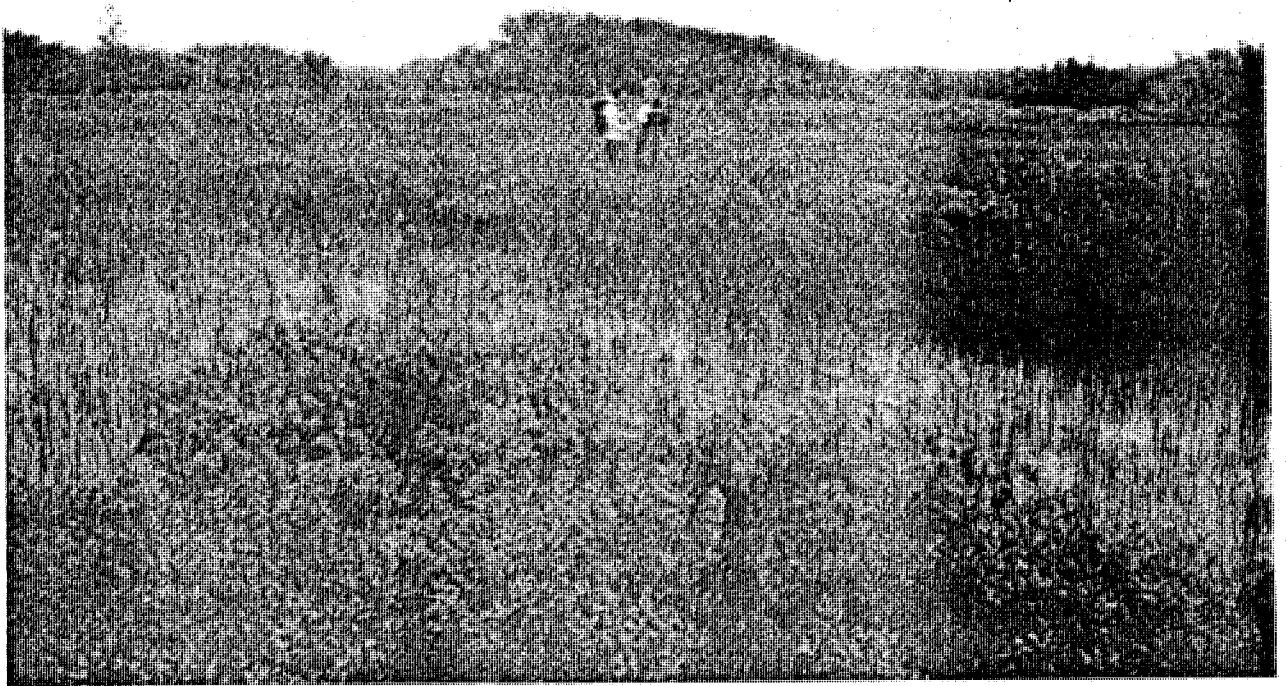
This type was described by Boggs (1994) for the Copper River Delta. Bosworth (1985) mentioned an *Equisetum variegatum*-*Cicuta douglasii* type for the Gustavus outwash plain. This *Equisetum variegatum* (variegated scouring-rush) c.t. is classified at level IV as herbaceous, forb, dry, seral herb type or herbaceous, forb, wet, subarctic lowland herb wet meadow type by Viereck et al. (1992) and as palustrine, persistent emergent wetland by Cowardin et al. (1979).

Distribution:

This community is common. It occurs most often on areas of perennially saturated mineral soil on outburst flood plains and occasionally within wetter areas of flood plains.

Vegetation:

Scattered willows and sweetgale overtop the dominant *Equisetum variegatum* (variegated scouring-rush). Several forbs and graminoids have a sparse canopy cover within this c.t., such as *Pinguicula vulgaris* (common butterwort) and *Carex lyngbyei* (lyngbyei sedge). The shrubs establish and grow on the slightly raised surfaces, along with many mosses and forbs. Other than these slightly raised surfaces, the area is uniformly covered with variegated scouring-rush. There is generally 20 to 50 percent bare ground. *Scorpidium scorpioides*, *Paludella squarrosa* and *Drepanocladus* species are common mosses.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Myrica gale</i>	67	5	1-15
<i>Salix barclayi</i>	100	2	1-7
<i>Salix commutata</i>	67	3	1-8
<i>Equisetum arvense</i>	67	2	1-4
<i>Equisetum variegatum</i>	100	43	35-70
<i>Pinguicula vulgaris</i>	67	1	-
<i>Tofieldia glutinosa</i>	67	1	-
<i>Carex lyngbyei</i>	67	3	1-8
<i>Deschampsia caespitosa</i>	83	2	1-3
<i>Juncus arcticus</i> spp. <i>sitchensis</i>	67	1	-

Environmental Factors (landscape, soils, and hydrology):

This community type occurs primarily on outburst flood plains, but also in old river channels and occasionally in newly uplifted areas. The soils have an average organic layer depth of 5 cm (2 in.) over the mineral horizon, usually sand and fine gravel. They are generally classified as Typic Cryaquents. The water table usually fluctuates between 10 and 40 cm (4-16 in.) below the ground surface, but during major storms, overland flow occurs through these stands.

Succession:

The moss flora indicates frequent through-flow of calcium-rich ground water (R. Andrus pers. comm. 1994). This community type is an early-seral type on perennially wet sandy areas. On the better drained sites, this c.t. will slowly become a shrub type (sweetgale or willow), while on the wetter sites where peat accumulates, these sites will be gradually acidified to bog types. See Figure 10 for an inferred chronosequence diagram for this c.t. on outburst flood plains.

Adjacent Communities:

This type often occurs adjacent to *Myrica gale/Equisetum variegatum* (sweetgale/variegated scouring-rush) on older surfaces and *Alnus sinuata-Rubus spectabilis* (Sitka alder-salmonberry) on nearby upland sites.

Menyanthes trifoliata-Equisetum variegatum Community Type
Buckbean-variegated scouring-rush: MENTRI-EQUVAR

Number of Stands Sampled: 7

Other Studies:

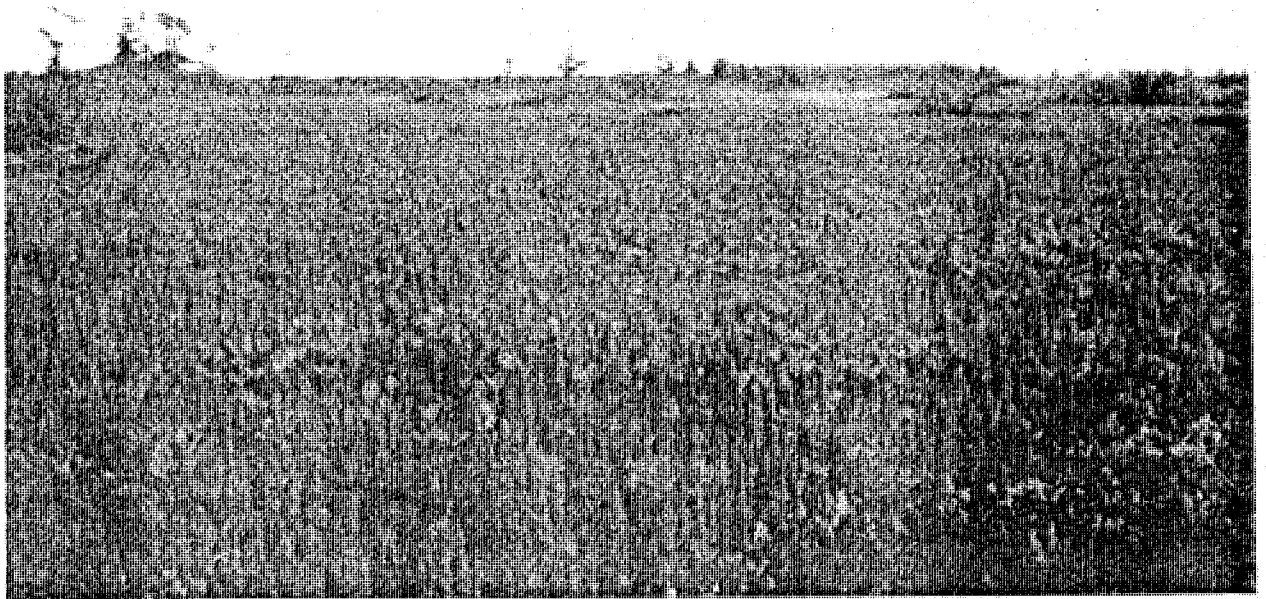
This type does not appear to be described from elsewhere in the state, although a few related types are described (see Viereck et al. 1992). This type is classified at level IV as herbaceous, forb, wet, subarctic lowland herb wet meadow by Viereck et al. (1992) and as palustrine, persistent emergent wetland by Cowardin et al. (1979).

Distribution:

This community is uncommon. It is found most often on areas of perennially saturated mineral soil on outburst flood plains, and within channels on distal outwash.

Vegetation:

Scattered willows and sweetgale overtop the dominant *Menyanthes trifoliata* (buckbean) and the various *Equisetum* spp. (variegated scouring-rush and horsetails). Forbs and graminoids with sparse canopy cover include *Pedicularis parviflora* (lousewort) and *Carex limosa* (mud sedge). Shrubs establish and grow on slightly raised surfaces, along with many mosses and forbs. Lower areas are dominated by forbs and grasses adapted for wetter conditions such as *Equisetum* spp. and *Eriophorum angustifolium* (cotton grass). There is generally 20 to 30 percent bare ground. *Scorpidium scorpioides* is the most common moss.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Myrica gale</i>	100	3	1-10
<i>Cicuta douglasii</i>	71	1	-
<i>Equisetum palustre</i>	57	8	3-10
<i>Equisetum variegatum</i>	86	9	1-20
<i>Menyanthes trifoliata</i>	100	28	10-60
<i>Parnassia palustris</i>	57	1	-
<i>Pedicularis parviflora</i>	86	4	1-10
<i>Polygonum viviparum</i>	57	1	1-2
<i>Tofieldia glutinosa</i>	57	1	-
<i>Carex flava</i>	57	1	1-2
<i>Carex interior</i>	57	5	1-10
<i>Carex limosa</i>	57	15	10-20
<i>Eriophorum angustifolium</i>	71	5	1-10

Environmental Factors (landscape, soils, and hydrology):

The soils of this type have an average organic layer depth of 19 cm (7 in.) over the mineral horizon, usually sand and fine gravel. They are generally classified as Typic Cryaquents and Histic Cryaquepts. The water table typically fluctuates between 10 and 30 cm (4-12 in.) below the ground surface, but during major storms overland flow occurs through these stands.

Succession:

The moss flora indicates frequent through-flow of calcium-rich ground water (R. Andrus pers. comm.). This community type is an early-seral type on perennially wet sandy areas on outburst flood plains, and probably is a late-seral channel type on distal outwash. On wetter outburst flood plain sites, this type may gradually be replaced by *Menyanthes trifoliata*-*Potentilla palustris* (buckbean-marsh cinquefoil) as peat accumulates. On drier sites, this type may be replaced by communities such as *Salix barclayi*/*Carex sitchensis* (barclay willow/Sitka sedge). See Figure 10 for an inferred chronosequence diagram for this c.t. on outburst flood plains.

Adjacent Communities:

This community often occurs adjacent to *Myrica gale*/*Equisetum variegatum* (sweetgale/variegated scouring-rush) on younger surfaces and *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on nearby upland sites.

***Menyanthes trifoliata*-*Potentilla palustris* Community Type**
Buckbean-marsh cinquefoil: MENTRI-POTPAL

Number of Stands Sampled: 12

Other Studies:

This type was described by Tande (1983) for the Anchorage area, by Racine and Walters (1991) for the Tanana River flats, by Drury (1956) for the Kuskokwim River Delta, and by Boggs (1994) for the Copper River Delta. Related types have been described from other sites around Alaska (see Viereck et al. 1992). This type is classified at level IV as herbaceous, forb, wet, subarctic lowland herb bog meadow by Viereck et al. (1992), and as palustrine, persistent emergent wetland by Cowardin et al. (1979).

Distribution:

This community is common. It occurs most often on the very wet areas of outburst flood plains, but is also found in old channels on distal outwash and in kettle ponds on moraines.

Vegetation:

Scattered *Cicuta douglasii* (water hemlock) and *Equisetum fluviatile* (swamp horsetail) overtop the dominant *Menyanthes trifoliata* (buckbean) and *Potentilla palustris* (marsh cinquefoil) on this often floating community type. While several forbs and graminoids have a sparse canopy cover, *Carex limosa* (mud sedge) is the only graminoid that occurs with any regularity. In some stands bryophytes are rare, while in others they form a solid carpet underneath the sedges and forbs. When present, common mosses include *Calligeron giganteum*, *Sphagnum squarrosum*, and *S. riparium*.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average %t Canopy cover	Range
<i>Cicuta douglasii</i>	75	2	1-5
<i>Equisetum fluviatile</i>	83	10	1-20
<i>Equisetum palustre</i>	83	8	1-25
<i>Menyanthes trifoliata</i>	100	38	15-60
<i>Pedicularis parviflora</i>	58	2	1-7
<i>Potentilla palustris</i>	83	24	1-55
<i>Carex limosa</i>	58	15	5-35
<i>Eriophorum russeolum</i>	58	2	1-7

Environmental Factors (landscape, soils, and hydrology):

The vegetation is often floating, and water tends to fill one's boots when attempting a crossing of these sites. This community is most common along the lower reaches of the Dangerous River in old river channels and in areas cut off by natural levees. The soils have an average organic layer depth of 60 cm (24 in.) and are usually composed of a loose root system of buckbean and marsh cinquefoil. The soils are generally classified as Histic Cryaquepts and Terric Cryofibrists. The water table is usually at or above the surface.

The moss species *Calligeron giganteum* is indicative of floating mats in calcareous terrain (Schofield 1992). For the Tanana River flats, sites with this community type are characterized by relatively high pH, conductivity, and calcium and magnesium concentration in the water (Racine and Walters 1991). It is likely that these same environmental parameters also exist for sites in Yakutat.

Succession:

The seral status of this community type is unclear. However, it is probably a late-seral type on sandy substrates with perennial standing water within the outburst flood plains. It is probably also a late-seral type in old outwash channels in distal outwash. On moraines it appears to be a seral type that slowly invades shallow kettle ponds. However, this type may gradually be replaced by *Sphagnum*-dominated communities as the vegetation loses contact with the ground water and only receives nutrients from precipitation. See Figure 10 for an inferred chronosequence diagram for this c.t. on outburst flood plains.

Adjacent Communities:

This community often occurs adjacent to *Salix barclayi*/*Carex sitchensis* (barclay willow/Sitka sedge) found on slightly drier sites and *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) found on nearby upland sites.

Mesic forb/*Athyrium filix-femina* Community Type
Mesic forb/lady fern: MESIC FORB/ATHFIL

Number of Stands Sampled: 4

Other Studies:

A related type was described by Byrd (1984) for the Aleutian Islands. This community is classified at level IV as herbaceous, forb, mesic, large umbel type by Viereck et al. (1992).

Distribution:

This community is uncommon. It occurs most often on nutrient-rich, well-drained areas of distal outwash, rolling bedrock hills, and outburst flood plains.

Vegetation:

Angelica lucida (sea coast angelica), *Heracleum lanatum* (cow parsnip), and *Epilobium angustifolium* (fireweed) dominate the forb layer. *Athyrium filix-femina* (lady fern) dominates the fern layer. Scattered forbs and graminoids occur. Leaf litter often covers 50 percent or more of the ground surface and therefore, mosses are less common than in many other types. *Rhytidiadelphus squarrosus* is the most common moss.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average %t Canopy cover	Range
<i>Rubus spectabilis</i>	75	9	2-15
<i>Angelica lucida</i>	75	11	3-20
<i>Circaea alpina</i>	100	6	1-15
<i>Conioselinum chinense</i>	75	2	1-3
<i>Epilobium angustifolium</i>	75	9	2-15
<i>Geum macrophyllum</i>	100	1	-
<i>Heracleum lanatum</i>	75	5	1-8
<i>Trientalis europaea</i>	100	1	1-3
<i>Calamagrostis canadensis</i>	75	4	1-6
<i>Athyrium filix-femina</i>	100	49	25-85

Environmental Factors (landscape, soils, and hydrology):

The soils are generally nutrient-rich, loamy soils that have an average organic layer depth of only 5 cm (2 in.). The soils generally are classified as Oxyaquic Cryorthents on the younger surfaces, and Dystric Cryochrepts on the older surfaces. The water table rises close to the surface on occasion, but is normally below one meter (3 ft.).

Succession:

The seral status of this community type is unclear. However, it seems to be a late-seral type on well-drained nutrient-rich soils. Both alder and spruce often grow nearby, but their seedlings may have difficulty competing with the robust ferns and forbs.

Adjacent Communities:

This community often occurs adjacent to *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on shallower soils, and *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) on alluvial flood plains.

Mesic forb Community Type
Mesic forb: MESIC FORB

Number of Stands Sampled: 8

Other Studies:

This is a closely related type to the mesic forb/*Athyrium filix-femina* (mesic forb/lady fern) c.t. Other related types are described in Viereck et al. (1992) for Southcentral Alaska and the Aleutian Islands. This community is classified at level IV as herbaceous, forb, mesic, large umbel type by Viereck et al. (1992).

Distribution:

This community is uncommon. It is found primarily on nutrient-rich, well drained slopes of the rolling bedrock hills of the Tanis Mesa area. It also is found occasionally along stream courses on the distal outwash.

Vegetation:

Solidago lepida (goldenrod), *Heracleum lanatum* (cow parsnip) and *Epilobium angustifolium* (fireweed) dominate. Scattered forbs and graminoids also occur. Leaf litter often covers 50 percent or more of the ground surface, hence mosses are less common than in many other types. *Rhytidiadelphus squarrosus* and *Pleurozium schreberi* are the most common mosses.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Achillea borealis</i>	100	4	1-20
<i>Angelica lucida</i>	75	5	2-10
<i>Conioselinum chinense</i>	75	2	1-4
<i>Epilobium angustifolium</i>	75	18	3-40
<i>Heracleum lanatum</i>	75	14	1-50
<i>Lupinus nootkatensis</i>	63	4	2-10
<i>Sanguisorba stipulata</i>	100	10	1-50
<i>Solidago lepida</i>	63	23	10-40
<i>Calamagrostis canadensis</i>	75	10	1-40
<i>Deschampsia caespitosa</i>	63	3	1-5

Environmental Factors (landscape, soils, and hydrology):

The soils are generally nutrient-rich loamy soils that have an average organic layer depth of only 7 cm (3 in.). They are classified variously, but commonly as Dystric Cryochrepts on older surfaces and Oxyaquic Cryorthents on younger surfaces. The water table rises near the surface on occasion, but is normally below one meter (3 ft.). This type can develop a thick organic horizon when it occurs adjacent to small stream channels: one sample plot had an organic horizon that was 37 cm (15 in.) thick.

Succession:

The seral status of this community type is unclear. However, it seems stable on well drained nutrient-rich soils. Although alder and spruce often grow nearby, both may have difficulty establishing given the robust forbs and occasionally high water table.

Adjacent Communities:

This type often occurs adjacent to *Alnus sinuata*-*Rubus spectabilis* (Sitka alder-salmonberry) on shallower soils, and *Picea sitchensis*/*Echinopanax horridum* (Sitka spruce/devil's club) on alluvial flood plains.

***Lupinus nootkatensis*/Salix setchelliana Community Type**
Nootka lupine/setchell willow: LUPNOO/SALSET

Number of Stands Sampled: 4

Other Studies:

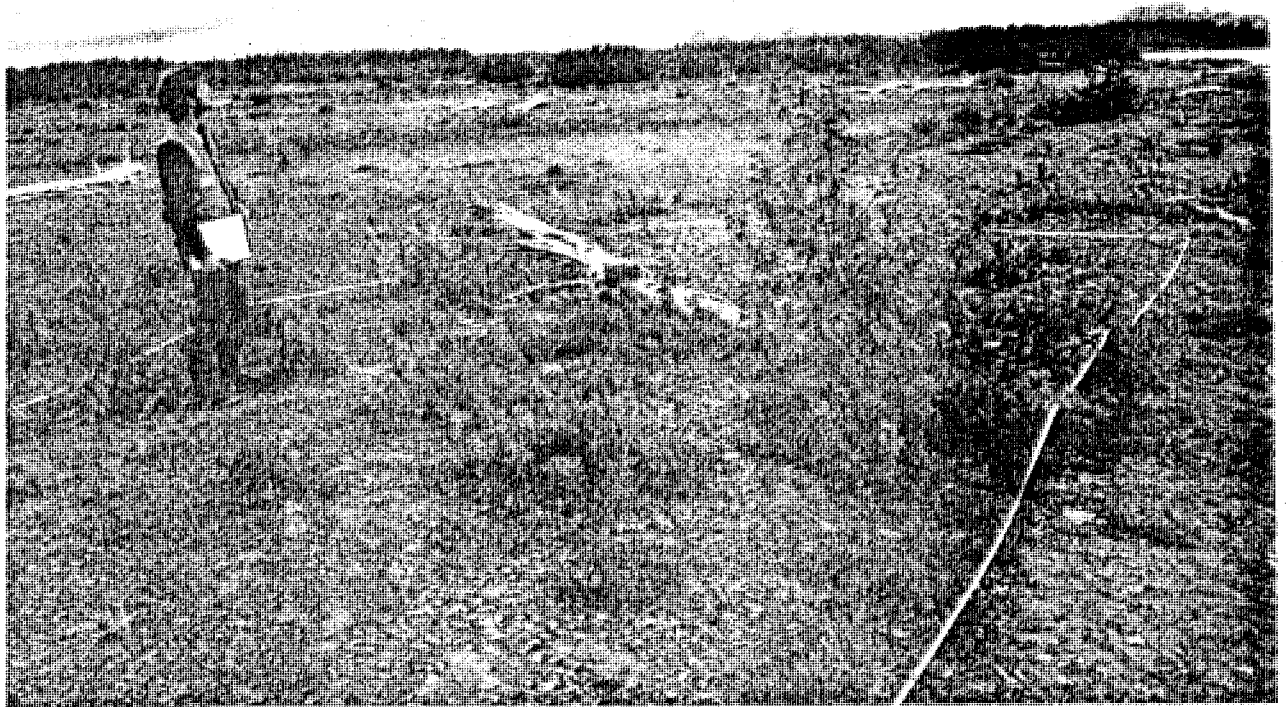
Boggs (1994) described a *Lupinus nootkatensis* (nootka lupine) type for the Copper River Delta. Other related types are described in Viereck et al. (1992). This type has also been observed along the Alsek River corridor in British Columbia. This community is classified at level IV as herbaceous, forb, dry, seral herb type by Viereck et al. (1992).

Distribution:

This community type is uncommon. It is found on open gravel bars along glacial rivers, such as the Dangerous and Alsek Rivers, and on gravel beaches of glacial lakes such as Harlequin and Tanis Lake. Occasionally, this type also is found along uplifted beaches.

Vegetation:

Astragalus alpinus (alpine milk-vetch), *Epilobium latifolium* (dwarf fireweed) and *Lupinus nootkatensis* (nootka lupine) dominate. Other scattered forbs and graminoids occur. Bare gravel and leaf litter often cover 70 percent or more of the ground surface, hence mosses are uncommon.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Salix barclayi</i>	75	1	1-2
<i>Salix alaxensis</i>	75	2	2-3
<i>Salix setchelliana</i>	75	4	1-10
<i>Achillea borealis</i>	100	2	1-4
<i>Astragalus alpinus</i>	75	8	5-15
<i>Epilobium latifolium</i>	75	21	1-60
<i>Lupinus nootkatensis</i>	75	7	2-15
<i>Rhinanthus minor borealis</i>	75	3	1-8
<i>Deschampsia caespitosa</i>	75	1	-
<i>Phleum commutatum</i>	75	1	-
<i>Poa arctica</i>	75	1	-

Environmental Factors (landscape, soils, and hydrology):

The soils are primarily gravel with a thin organic horizon that averages only 2 cm (1 in.) thick. They are classified as either Oxyaquic Cryofluvents or Typic Cryaquents. The water table is generally within 40 to 100 cm (16-40 in.) of the surface. Floods cover the surface seasonally.

Succession:

This is an early-seral type that colonizes the most recently deposited gravel bars. If the river does not disturb the gravel bar, this type will be replaced by *Fragaria chiloensis*-*Achillea borealis* (beach strawberry-yarrow). Subsequently, *Alnus sinuata*-*Salix sitchensis* (Sitka alder-Sitka willow) will establish, and then a forested type. See Figure 9 for an inferred chronosequence diagram for this c.t. on the flood plains of the Yakutat foreland.

Adjacent Communities:

This c.t. often occurs adjacent to *Fragaria chiloensis*-*Achillea borealis* (beach strawberry-yarrow) and *Alnus sinuata*-*Salix sitchensis* (Sitka alder-Sitka willow), both found on slightly older gravel bars.

***Fragaria chiloensis*-*Achillea borealis* Community Type**
Beach strawberry-yarrow: FRACHI-ACHBOR

Number of Stands Sampled: 11

Other Studies:

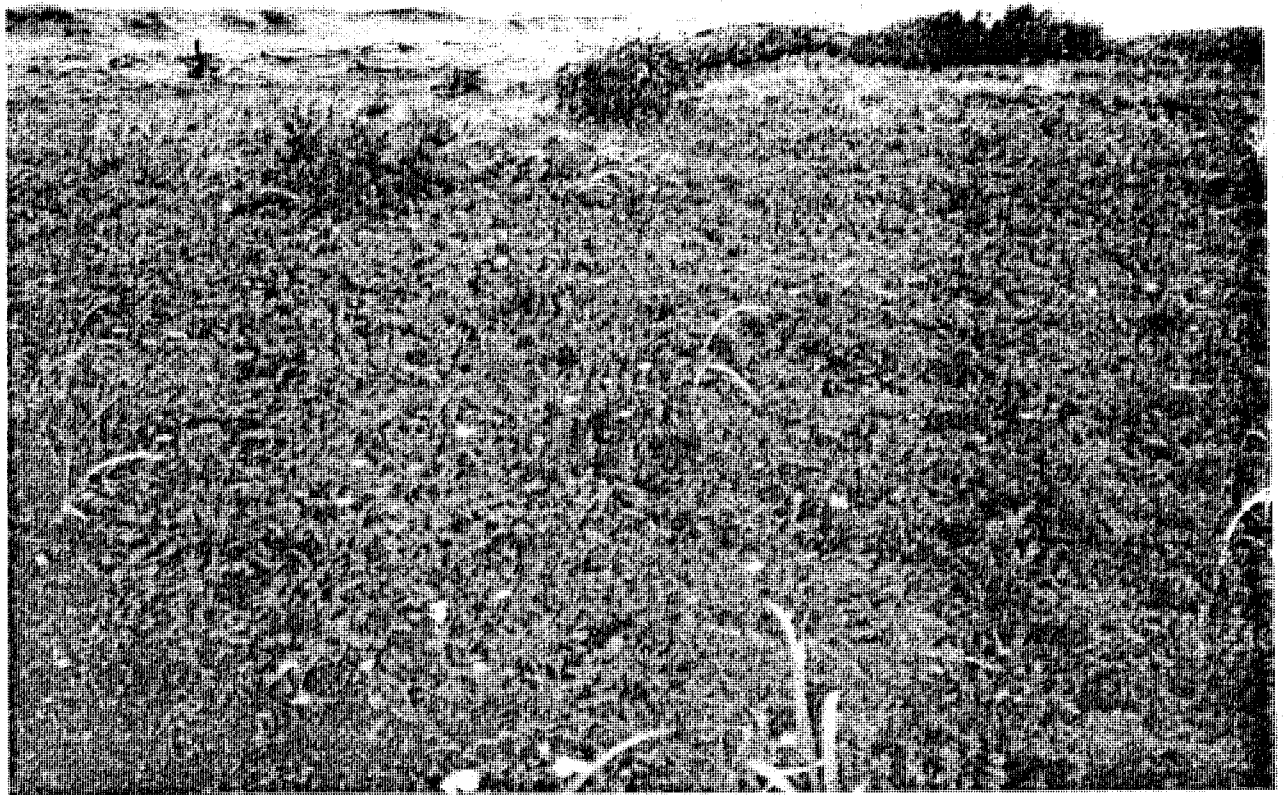
This type is often associated with *Lupinus nootkatensis*/*Salix setchelliana* (nootka lupine/setchell willow). Boggs (1994) describes a *Fragaria chiloensis* (beach strawberry) c.t. for the Copper River Delta, but it does not appear to have been described elsewhere in the state (Vioreck et al. 1992). This community is classified at level IV as herbaceous, forb, dry and mesic, mixed herb type by Vioreck et al. (1992).

Distribution:

This community is common, and occurs most often on well drained beach sands. It also is found on gravel bars along larger glacial rivers.

Vegetation:

Fragaria chiloensis (beach strawberry), *Rhinanthus minor* (yellow rattle), and *Festuca rubra* (red fescue) dominate. Other scattered forbs and graminoids occasionally contribute substantial cover, such as *Lupinus nootkatensis* (nootka lupine) and *Astragalus alpinus* (alpine milk-vetch). Moss cover is generally near 90 percent. *Rhytidadelphus squarrosus* and *Ceratodon purpureus* are common species.



The following table lists the vascular species that occur in more than 50 percent of the stands (> 50 percent constancy), their constancy, the average percent canopy cover, and range of cover values on plots where the species occurs.

Species	Constancy	Average % Canopy cover	Range
<i>Picea sitchensis</i> regen.	55	1	1-3
<i>Achillea borealis</i>	91	5	1-10
<i>Fragaria chiloensis</i>	100	25	2-60
<i>Rhinanthus minor borealis</i>	55	9	2-15
<i>Festuca rubra</i>	73	10	1-40
<i>Elymus arenarius</i>	55	8	1-20

Environmental Factors (landscape, soils, and hydrology):

This community type is found on beaches, just upslope from the beach-rye grass zone, and on fine sediment along the large glacial rivers of the Yakutat foreland. The soils are primarily sand with a thin organic horizon that averages only 1.5 cm (0.6 in.) thick. They generally are classified as Typic Cryopsamments. The water table is generally well below 100 cm (40 in.) of the surface. Seasonal storms may temporarily flood these stands.

Succession:

This c.t. colonizes the area of the beach just out of reach of most storm tides. The stands will be colonized by spruce and alder; indeed, both species are already common as seedlings within this c.t. See Figure 8 for an inferred chronosequence diagram for this c.t. on the uplifted beaches of the Yakutat foreland.

Adjacent Communities:

This community often occurs adjacent to *Elymus arenarius* (beach rye grass), found between the unvegetated beach and this backbeach meadow type, and with early-seral "doghair" *Picea sitchensis* (Sitka spruce) found on the older uplifted beach sites.

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**APPENDIX 1. PLACEMENT OF COMMUNITY TYPES FROM THE YAKUTAT FORELAND, ALASKA,
INTO THE ALASKA VEGETATION CLASSIFICATION (VIERECK et al. 1992).**

Level I ¹	Level II	Level III	Level IV	Level V
Forest	Needleleaf forest	Closed needleleaf forest (canopy 60-100 percent)	Sitka spruce	<i>Picea sitchensis</i> / <i>Alnus sinuata</i> <i>Picea sitchensis</i> / <i>Echinopanax horridum</i> - <i>Rubus spectabilis</i> <i>Picea sitchensis</i> / <i>Vaccinium</i> - <i>Echinopanax horridum</i> <i>Picea sitchensis</i> / <i>Echinopanax horridum</i> <i>Picea sitchensis</i> / <i>Vaccinium</i> <i>Picea sitchensis</i> / <i>Seral</i>
		<i>NOTE: These forest types also occur in the open needleleaf forest category</i>	Western hemlock	<i>Tsuga heterophylla</i> / <i>Vaccinium</i> - <i>Echinopanax horridum</i> <i>Tsuga heterophylla</i> / <i>Vaccinium</i> / <i>Dryopteris dilatata</i> <i>Tsuga heterophylla</i> / <i>Vaccinium</i>
			Mountain hemlock	<i>Tsuga mertensiana</i> / <i>Vaccinium</i>
			Mixed conifer	Mixed conifer/ <i>Vaccinium</i> / <i>Lysichitum americanum</i> Mixed conifer/ <i>Vaccinium</i>
		Needleleaf woodland (canopy 10-25 percent)	Lodgepole pine	<i>Pinus contorta</i> / <i>Sphagnum</i>
			Sitka spruce bog	<i>Picea sitchensis</i> / <i>Sphagnum</i>
	Broadleaf forest	Open broadleaf forest (canopy 25-60 percent)	Black cottonwood	<i>Populus trichocarpa</i> / <i>Salix</i> <i>Populus trichocarpa</i> / <i>Rubus spectabilis</i> <i>Populus trichocarpa</i> / <i>Echinopanax horridum</i>
		Broadleaf woodland (canopy 10-25 percent)	Black Cottonwood	<i>Populus trichocarpa</i> / <i>Salix</i> <i>Populus trichocarpa</i> / <i>Rubus spectabilis</i> <i>Populus trichocarpa</i> / <i>Echinopanax horridum</i>
	Mixed forest	Closed mixed forest (canopy 60-100 percent)	Sitka spruce-black cottonwood (new level)	<i>Picea sitchensis</i> - <i>Populus trichocarpa</i> / <i>Alnus sinuata</i> <i>Picea sitchensis</i> - <i>Populus trichocarpa</i> / <i>Echinopanax horridum</i> <i>Picea sitchensis</i> - <i>Populus trichocarpa</i> / <i>Seral</i>
		Open mixed forest (canopy 25-60 percent)	Sitka spruce-black cottonwood (new level)	<i>Picea sitchensis</i> - <i>Populus trichocarpa</i> / <i>Alnus sinuata</i> <i>Picea sitchensis</i> - <i>Populus trichocarpa</i> / <i>Echinopanax horridum</i> <i>Picea sitchensis</i> - <i>Populus trichocarpa</i> / <i>Seral</i>
Scrub	Dwarf tree	Dwarf tree scrub woodland (canopy 10-25 percent)	Sitka spruce-bog (new level)	<i>Picea sitchensis</i> / <i>Sphagnum</i>

Appendix 1. (continued)

Level I'	Level II	Level III	Level IV	Level V
Scrub (cont.)	Tall scrub	Closed tall scrub (canopy 75-100 percent)	Willow	<i>Salix sitchensis</i> <i>Salix hookeriana</i> <i>Salix barclayi/Carex pluriflora</i> <i>Salix barclayi/Carex sitchensis</i> <i>Salix barclayi/Fragaria chiloensis</i> <i>Salix sitchensis</i>
			Alder	<i>Alnus sinuata-Rubus spectabilis</i>
			Alder-willow	<i>Alnus sinuata-Salix sitchensis</i>
			Shrub swamp	<i>Alnus sinuata/graminoid</i>
			Alder-crabapple (new level)	<i>Alnus sinuata-Malus fusca</i>
		Open tall scrub (canopy 25-75 percent, less than 3 m tall)	Willow	<i>Salix sitchensis</i> <i>Salix hookeriana</i> <i>Salix barclayi/Carex pluriflora</i> <i>Salix barclayi/Carex sitchensis</i> <i>Salix barclayi/mixed herbs</i> <i>Salix barclayi/Fragaria chiloensis</i>
			Alder	<i>Alnus sinuata-Rubus spectabilis</i>
			Alder-willow	<i>Alnus sinuata-Salix sitchensis</i>
			Shrub swamp	<i>Alnus sinuata/graminoid</i>
			Alder-crabapple (new level)	<i>Alnus sinuata-Malus fusca</i>
			Salmonberry (new level)	<i>Rubus spectabilis/Athyrium filix-femina</i>
	Low scrub	Open low scrub (canopy 25-75 percent, shrubs 20 cm to 1.5 m tall)	Ericaceous shrub bog	<i>Vaccinium uliginosum-Empetrum nigrum</i> <i>Empetrum nigrum/Carex pluriflora</i> <i>Andromeda polifolia/Carex pluriflora</i>
			Sweetgale- graminoid bog	<i>Myrica gale/Carex livida</i> <i>Myrica gale/Carex sitchensis</i> <i>Myrica gale/Carex pluriflora</i> <i>Myrica gale/Equisetum variegatum</i>
Herbaceous	Graminoid herbaceous	Dry graminoid herbaceous	<i>Elymus</i>	<i>Elymus arenarius</i>
		Mesic graminoid herbaceous	Bluejoint meadow	<i>Calamagrostis canadensis</i>
			Bluejoint-herb	<i>Calamagrostis canadensis/Potentilla egedii</i>

Appendix 1. (concluded)

Level I ¹	Level II	Level III	Level IV	Level V
Herbaceous (cont.)	Graminoid herbaceous	Wet graminoid herbaceous	Fresh sedge marsh	<i>Eleocharis palustris</i>
			Subarctic lowland sedge wet meadow	<i>Carex lyngbyei</i> <i>Carex saxatilis</i> <i>Carex livida-Trichophorum caespitosum</i> <i>Trichophorum caespitosum</i> <i>Carex sitchensis/Equisetum fluviatile</i>
			Halophytic grass wet meadow	<i>Puccinellia pumila</i>
			Halophytic sedge wet meadow	<i>Carex lyngbyei</i> <i>Carex pluriflora-Carex lyngbyei</i>
			Subarctic lowland sedge bog meadow	<i>Carex pluriflora-Carex lyngbyei</i> <i>Carex livida-Trichophorum caespitosum</i> <i>Carex sitchensis/Oxycoccus palustris</i>
	Forb herbaceous	Dry forb herbaceous	Seral herbs	<i>Lupinus nootkatensis/Salix setchelliana</i> <i>Fragaria chiloensis-Achillea borealis</i> <i>Equisetum variegatum</i>
		Mesic forb herbaceous	Mixed herbs	<i>Fragaria chiloensis/Achillea borealis</i>
			Large umbel	Mesic forb/ <i>Athyrium filix-femina</i> Mesic forb
		Wet forb herbaceous	Fresh herb marsh	<i>Equisetum fluviatile</i>
			Subarctic lowland herb wet meadow	<i>Equisetum variegatum</i> <i>Menyanthes trifoliata/Equisetum variegatum</i>
			Subarctic lowland herb bog meadow	<i>Menyanthes trifoliata/Potentilla palustris</i>
	Aquatic herbaceous (floating and submerged)	Freshwater aquatic herbaceous	Pondlily	<i>Nuphar polysepalum</i>
			Water milfoil	<i>Myriophyllum alterniflorum</i>

¹ Viereck et al. (1992) "have constructed a hierarchical classification containing units at five levels of resolution (levels I through V). The broadest, most generalized level (level I) consists of three formations--forest, scrub, and herbaceous. At the finest level of resolution (level V) units are discrete plant communities, with levels II, III, and IV intermediate in resolution. We have not attempted to name levels II, III, and IV, although level IV in forest is comparable to Daubenmire's (1952) series."

APPENDIX 2. COMPARISON OF WETLAND AND LAND CLASSIFICATION SYSTEMS BY VARIOUS AUTHORS.

YAKUTAT COMMUNITY TYPES	VIREECK et al. (1992); (levels III and IV)	NATIONAL WETLANDS WORKING GROUP (1988)	COWARDIN et al. (1979)	U.S. FISH AND WILDLIFE SERVICE, NATIONAL WETLAND INVENTORY (1981)
TREE TYPES				
TSUMET/VACCIN	Closed or open needleleaf forest, mountain hemlock	—	—	—
MIXED CON/ VACCIN/LYSAME	Closed or open needleleaf forest, mixed conifer	Flat swamp	Palustrine, forested, needle- leaved evergreen	PFO4B
MIXED CON/ VACCIN	same	—	—	—
TSUHET/VACCIN- ECHHOR	Closed needleleaf forest, western hemlock	—	—	—
TSUHET/VACCIN/ DRYDIL	same	—	—	—
TSUHET/VACCIN	same	—	—	—
PICSIT/ALNSIN ¹	Closed or open needleleaf forest, Sitka spruce	Peat margin swamp	Palustrine, forested, needle- leaved evergreen	PFO4E
PICSIT/ECHHOR- RUBSPE	same	—	—	—
PICSIT/VACCIN- ECHHOR	same	—	—	—
PICSIT/ECHHOR	same	—	—	—
PICSIT/VACCIN	same	—	—	—
PICSIT/SERAL	same	—	—	—
PICSIT-POPTRI/ALNSIN	Closed or open mixed forest, Sitka spruce- black cottonwood	—	—	—
PICSIT-POPTRI/ECHHOR	same	—	—	—
PICSIT-POPTRI/SERAL	same	—	—	—
POPTRI/SALIX	Open broadleaf forest or woodland, black cottonwood	—	—	—
POPTRI/RUBSPE	same	—	—	—
POPTRI/ECHHOR	same	—	—	—
PINCON/SPHAGN	Needleleaf woodland, lodgepole pine	Blanket or flat bog	Palustrine, forested, needle- leaved evergreen	PFO4B
PICSIT/SPHAGN	Dwarf tree scrub woodland, Sitka spruce bog	Domed or flat bog	Palustrine, forested, needle- leaved evergreen	PFO4B

Appendix 2. (continued)

YAKUTAT COMMUNITY TYPES	VIERECK et al. (1992); (levels III and IV)	NATIONAL WETLANDS WORKING GROUP (1988)	COWARDIN et al. (1979)	U.S. FISH AND WILDLIFE SERVICE, NATIONAL WETLAND INVENTORY (1981)
SHRUB TYPES				
RUBSPE/ATHFIL	Open tall scrub, salmonberry	---	---	---
ALNSIN-SALSIT	Closed or open tall scrub, alder- willow	---	---	---
ALNSIN-MALFUS	Closed or open tall scrub, alder- crabapple	---	---	---
ALNSIN-RUBSPE	Closed or open tall scrub, alder	---	---	---
ALNSIN/GRAMIN	Closed or open tall scrub, shrub swamp	Stream swamp	Palustrine, scrub- shrub, broad- leaved deciduous	PSS1C
SALSIT ¹	Closed or open tall scrub, willow	---	Palustrine, scrub- shrub, broad- leaved deciduous	PSS1D
SALHOO	same	---	same	PSS1C
SALBAR/CARPLU	same	Flat bog	same	PSS1B
SALBAR/CARSIT	same	Flat or horizontal bog or fen	same	PSS1E
SALBAR/MIXED HERB	same	---	---	---
SALBAR/FRACHI	same	---	---	---
MYRGAL/CARLIV	Open low scrub, sweetgale- graminoid bog	Horizontal fen	Palustrine, scrub- shrub, broad- leaved deciduous	PSS1E
MYRGAL/CARSIT	same	Horizontal fen	same	PSS1E
MYRGAL/CARPLU	same	Horizontal fen	same	PSS1B
MYRGAL/EQUVAR	same	Horizontal fen	same	PSS1D
EMPNIG/CARPLU	Open low scrub, Ericaceous shrub bog	Horizontal fen	Palustrine, scrub- shrub, needle- leaved evergreen	PSS4B
VACULI-EMPNIG	same	Horizontal fen	Palustrine, scrub- shrub, broad- leaved deciduous	PSS1E
ANDPOL/CARPLU	same	Flat bog	Palustrine, scrub- shrub, needle- leaved evergreen	PSS4B

Appendix 2. (continued)

YAKUTAT COMMUNITY TYPES	VIERECK et al. (1992); (levels III and IV)	NATIONAL WETLANDS WORKING GROUP (1988)	COWARDIN et al. (1979)	U.S. FISH AND WILDLIFE SERVICE, NATIONAL WETLAND INVENTORY (1981)
GRAMINOID TYPES	WET GRAMINOID HERBACEOUS			
PUCPUM	Halophytic grass wet meadow	Estuarine high marsh	Estuarine, intertidal, persistent emergent	E2EM1
ELEPAL	Fresh sedge marsh	Shallow basin or estuarine high marsh	Palustrine or estuarine persistent emergent	PEM1F
CARLYN	Halophytic or subarctic lowland sedge wet meadow	Estuarine low, high marsh, and shallow basin marsh	same	E2EM1
CARSAX	Subarctic lowland sedge wet meadow	Channel or spring fen	Palustrine persistent emergent	PEM1D
CARPLU-CARLYN	Halophytic sedge or subarctic lowland sedge bog meadow	Flat bog	same	PEM1B
CARLIV-TRICAE	Subarctic lowland sedge wet meadow or sedge bog meadow	Flat or blanket bog	same	PEM1B
TRICAE	Subarctic lowland sedge wet meadow	Horizontal fen	same	PEM1E
CARSIT/OXYPAL	Subarctic lowland sedge bog meadow	Domed bog	same	PEM1B
CARSIT/EQUFLU	Subarctic lowland sedge wet meadow	Channel marsh	same	PEM1F
CALCAN/POTEGE	Mesic graminoid herbaceous, bluejoint-herb	Coastal high marsh	same	PEM1C
ELYARE	Dry graminoid herbaceous	—	—	—
CALCAN ¹	Mesic graminoid herbaceous, bluejoint meadow	Horizontal fen	Palustrine, persistent emergent	PEM1C

Appendix 2. (concluded)

YAKUTAT COMMUNITY TYPES	VIERECK et al. (1992); (levels III and IV)	NATIONAL WETLANDS WORKING GROUP (1988)	COWARDIN et al. (1979)	U.S. FISH AND WILDLIFE SERVICE, NATIONAL WETLAND INVENTORY (1981)
FORB TYPES				
NUPPOL	Freshwater aquatic herbaceous, pondlily	Shallow basin, shallow water	Palustrine, aquatic bed, floating-leaved vascular	PAB4
MYRALT	Freshwater aquatic herbaceous, water milfoil	Shore water, shallow water	Palustrine, aquatic bed, rooted vascular	PAB3
EQUFLU	Wet forb herbaceous, fresh herb marsh	Shore or channel marsh	Palustrine, persistent emergent	PEM1F
EQUVAR	Wet forb herbaceous, subarctic lowland herb wet meadow	Horizontal fen	Palustrine, persistent emergent	PEM1D
MENTRI-EQUVAR	same	Horizontal fen	same	PEM1C
MENTRI-POTPAL	Wet forb herbaceous, Subarctic lowland herb bog meadow	Floating fen	Palustrine, persistent emergent	PEM1H
MESIC FORB/ATHFIL	Mesic forb herbaceous, large umbel	—	—	—
MESIC FORB	same	—	—	—
LUPNOO/SALSET	dry forb herbaceous, seral herbs	—	—	—
FRACHI-ACHBOR	dry and mesic forb herbaceous, mixed herbs	—	—	—

¹NOTE: Some of these community types are not wetlands.

APPENDIX 3. INDICATOR SPECIES FOR COMMUNITY TYPES OF THE YAKUTAT FORELAND.

SCIENTIFIC NAME	COMMON NAME
TREES	
<i>Picea sitchensis</i>	Sitka spruce
<i>Pinus contorta contorta</i>	Shorepine or lodgepole pine
<i>Populus balsamifera trichocarpa</i>	Black cottonwood
<i>Tsuga heterophylla</i>	Western hemlock
<i>Tsuga mertensiana</i>	Mountain hemlock
TALL SHRUBS (>30 cm [1 ft.])	
<i>Alnus sinuata</i>	Sitka alder
<i>Echinopanax horridum</i>	Devil's club
<i>Malus fusca</i>	Oregon crab apple
<i>Myrica gale</i>	Sweetgale
<i>Rubus spectabilis</i>	Salmonberry
<i>Salix barclayi</i>	Barclay willow
<i>Salix hookeriana</i>	Hooker willow
<i>Salix sitchensis</i>	Sitka willow
<i>Sambucus racemosa</i>	Red elderberry
<i>Vaccinium sp. (oval. & alask.)</i>	Tall Blueberry sp.
LOW AND SUBSHRUBS (<30 cm [1 ft.])	
<i>Andromeda polifolia</i>	Bog rosemary
<i>Empetrum nigrum</i>	Crowberry
<i>Oxycoccus palustris</i>	Bog cranberry
<i>Salix setchelliana</i>	Setchell willow
<i>Vaccinium uliginosum</i>	Bog blueberry
FORBS	
<i>Achillea borealis</i>	Yarrow
<i>Angelica genuflexa</i>	Bent-leaved angelica
<i>Aster subspicatus</i>	Douglas' aster
<i>Astragalus alpinus</i>	Alpine milk-vetch
<i>Drosera rotundifolia</i>	Round-leaf sundew
<i>Epilobium angustifolium</i>	Fireweed
<i>Epilobium latifolium</i>	Dwarf fireweed
<i>Equisetum arvense</i>	Meadow horsetail
<i>Equisetum fluviatile</i>	Swamp horsetail
<i>Equisetum variegatum</i>	Northern horsetail
<i>Fragaria chiloensis</i>	Beach strawberry
<i>Heracleum lanatum</i>	Cow parsnip
<i>Hippuris vulgaris</i>	Common maretail
<i>Lupinus nootkatensis</i>	Nootka lupine
<i>Lysichitum americanum</i>	Yellow skunk-cabbage
<i>Menyanthes trifoliata</i>	Buckbean
<i>Myriophyllum alterniflorum</i>	Water-milfoil
<i>Myriophyllum spicatum</i>	Water-milfoil
<i>Nuphar polysepalum</i>	Yellow water lily
<i>Potentilla egedii grandis</i>	Pacific silverweed
<i>Potentilla palustris</i>	Marsh cinquefoil
<i>Rhinanthus minor borealis</i>	Yellow rattle
<i>Sanguisorba stipulata</i>	Burnet
<i>Solidago canadensis</i>	Goldenrod

Appendix 3. (concluded)**SCIENTIFIC NAME****COMMON NAME****GRAMINOIDS**

<i>Calamagrostis canadensis</i>	Bluejoint
<i>Calamagrostis inexpansa</i>	Bluejoint
<i>Carex capillaris</i>	Hair-like sedge
<i>Carex flava</i>	Yellow sedge
<i>Carex livida</i>	Livid sedge
<i>Carex lyngbyei</i>	Lyngbyei sedge
<i>Carex macrochaeta</i>	Alaska long-awn sedge
<i>Carex pluriflora</i>	Many-flowered sedge
<i>Carex rostrata</i>	Beaked sedge
<i>Carex saxatilis</i>	Russet sedge
<i>Carex sitchensis</i>	Sitka sedge
<i>Deschampsia beringensis</i>	Hairgrass
<i>Deschampsia caespitosa</i>	Hairgrass
<i>Eleocharis palustris</i>	Spike rush
<i>Elymus arenarius mollis</i>	Beach-rye grass
<i>Eriophorum angustifolium</i>	Cottongrass
<i>Eriophorum russeolum</i>	Cottongrass
<i>Hordeum brachyantherum</i>	Meadow barley
<i>Puccinellia pumila</i>	Alkali grass
<i>Trichophorum caespitosum</i>	Tufted clubrush

FERNS AND ALLIES

<i>Athyrium filix-femina</i>	Lady fern
<i>Dryopteris dilatata</i>	Shield fern

MOSSES

<i>Sphagnum</i> spp.	Peat moss
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APPENDIX 4. CONSTANCY (CON) AND AVERAGE CANOPY COVER (ACOV) OF VASCULAR SPECIES
IN EACH COMMUNITY TYPE.

TREE COMMUNITIES	MIXED CON/VACCIN/LYSAME				TSUHET/VACCIN/ECHHOR			
	TSUMER/VACCIN		MIXED CON/VACCIN		TSUHET/VACCIN		TSUHET/VACCIN/DRYDIL	
	1 Plot	3 Plots	8 Plots	3 Plots	4 Plots			
SPECIES	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV
TREES								
<i>Picea sitchensis</i>	100 1	67 11	88 22	100 7	50 4			
<i>Tsuga heterophylla</i>	. .	67 20	88 17	100 55	100 55			
<i>Tsuga mertensiana</i>	100 40	67 10	100 14	. .	. .	
TREES-REGENERATION								
<i>Picea sitchensis</i> regen	100 1	67 4	100 1	100 2	75 1			
<i>Tsuga heterophylla</i> regen	. .	67 9	88 3	100 7	100 8			
<i>Tsuga mertensiana</i> regen	100 3	67 4	88 2	. .	. .	
TALL SHRUBS								
<i>Alnus sinuata</i>	. .	33 20	50 8	. .	. .	
<i>Cladanthamnus pyrolaeiflorus</i>	100 4	. .	13 1	. .	. .	
<i>Echinopanax horridum</i>	. .	33 1	88 8	100 11	100 3			
<i>Malus fusca</i>	100 5	. .	. .	. .	. .
<i>Menziesia ferruginea</i>	100 5	67 6	75 5	33 1	50 3			
<i>Ribes bracteosum</i>	. .	. .	13 1	. .	50 1			
<i>Rubus spectabilis</i>	100 2	67 10	100 9	100 5	75 2			
<i>Sambucus racemosa</i>	. .	. .	. .	33 1	25 1			
<i>Sorbus sitchensis</i>	. .	. .	. .	. .	25 1			
<i>Vaccinium</i> sp. (oval & alask)	100 20	67 53	100 53	100 47	100 64			
<i>Viburnum edule</i>	. .	33 1	25 3	. .	. .	
LOW AND SUBSHRUBS								
<i>Empetrum nigrum</i>	100 4	. .	. .	. .	. .
FORBS								
<i>Angelica lucida</i>	. .	. .	13 1	. .	. .	
<i>Boschniakia rossica</i>	. .	33 1	. .	. .	. .
<i>Caltha palustris asarifolia</i>	. .	. .	13 2	. .	. .	
<i>Cardamine umbellata</i>	. .	. .	13 1	. .	. .	
<i>Circaea alpina</i>	. .	. .	38 2	. .	. .	
<i>Coptis asplenifolia</i>	100 5	67 6	38 13	. .	25 6			
<i>Coptis trifolia</i>	. .	. .	13 1	33 1	. .			
<i>Cornus canadensis</i>	100 8	67 10	100 9	100 5	100 4			
<i>Dodecatheon jeffreyi</i>	. .	33 1	. .	. .	. .
<i>Epilobium angustifolium</i>	. .	. .	13 1	. .	. .	
<i>Epilobium</i> sp.	. .	. .	13 1	. .	. .	
<i>Equisetum arvense</i>	. .	. .	25 2	. .	. .	
<i>Equisetum pratense</i>	. .	. .	13 4	. .	. .	
<i>Equisetum</i> sp.	. .	. .	. .	33 1	. .			
<i>Erigeron peregrinus</i>	. .	. .	13 1	. .	. .	
<i>Fauria crista-galli</i>	100 7	33 1	13 1	. .	. .	
<i>Galium trifidum</i>	. .	. .	13 1	. .	. .	
<i>Geum macrophyllum</i>	. .	. .	13 1	. .	. .	
<i>Listera caurina</i>	. .	. .	13 1	. .	. .	
<i>Listera cordata</i>	. .	33 1	63 1	100 1	75 1			
<i>Lysichitum americanum</i>	100 2	67 20	38 1	. .	. .	
<i>Mimulus guttatus</i>	. .	. .	13 1	. .	. .	
<i>Moneses uniflora</i>	. .	. .	13 1	67 1	25 1			
<i>Parnassia palustris</i>	. .	. .	13 2	. .	. .	
<i>Petasites hyperboreus</i>	. .	. .	13 1	. .	. .	
<i>Platanthera saccata</i>	. .	. .	25 1	. .	. .	
<i>Prenanthes alata</i>	. .	. .	13 1	. .	. .	
<i>Rubus arcticus stellatus</i>	100 1	. .	. .	. .	. .
<i>Rubus pedatus</i>	100 8	67 18	100 19	100 12	100 25			
<i>Sanguisorba menziesii</i>	. .	33 1	. .	. .	. .
<i>Sanguisorba stipulata</i>	. .	. .	13 2	. .	. .	
<i>Stellaria sitchana</i>	. .	. .	13 1	. .	. .	
<i>Streptopus amplexifolius</i>	100 1	67 1	88 2	100 1	75 1			

SPECIES	MIXED CON/VACCIN/LYSAME				TSUNET/VACCIN/ECHNOR				TSUNET/VACCIN/DRYDIL			
	TSUNET/VACCIN		MIXED CON/VACCIN		MIXED CON/VACCIN		TSUNET/VACCIN		TSUNET/VACCIN/DRYDIL		TSUNET/VACCIN/DRYDIL	
	1 Plot	3 Plots	8 Plots	3 Plots	4 Plots	1 Plot	3 Plots	8 Plots	3 Plots	4 Plots	1 Plot	3 Plots
	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV
<i>Tierella trifoliata</i>	.	.	67	2	50	2	67	1	50	3	.	.
<i>Trientalis europaea</i>	13	1	.	.	.	.	.	.
<i>Veratrum viride</i>	100	2	67	1	.	.	.	.	.	.	.	.
<i>Viola epipsila</i>	.	.	33	1	25	2	.	.	.	.	.	.
<i>Viola langsdorffii</i>	13	1	.	.	.	.	.	.
GRAMINOIDS												
<i>Agrostis</i> sp.	13	1	.	.	.	.	.	.
<i>Calamagrostis nutkaensis</i>	100	5	.	.	13	25	.	.	.	.	.	.
<i>Carex anthoxanthea</i>	13	1	.	.	.	.	.	.
<i>Carex disperma</i>	25	3	.	.	.	.	.	.
<i>Carex macrochaeta</i>	25	2	.	.	.	.	.	.
<i>Carex sitchensis</i>	100	8	67	1	13	1	.	.	.	.	.	.
<i>Cinna latifolia</i>	25	2	.	.	25	1	.	.
<i>Luzula parviflora</i>	25	1	.	.	50	1	.	.
<i>Poa arctica</i>	13	3	.	.	.	.	.	.
<i>Vahlodea stropurpurea latifolia</i>	13	1	.	.	.	.	.	.
FERNS AND ALLIES												
<i>Athyrium filix-femina</i>	.	.	67	2	38	10	.	.	25	1	.	.
<i>Blechnum spicant</i>	13	1	.	.	.	.	.	.
<i>Dryopteris dilatata</i>	.	.	67	1	75	1	100	6	100	7	.	.
<i>Gymnocarpium dryopteris</i>	100	1	67	13	100	6	100	6	100	8	.	.
<i>Lycopodium annotinum</i>	38	1	67	1	25	1	.	.
<i>Lycopodium selago</i>	13	4	.	.	.	.	.	.
<i>Thelypteris phegopteris</i>	.	.	33	1	13	1	.	.	.	.	.	.
UNKNOWN												
GRAMINOID UNKNOWN	.	.	33	1	13	1	.	.	.	.	.	.
SEDGE UNKNOWN	.	.	33	4	.	.	.	.	.	.	.	.

TREE COMMUNITIES (CONTINUED)

SPECIES	TSUNET/VACCIN		PICSIT/ALNSIN		PICSIT/ECHHOR-RUBESPE		PICSIT/ECHHOR-VACCIN		PICSIT/ECHHOR	
	3 Plots		17 Plots		25 Plots		37 Plots		27 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
TREES										
<i>Picea sitchensis</i>	100	8	100	41	100	47	100	43	100	41
<i>Populus balsamifera trichocarpa</i>	.	.	6	30	4	5	16	3	4	2
<i>Tsuga heterophylla</i>	100	55	6	10	40	18	46	18	37	20
<i>Tsuga mertensiana</i>	.	.	6	2	.	.	3	2	4	Tr
TREES-REGENERATION										
<i>Picea sitchensis</i> regen	100	2	59	12	84	4	92	3	89	4
<i>Populus balsamifera trichocarpa</i> regen	.	.	6	5	.	.	.	.	.	.
<i>Tsuga heterophylla</i> regen	100	12	18	6	52	3	54	5	48	8
<i>Tsuga mertensiana</i> regen	.	.	6	1	.	.	5	Tr	4	2
TALL SHRUBS										
<i>Alnus sinuata</i>	33	1	100	22	24	1	22	2	19	1
<i>Echinopanax horridum</i>	33	1	88	19	100	33	100	27	100	46
<i>Menziesia ferruginea</i>	33	1	6	2	20	3	11	1	11	1
<i>Ribes bracteosum</i>	.	.	6	6	8	11	3	1	4	1
<i>Ribes laxiflorum</i>	.	.	6	1	8	1	.	.	.	.
<i>Rubus spectabilis</i>	67	3	76	28	100	25	70	4	81	5
<i>Salix barclayi</i>	.	.	12	11	.	.	.	.	.	.
<i>Salix commutata</i>	.	.	6	3	.	.	.	.	.	.
<i>Salix hookeriana</i>	.	.	6	1	.	.	.	.	.	.
<i>Salix sitchensis</i>	.	.	6	1	.	.	3	1	4	1
<i>Sambucus racemosa</i>	.	.	29	1	20	3	.	.	7	1
<i>Vaccinium</i> sp. (oval & alask)	100	63	76	12	88	25	100	37	89	6
<i>Viburnum edule</i>	33	1	59	3	24	4	30	1	33	2
LOW AND SUBSHRUBS										
<i>Empetrum nigrum</i>	.	.	18	4	.	.	.	.	.	.
<i>Oxycoccus palustris</i>	.	.	6	1	.	.	.	.	.	.
<i>Vaccinium uliginosum</i>	.	.	6	2	.	.	.	.	.	.
<i>Vaccinium vitis-idaea</i>	.	.	6	5	.	.	.	.	.	.
FORBS										
<i>Achillea borealis</i>	.	.	6	1	.	.	.	.	.	.
<i>Aconitum delphinifolium</i>	.	.	6	1	.	.	.	.	.	.
<i>Actaea rubra</i>	.	.	6	1	8	3	5	1	.	.
<i>Angelica genuflexa</i>	.	.	29	1	.	.	.	.	4	1
<i>Angelica lucida</i>	.	.	6	2	.	.	.	.	.	.
<i>Arnica latifolia</i>	.	.	.	.	.	.	3	1	.	.
<i>Aruncus sylvestris</i>	.	.	24	1	.	.	3	1	7	1
<i>Aster subspicatus</i>	.	.	6	1	.	.	.	.	.	.
<i>Caltha palustris asarifolia</i>	.	.	24	2	.	.	.	.	.	.
<i>Cicuta douglasii</i>	.	.	6	1	.	.	.	.	.	.
<i>Circaea alpina</i>	.	.	65	11	76	17	24	4	74	7
<i>Conioselinum chinense</i>	.	.	6	1	.	.	.	.	.	.
<i>Coptis asplenifolia</i>	33	15	.	.	4	3	5	6	11	5
<i>Coptis trifolia</i>	.	.	6	1	4	1	3	1	4	1
<i>Cornus canadensis</i>	100	7	59	3	52	4	89	3	59	1
<i>Cornus suecica</i>	.	.	6	3	.	.	.	.	.	.
<i>Epilobium angustifolium</i>	.	.	24	1	.	.	8	1	4	1
<i>Epilobium glandulosum</i>	.	.	6	1	.	.	.	.	.	.
<i>Epilobium latifolium</i>	.	.	.	.	.	.	3	1	.	.
<i>Epilobium palustre</i>	.	.	6	2	.	.	.	.	.	.
<i>Equisetum arvense</i>	.	.	35	5	8	1	3	1	15	3
<i>Equisetum fluviatile</i>	.	.	6	1	.	.	.	.	.	.
<i>Equisetum palustre</i>	.	.	12	1	.	.	.	.	.	.
<i>Equisetum pratense</i>	.	.	6	2	.	.	5	1	4	1
<i>Equisetum</i> sp.	33	2	24	4	12	3	5	2	7	4
<i>Equisetum variegatum</i>	.	.	6	1	.	.	.	.	.	.
<i>Fragaria chiloensis</i>	.	.	6	1	.	.	.	.	.	.

SPECIES	TSUNET/VACCIN		PICSIT/ALNSIN		PICSIT/ECHHOR-RUBSPE		PICSIT/ECHHOR-VACCIN		PICSIT/ECHHOR	
	3 Plots		17 Plots		25 Plots		37 Plots		27 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
<i>Galium trifidum</i>	.	.	12	1	.	.	.	.	.	.
<i>Galium triflorum</i>	.	.	12	1	.	.	.	.	.	.
<i>Goodyera oblongifolia</i>	4	1
<i>Heracleum lanatum</i>	.	.	6	2	.	.	.	.	4	1
<i>Heuchera glabra</i>	.	.	6	1	.	.	.	.	.	.
<i>Lathyrus palustris</i>	.	.	6	1	.	.	.	.	.	.
<i>Listera caurina</i>	33	1	12	1	8	1	16	1	4	1
<i>Listera cordata</i>	67	1	18	7	24	1	68	1	37	1
<i>Lupinus nootkatensis</i>	.	.	6	3	.	.	.	.	.	.
<i>Lysichiton americanum</i>	.	.	41	14	20	2	8	1	.	.
<i>Malanthemum dilatatum</i>	.	.	18	4	20	2	3	1	7	6
<i>Moneses uniflora</i>	33	1	12	1	4	1	22	1	22	1
<i>Osmorhiza chilensis</i>	4	5	.	.	.	.
<i>Platanthera dilatata</i>	.	.	6	1	.	.	3	1	.	.
<i>Platanthera saccata</i>	.	.	29	1	.	.	14	1	.	.
<i>Platanthera sp.</i>	.	.	6	1	.	.	.	.	.	.
<i>Potentilla palustris</i>	.	.	18	2	.	.	.	.	.	.
<i>Prenanthes alata</i>	.	.	24	12	20	1	5	1	22	1
<i>Pyrola asarifolia</i>	.	.	12	5	.	.	3	1	4	1
<i>Pyrola secunda</i>	.	.	18	3	.	.	8	1	7	1
<i>Rubus arcticus stellatus</i>	.	.	24	1	4	5	.	.	.	.
<i>Rubus pedatus</i>	100	25	59	10	88	20	100	26	100	26
<i>Sanguisorba stipulata</i>	.	.	18	3	.	.	.	.	4	1
<i>Stellaria crispa</i>	.	.	6	1	.	.	.	.	4	2
<i>Streptopus amplexifolius</i>	.	.	82	2	100	2	81	1	100	1
<i>Tiarella trifoliata</i>	.	.	82	4	92	9	89	6	93	7
<i>Trientalis europa</i>	.	.	35	1	.	.	.	.	.	.
<i>Valeriana sitchensis</i>	.	.	6	1	.	.	.	.	.	.
<i>Veratrum viride</i>	.	.	29	1	4	1	11	1	.	.
<i>Viola epipsila</i>	.	.	12	2	12	1	16	1	4	2
<i>Viola glabella</i>	.	.	6	1	16	2	5	3	15	1
<i>Viola langsdoeffii</i>	.	.	35	1	8	3	11	1	4	1
<i>Viola sp.</i>	.	.	6	3	.	.	5	1	.	.
GRAMINOIDS										
<i>Calamagrostis canadensis</i>	.	.	29	1	.	.	.	.	4	1
<i>Calamagrostis nutkaensis</i>	.	.	6	2	.	.	.	.	.	.
<i>Carex Mertensii</i>	4	1	.	.	.	.
<i>Carex anthoxantha</i>	.	.	6	3	.	.	.	.	.	.
<i>Carex aquatilis</i>	3	1	.	.
<i>Carex canescens</i>	.	.	12	1	.	.	3	1	.	.
<i>Carex disperma</i>	.	.	6	1	.	.	.	.	.	.
<i>Carex interior</i>	.	.	6	1	.	.	.	.	.	.
<i>Carex macrochaeta</i>	.	.	18	8	.	.	.	.	.	.
<i>Carex pluriflora</i>	.	.	6	15	.	.	.	.	.	.
<i>Carex sitchensis</i>	.	.	18	30	.	.	.	.	.	.
<i>Cinna latifolia</i>	.	.	6	1	.	.	11	1	7	1
<i>Deschampsia caespitosa</i>	.	.	6	3	.	.	.	.	.	.
<i>Elymus hirsutus</i>	.	.	18	1	.	.	3	1	4	1
<i>Eriophorum angustifolium</i>	.	.	6	1	.	.	3	1	.	.
<i>Eriophorum russeolum</i>	.	.	6	1	.	.	.	.	.	.
<i>Glyceria pauciflora</i>	5	1	.	.
<i>Luzula multiflora</i>	.	.	6	1	.	.	.	.	.	.
<i>Luzula parviflora</i>	.	.	6	1	8	1	8	1	15	1
<i>Luzula rufescens</i>	7	2
<i>Scirpus microcarpus</i>	.	.	12	10	.	.	.	.	.	.
<i>Trisetum cernuum</i>	.	.	12	1	12	1	5	1	11	2
<i>Trisetum spicatum</i>	3	1	.	.
<i>Vahlodea atropurpurea latifolia</i>	.	.	6	1	.	.	5	1	.	.

SPECIES	TSURET/VACCIN		PICSIT/ALNSIN		PICSIT/ECHHOR-RUESPE		PICSIT/ECHHOR-VACCIN		PICSIT/ECHHOR	
	3 Plots		17 Plots		25 Plots		37 Plots		27 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
FERNS AND ALLIES										
Athyrium filix-femina	.	.	82	10	88	12	41	3	81	7
Blechnum spicant	.	.	.	.	8	2	5	1	4	1
Cystopteris fragilis	.	.	.	.	.	.	3	1	.	.
Dryopteris dilatata	67	2	65	6	92	8	84	6	93	8
Gymnocarpium dryopteris	100	2	71	5	80	10	92	5	96	5
Lycopodium annotinum	33	1	6	1	16	1	38	1	30	2
Lycopodium selago	.	.	6	1	.	.	8	2	7	1
Polypodium glycyrrhiza	.	.	29	1	36	1	19	1	33	1
Polystichum Braunii	.	.	18	2	8	2	.	.	7	1
Thelypteris phegopteris	.	.	35	3	60	3	11	1	30	2
UNKNOWN										
GRAMINOID UNKNOWN	.	.	18	2	8	2	8	1	15	1
SEDGE UNKNOWN	33	3	12	13	4	1	5	5	4	1

TREE COMMUNITIES (CONTINUED)

SPECIES	PICSIT/VACCIN		PICSIT/SERAL		PICSIT-POPTRI/ALNSIN		PICSIT-POPTRI/ECHHOR		PICSIT-POPTRI/SERAL	
	23 Plots		4 Plots		6 Plots		5 Plots		8 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
TREES										
<i>Picea sitchensis</i>	100	46	100	56	100	27	100	41	100	34
<i>Populus balsamifera trichocarpa</i>	.	.	.	.	100	29	100	12	100	15
<i>Tsuga heterophylla</i>	61	22	.	.	17	1	20	1	13	1
TREES-REGENERATION										
<i>Picea sitchensis</i> regen	91	6	75	8	100	14	100	21	100	16
<i>Populus balsamifera trichocarpa</i> regen	.	.	.	.	17	5	.	.	25	2
<i>Tsuga heterophylla</i> regen	65	9	.	.	.	.	.	.	38	6
TALL SHRUBS										
<i>Alnus sinuata</i>	43	2	.	.	100	22	40	5	50	1
<i>Echinopanax horridum</i>	87	2	50	3	100	8	100	15	63	2
<i>Menziesia ferruginea</i>	35	1	.	.	.	.	.	.	13	1
<i>Ribes bracteosum</i>	.	.	.	.	17	1	.	.	.	.
<i>Rubus spectabilis</i>	96	10	25	20	100	10	80	3	25	1
<i>Salix barclayi</i>	.	.	.	.	33	5	.	.	50	8
<i>Salix alaxensis</i>	.	.	.	.	33	2	.	.	.	.
<i>Salix commutata</i>	.	.	.	.	33	1	.	.	25	1
<i>Salix sitchensis</i>	.	.	.	.	33	2	20	8	50	5
<i>Sambucus racemosa</i>	.	.	25	3	17	1	.	.	13	1
<i>Vaccinium</i> sp. (oval & alask)	100	46	50	1	50	1	80	26	75	3
<i>Viburnum edule</i>	39	2	50	2	83	2	60	1	38	2
LOW AND SUBSHRUBS										
<i>Empetrum nigrum</i>	.	.	.	.	.	.	.	.	13	4
<i>Vaccinium uliginosum</i>	.	.	.	.	17	1	.	.	13	1
FORBS										
<i>Achillea borealis</i>	4	1	.	.	17	1	.	.	38	2
<i>Actaea rubra</i>	.	.	.	.	83	1	20	1	25	1
<i>Angelica lucida</i>	.	.	.	.	33	1	20	1	.	.
<i>Aruncus sylvestris</i>	.	.	.	.	33	1	20	1	25	1
<i>Boschniakia rossica</i>	.	.	.	.	50	1	40	1	.	.
<i>Cardamine umbellata</i>	.	.	.	.	17	1	.	.	.	.
<i>Castilleja miniata</i>	.	.	.	.	.	.	.	.	13	1
<i>Castilleja unalaschensis</i>	.	.	.	.	.	.	.	.	13	1
<i>Cicuta douglasii</i>	.	.	.	.	.	.	.	.	13	1
<i>Circaea alpina</i>	4	1	75	3	67	25	80	6	13	1
<i>Coeloglossum viride bracteatum</i>	.	.	.	.	.	.	.	.	13	1
<i>Conioselinum chinense</i>	.	.	.	.	17	1	20	1	.	.
<i>Coptis asplenifolia</i>	9	11	.	.	.	.	.	.	.	.
<i>Coptis trifolia</i>	9	3	.	.	.	.	.	.	.	.
<i>Cornus canadensis</i>	87	7	25	1	50	6	100	2	50	12
<i>Epilobium alpinum</i>	.	.	.	.	17	2	.	.	.	.
<i>Epilobium angustifolium</i>	.	.	.	.	50	1	40	1	25	5
<i>Epilobium glandulosum</i>	.	.	.	.	17	1	.	.	.	.
<i>Epilobium leptocarpum</i>	.	.	.	.	.	.	.	.	13	1
<i>Epilobium</i> sp.	4	7	.	.	17	1	.	.	25	7
<i>Equisetum arvense</i>	4	1	.	.	33	3	.	.	.	.
<i>Equisetum</i> sp.	26	7	25	1	17	1	.	.	13	1
<i>Equisetum variegatum</i>	.	.	.	.	33	1	.	.	.	.
<i>Fragaria chiloensis</i>	4	1	25	1	33	1	.	.	50	8
<i>Galium triflorum</i>	.	.	.	.	33	1	.	.	.	.
<i>Geranium erianthum</i>	.	.	.	.	17	1	40	1	.	.
<i>Geum calthifolium</i>	.	.	.	.	.	.	.	.	13	2
<i>Geum macrophyllum</i>	.	.	.	.	50	1	.	.	.	.
<i>Goodyera oblongifolia</i>	.	.	.	.	17	2	40	1	38	1
<i>Hedysarum alpinum</i>	.	.	.	.	17	1	.	.	.	.
<i>Heracleum lanatum</i>	.	.	25	1	.	.	.	.	13	1
<i>Heuchera glabra</i>	.	.	.	.	.	.	20	1	.	.
<i>Listera caurina</i>	4	1	.	.	17	1	40	1	.	.
<i>Listera cordata</i>	61	2	50	2	67	2	80	1	75	1

SPECIES	PICSIT/VACCIN		PICSIT/SERAL		PICSIT-POPTRI/ALNSIN		PICSIT-POPTRI/ECHHOR		PICSIT-POPTRI/SERAL	
	23 Plots		4 Plots		6 Plots		5 Plots		8 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
<i>Lupinus nootkatensis</i>	4	2	25	3	17	1	20	1	50	13
<i>Lysichiton americanum</i>	.	.	.	.	.	.	.	.	13	1
<i>Meibianthamnium dilatatum</i>	.	.	.	.	.	.	.	.	13	1
<i>Moehringia lateriflora</i>	.	.	.	.	.	.	.	.	13	1
<i>Moneses uniflora</i>	22	1	.	.	17	1	40	1	25	1
<i>Osmorhiza chilensis</i>	.	.	.	.	33	1	20	1	.	.
<i>Parnassia fimbriata</i>	.	.	.	.	.	.	.	.	25	1
<i>Pedicularis parviflora</i>	.	.	.	.	17	1	.	.	.	.
<i>Platanthera dilatata</i>	.	.	.	.	17	1	.	.	13	1
<i>Platanthera saccata</i>	4	1	.	.	17	1	.	.	25	1
<i>Polygonum viviparum</i>	.	.	.	.	17	1	.	.	.	.
<i>Prenanthes alata</i>	4	1	.	.	33	1	40	1	38	1
<i>Pyrola asarifolia</i>	.	.	25	2	100	2	60	1	63	5
<i>Pyrola minor</i>	.	.	.	.	17	1	.	.	.	.
<i>Pyrola secunda</i>	9	2	75	1	83	5	60	2	88	3
<i>Ranunculus Bongardi</i>	.	.	.	.	17	1	.	.	.	.
<i>Rubus arcticus stellatus</i>	9	1	.	.	17	3	.	.	38	1
<i>Rubus pedatus</i>	91	26	100	3	67	12	100	31	88	7
<i>Sanguisorba stipulata</i>	4	1	25	1	50	1	40	1	.	.
<i>Stellaria crispa</i>	.	.	.	.	50	2	.	.	.	.
<i>Stellaria sitchana</i>	.	.	.	.	17	5	.	.	.	.
<i>Streptopus amplexifolius</i>	57	3	50	1	100	2	80	1	63	1
<i>Tiarella trifoliata</i>	61	3	25	2	50	1	100	8	25	1
<i>Trientalis europaea</i>	.	.	.	.	33	1	.	.	38	1
<i>Veratrum viride</i>	.	.	.	.	.	.	40	1	.	.
<i>Viola glabella</i>	4	2	.	.	.	.	.	.	13	2
<i>Viola langsdoeffii</i>	.	.	.	.	.	.	40	1	13	1
GRAMINOIDS										
<i>Agrostis borealis</i>	.	.	.	.	17	1	.	.	.	.
<i>Calamagrostis canadensis</i>	4	8	.	.	33	1	.	.	25	1
<i>Carex canescens</i>	4	1	.	.	.	.	.	.	.	.
<i>Carex macrochaeta</i>	4	1	.	.	17	1	20	1	13	1
<i>Carex sp.</i>	9	3	.	.	.	.	.	.	13	10
<i>Carex stylosa</i>	4	1	.	.	.	.	.	.	.	.
<i>Cinna latifolia</i>	.	.	.	.	.	.	20	2	.	.
<i>Deschampsia caespitosa</i>	.	.	.	.	.	.	20	1	.	.
<i>Elymus hirsutus</i>	.	.	.	.	17	1	.	.	.	.
<i>Elymus subsecundus</i>	.	.	.	.	17	1	.	.	.	.
<i>Festuca rubra</i>	.	.	.	.	17	1	.	.	.	.
<i>Luzula multiflora</i>	.	.	.	.	17	1	.	.	.	.
<i>Phleum commutatum americanum</i>	.	.	.	.	17	1	.	.	38	1
<i>Poa arctica</i>	.	.	.	.	17	1	.	.	.	.
<i>Trisetum cernuum</i>	9	3	.	.	50	1	20	2	25	1
<i>Trisetum spicatum</i>	.	.	.	.	.	.	.	.	13	1
<i>Vahlodea atropurpurea latifolia</i>	4	1	.	.	.	.	.	.	.	.
FERNS AND ALLIES										
<i>Athyrium filix-femina</i>	43	5	50	3	83	2	80	3	50	2
<i>Blechnum spicant</i>	4	1	.	.	.	.	.	.	.	.
<i>Dryopteris dilatata</i>	65	5	.	.	67	1	60	1	38	1
<i>Gymnocarpium dryopteris</i>	87	5	.	.	33	2	40	1	50	6
<i>Lycopodium annotinum</i>	26	2	.	.	.	.	20	1	.	.
<i>Lycopodium selago</i>	22	3	.	.	17	1	.	.	25	1
<i>Polypodium glycyrrhiza</i>	22	1	.	.	.	.	20	1	.	.
<i>Thelypteris phegopteris</i>	13	1	.	.	17	10	20	1	13	1
UNKNOWN										
GRAMINOID UNKNOWN	17	2	.	.	.	.	60	1	25	2
SEDGE UNKNOWN	9	3	.	.	.	.	.	.	13	10

TREE COMMUNITIES (CONTINUED)

SPECIES	POPTRI/SALIX		POPTRI/RUBSPE		POPTRI/ECHHOR		PINCON/SPHAGN		PICSIT/SPHAGN	
	7 Plots	CON ACOV	11 Plots	CON ACOV	5 Plots	CON ACOV	7 Plots	CON ACOV	7 Plots	CON ACOV
TREES										
<i>Picea sitchensis</i>	57	9	18	6	20	2	57	1	71	10
<i>Pinus contorta contorta</i>	.	.	.	.	.	.	100	10	14	1
<i>Populus balsamifera trichocarpa</i>	100	26	100	23	100	26	.	.	.	.
<i>Tsuga heterophylla</i>	.	.	.	.	.	.	14	1	.	.
<i>Tsuga mertensiana</i>	.	.	.	.	.	.	43	1	14	15
TREES-REGENERATION										
<i>Picea sitchensis</i> regen	86	2	45	8	40	6	71	2	86	7
<i>Pinus contorta</i> regen	.	.	.	.	.	.	100	10	.	.
<i>Populus balsamifera trichocarpa</i> regen	.	.	27	3	.	.	.	.	.	.
<i>Tsuga heterophylla</i> regen	.	.	.	.	20	1	57	1	14	10
<i>Tsuga mertensiana</i> regen	.	.	.	.	.	.	71	3	14	2
TALL SHRUBS										
<i>Alnus sinuata</i>	86	46	100	50	100	44	29	1	29	13
<i>Echinopanax horridum</i>	57	1	91	23	100	22	.	.	.	.
<i>Malus fusca</i>	14	1	.	.	.	.	.	.	.	.
<i>Menziesia ferruginea</i>	.	.	.	.	.	.	71	1	29	4
<i>Myrica gale</i>	.	.	.	.	.	.	43	10	86	17
<i>Ribes bracteosum</i>	.	.	9	2	80	1	.	.	.	.
<i>Rubus spectabilis</i>	71	8	100	51	100	7	14	1	14	1
<i>Salix barclayi</i>	86	12	18	1	.	.	14	4	.	.
<i>Salix alaxensis</i>	43	2	.	.	.	.	.	.	.	.
<i>Salix commutata</i>	29	23	.	.	.	.	14	2	.	.
<i>Salix sitchensis</i>	100	12	36	1	.	.	.	.	.	.
<i>Sambucus racemosa</i>	14	1	73	7	80	13	.	.	.	.
<i>Sorbus sitchensis</i>	.	.	.	.	.	.	14	1	14	1
<i>Vaccinium</i> sp. (oval & alask)	.	.	9	1	.	.	71	1	57	7
<i>Viburnum edule</i>	71	2	73	3	40	1	14	1	43	1
LOW AND SUBSHRUBS										
<i>Andromeda polifolia</i>	.	.	.	.	.	.	29	1	29	2
<i>Empetrum nigrum</i>	.	.	.	.	.	.	100	7	57	13
<i>Kalmia polifolia</i>	.	.	.	.	.	.	71	2	29	2
<i>Ledum groenlandicum</i>	.	.	.	.	.	.	86	5	29	1
<i>Oxycoccus palustris</i>	.	.	.	.	.	.	86	12	57	11
<i>Vaccinium uliginosum</i>	14	1	.	.	.	.	86	5	29	21
<i>Vaccinium vitis-idaea</i>	.	.	.	.	.	.	14	2	.	.
FORBS										
<i>Achillea borealis</i>	71	1	18	1	40	1	.	.	.	.
<i>Actaea rubra</i>	71	2	45	1	80	1	.	.	.	.
<i>Angelica genuflexa</i>	29	6	9	1	20	1	.	.	.	.
<i>Angelica lucida</i>	29	1	27	1	.	.	.	.	.	.
<i>Aquilegia formosa</i>	14	1	.	.	.	.	.	.	.	.
<i>Artemisia tilesii</i>	29	1	.	.	.	.	.	.	.	.
<i>Aruncus sylvestris</i>	57	5	45	2	20	5	.	.	.	.
<i>Aster subspicatus</i>	29	2	9	1	.	.	14	4	.	.
<i>Boschniakia rossica</i>	57	1	18	1	20	1	.	.	.	.
<i>Cardamine umbellata</i>	.	.	9	1	20	1	.	.	.	.
<i>Cicuta douglasii</i>	.	.	9	4	.	.	.	.	14	5
<i>Circea alpina</i>	86	15	91	14	100	13	.	.	.	.
<i>Contioselinum chinense</i>	43	1	.	.	.	.	.	.	.	.
<i>Coptis asplenifolia</i>	.	.	.	.	.	.	29	1	14	4
<i>Coptis trifolia</i>	.	.	.	.	.	.	71	2	.	.
<i>Cornus canadensis</i>	29	3	.	.	.	.	100	2	57	8
<i>Cornus suecica</i>	.	.	.	.	.	.	29	3	14	1
<i>Dodecatheon jeffreyi</i>	.	.	.	.	.	.	57	1	.	.
<i>Drosera rotundifolia</i>	.	.	.	.	.	.	71	2	29	1
<i>Epilobium adenocaulon</i>	14	1	.	.	.	.	.	.	.	.
<i>Epilobium alpinum</i>	14	1	9	1	.	.	.	.	.	.
<i>Epilobium angustifolium</i>	71	4	27	2	20	1	14	3	.	.

SPECIES	POPTRI/RUBSPE				PINCON/SPHAGN			
	POPTRI/SALIX		POPTRI/ECHHOR		PICSIT/SPHAGN			
	7 Plots	11 Plots	5 Plots	7 Plots	7 Plots			
	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV			
Epilobium glandulosum	43 1	27 1	20 1	.	.	.	.	.
Epilobium hornemannii	14 1	.	.	.	.	.	.	.
Epilobium sp.	.	9 1	20 2	.	.	14	2	.
Equisetum arvense	43 1	18 2	40 1	.	.	29	1	.
Equisetum palustre	.	.	.	.	.	14	2	.
Equisetum pratense	.	.	20 2	.	.	.	.	.
Equisetum sp.	.	45 1	.	.	.	14	10	.
Equisetum variegatum	29 1	.	.	14 5	.	.	.	.
Erigeron peregrinus	.	9 1	.	14 1	.	14	1	.
Fauria crista-galli	14 2	.	.	57 7	.	.	.	.
Fragaria chiloensis	43 4	18 2	20 1	14 1	.	.	.	.
Galium trifidum	.	9 2	20 1	.	.	.	.	.
Galium triflorum	29 2	18 1	20 2	.	.	.	.	.
Gentiana douglasiana	.	.	.	71 2	.	57	1	.
Geranium erianthum	14 1	.	.	.	.	.	.	.
Geum calthifolium	.	.	.	71 1	.	14	1	.
Geum macrophyllum	43 4	36 1	40 1	.	.	.	.	.
Goodyera oblongifolia	.	.	20 1	.	.	.	.	.
Hedysarum alpinum	14 1	.	.	.	.	.	.	.
Heracleum lanatum	57 3	55 6	60 2	14 1	.	.	.	.
Iris setosa	.	.	.	.	.	29	1	.
Ligusticum scoticum	14 1	.	.	.	.	.	.	.
Listera cordata	14 1	.	40 1	.	.	.	.	.
Lupinus nootkatensis	43 9	.	.	14 20	.	.	.	.
Lysichitum americanum	.	.	.	43 1	.	29	13	.
Lysimachia thyrsiflora	.	.	.	.	.	14	1	.
Menyanthes trifoliata	.	.	.	.	.	14	2	.
Osmorhiza chilensis	.	9 1	40 2	.	.	.	.	.
Parnassia fimbriata	.	.	20 4	.	.	.	.	.
Parnassia palustris	.	.	.	14 1	.	.	.	.
Pedicularis oederi	14 3	.	.	.	.	.	.	.
Pedicularis parviflora	.	.	.	71 1	.	14	1	.
Plantago macrocarpa	.	.	.	29 1	.	14	1	.
Platanthera dilatata	14 1	.	.	86 1	.	57	2	.
Platanthera saccata	14 1	9 2	20 1	.	.	.	.	.
Platanthera sp.	14 1	.	.	29 1	.	14	1	.
Polemonium acutiflorum	14 1	.	.	.	.	.	.	.
Polygonum viviparum	.	.	.	14 1	.	.	.	.
Potentilla egedii grandis	14 1	.	.	.	.	.	.	.
Potentilla palustris	.	.	.	.	.	29	2	.
Prenanthes alata	14 1	18 1	20 1	.	.	.	.	.
Pyrola asarifolia	86 7	64 4	40 11	.	.	.	.	.
Pyrola grandiflora	14 2	.	.	.	.	.	.	.
Pyrola secunda	71 2	18 1	20 15	.	.	.	.	.
Rubus arcticus stellatus	57 6	.	20 1	29 1	.	86	2	.
Rubus pedatus	14 3	9 1	20 1	43 1	.	43	1	.
Sanguisorba menziesii	.	.	.	71 12	.	14	1	.
Sanguisorba stipulata	57 2	9 8	.	.	.	14	5	.
Solidago lepida	43 1	.	.	.	.	.	.	.
Spiranthes romanzoffiana	.	.	.	29 2	.	.	.	.
Stellaria borealis	.	.	20 2	.	.	.	.	.
Stellaria calycantha	14 1	.	.	.	.	.	.	.
Stellaria crispa	29 1	27 1	20 4	.	.	.	.	.
Stellaria sitchana	14 1	.	.	.	.	.	.	.
Stellaria species	14 1	.	.	.	.	.	.	.
Streptopus amplexifolius	86 1	82 1	80 1	.	.	71	1	.
Suertia perennis	.	.	.	14 8	.	.	.	.
Tellima grandiflora	.	9 1	40 2	.	.	.	.	.
Tiarella trifoliata	14 1	45 1	20 2	.	.	.	.	.
Tofieldia glutinosa	.	.	.	43 1	.	14	1	.
Trientalis europea	57 1	.	.	43 1	.	43	1	.
Urtica Lyallii	.	.	20 15	.	.	.	.	.
Veratrum viride	.	9 1	.	.	.	14	7	.

SPECIES	POPTRI/SALIX		POPTRI/RUBSPE		POPTRI/ECHNOR		PINCON/SPHAGN		PICSIT/SPHAGN	
	7 Plots		11 Plots		5 Plots		7 Plots		7 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
<i>Viola epipsila</i>	.	.	.	.	.	.	14	1	14	1
<i>Viola glabella</i>	.	.	.	.	.	.	.	.	14	1
<i>Viola langsdorffii</i>	43	1	.	.	.	.	.	.	.	.
GRAMINOIDS										
<i>Agrostis aequivalvis</i>	.	.	.	.	.	.	29	1	14	3
<i>Agrostis alaskana</i>	.	.	.	.	.	.	14	1	29	1
<i>Agrostis borealis</i>	14	1	.	.	.	.	.	.	.	.
<i>Agrostis exarata</i>	14	4	.	.	.	.	.	.	.	.
<i>Calamagrostis canadensis</i>	57	6	55	2	20	1	71	1	29	8
<i>Calamagrostis inexpansa</i>	14	1	.	.	.	.	.	.	.	.
<i>Carex anthoxanthea</i>	.	.	.	.	.	.	14	1	29	2
<i>Carex canescens</i>	.	.	.	.	.	.	.	.	29	1
<i>Carex capillaris</i>	.	.	.	.	.	.	14	4	.	.
<i>Carex disperma</i>	14	1	.	.	.	.	.	.	.	.
<i>Carex flava</i>	.	.	.	.	.	.	14	3	.	.
<i>Carex livida</i>	.	.	.	.	.	.	29	1	14	1
<i>Carex lyngbyei</i>	.	.	.	.	.	.	.	.	14	40
<i>Carex macrochaeta</i>	57	2	9	1	.	.	14	1	14	1
<i>Carex muricata</i>	.	.	.	.	.	.	14	1	.	.
<i>Carex pauciflora</i>	.	.	.	.	.	.	71	8	.	.
<i>Carex pluriflora</i>	.	.	.	.	.	.	71	9	43	9
<i>Carex saxatilis</i>	.	.	.	.	.	.	14	2	.	.
<i>Carex sitchensis</i>	.	.	.	.	.	.	86	8	57	48
<i>Carex sp.</i>	.	.	.	.	20	3	.	.	14	25
<i>Cinna latifolia</i>	14	1	18	1	.	.	.	.	.	.
<i>Deschampsia caespitosa</i>	14	1	.	.	20	1	57	4	14	1
<i>Deschampsia sp.</i>	.	.	.	.	.	.	14	1	.	.
<i>Elymus hirsutus</i>	29	3	9	2	20	1	.	.	.	.
<i>Elymus subsecundus</i>	29	1	.	.	.	.	.	.	.	.
<i>Eriophorum angustifolium</i>	.	.	.	.	.	.	71	12	71	10
<i>Eriophorum russeolum</i>	.	.	.	.	.	.	.	.	29	2
<i>Festuca rubra</i>	.	.	.	.	.	.	14	1	.	.
<i>Hordeum brachyantherum</i>	.	.	9	6	.	.	.	.	.	.
<i>Phleum commutatum americanum</i>	29	1	.	.	20	1	.	.	.	.
<i>Poa arctica</i>	14	1	.	.	.	.	.	.	.	.
<i>Poa sp.</i>	14	1	.	.	.	.	.	.	.	.
<i>Trichophorum caespitosum</i>	.	.	.	.	.	.	71	17	.	.
<i>Trisetum cernuum</i>	14	1	9	1	20	1	.	.	14	10
<i>Vahlodea atropurpurea latifolia</i>	.	.	.	.	.	.	14	1	.	.
FERNS AND ALLIES										
<i>Athyrium filix-femina</i>	57	4	82	10	100	12	.	.	14	1
<i>Blechnum spicant</i>	.	.	.	.	.	.	14	1	.	.
<i>Dryopteris dilatata</i>	14	1	45	2	20	2	.	.	.	.
<i>Gymnocarpium dryopteris</i>	14	2	36	5	60	3	.	.	14	1
<i>Lycopodium annotinum</i>	.	.	.	.	.	.	.	.	14	1
<i>Polypodium glycyrrhiza</i>	.	.	9	1	.	.	.	.	.	.
<i>Polystichum Braunii</i>	.	.	9	1	.	.	.	.	.	.
<i>Thelypteris phegopteris</i>	14	1	9	1	.	.	.	.	.	.
UNKNOWN										
GRAMINOID UNKNOWN	.	.	18	7	.	.	.	.	29	18
SEDGE UNKNOWN	.	.	.	.	20	3	14	70	29	55

SHRUB COMMUNITIES

SPECIES	RUESPE/ATHFIL				ALNSIN-SALSIT				ALNSIN-RUESPE				ALNSIN/GRAMINOID			
	2 Plots		5 Plots		5 Plots		5 Plots		14 Plots		5 Plots		5 Plots		5 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
TREES																
<i>Picea sitchensis</i>	20	2	.	.	.	.	.	.	.	.	.	.
<i>Populus balsamifera trichocarpa</i>	.	.	40	2	.	.	.	.	14	2	.	.	.	.	.	.
TREES-REGENERATION																
<i>Picea sitchensis</i> regen	.	.	40	2	.	.	.	.	.	.	.	.	.	.	.	.
<i>Populus balsamifera trichocarpa</i> regen	.	.	20	15	.	.	.	.	7	1	.	.	.	.	.	.
TALL SHRUBS																
<i>Alnus sinuata</i>	50	1	100	52	100	42	100	76	100	66	100	66	100	66	100	66
<i>Echinopanax horridum</i>	100	3	40	5	20	2	57	11	.	.	.	.	.	.	.	.
<i>Malus fusca</i>	100	36	.	.	.	.	.	.	.	.	.	.
<i>Ribes bracteosum</i>	.	.	20	2	.	.	7	2	.	.	.	.	.	.	.	.
<i>Rubus spectabilis</i>	100	80	80	27	100	58	100	56	20	3	20	3	20	3	20	3
<i>Salix berclayi</i>	.	.	20	2	20	5	.	.	80	10	80	10	80	10	80	10
<i>Salix elaeagnis</i>	20	3	20	3	20	3	20	3
<i>Salix commutata</i>	20	1	20	1	20	1	20	1
<i>Salix hookeriana</i>	.	.	20	3	.	.	7	2	20	2	20	2	20	2	20	2
<i>Salix sitchensis</i>	.	.	100	21	.	.	29	2	40	3	40	3	40	3	40	3
<i>Sambucus racemosa</i>	50	2	60	2	20	1	79	11	20	1	20	1	20	1	20	1
<i>Vaccinium</i> sp. (oval & alask)	20	1	.	.	.	.	.	.	.	.	.	.
<i>Viburnum edule</i>	.	.	80	1	40	1	29	2	40	3	40	3	40	3	40	3
LOW AND SUBSHRUBS																
<i>Salix setchelliana</i>	20	4	20	4	20	4	20	4
FORBS																
<i>Achillea borealis</i>	.	.	20	1	20	1	.	.	60	5	60	5	60	5	60	5
<i>Aconitum delphinifolium</i>	20	1	20	1	20	1	20	1
<i>Actaea rubra</i>	.	.	20	1	.	.	21	1	.	.	.	.	.	.	.	.
<i>Angelica genuflexa</i>	50	2	60	5	.	.	43	2	60	7	60	7	60	7	60	7
<i>Angelica lucida</i>	.	.	20	20	40	2	7	1	20	15	20	15	20	15	20	15
<i>Aquilegia formosa</i>	.	.	20	1	.	.	.	.	.	.	.	.	.	.	.	.
<i>Arabis hirsuta</i>	.	.	20	1	.	.	.	.	.	.	.	.	.	.	.	.
<i>Arabis lyrata</i>	20	1	20	1	20	1	20	1
<i>Artemisia tilesii</i>	.	.	20	1	.	.	.	.	20	3	20	3	20	3	20	3
<i>Aruncus sylvestris</i>	.	.	20	3	20	20	7	5	40	3	40	3	40	3	40	3
<i>Aster subspicatus</i>	.	.	20	1	.	.	.	.	40	4	40	4	40	4	40	4
<i>Astragalus alpinus</i>	20	1	20	1	20	1	20	1
<i>Boschniakia rossica</i>	.	.	40	1	80	1	14	1	.	.	.	.	.	.	.	.
<i>Caltha palustris asarifolia</i>	.	.	20	1	.	.	.	.	.	.	.	.	.	.	.	.
<i>Cardamine umbellata</i>	100	1	20	1	20	1	7	1	.	.	.	.	.	.	.	.
<i>Castilleja unalaschensis</i>	20	30	20	30	20	30	20	30
<i>Cerastium Beeringianum</i>	20	1	20	1	20	1	20	1
<i>Cicuta douglasii</i>	7	3	.	.	.	.	.	.	.	.
<i>Circaea alpina</i>	100	2	80	12	80	2	86	5	40	4	40	4	40	4	40	4
<i>Claytonia sibirica</i>	.	.	20	2	.	.	.	.	.	.	.	.	.	.	.	.
<i>Conioselinum chinense</i>	.	.	40	1	.	.	.	.	40	2	40	2	40	2	40	2
<i>Epilobium alpinum</i>	7	1	20	1	20	1	20	1	20	1
<i>Epilobium angustifolium</i>	50	1	20	1	60	1	7	2	.	.	.	.	.	.	.	.
<i>Epilobium glandulosum</i>	7	1	20	1	20	1	20	1	20	1
<i>Epilobium latifolium</i>	20	25	20	25	20	25	20	25
<i>Epilobium</i> sp.	.	.	20	1	.	.	7	1	.	.	.	.	.	.	.	.
<i>Equisetum arvense</i>	.	.	80	5	.	.	21	20	40	2	40	2	40	2	40	2
<i>Equisetum palustre</i>	.	.	20	25	.	.	7	2	20	1	20	1	20	1	20	1
<i>Equisetum pratense</i>	14	4	.	.	.	.	.	.	.	.
<i>Equisetum</i> sp.	7	1	.	.	.	.	.	.	.	.
<i>Equisetum variegatum</i>	.	.	20	1	.	.	.	.	40	4	40	4	40	4	40	4
<i>Fragaria chiloensis</i>	20	1	20	1	20	1	20	1
<i>Fritillaria camschatcensis</i>	.	.	20	1	20	1	.	.	.	.	.	.	.	.	.	.
<i>Galium trifidum</i>	.	.	20	1	.	.	.	.	40	1	40	1	40	1	40	1

SPECIES	ALNSIN-SALSTY				ALNSIN-RUPSPE			
	RUPSPE/ATNFIL		5 Plots		ALNSIN-HALFUS		ALNSIN/GRAMINOID	
	2 Plots	CON ACOV	CON ACOV	CON ACOV	5 Plots	CON ACOV	14 Plots	CON ACOV
<i>Galium trifidum columbianum</i>	20	1	.	.
<i>Galium trifidum trifidum</i>	7	1
<i>Galium triflorum</i>	.	.	20	1	.	.	7	1
<i>Gentiana amarella</i>	20
<i>Geum macrophyllum</i>	.	.	60	8	.	.	43	2
<i>Hedysarum alpinum</i>	20
<i>Heracleum lanatum</i>	100	3	60	22	60	1	43	3
<i>Lathyrus maritimus</i>	20
<i>Ligusticum scoticum</i>	20
<i>Lysichitum americanum</i>	.	.	20	1	.	.	7	1
<i>Maianthemum dilatatum</i>	60	8	29	3
<i>Parnassia palustris</i>	40
<i>Platanthera hyperborea</i>	.	.	20	1	.	.	.	.
<i>Platanthera saccata</i>	7	1
<i>Polygonum viviparum</i>	40
<i>Potentilla palustris</i>	7	1
<i>Potentilla villosa</i>	20
<i>Prenanthes alata</i>	.	.	20	1	.	.	.	.
<i>Pyrola asarifolia</i>	.	.	40	8	.	.	14	1
<i>Ranunculus Bongardi</i>	.	.	40	2	.	.	.	20
<i>Ranunculus Macounii</i>	20
<i>Rhinanthus minor borealis</i>	20
<i>Rubus arcticus stellatus</i>	7	1
<i>Rubus pedatus</i>	50	1	.	.	.	.	.	.
<i>Sanguisorba stipulata</i>	.	.	20	2	20	1	.	20
<i>Saussurea americana</i>	7	2
<i>Senecio triangularis</i>	.	.	20	1	.	.	.	.
<i>Sibbaldia procumbens</i>	20
<i>Solidago lepida</i>	20	1	.	.
<i>Stellaria calycantha</i>	50	1	.	.	20	1	.	.
<i>Stellaria crassifolia</i>	20
<i>Stellaria crispa</i>	100	28	60	1	.	.	21	1
<i>Stellaria sitchana</i>	40
<i>Streptopus amplexifolius</i>	100	1	40	1	80	1	43	1
<i>Tellima grandiflora</i>	.	.	20	1	.	.	14	3
<i>Tiarella trifoliata</i>	20	1	7	1
<i>Trientalis europea</i>	50	1	.	.	40	1	7	1
<i>Veratrum viride</i>	100	3	.	.	100	1	43	2
<i>Viola epipsila</i>	60	1	7	4
<i>Viola glabella</i>	7	1
GRAMINOIDS								
<i>Agrostis alaskana</i>	20
<i>Agrostis borealis</i>	20
<i>Agrostis exarata</i>	40
<i>Calamagrostis canadensis</i>	100	5	40	3	80	4	29	3
<i>Carex Mertensii</i>	.	.	20	1	.	.	.	.
<i>Carex disperma</i>	50	1	.	.	.	.	.	.
<i>Carex eleusinoides</i>	20
<i>Carex lyngbyei</i>	7	1
<i>Carex macrochaeta</i>	40	3	.	.
<i>Carex maritima</i>	20
<i>Carex sitchensis</i>	20	1	.	40
<i>Carex sp.</i>	7	1
<i>Cinna latifolia</i>	.	.	20	1	.	.	14	1
<i>Deschampsia caespitosa</i>	60
<i>Elymus hirsutus</i>	.	.	40	4	20	3	7	5
<i>Festuca rubra</i>	.	.	20	1	.	.	.	40
<i>Hordeum brachyantherum</i>	20
<i>Luzula parviflora</i>	.	.	20	1	.	.	7	1
<i>Phleum commutatum americanum</i>	20
<i>Poa arctica</i>	20
<i>Scirpus microcarpus</i>	20

SPECIES	ALNSIN-SALSIT				ALNSIN-RUESPE				ALNSIN/GRAMINOID	
	RUESPE/ATHFIL		5 Plots		ALNSIN-MALFUS		14 Plots		5 Plots	
	2 Plots	CON ACOV	CON	ACOV	5 Plots	CON ACOV	CON	ACOV	CON	ACOV
FERNS AND ALLIES										
Athyrium filix-femina	100	15	20	30	100	22	100	15	20	20
Cystopteris fragilis	.	.	.	.	.	.	7	1	.	.
Dryopteris dilatata	.	.	20	2	40	2	29	2	.	.
Gymnocarpium dryopteris	50	1	.	.	60	1	36	3	.	.
Polystichum Braunii	.	.	.	.	.	.	21	3	.	.
Thelypteris phegopteris	.	.	.	.	60	5	.	.	.	.
UNKNOWN										
GRAMINOID UNKNOWN	.	.	20	1	.	.	14	1	.	.
SEDGE UNKNOWN	.	.	.	.	.	.	7	1	.	.

SHRUB COMMUNITIES (CONTINUED)

SPECIES	SALSIT		SALHOO		SALBAR/CARPLU		SALBAR/CARSIT		SALBAR/MIXED HERB	
	10 Plots	CON ACOV	3 Plots	CON ACOV	6 Plots	CON ACOV	11 Plots	CON ACOV	5 Plots	CON ACOV
TREES-REGENERATION										
<i>Picea sitchensis</i> regen	10	2	.	.	17	2	18	1	20	1
<i>Populus balsamifera</i> trichocarpa regen	20	11	.	.	.	.	.	.	.	.
TALL SHRUBS										
<i>Alnus sinuata</i>	50	16	33	1	33	3	18	1	.	.
<i>Myrica gale</i>	.	.	.	.	50	26	55	32	40	7
<i>Rubus spectabilis</i>	60	25	100	21	.	.	.	.	40	18
<i>Salix barclayi</i>	70	15	33	10	100	26	100	45	100	64
<i>Salix elaeagnis</i>	30	3	.	.	.	.	.	.	.	.
<i>Salix commutata</i>	10	3	.	.	83	28	45	21	60	11
<i>Salix hookeriana</i>	.	.	100	48	17	5	.	.	20	1
<i>Salix sitchensis</i>	100	57	33	7	.	.	18	3	20	1
<i>Sambucus racemosa</i>	10	5	33	5	.	.	.	.	60	4
<i>Viburnum edule</i>	40	2	33	1	33	1	27	2	80	1
LOW AND SUBSHRUBS										
<i>Empetrum nigrum</i>	.	.	.	.	17	20	.	.	.	.
<i>Oxycoccus palustris</i>	.	.	.	.	17	1	.	.	.	.
<i>Vaccinium uliginosum</i>	.	.	.	.	17	60	.	.	.	.
FORBS										
<i>Achillea borealis</i>	10	3	33	1	17	1	.	.	20	1
<i>Actaea rubra</i>	.	.	33	1	.	.	.	.	40	1
<i>Angelica genuflexa</i>	60	1	100	3	33	2	91	3	80	3
<i>Angelica lucida</i>	10	2	.	.	.	.	9	2	60	7
<i>Arabis lyrata</i>	.	.	.	.	.	.	.	.	20	1
<i>Aruncus sylvestris</i>	10	2	.	.	.	.	.	.	.	.
<i>Aster subspicatus</i>	.	.	.	.	33	1	36	3	40	1
<i>Caltha palustris</i> asarifolia	20	6	67	1	50	2	27	2	20	1
<i>Cardamine umbellata</i>	10	1	33	1	.	.	.	.	.	.
<i>Cicuta douglasii</i>	10	1	33	1	50	2	18	1	.	.
<i>Circaea alpina</i>	70	6	67	5	.	.	.	.	60	19
<i>Conioselinum chinense</i>	40	1	67	1	.	.	.	.	20	1
<i>Cornus canadensis</i>	10	1	.	.	.	.	.	.	20	1
<i>Dodecatheon jeffreyi</i>	.	.	.	.	.	.	9	1	.	.
<i>Drosera rotundifolia</i>	.	.	.	.	17	1	.	.	.	.
<i>Epilobium adenocaulon</i>	.	.	.	.	17	2	.	.	.	.
<i>Epilobium angustifolium</i>	30	3	.	.	17	1	18	1	40	3
<i>Epilobium behringianum</i>	.	.	33	2	.	.	9	1	.	.
<i>Epilobium glandulosum</i>	20	1	.	.	.	.	.	.	40	1
<i>Epilobium latifolium</i>	10	1	.	.	.	.	.	.	.	.
<i>Epilobium palustre</i>	.	.	.	.	17	1	18	1	.	.
<i>Epilobium</i> sp.	20	1	33	1	17	1	9	1	.	.
<i>Equisetum arvense</i>	60	20	67	25	67	12	9	1	100	6
<i>Equisetum fluviatile</i>	10	40	.	.	17	1	.	.	.	.
<i>Equisetum palustre</i>	.	.	33	3	33	1	73	1	.	.
<i>Equisetum pratense</i>	10	1	33	3	.	.	.	.	.	.
<i>Equisetum variegatum</i>	.	.	.	.	17	1	.	.	20	2
<i>Erigeron peregrinus</i>	.	.	.	.	17	1	.	.	20	1
<i>Fragaria chiloensis</i>	.	.	33	1	.	.	.	.	.	.
<i>Fritillaria camschatcensis</i>	30	1	67	1	.	.	.	.	40	1
<i>Galium trifidum</i>	20	1	33	1	33	2	18	1	.	.
<i>Galium trifidum columbianum</i>	.	.	.	.	.	.	.	.	20	5
<i>Galium trifidum trifidum</i>	.	.	33	1	.	.	9	1	.	.
<i>Galium triflorum</i>	.	.	.	.	.	.	9	1	40	3
<i>Geranium erianthum</i>	.	.	.	.	.	.	18	1	.	.
<i>Geum calthifolium</i>	.	.	.	.	17	1	9	1	.	.
<i>Geum macrophyllum</i>	40	1	67	2	.	.	.	.	80	3
<i>Heracleum lanatum</i>	50	5	67	2	.	.	.	.	60	3
<i>Iris setosa</i>	.	.	33	1	17	3	9	3	20	1
<i>Lathyrus palustris</i>	.	.	33	6	17	2	.	.	.	.

SPECIES	SALSIT		SALHOO		SALBAR/CARPLU		SALBAR/CARSIT		SALBAR/MIXED HERB	
	10 Plots		3 Plots		6 Plots		11 Plots		5 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
Ligusticum scoticum	.	.	33	2	17	2	.	.	20	2
Lupinus Kuschei	10	1	.	.	.	.	.	.	.	.
Lupinus nootkatensis	10	2	33	2	17	20	36	4	40	5
Lysichitum americanum	10	1	.	.	17	3	9	10	20	2
Menyanthes trifoliata	.	.	.	.	50	7	9	3	.	.
Pedicularis parviflora	.	.	.	.	33	1	18	1	.	.
Platanthera dilatata	.	.	33	1	67	1	18	1	20	1
Platanthera saccata	20	1	33	1	.	.	9	1	20	1
Platanthera sp.	.	.	.	.	.	.	9	1	.	.
Polemonium scutiflorum	.	.	33	1	17	1	45	2	20	2
Polygonum viviparum	.	.	.	.	17	2	9	2	20	1
Potentilla palustris	10	1	33	1	83	3	55	6	20	1
Pyrola asarifolia	10	3	.	.	.	.	9	2	60	1
Pyrola secunda	10	2	.	.	.	.	.	.	.	.
Ranunculus Bongardi	20	3	33	3	.	.	.	.	20	1
Ranunculus Macounii	.	.	.	.	.	.	.	.	20	1
Ranunculus occidentalis Nelsoni	.	.	33	1	.	.	.	.	.	.
Ranunculus pacificus	.	.	33	1	.	.	.	.	20	1
Rhinanthus minor borealis	10	2	.	.	.	.	.	.	.	.
Rubus arcticus stellatus	10	1	33	1	83	1	73	2	60	2
Rumex species	10	1	.	.	.	.	.	.	.	.
Sanguisorba stipulata	40	1	33	2	17	1	45	2	60	1
Senecio triangularis	.	.	33	1	.	.	9	1	.	.
Solidago lepidota	.	.	67	1	17	2	9	1	40	6
Stellaria borealis	.	.	.	.	.	.	.	.	20	1
Stellaria crassifolia	.	.	33	1	17	1	.	.	20	1
Stellaria crispa	20	1	.	.	.	.	.	.	.	.
Stellaria sitchensis	10	1	33	2	.	.	9	1	.	.
Stellaria species	10	1	.	.	.	.	.	.	.	.
Streptopus amplexifolius	60	1	67	1	17	1	.	.	60	1
Swertia perennis	.	.	.	.	17	1	9	1	.	.
Thalictrum spersiflorum	.	.	67	1	.	.	.	.	.	.
Tiarella trifoliata	10	1	.	.	.	.	.	.	.	.
Tiarella unifoliata	10	3	.	.	.	.	.	.	.	.
Trientalis europea	20	1	67	3	67	1	91	1	80	1
Urtica Lyallii	20	2	.	.	.	.	.	.	.	.
Veratrum viride	10	1	.	.	.	.	.	.	.	.
Viola epipsila	10	1	.	.	17	1	36	1	40	1
Viola glabella	.	.	.	.	.	.	.	.	20	3
Viola langsdorfii	10	2	.	.	17	1	18	1	20	3
Viola sp.	30	2	33	1	.	.	9	1	.	.
GRAMINOIDS										
Agrostis aequivalvis	.	.	.	.	17	1	9	1	.	.
Agrostis alaskana	.	.	.	.	.	.	27	4	20	3
Agrostis exarata	10	1	.	.	.	.	.	.	.	.
Agrostis scabra	10	1	.	.	.	.	.	.	.	.
Calamagrostis canadensis	60	7	67	10	83	12	73	9	100	3
Calamagrostis inexpectata	.	.	.	.	.	.	9	2	.	.
Carex disperma	10	1	.	.	.	.	9	1	.	.
Carex interior	.	.	.	.	.	.	.	.	20	4
Carex lyngbyei	.	.	33	6	33	70	.	.	.	.
Carex macrochaeta	30	4	.	.	.	.	.	.	.	.
Carex pachystachya	.	.	33	1	.	.	.	.	.	.
Carex phyllomanica	10	1	.	.	.	.	.	.	.	.
Carex pluriflora	.	.	33	1	100	31	18	18	.	.
Carex saxatilis	.	.	.	.	17	1	.	.	20	1
Carex sitchensis	20	10	33	8	17	5	100	60	.	.
Cinna latifolia	10	1	.	.	.	.	.	.	.	.
Deschampsia caespitosa	10	2	33	1	50	4	45	2	20	1
Deschampsia elongata	10	1	.	.	.	.	.	.	.	.
Eleocharis palustris	.	.	.	.	17	1	.	.	.	.
Elymus hirsutus	40	2	33	1	.	.	.	.	.	.

SPECIES	SALSIT		SALHOO		SALBAR/CARPLU		SALBAR/CARSIT		SALBAR/MIXED HERB	
	10 Plots		3 Plots		6 Plots		11 Plots		5 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
<i>Elymus subsecundus</i>	.	.	.	.	.	.	.	.	20	3
<i>Eriophorum angustifolium</i>	.	.	.	.	17	5	.	.	.	.
<i>Eriophorum russeolum</i>	.	.	.	.	17	1	9	1	.	.
<i>Festuca rubra</i>	10	1	33	1	17	1	18	1	20	2
<i>Hierochloa odorata</i>	.	.	.	.	.	.	.	.	20	1
<i>Hordeum brachyantherum</i>	.	.	.	.	.	.	.	.	20	1
<i>Luzula multiflora</i>	10	1	.	.	.	.	9	1	.	.
<i>Luzula parviflora</i>	30	2	.	.	.	.	9	2	.	.
<i>Phleum commutatum americanum</i>	20	1	.	.	.	.	.	.	.	.
<i>Poa</i> sp.	10	1	.	.	.	.	.	.	.	.
<i>Trichophorum caespitosum</i>	.	.	.	.	17	1	.	.	.	.
<i>Trisetum cernuum</i>	.	.	.	.	.	.	.	.	20	3
<i>Vahlodea atropurpurea latifolia</i>	.	.	33	1	.	.	.	.	.	.
FERNS AND ALLIES										
<i>Athyrium filix-femina</i>	40	24	100	6	17	1	9	1	80	21
<i>Dryopteris dilatata</i>	10	1	.	.	.	.	.	.	.	.
<i>Gymnocarpium dryopteris</i>	40	4	.	.	.	.	.	.	.	.
<i>Polystichum Braunii</i>	10	1	.	.	.	.	.	.	.	.

SHRUB COMMUNITIES (CONTINUED)

SPECIES	MYRGAL/CARLIV				MYRGAL/CARPLU				MYRGAL/EQUVAR	
	SALBAR/FRACHI		10 Plots		MYRGAL/CARSIT		4 Plots		7 Plots	
	16 Plots	CON ACOV	CON ACOV	CON ACOV	16 Plots	CON ACOV	CON ACOV	CON ACOV	CON ACOV	CON ACOV
TREES										
<i>Picea sitchensis</i>	19	4	.	.	.	.	.	.	.	.
<i>Pinus contorta contorta</i>	.	.	10	1	.	.	.	.	.	.
<i>Populus balsamifera trichocarpa</i>	6	5	.	.	.	.	.	.	.	.
TREES-REGENERATION										
<i>Picea sitchensis</i> regen	38	2	10	1	.	.	50	1	29	2
<i>Populus balsamifera trichocarpa</i> regen	31	2	.	.	.	.	.	.	14	1
TALL SHRUBS										
<i>Alnus sinuata</i>	25	5	.	.	.	.	.	.	14	2
<i>Myrica gale</i>	.	.	100	47	100	52	100	58	100	56
<i>Rubus spectabilis</i>	6	1	.	.	.	.	.	.	.	.
<i>Salix barclayi</i>	100	35	.	.	13	3	.	.	86	2
<i>Salix alexensis</i>	13	2	.	.	.	.	.	.	29	1
<i>Salix commutata</i>	75	21	.	.	6	1	.	.	71	1
<i>Salix hookeriana</i>	6	5	.	.	13	1	.	.	14	1
<i>Salix sitchensis</i>	19	6	.	.	.	.	.	.	29	1
<i>Viburnum edule</i>	6	1	.	.	.	.	.	.	29	1
LOW AND SUBSHRUBS										
<i>Andromeda polifolia</i>	.	.	40	3	6	1	.	.	.	.
<i>Empetrum nigrum</i>	31	9	40	1	13	5	.	.	29	1
<i>Kalmia polifolia</i>	.	.	.	.	.	.	25	1	.	.
<i>Ledum groenlandicum</i>	.	.	10	1	.	.	.	.	.	.
<i>Oxycoccus palustris</i>	.	.	60	2	19	3	75	3	29	2
<i>Salix setchelliana</i>	6	15	.	.	.	.	.	.	.	.
<i>Vaccinium uliginosum</i>	44	2	40	2	6	5	.	.	14	1
<i>Vaccinium vitis-idaea</i>	.	.	.	.	6	1	.	.	.	.
FORBS										
<i>Achillea borealis</i>	100	6	10	1	.	.	.	.	57	1
<i>Allium schoenoprasum</i>	6	1	.	.	.	.	.	.	.	.
<i>Anemone narcissiflora</i>	6	1	.	.	.	.	.	.	.	.
<i>Angelica genuflexa</i>	38	10	.	.	13	1	75	2	43	1
<i>Angelica lucida</i>	25	1	.	.	6	1	.	.	14	1
<i>Aquilegia formosa</i>	6	1	.	.	.	.	.	.	.	.
<i>Artemisia arctica arctica</i>	6	1	.	.	.	.	.	.	.	.
<i>Aster subspicatus</i>	31	1	20	2	13	1	25	4	86	4
<i>Astragalus alpinus</i>	13	4	.	.	.	.	.	.	.	.
<i>Caltha palustris asarifolia</i>	.	.	.	.	6	1	25	1	43	1
<i>Campanula rotundifolia</i>	13	2	.	.	.	.	.	.	.	.
<i>Castilleja miniata</i>	6	3	.	.	.	.	.	.	.	.
<i>Castilleja unalaschensis</i>	19	2	.	.	.	.	.	.	.	.
<i>Cerastium Beeringianum</i>	6	15	.	.	.	.	.	.	.	.
<i>Cicuta douglasii</i>	.	.	.	.	38	1	50	2	43	4
<i>Conioselinum chinense</i>	25	2	.	.	13	1	.	.	57	1
<i>Coptis trifolia</i>	.	.	40	3	.	.	.	.	29	1
<i>Cornus canadensis</i>	.	.	.	.	.	.	.	.	14	1
<i>Dodecatheon jeffreyi</i>	6	2	20	2	.	.	.	.	.	.
<i>Dodecatheon pulchellum</i>	.	.	10	1	.	.	.	.	14	1
<i>Drosera anglica</i>	.	.	30	3	.	.	.	.	.	.
<i>Drosera rotundifolia</i>	.	.	50	3	6	1	50	1	.	.
<i>Epilobium alpinum</i>	6	1	.	.	.	.	.	.	.	.
<i>Epilobium angustifolium</i>	63	8	.	.	.	.	.	.	.	.
<i>Epilobium glandulosum</i>	.	.	.	.	.	.	.	.	14	1
<i>Epilobium latifolium</i>	19	4	.	.	.	.	.	.	14	1
<i>Epilobium palustre</i>	6	1	.	.	6	1	25	1	.	.
<i>Epilobium</i> sp.	.	.	.	.	6	1	.	.	.	.
<i>Equisetum arvense</i>	13	23	.	.	6	1	25	1	43	1
<i>Equisetum fluviatile</i>	.	.	30	3	.	.	50	1	.	.
<i>Equisetum palustre</i>	.	.	80	2	25	1	50	4	29	2

SPECIES	SALBAR/FRACHI		MYRGAL/CARLIV		MYRGAL/CARSIT		MYRGAL/CARPLU		MYRGAL/EQUVAR	
	16 Plots		10 Plots		16 Plots		4 Plots		7 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
Equisetum sp.	.	.	.	.	13	2	.	.	14	65
Equisetum variegatum	25	2	30	5	6	2	.	.	86	20
Erigeron peregrinus	.	.	60	1	13	3	.	.	43	1
Erigeron sp.	.	.	.	.	6	1	.	.	.	.
Euphrasia mollis	6	1	.	.	.	.	.	.	.	.
Fragaria chiloensis	81	12	.	.	.	.	.	.	.	.
Fritillaria camtschaticensis	19	2	.	.	.	.	.	.	.	.
Galium trifidum	6	1	.	.	.	.	.	.	29	1
Galium trifidum columbianum	.	.	.	.	.	.	25	1	.	.
Galium trifidum trifidum	.	.	10	1	6	1	.	.	.	.
Galium triflorum	.	.	.	.	6	1	.	.	.	.
Gentiana douglasiana	.	.	40	1	13	2	25	4	.	.
Geranium erianthum	19	6	.	.	.	.	.	.	.	.
Geum calthifolium	.	.	50	2	13	7	.	.	.	.
Geum macrophyllum	6	1	.	.	.	.	.	.	.	.
Hedysarum alpinum	6	10	.	.	.	.	.	.	.	.
Heracleum lanatum	25	2	.	.	.	.	.	.	.	.
Iris setosa	.	.	10	1	25	1	50	1	14	1
Lathyrus palustris	.	.	.	.	.	.	25	1	.	.
Ligusticum scoticum	.	.	.	.	.	.	.	.	14	1
Lupinus nootkatensis	81	10	.	.	25	4	.	.	43	18
Lysimachia thyrsiflora	.	.	.	.	6	1	50	1	29	1
Malaxis monophylla	.	.	.	.	.	.	.	.	14	1
Menyanthes trifoliata	.	.	80	19	25	3	50	30	29	1
Moehringia lateriflora	6	1	.	.	.	.	.	.	.	.
Parnassia palustris	19	1	30	1	.	.	.	.	71	1
Pedicularis oederi	13	1	.	.	.	.	.	.	.	.
Pedicularis parviflora	25	1	40	1	.	.	.	.	.	.
Petasites hyperboreus	6	1	.	.	.	.	.	.	14	1
Pinguicula vulgaris	.	.	30	1	.	.	.	.	43	1
Plantago macrocarpa	.	.	30	1	13	1	.	.	29	2
Platanthera dilatata	6	1	60	1	44	1	25	1	71	1
Platanthera hyperborea	.	.	.	.	.	.	.	.	14	1
Platanthera saccata	.	.	10	1	.	.	.	.	14	1
Platanthera sp.	6	1	10	1	.	.	25	1	.	.
Polemonium acutiflorum	31	5	.	.	19	1	100	3	.	.
Polygonum viviparum	50	3	20	1	13	1	25	1	43	1
Potentilla egedii grandis	.	.	.	.	.	.	.	.	71	4
Potentilla palustris	6	1	30	2	56	10	100	2	14	2
Primula egaliksensis	6	1	.	.	.	.	.	.	29	1
Pyrola asarifolia	38	3	.	.	.	.	.	.	.	.
Pyrola grandiflora	6	1	.	.	.	.	.	.	.	.
Pyrola minor	13	1	.	.	.	.	.	.	.	.
Pyrola secunda	31	3	.	.	.	.	.	.	.	.
Rhinanthus minor borealis	50	1	10	1	.	.	.	.	29	1
Rubus arcticus stellatus	88	3	40	1	94	2	100	2	43	1
Rubus pedatus	.	.	10	1	.	.	.	.	14	1
Sanguisorba menziesii	.	.	10	10	.	.	.	.	.	.
Sanguisorba stipulata	50	4	40	1	38	2	25	1	57	5
Sedum rosea	19	2	.	.	.	.	.	.	.	.
Senecio pauciflorus	6	1	.	.	.	.	.	.	.	.
Sibbaldia procumbens	13	3	.	.	.	.	.	.	.	.
Solidago lepida	69	3	.	.	6	3	.	.	.	.
Spiranthes romanoffiana	6	1	20	1	.	.	.	.	14	1
Stellaria borealis	6	2	.	.	.	.	.	.	.	.
Stellaria crassifolia	.	.	.	.	6	1	.	.	.	.
Stellaria species	6	1	.	.	6	1	.	.	.	.
Swertia perennis	19	3	30	1	6	2	25	1	14	1
Taraxacum sp.	6	1	.	.	.	.	.	.	.	.
Thalictrum alpinum	.	.	10	1	6	4	.	.	.	.
Tierella trifoliata	.	.	.	.	6	1	.	.	.	.
Tofieldia glutinosa	.	.	60	1	13	1	.	.	57	1

SPECIES	HYRGAL/CARLIV				HYRGAL/CARPLU				HYRGAL/EQUVAR			
	SALEAR/FRACHI		10 Plots		HYRGAL/CARSIT		4 Plots		7 Plots			
	16 Plots	CON ACOV	CON ACOV		16 Plots	CON ACOV	CON ACOV		CON ACOV		CON ACOV	
<i>Trientalis europea</i>	75	1	30	1	69	1	50	2	29	1		
<i>Triglochin maritimum</i>	.	.	30	1	6	1	.	.	29	2		
<i>Utricularia intermedia</i>	.	.	20	1	.	.	25	1	14	1		
<i>Viola epipsila</i>	13	4	20	1	19	5	50	1	.	.		
<i>Viola glabella</i>	.	.	.	.	6	3	.	.	14	2		
<i>Viola langsдорffii</i>	19	4	40	1	25	3	25	4	29	3		
<i>Viola sp.</i>	6	1	10	5	6	1	.	.	14	2		
GRAMINOIDS												
<i>Agrostis aequivalvis</i>	.	.	30	1	6	1	.	.	.	.
<i>Agrostis alaskana</i>	31	2	20	3	19	1	100	2	14	5		
<i>Agrostis borealis</i>	6	2	.	.	6	1	.	.	.	.
<i>Agrostis scabra</i>	6	3	.	.	6	10	.	.	.	.
<i>Agrostis sp.</i>	6	10	.	.	13	7	.	.	.	.
<i>Bromus ciliatus</i>	6	1	.	.	.	.	.	.	.	.
<i>Calamagrostis canadensis</i>	50	3	.	.	44	3	50	1	57	2		
<i>Calamagrostis inexpectata</i>	.	.	10	1	6	5	.	.	.	.
<i>Calamagrostis neglecta</i>	6	2	.	.	.	.	.	.	.	.
<i>Carex anthoxantha</i>	6	5	.	.	6	20	.	.	.	.
<i>Carex canescens</i>	.	.	.	.	19	3	.	.	.	.
<i>Carex capillaris</i>	6	1	.	.	.	.	.	.	.	.
<i>Carex dioica</i>	6	1	.	.	.	.	.	.	.	.
<i>Carex flava</i>	.	.	30	9	6	5	.	.	71	5		
<i>Carex gmelini</i>	6	1	.	.	.	.	.	.	.	.
<i>Carex interior</i>	.	.	10	1	.	.	.	.	29	1		
<i>Carex leptalea</i>	6	1	.	.	.	.	.	.	14	3		
<i>Carex limosa</i>	.	.	20	6	6	1	.	.	14	1		
<i>Carex livida</i>	.	.	80	15	38	14	50	14	57	5		
<i>Carex lyngbyei</i>	6	1	.	.	.	.	50	17	14	1		
<i>Carex macloviana</i>	6	1	.	.	.	.	.	.	.	.
<i>Carex macrochaeta</i>	13	6	.	.	.	.	.	.	.	.
<i>Carex microglochin</i>	.	.	.	.	.	.	.	.	14	1		
<i>Carex muricata</i>	.	.	30	3	.	.	.	.	.	.
<i>Carex pauciflora</i>	6	1	20	8	.	.	.	.	.	.
<i>Carex phyllomanica</i>	.	.	10	1	.	.	.	.	.	.
<i>Carex pluriflora</i>	.	.	10	1	44	6	100	45	.	.		
<i>Carex saxatilis</i>	13	9	10	10	6	1	.	.	43	3		
<i>Carex sitchensis</i>	.	.	30	7	100	45	25	20	.	.		
<i>Cinna latifolia</i>	6	1	.	.	.	.	.	.	.	.
<i>Deschampsia caespitosa</i>	69	3	60	2	75	4	100	4	86	5		
<i>Elymus hirsutus</i>	6	4	.	.	.	.	.	.	.	.
<i>Eriophorum angustifolium</i>	6	1	80	10	31	5	25	1	43	1		
<i>Eriophorum russeolum</i>	.	.	10	1	6	2	50	1	.	.		
<i>Festuca rubra</i>	63	3	20	2	19	1	25	3	29	2		
<i>Hierochloa odorata</i>	25	1	.	.	.	.	.	.	14	1		
<i>Hordeum brachyantherum</i>	6	5	.	.	.	.	.	.	.	.
<i>Juncus alpinus</i>	.	.	.	.	.	.	.	.	29	1		
<i>Juncus arcticus sitchensis</i>	6	2	.	.	.	.	.	.	43	1		
<i>Juncus falcatus</i>	.	.	.	.	.	.	.	.	14	2		
<i>Juncus triglumis</i>	13	10	.	.	.	.	.	.	.	.
<i>Luzula multiflora</i>	50	1	.	.	25	1	75	1	.	.		
<i>Luzula parviflora</i>	.	.	.	.	6	2	.	.	.	.
<i>Luzula sp.</i>	.	.	10	1	.	.	.	.	.	.
<i>Phleum commutatum americanum</i>	31	2	.	.	.	.	.	.	.	.
<i>Poa alpina</i>	13	1	.	.	.	.	.	.	.	.
<i>Poa arctica</i>	13	2	.	.	.	.	.	.	.	.
<i>Poa sp.</i>	6	1	.	.	.	.	.	.	.	.
<i>Trichophorum caespitosum</i>	6	2	60	23	25	8	.	.	29	3		
<i>Trisetum cernuum</i>	6	1	.	.	.	.	.	.	.	.
<i>Trisetum spicatum</i>	25	1	.	.	.	.	.	.	.	.
FERNS AND ALLIES												
<i>Athyrium filix-femina</i>	6	1	.	.	.	.	.	.	.	.
UNKNOWN												
GRAMINOID UNKNOWN	6	1	.	.	19	9	.	.	14	5		
SEDGE UNKNOWN	.	.	.	.	19	58	.	.	14	6		

SHRUB COMMUNITIES (CONTINUED)

SPECIES	VACULI-EMPNIIG					
	EMPNIIG/CARPLU				ANDPOL/CARPLU	
	5 Plots	CON ACOV	8 Plots	CON ACOV	2 Plots	CON ACOV
TREES						
<i>Picea sitchensis</i>	20	4	13	1	.	.
TREES-REGENERATION						
<i>Picea sitchensis</i> regen	80	1	50	2	50	2
<i>Tsuga heterophylla</i> regen	20	1	.	.	.	.
TALL SHRUBS						
<i>Myrica gale</i>	20	10	.	.	.	.
<i>Salix berclayi</i>	.	.	88	4	.	.
<i>Salix commutata</i>	.	.	75	3	.	.
<i>Viburnum edule</i>	.	.	25	1	.	.
LOW AND SUBSHRUBS						
<i>Andromeda polifolia</i>	20	1	13	4	100	25
<i>Empetrum nigrum</i>	100	34	100	28	100	2
<i>Oxycoccus palustris</i>	100	5	50	3	100	8
<i>Vaccinium uliginosum</i>	60	12	100	37	100	7
<i>Vaccinium vitis-idaea</i>	20	1	.	.	.	.
FORBS						
<i>Achillea borealis</i>	.	.	25	6	.	.
<i>Angelica genuflexa</i>	.	.	13	1	.	.
<i>Antennaria pallida</i>	.	.	13	1	.	.
<i>Aster subspicatus</i>	.	.	13	1	.	.
<i>Coptis trifolia</i>	20	1	25	1	.	.
<i>Cornus canadensis</i>	40	2	38	3	.	.
<i>Drosera rotundifolia</i>	100	3	25	1	100	2
<i>Epilobium angustifolium</i>	.	.	38	2	.	.
<i>Epilobium latifolium</i>	.	.	13	10	.	.
<i>Epilobium palustre</i>	.	.	13	2	.	.
<i>Equisetum arvense</i>	.	.	63	1	.	.
<i>Equisetum fluviatile</i>	.	.	13	5	.	.
<i>Equisetum palustre</i>	.	.	.	.	100	6
<i>Equisetum variegatum</i>	.	.	50	2	.	.
<i>Erigeron peregrinus</i>	.	.	25	1	.	.
<i>Erigeron</i> sp.	.	.	13	3	.	.
<i>Euphrasia mollis</i>	.	.	13	1	.	.
<i>Frageria chiloensis</i>	.	.	38	2	.	.
<i>Fritillaria camschatcensis</i>	.	.	13	1	.	.
<i>Gentiana douglasiana</i>	20	1	13	1	100	1
<i>Geum calthifolium</i>	40	1	.	.	.	.
<i>Hedysarum alpinum</i>	.	.	13	1	.	.
<i>Heracleum lanatum</i>	.	.	13	1	.	.
<i>Listera cordata</i>	.	.	13	1	.	.
<i>Lupinus nootkatensis</i>	.	.	25	2	.	.
<i>Lysimachia thyrsiflora</i>	.	.	.	.	50	1
<i>Meianthemum dilatatum</i>	20	1	.	.	.	.
<i>Menyanthes trifoliata</i>	.	.	.	.	50	1
<i>Parnassia palustris</i>	.	.	38	1	.	.
<i>Pedicularis oederi</i>	.	.	25	2	.	.
<i>Pedicularis perviflora</i>	20	1	38	1	50	2
<i>Platanthera dilatata</i>	40	1	63	1	100	1
<i>Platanthera saccata</i>	20	1	13	1	.	.
<i>Polygonum viviparum</i>	.	.	75	5	.	.
<i>Potentilla palustris</i>	.	.	13	3	50	1
<i>Primula egaliksensis</i>	.	.	13	1	.	.
<i>Rhinanthus minor borealis</i>	.	.	25	1	.	.
<i>Rubus arcticus stellatus</i>	.	.	88	2	50	1
<i>Sanguisorba stipuleta</i>	.	.	13	1	.	.
<i>Senecio pauciflorus</i>	.	.	13	1	.	.
<i>Solidago lepida</i>	20	1	13	3	.	.

VACULI-EMPNIIG

SPECIES	EMPNIIG/CARPLU		8 Plots		ANDPOL/CARPLU	
	5 Plots		CON	ACOV	2 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV
<i>Spiranthes romanzoffiana</i>	.	.	13	1	.	.
<i>Suertia perennis</i>	.	.	38	2	.	.
<i>Tofieldia glutinosa</i>	80	1	50	1	50	1
<i>Trientalis europaea</i>	60	1	38	1	50	1
<i>Viola epipsila</i>	.	.	13	1	.	.
<i>Viola glabella</i>	.	.	13	1	.	.
<i>Viola langsdoeffii</i>	.	.	13	4	.	.
<i>Viola sp.</i>	.	.	13	1	.	.
GRAMINOIDS						
<i>Agrostis aequivalvis</i>	40	1	13	1	.	.
<i>Agrostis alaskana</i>	.	.	38	2	.	.
<i>Calamagrostis canadensis</i>	.	.	25	2	.	.
<i>Calamagrostis inexpectata</i>	.	.	13	1	.	.
<i>Carex anthoxantha</i>	.	.	38	6	.	.
<i>Carex capillaris</i>	.	.	13	5	.	.
<i>Carex livida</i>	40	15	13	1	.	.
<i>Carex lyngbyei</i>	.	.	.	.	100	13
<i>Carex macrochaeta</i>	.	.	13	2	.	.
<i>Carex pauciflora</i>	40	1	.	.	.	.
<i>Carex pluriflora</i>	100	18	50	10	100	23
<i>Carex saxatilis</i>	.	.	13	1	.	.
<i>Carex sitchensis</i>	80	9	25	18	.	.
<i>Carex sp.</i>	.	.	13	1	.	.
<i>Carex stylosa</i>	20	1	.	.	.	.
<i>Deschampsia caespitosa</i>	20	1	88	3	.	.
<i>Eriophorum angustifolium</i>	80	7	75	15	.	.
<i>Eriophorum russeolum</i>	20	1	25	2	100	6
<i>Festuca rubra</i>	.	.	25	1	.	.
<i>Juncus arcticus sitchensis</i>	.	.	13	1	.	.
<i>Juncus falcatus</i>	.	.	13	1	.	.
<i>Luzula multiflora</i>	.	.	38	1	50	1
<i>Phleum commutatum americanum</i>	.	.	13	1	.	.
<i>Poa arctica</i>	.	.	13	1	.	.
<i>Trichophorum caespitosum</i>	20	1	25	5	.	.
<i>Trisetum cernuum</i>	.	.	13	4	.	.
<i>Vahlodes atropurpurea latifolia</i>	.	.	13	1	.	.

GRAMINOID COMMUNITIES

SPECIES	PUCPUM		ELEPAL		CARLYN		CARSAX	
	1 Plot	CON ACOV	3 Plots	CON ACOV	5 Plots	CON ACOV	6 Plots	CON ACOV
TREES								
<i>Picea sitchensis</i>
TREES-REGENERATION								
<i>Picea sitchensis</i> regen	17	1
TALL SHRUBS								
<i>Alnus sinuata</i>
<i>Myrica gale</i>	33	5
<i>Salix berclayi</i>	20	1	33	6
<i>Salix alaxensis</i>	.	.	33	1	.	.	.	.
<i>Salix commutata</i>
<i>Viburnum edule</i>	17	1
LOW AND SUBSHRUBS								
<i>Andromeda polifolia</i>
<i>Empetrum nigrum</i>
<i>Kalmia polifolia</i>
<i>Ledum groenlandicum</i>
<i>Oxycoccus palustris</i>
<i>Vaccinium uliginosum</i>
FORBS								
<i>Achillea borealis</i>
<i>Angelica genuflexa</i>	17	1
<i>Angelica lucida</i>
<i>Aster subspicatus</i>
<i>Callitriche verna</i>	.	.	33	2	.	.	.	.
<i>Caltha palustris asarifolia</i>	20	2	33	2
<i>Cicuta douglasii</i>	20	1	17	2
<i>Conioselinum chinense</i>
<i>Cornus canadensis</i>
<i>Drosera rotundifolia</i>
<i>Epilobium alpinum</i>
<i>Epilobium glandulosum</i>	20	1	.	.
<i>Epilobium palustre</i>	20	2	.	.
<i>Epilobium</i> sp.
<i>Equisetum arvense</i>	17	1
<i>Equisetum fluviatile</i>	.	.	33	2	20	15	17	20
<i>Equisetum palustre</i>	20	15	33	9
<i>Equisetum pratense</i>
<i>Equisetum</i> sp.
<i>Equisetum variegatum</i>	.	.	33	3	20	20	67	2
<i>Erigeron peregrinus</i>	33	1
<i>Fritillaria camschatcensis</i>
<i>Galium trifidum</i>
<i>Gentiana douglasiana</i>
<i>Geum calthifolium</i>
<i>Hippuris vulgaris</i>	20	1	17	2
<i>Iris setosa</i>	17	1
<i>Lathyrus maritimus</i>	.	.	33	1	.	.	.	.
<i>Lathyrus palustris</i>
<i>Ligusticum scoticum</i>
<i>Lupinus nootkatensis</i>	17	4
<i>Lysichiton americanum</i>	17	1
<i>Lysimachia thyrsiflora</i>	20	2	17	1
<i>Menyanthes trifoliata</i>	33	7
<i>Parnassia palustris</i>	.	.	33	1	20	1	.	.
<i>Pedicularis parviflora</i>	17	2
<i>Plantago macrocarpa</i>
<i>Platanthera dilatata</i>	20	1	17	1
<i>Polemonium acutiflorum</i>

SPECIES	PUCPUM		ELEPAL		CARLYN		CARSAX	
	1 Plot	CON ACOV	3 Plots	CON ACOV	5 Plots	CON ACOV	6 Plots	CON ACOV
<i>Polygonum viviparum</i>	20	1	.	.
<i>Potentilla egedii grandis</i>	.	.	67	4	20	1	.	.
<i>Potentilla palustris</i>	33	5
<i>Ranunculus cymbalaria</i>	100	1	67	2	.	.	.	.
<i>Ranunculus flammula</i>	20	1	.	.
<i>Ranunculus pallasii</i>	20	2	.	.
<i>Rhinanthus minor borealis</i>	.	.	33	1	20	1	.	.
<i>Rubus arcticus stellatus</i>
<i>Rumex fenestratus</i>
<i>Sanguisorba stipulata</i>	17	1
<i>Solidago lepidota</i>
<i>Sparganium angustifolium</i>	.	.	33	2	.	.	.	.
<i>Thalictrum sparsiflorum</i>	17	1
<i>Toffieldia glutinosa</i>
<i>Trientalis europea</i>	17	1
<i>Triglochin maritimum</i>	100	5	33	1	20	2	17	1
<i>Triglochin palustre</i>	.	.	33	1	.	.	.	.
<i>Viola epipsila</i>
<i>Viola sp.</i>	20	2	.	.
GRAMINOIDS								
<i>Agrostis aequivalvis</i>
<i>Agrostis alaskana</i>	40	3	.	.
<i>Calamagrostis canadensis</i>
<i>Calamagrostis inexpansa</i>	20	1	.	.
<i>Calamagrostis neglecta</i>
<i>Carex canescens</i>
<i>Carex flava</i>	33	7
<i>Carex interior</i>	17	3
<i>Carex limosa</i>
<i>Carex livida</i>	50	1
<i>Carex lyngbyei</i>	100	78	.	.
<i>Carex oederi</i>	.	.	33	1	.	.	.	.
<i>Carex pluriflora</i>
<i>Carex saxatilis</i>	20	35	100	63
<i>Carex sitchensis</i>	33	19
<i>Carex sp.</i>
<i>Deschampsia caespitosa</i>	.	.	67	2	60	3	17	2
<i>Eleocharis palustris</i>	.	.	100	48	20	1	.	.
<i>Eriophorum russeolum</i>
<i>Festuca rubra</i>	20	2	.	.
<i>Hierochloa odorata</i>
<i>Hordeum brachyantherum</i>	20	1	.	.
<i>Juncus alpinus</i>	.	.	33	1	.	.	.	.
<i>Juncus arcticus sitchensis</i>	.	.	33	1	.	.	.	.
<i>Juncus bufonius</i>	.	.	67	3	.	.	.	.
<i>Luzula multiflora</i>	17	1
<i>Poa eminens</i>	.	.	33	2	.	.	.	.
<i>Puccinellia nutkaensis</i>	.	.	67	1	.	.	.	.
<i>Puccinellia pumila</i>	100	50	.	.	.	.	.	.
<i>Trichophorum caespitosum</i>
UNKNOWN								
SEDGE UNKNOWN

GRAMINOID COMMUNITIES (CONTINUED)

SPECIES	CARPLU-CARLYN				CARLIV-TRICAE				CARSLT/OXYPAL			
	11 Plots		17 Plots		7 Plots		19 Plots		7 Plots		19 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
TREES												
<i>Picea sitchensis</i>	9	2	.	.	.	.	11	1				
TREES-REGENERATION												
<i>Picea sitchensis</i> regen	55	2	41	2	29	1	26	1				
<i>Pinus contorta</i> regen	.	.	12	1	.	.	.	.
<i>Tsuga mertensiana</i> regen	.	.	12	1	.	.	.	.
TALL SHRUBS												
<i>Alnus sinuata</i>	27	1	6	1	14	1	11	1				
<i>Myrica gale</i>	27	11	35	12	57	9	32	7				
<i>Salix berclayi</i>	9	10	.	.	57	2	5	6				
<i>Salix commutata</i>	9	1	.	.	71	2	11	1				
<i>Salix sitchensis</i>	.	.	.	.	.	.	5	1				
<i>Vaccinium</i> sp. (oval & black)	.	.	.	.	.	.	5	1				
<i>Viburnum edule</i>	.	.	6	1	.	.	.	.
LOW AND SUBSHRUBS												
<i>Andromeda polifolia</i>	18	5	59	1	29	1	26	5				
<i>Empetrum nigrum</i>	36	1	88	3	86	5	58	4				
<i>Kalmia polifolia</i>	9	1	29	2	.	.	5	4				
<i>Ledum groenlandicum</i>	9	1	24	1	14	1	.	.				
<i>Oxycoccus pelustris</i>	55	6	100	2	86	1	89	4				
<i>Salix reticulata</i>	.	.	.	.	14	1	.	.				
<i>Vaccinium uliginosum</i>	27	1	41	2	71	4	58	3				
FORBS												
<i>Achillea borealis</i>	18	1	.	.	57	2	5	1				
<i>Actaea rubra</i>	.	.	6	2	.	.	.	.
<i>Angelica genuflexa</i>	.	.	6	1	14	1	5	2				
<i>Angelica lucida</i>	9	1	.	.	.	.	.	.
<i>Aster subspicatus</i>	18	1	18	1	29	1	.	.				
<i>Caltha palustris asarifolia</i>	9	2	.	.	.	.	5	1				
<i>Cicuta douglasii</i>	18	11	.	.	.	.	.	.
<i>Conioselinum chinense</i>	9	2	6	2	14	1	.	.				
<i>Coptis trifolia</i>	.	.	53	2	57	2	11	1				
<i>Cornus canadensis</i>	9	1	35	1	.	.	21	2				
<i>Cornus suecica</i>	.	.	18	4	.	.	.	.
<i>Dodecatheon jeffreyi</i>	.	.	35	1	.	.	5	1				
<i>Dodecatheon pulchellum</i>	.	.	.	.	14	1	.	.				
<i>Drosera anglica</i>	.	.	59	5	.	.	.	.
<i>Drosera rotundifolia</i>	64	4	94	4	43	1	79	3				
<i>Epilobium adenocaulon</i>	.	.	.	.	14	2	.	.				
<i>Epilobium alpinum</i>	9	1	.	.	.	.	.	.
<i>Epilobium angustifolium</i>	.	.	.	.	14	1	.	.				
<i>Epilobium glandulosum</i>	9	1	.	.	.	.	.	.
<i>Epilobium palustre</i>	9	1	.	.	14	1	.	.				
<i>Epilobium</i> sp.	9	1	.	.	.	.	.	.
<i>Equisetum arvense</i>	18	1	6	1	57	1	.	.				
<i>Equisetum fluviatile</i>	.	.	12	2	.	.	.	.
<i>Equisetum palustre</i>	36	1	41	2	14	1	37	3				
<i>Equisetum pratense</i>	9	1	6	1	.	.	.	.
<i>Equisetum</i> sp.	9	2	6	1	.	.	16	1				
<i>Equisetum variegatum</i>	.	.	.	.	71	3	5	1				
<i>Erigeron peregrinus</i>	.	.	29	1	43	4	5	1				
<i>Fauria crista-galli</i>	.	.	18	1	.	.	.	.
<i>Frageria chiloensis</i>	.	.	6	1	29	1	.	.				
<i>Fritillaria camschatcensis</i>	36	1	18	1	29	1	5	1				
<i>Galium trifidum</i>	18	1	.	.	14	2	.	.				
<i>Gentiana douglasiana</i>	27	1	82	2	14	1	37	1				
<i>Geum calthifolium</i>	9	1	41	3	57	1	5	3				
<i>Geum macrophyllum</i>	.	.	6	1	.	.	.	.

SPECIES	CARPIU-CARLYN				CARLIV-TRICAE				CARSI/OXYPAL			
	11 Plots		17 Plots		7 Plots		19 Plots		CON ACOV		CON ACOV	
	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
<i>Nedysarum alpinum</i>	.	.	.	.	14	1	.	.	.	.	.	.
<i>Iris setosa</i>	64	13	6	2	14	3	5	6	.	.	.	.
<i>Lathyrus palustris</i>	27	13	.	.	.	.	.	.	.	.	.	.
<i>Ligusticum scoticum</i>	9	1	.	.	.	.	.	.	.	.	.	.
<i>Lupinus nootkatensis</i>	36	2	6	4	57	4	11	5	.	.	.	.
<i>Lysimachia thyrsoflora</i>	9	1	.	.	.	.	.	.	.	.	.	.
<i>Menyanthes trifoliata</i>	18	28	29	6	14	2	47	3	.	.	.	.
<i>Parnassia fimbriata</i>	.	.	.	.	14	1	.	.	.	.	.	.
<i>Parnassia palustris</i>	.	.	.	.	29	1	5	1	.	.	.	.
<i>Pedicularis oederi</i>	.	.	.	.	29	1	.	.	.	.	.	.
<i>Pedicularis parviflora</i>	9	1	94	1	43	1	47	1	.	.	.	.
<i>Petasites hyperboreus</i>	.	.	.	.	14	8	.	.	.	.	.	.
<i>Pinguicula vulgaris</i>	.	.	6	1	57	1	.	.	.	.	.	.
<i>Plantago macrocarpa</i>	9	1	6	1	14	1	5	1	.	.	.	.
<i>Platanthera dilatata</i>	64	1	71	1	86	1	68	1	.	.	.	.
<i>Platanthera hyperborea</i>	.	.	.	.	14	1	.	.	.	.	.	.
<i>Platanthera saccata</i>	.	.	.	.	.	.	5	1	.	.	.	.
<i>Platanthera sp.</i>	.	.	.	.	.	.	5	1	.	.	.	.
<i>Polemonium acutiflorum</i>	36	2	6	1	.	.	5	2	.	.	.	.
<i>Polygonum viviparum</i>	9	2	12	1	86	2	21	1	.	.	.	.
<i>Potentilla egedii grandis</i>	9	2	.	.	.	.	.	.	.	.	.	.
<i>Potentilla palustris</i>	45	2	.	.	.	.	21	1	.	.	.	.
<i>Rhinanthus minor borealis</i>	.	.	.	.	43	1	.	.	.	.	.	.
<i>Rubus arcticus stellatus</i>	73	2	18	1	86	3	42	2	.	.	.	.
<i>Rubus pedatus</i>	.	.	6	1	.	.	5	1	.	.	.	.
<i>Rumex fenestratus</i>	9	2	.	.	.	.	.	.	.	.	.	.
<i>Sanguisorba menziesii</i>	.	.	6	2	.	.	.	.	.	.	.	.
<i>Sanguisorba stipulata</i>	.	.	18	4	57	2	5	3	.	.	.	.
<i>Senecio pauciflorus</i>	.	.	.	.	14	1	.	.	.	.	.	.
<i>Solidago lepida</i>	9	1	6	1	14	6	5	1	.	.	.	.
<i>Spiranthes romanzoffiana</i>	.	.	6	1	29	1	5	1	.	.	.	.
<i>Stellaria borealis</i>	.	.	.	.	14	1	.	.	.	.	.	.
<i>Streptopus amplexifolius</i>	.	.	6	1	.	.	.	.	.	.	.	.
<i>Swertia perennis</i>	.	.	6	1	86	5	5	6	.	.	.	.
<i>Thalictrum alpinum</i>	.	.	6	5	.	.	.	.	.	.	.	.
<i>Thalictrum sparsiflorum</i>	.	.	.	.	14	1	.	.	.	.	.	.
<i>Tofieldia glutinosa</i>	9	1	82	1	100	1	16	1	.	.	.	.
<i>Trientalis europea</i>	64	1	47	1	57	1	42	1	.	.	.	.
<i>Triglochin maritimum</i>	27	5	6	1	43	2	.	.	.	.	.	.
<i>Utricularia intermedia</i>	.	.	18	3	14	1	.	.	.	.	.	.
<i>Viola epipsila</i>	27	1	.	.	.	.	5	2	.	.	.	.
<i>Viola langesdorfii</i>	.	.	.	.	29	7	5	1	.	.	.	.
<i>Viola sp.</i>	.	.	.	.	29	1	.	.	.	.	.	.
GRAMINOIDS												
<i>Agrostis aequivalvis</i>	9	1	53	2	14	2	16	1	.	.	.	.
<i>Agrostis alaskana</i>	45	3	18	3	14	2	.	.	.	.	.	.
<i>Agrostis sp.</i>	.	.	6	2	.	.	5	1	.	.	.	.
<i>Calamagrostis canadensis</i>	45	5	6	1	43	1	26	2	.	.	.	.
<i>Calamagrostis neglecta</i>	9	3	.	.	.	.	.	.	.	.	.	.
<i>Calamagrostis rutkeensis</i>	.	.	.	.	.	.	5	20	.	.	.	.
<i>Carex anthoxantha</i>	.	.	12	4	29	12	.	.	.	.	.	.
<i>Carex canescens</i>	18	2	.	.	.	.	.	.	.	.	.	.
<i>Carex capillaris</i>	.	.	6	4	43	7	.	.	.	.	.	.
<i>Carex flava</i>	.	.	.	.	57	2	.	.	.	.	.	.
<i>Carex leptalea</i>	.	.	6	1	14	1	.	.	.	.	.	.
<i>Carex limosa</i>	9	20	18	16	.	.	5	1	.	.	.	.
<i>Carex livida</i>	.	.	94	12	43	2	32	7	.	.	.	.
<i>Carex lyngbyei</i>	73	18	6	1	14	10	.	.	.	.	.	.
<i>Carex macrochaeta</i>	.	.	.	.	14	1	.	.	.	.	.	.
<i>Carex microglochin</i>	.	.	6	1	.	.	.	.	.	.	.	.
<i>Carex muricata</i>	.	.	24	4	.	.	.	.	.	.	.	.
<i>Carex pauciflora</i>	.	.	65	15	.	.	.	.	.	.	.	.

SPECIES	CARLIV-TRICAE				CARLIV-TRICAE				CARSIT/OXYPAL			
	CARPLY-CARLYN		17 Plots		TRICAE		19 Plots		TRICAE		19 Plots	
	11 Plots	CON ACOV	CON ACOV	CON ACOV	7 Plots	CON ACOV	CON ACOV	CON ACOV	7 Plots	CON ACOV	CON ACOV	CON ACOV
<i>Carex phyllomanica</i>	.	.	29	2	.	.	.	.	.	.	.	.
<i>Carex pluriflora</i>	100	29	35	7	29	2	68	11	29	2	68	11
<i>Carex pyrenaica</i>	.	.	.	.	14	15	.	.	14	15	.	.
<i>Carex saxatilis</i>	.	.	.	.	43	1	5	2	43	1	5	2
<i>Carex sitchensis</i>	.	.	47	7	14	3	95	34	14	3	95	34
<i>Carex sp.</i>	18	13	.	.	.	.	.	.	.	.	.	.
<i>Deschampsia caespitosa</i>	55	6	29	2	71	4	16	2	71	4	16	2
<i>Elymus hirsutus</i>	.	.	.	.	14	1	.	.	14	1	.	.
<i>Eriophorum angustifolium</i>	.	.	82	16	43	1	79	14	43	1	79	14
<i>Eriophorum russeolum</i>	64	7	12	2	.	.	32	3	.	.	32	3
<i>Festuca rubra</i>	9	2	6	1	57	2	.	.	57	2	.	.
<i>Hierochloa odorata</i>	27	1	.	.	14	1	.	.	14	1	.	.
<i>Juncus arcticus sitchensis</i>	.	.	.	.	14	1	.	.	14	1	.	.
<i>Juncus castaneus</i>	.	.	6	10	14	15	.	.	14	15	.	.
<i>Juncus falcatus</i>	.	.	.	.	14	1	.	.	14	1	.	.
<i>Juncus triglumis</i>	.	.	6	1	.	.	.	.	.	.	.	.
<i>Luzula multiflora</i>	64	3	12	1	43	1	16	4	43	1	16	4
<i>Phleum commutatum americanum</i>	.	.	.	.	14	1	.	.	14	1	.	.
<i>Trichophorum caespitosum</i>	9	5	76	11	100	31	5	2	100	31	5	2
FERNS AND ALLIES												
<i>Athyrium filix-femina</i>	.	.	.	.	.	.	5	1	.	.	5	1
<i>Lycopodium selago</i>	.	.	.	.	29	1	.	.	29	1	.	.
UNKNOWN												
GRAMINOID UNKNOWN	.	.	.	.	.	.	5	20	.	.	5	20
SEDGE UNKNOWN	.	.	6	3	.	.	.	.	.	.	.	.

GRANINGOID COMMUNITIES (CONTINUED)

SPECIES	CARSIT/EQUFLU		CALCAN/POTEGE		ELYARE		CALCAN	
	6 Plots	COM ACOV	6 Plots	COM ACOV	4 Plots	COM ACOV	9 Plots	COM ACOV
TALL SHRUBS								
<i>Myrica gale</i>	17	2	.	.	.	.	22	11
<i>Rubus spectabilis</i>	.	.	.	.	.	.	11	2
<i>Salix berclayi</i>	17	1	.	.	.	.	22	5
<i>Salix commutata</i>	.	.	17	2	.	.	.	.
<i>Salix sitchensis</i>	.	.	17	2	.	.	.	.
<i>Sambucus racemosa</i>	.	.	.	.	.	.	11	1
LOW AND SUBSHRUBS								
<i>Salix setchelliana</i>	.	.	17	1	.	.	.	.
FORBS								
<i>Achillea borealis</i>	.	.	83	6	50	2	44	2
<i>Actaea rubra</i>	.	.	.	.	.	.	11	10
<i>Angelica genuflexa</i>	50	4	50	3	.	.	78	5
<i>Angelica lucida</i>	.	.	50	9	25	10	11	1
<i>Aster sibiricus</i>	.	.	.	.	.	.	11	2
<i>Aster subspicatus</i>	.	.	.	.	.	.	33	4
<i>Caltha palustris asarifolia</i>	67	6	33	2	.	.	33	1
<i>Castilleja unalaschensis</i>	.	.	.	.	25	1	.	.
<i>Cicuta douglasii</i>	33	4	50	5	.	.	44	2
<i>Conioselinum chinense</i>	.	.	67	4	25	1	33	2
<i>Epilobium adenocaulon</i>	.	.	.	.	.	.	11	1
<i>Epilobium angustifolium</i>	.	.	.	.	.	.	22	1
<i>Epilobium glandulosum</i>	.	.	67	3	.	.	33	3
<i>Epilobium palustre</i>	.	.	17	1	.	.	.	.
<i>Epilobium sp.</i>	.	.	17	1	.	.	11	4
<i>Equisetum arvense</i>	17	1	33	25	.	.	44	19
<i>Equisetum fluviatile</i>	100	5	.	.	.	.	11	1
<i>Equisetum palustre</i>	50	1	.	.	.	.	22	2
<i>Equisetum sp.</i>	.	.	.	.	.	.	11	1
<i>Equisetum variegatum</i>	.	.	33	2	.	.	.	.
<i>Erigeron peregrinus</i>	.	.	17	2	.	.	11	2
<i>Fragaria chiloensis</i>	.	.	.	.	.	.	11	1
<i>Fritillaria camschatcensis</i>	.	.	33	3	.	.	22	1
<i>Galium trifidum</i>	17	1	33	5	.	.	56	3
<i>Galium trifidum columbianum</i>	.	.	50	6	.	.	.	.
<i>Galium trifidum trifidum</i>	.	.	33	5	.	.	11	3
<i>Galium triflorum</i>	17	1	.	.	.	.	.	.
<i>Geranium erianthum</i>	.	.	.	.	.	.	22	2
<i>Geum macrophyllum</i>	.	.	33	7	.	.	22	2
<i>Glehnia littoralis</i>	.	.	.	.	75	2	.	.
<i>Heracleum lanatum</i>	.	.	33	18	.	.	44	2
<i>Hippuris vulgaris</i>	17	2	.	.	.	.	.	.
<i>Honckenya peploides major</i>	.	.	.	.	25	1	.	.
<i>Iris setosa</i>	.	.	50	8	.	.	67	4
<i>Lathyrus maritimus</i>	.	.	17	1	75	8	.	.
<i>Lathyrus palustris</i>	.	.	67	6	.	.	44	9
<i>Ligusticum scoticum</i>	.	.	.	.	.	.	11	1
<i>Lupinus nootkatensis</i>	17	1	83	21	.	.	44	7
<i>Lysimachia thyrsiflora</i>	17	30	.	.	.	.	11	5
<i>Menyanthes trifoliata</i>	50	1	.	.	.	.	22	13
<i>Plantago macrocarpa</i>	.	.	17	1	.	.	.	.
<i>Plantago maritima</i>	.	.	17	1	.	.	.	.
<i>Platanthera dilatata</i>	.	.	17	1	.	.	33	2
<i>Polemonium acutiflorum</i>	.	.	17	2	.	.	33	3
<i>Polygonum viviparum</i>	.	.	17	1	.	.	.	.
<i>Potamogeton natans</i>	17	2	.	.	.	.	.	.
<i>Potentilla egedii grandis</i>	.	.	100	12	25	5	.	.
<i>Potentilla palustris</i>	83	5	50	2	.	.	33	10
<i>Ranunculus Macounii</i>	.	.	.	.	.	.	11	5
<i>Ranunculus pacificus</i>	.	.	33	1	.	.	.	.

SPECIES	CARSIT/EQUIFLU		CALCAN/POTEGE		ELYARE		CALCAN	
	6 Plots	CON ACOV	6 Plots	CON ACOV	4 Plots	CON ACOV	9 Plots	CON ACOV
<i>Rhinanthus minor borealis</i>	.	.	33	2	.	.	.	.
<i>Rubus arcticus stellatus</i>	.	.	33	2	.	.	44	3
<i>Rumex fenestratus</i>	.	.	83	1	.	.	44	1
<i>Rumex species</i>	17	1	.	.	.	.	.	.
<i>Sanguisorba stipulata</i>	33	1
<i>Senecio pseudo-Arnica</i>	25	1	.	.
<i>Solidago lepida</i>	.	.	17	5	.	.	33	1
<i>Stellaria borealis</i>	.	.	33	3	.	.	.	.
<i>Stellaria crassifolia</i>	22	3
<i>Stellaria sitchensis</i>	.	.	33	2	.	.	22	3
<i>Stellaria species</i>	50	1	.	.	.	.	.	.
<i>Thalictrum sparsiflorum</i>	11	1
<i>Trientalis europea</i>	17	1	50	1	.	.	56	2
<i>Viola epipsila</i>	11	1
<i>Viola glabella</i>	17	1	.	.	.	.	.	.
<i>Viola langsдорffii</i>	33	1
<i>Viola sp.</i>	11	1
GRAMINOIDS								
<i>Agrostis alaskana</i>	11	1
<i>Agrostis borealis</i>	11	1
<i>Agrostis scabra</i>	.	.	17	2	.	.	.	.
<i>Calamagrostis canadensis</i>	17	1	83	31	.	.	100	44
<i>Calamagrostis inexpansa</i>	.	.	17	25	.	.	11	10
<i>Calamagrostis nutkaensis</i>	.	.	50	3	.	.	.	.
<i>Carex aquatilis</i>	.	.	17	1	.	.	.	.
<i>Carex canescens</i>	17	1	33	2	.	.	.	.
<i>Carex livida</i>	11	2
<i>Carex lyngbyei</i>	.	.	50	3	.	.	11	3
<i>Carex macloviana</i>	.	.	33	2	.	.	.	.
<i>Carex macrocephala</i>	50	17	.	.
<i>Carex pachystachya</i>	.	.	17	2	.	.	11	2
<i>Carex pluriflora</i>	33	4
<i>Carex saxatilis</i>	.	.	17	1	.	.	22	1
<i>Carex sitchensis</i>	100	71	.	.	.	.	78	31
<i>Deschampsia caespitosa</i>	.	.	83	9	25	3	56	21
<i>Eleocharis palustris</i>	.	.	17	4	.	.	11	1
<i>Elymus arenarius</i>	.	.	33	4	100	40	.	.
<i>Festuca rubra</i>	17	1	67	2	.	.	.	.
<i>Microchloa odorata</i>	.	.	50	3	.	.	11	1
<i>Hordeum brachyantherum</i>	.	.	67	4	25	5	.	.
<i>Juncus falcatus</i>	.	.	17	1	.	.	.	.
<i>Luzula sp.</i>	.	.	17	4	.	.	.	.
<i>Phleum commutatum americanum</i>	.	.	33	1	.	.	.	.
<i>Poa eminens</i>	.	.	67	3	.	.	.	.
<i>Poa laxiflora</i>	.	.	17	1	.	.	.	.
<i>Poa palustris</i>	.	.	17	3	.	.	.	.
<i>Poa pratensis</i>	.	.	17	1	.	.	.	.
<i>Poa sp.</i>	.	.	33	1	.	.	.	.
<i>Scirpus microcarpus</i>	11	1
<i>Trisetum cernuum</i>	.	.	17	5	.	.	11	1
<i>Vahlodea atropurpurea latifolia</i>	11	1
FERNS AND ALLIES								
<i>Athyrium filix-femina</i>	33	1	.	.	.	.	.	.

FORB COMMUNITIES

SPECIES	NUPPOL		MYRALT		EQUFLU		EQUVAR		MENTRI-EQUVAR	
	1 Plots	CON ACOV	3 Plots	CON ACOV	4 Plots	CON ACOV	6 Plots	CON ACOV	7 Plots	CON ACOV
TREES-REGENERATION										
<i>Populus balsamifera trichocarpa</i> regen	17	1	.	.
TALL SHRUBS										
<i>Alnus sinuata</i>	17	2	29	1
<i>Myrica gale</i>	67	5	100	3
<i>Salix barclayi</i>	100	2	43	3
<i>Salix alaxensis</i>	33	1	.	.
<i>Salix commutata</i>	67	3	43	2
<i>Salix hookeriana</i>	17	1	14	1
<i>Salix sitchensis</i>	17	1	29	1
LOW AND SUBSHRUBS										
<i>Andromeda polifolia</i>	29	3
<i>Empetrum nigrum</i>	17	1	.	.
<i>Oxycoccus palustris</i>	43	2
<i>Vaccinium uliginosum</i>	17	1	14	5
FORBS										
<i>Achillea borealis</i>	50	1	.	.
<i>Angelica genuflexa</i>	17	2	.	.
<i>Aster subspicatus</i>	33	4	.	.
<i>Caltha palustris asarifolia</i>	25	5	17	1	14	1
<i>Cicuta douglasii</i>	50	1	50	2	71	1
<i>Conioselinum chinense</i>	33	1	.	.
<i>Dodecatheon pulchellum</i>	17	1	14	1
<i>Drosera anglica</i>	43	2
<i>Drosera rotundifolia</i>	17	1	43	1
<i>Epilobium palustre</i>	25	1	17	1	.	.
<i>Epilobium</i> sp.	14	1
<i>Equisetum arvense</i>	67	2	43	5
<i>Equisetum fluviatile</i>	100	38	.	.	14	5
<i>Equisetum palustre</i>	33	1	57	8
<i>Equisetum</i> sp.	14	1
<i>Equisetum variegatum</i>	25	1	100	43	86	9
<i>Fragaria chiloensis</i>	17	1	.	.
<i>Galium trifidum</i>	50	1	14	1
<i>Geum calthifolium</i>	17	1	.	.
<i>Hippuris vulgaris</i>	.	.	33	1	25	30	.	.	.	.
<i>Lupinus nootkatensis</i>	50	4	.	.
<i>Lysimachia thyrsiflora</i>	25	1	.	.	.	.
<i>Menyanthes trifoliata</i>	100	1	.	.	25	15	17	2	100	28
<i>Myriophyllum alterniflorum</i>	.	.	67	73	.	.	.	.	.	.
<i>Myriophyllum spicatum</i>	.	.	67	25	25	5	.	.	.	.
<i>Nuphar polysepalum</i>	100	40	33	1	.	.	.	.	.	.
<i>Parnassia palustris</i>	50	1	57	1
<i>Pedicularis parviflora</i>	50	1	86	4
<i>Pinguicula vulgaris</i>	67	1	29	1
<i>Platanthera dilatata</i>	50	1	29	1
<i>Platanthera hyperborea</i>	17	1	29	1
<i>Platanthera</i> sp.	29	1
<i>Polygonum viviparum</i>	50	3	57	1
<i>Potamogeton Berchtoldi</i>	.	.	33	1	.	.	.	.	.	.
<i>Potamogeton alpinus</i>	25	5	.	.	.	.
<i>Potamogeton gramineus</i>	17	1	14	1
<i>Potamogeton pectinatus</i>	.	.	67	10	25	1	.	.	.	.
<i>Potamogeton richardsonii</i>	.	.	33	1	.	.	.	.	.	.
<i>Potentilla egedii grandis</i>	50	3	14	1
<i>Potentilla palustris</i>	17	1	43	2
<i>Primula egelikensis</i>	50	1	29	1
<i>Pyrola asarifolia</i>	17	1	.	.
<i>Ranunculus confervoides</i>	.	.	67	6	.	.	.	.	.	.

SPECIES	NUPPOL		MYRALT		EQUFLU		EQUVAR		MENTRI-EQUVAR	
	1 Plots	CON ACOV	3 Plots	CON ACOV	4 Plots	CON ACOV	6 Plots	CON ACOV	7 Plots	CON ACOV
<i>Rhinanthus minor borealis</i>	33	1	.	.
<i>Rubus arcticus stellatus</i>	17	2	29	1
<i>Rumex fenestratus</i>	25	1	.	.	.	.
<i>Sanguisorba stipulata</i>	14	1
<i>Sparganium angustifolium</i>	100	1	33	1	25	3	.	.	.	.
<i>Spiranthes romanzoffiana</i>	17	1	.	.
<i>Swertia perennis</i>	17	3	.	.
<i>Thalictrum sparsiflorum</i>	17	1	.	.
<i>Tofieldia glutinosa</i>	67	1	57	1
<i>Trientalis europea</i>	14	1
<i>Triglochin maritimum</i>	17	1	14	1
<i>Utricularia intermedia</i>	17	3	43	1
<i>Viola epipsila</i>	14	1
<i>Viola glabella</i>	14	1
<i>Viola sp.</i>	17	1	.	.
GRAMINOIDS										
<i>Agrostis alaskana</i>	25	1	.	.	29	4
<i>Agrostis borealis</i>	17	2	.	.
<i>Calamagrostis canadensis</i>	50	1	.	.
<i>Calamagrostis neglecta</i>	17	1	.	.
<i>Carex anthoxanthes</i>	17	10	.	.
<i>Carex aquatilis</i>	25	1	33	5	14	1
<i>Carex canescens</i>	29	1
<i>Carex capillaris</i>	29	1
<i>Carex diandra</i>	17	Tr	.	.
<i>Carex dioica</i>	17	5	.	.
<i>Carex flava</i>	50	3	57	1
<i>Carex interior</i>	57	5
<i>Carex limosa</i>	17	2	57	15
<i>Carex livida</i>	29	3
<i>Carex lyngbyei</i>	67	3	29	9
<i>Carex macrochaeta</i>	17	1	.	.
<i>Carex maritima</i>	17	1	.	.
<i>Carex microglochin</i>	17	1	.	.
<i>Carex oederi</i>	50	12	29	1
<i>Carex pachystachya</i>	14	1
<i>Carex pauciflora</i>	17	2	.	.
<i>Carex pluriflora</i>	29	2
<i>Carex pyrenaica</i>	14	1
<i>Carex saxatilis</i>	50	10	17	10	29	2
<i>Carex sitchensis</i>	17	2	.	.
<i>Carex stylosa</i>	14	1
<i>Deschampsia caespitosa</i>	25	1	83	2	.	.
<i>Deschampsia sp.</i>	17	1	.	.
<i>Eleocharis kamschatica</i>	17	3	.	.
<i>Eleocharis nitida</i>	17	1	.	.
<i>Eleocharis palustris</i>	17	1	14	1
<i>Eriophorum angustifolium</i>	33	2	71	5
<i>Eriophorum russeolum</i>	43	1
<i>Festuca rubra</i>	14	2
<i>Glyceria borealis</i>	.	.	33	1	.	.	.	.	14	1
<i>Microchloa odorata</i>
<i>Juncus alpinus</i>	33	1	.	.
<i>Juncus arcticus sitchensis</i>	67	1	.	.
<i>Juncus castaneus</i>	17	1	.	.
<i>Juncus triglumis</i>	43	1
<i>Luzula multiflora</i>	14	1
<i>Luzula parviflora</i>	17	1	.	.
<i>Puccinellia maritima</i>	25	2	.	.	.	.
<i>Trichophorum caespitosum</i>	17	3	.	.
UNKNOWN										
SEDGE UNKNOWN	14	4

FORB COMMUNITIES (CONTINUED)

SPECIES	MESIC FORB/ATHFIL				LUPNOO/SALSET				FRACHI-ACHBOR	
	HENTRI-POTPAL		4 Plots		MESIC FORB		4 Plots		11 Plots	
	12 Plots	CON ACOV	CON	ACOV	8 Plots	CON ACOV	CON	ACOV	CON	ACOV
TREES-REGENERATION										
<i>Picea sitchensis</i> regen	8	1	.	.	.	.	.	.	55	1
<i>Populus balsamifera</i> trichocarpa regen	.	.	.	.	.	.	75	2	9	2
TALL SHRUBS										
<i>Alnus sinuata</i>	17	2	.	.	25	1	50	2	45	2
<i>Echinopenax horridum</i>	.	.	.	.	.	.	.	.	18	1
<i>Myrica gale</i>	17	1	.	.	.	.	.	.	.	.
<i>Rubus spectabilis</i>	.	.	75	9	38	2	.	.	.	.
<i>Salix barclayi</i>	17	1	.	.	25	1	75	1	9	3
<i>Salix alaxensis</i>	.	.	.	.	.	.	75	2	9	3
<i>Salix commutata</i>	.	.	.	.	.	.	50	1	18	1
<i>Salix hookeriana</i>	8	5	.	.	.	.	.	.	.	.
<i>Salix sitchensis</i>	.	.	.	.	.	.	50	2	.	.
<i>Sambucus racemosa</i>	.	.	50	4	13	1	.	.	.	.
<i>Vaccinium</i> sp. (oval & alask)	.	.	.	.	.	.	.	.	18	2
<i>Viburnum edule</i>	.	.	.	.	13	1	.	.	9	1
LOW AND SUBSHRUBS										
<i>Empetrum nigrum</i>	.	.	.	.	13	1	.	.	9	2
<i>Salix arctica</i>	.	.	.	.	.	.	50	1	.	.
<i>Salix ovalifolia</i>	.	.	.	.	.	.	25	1	.	.
<i>Salix setchelliana</i>	.	.	.	.	.	.	75	4	9	6
FORBS										
<i>Achillea borealis</i>	.	.	50	2	100	4	100	2	91	5
<i>Aconitum delphinifolium</i>	.	.	.	.	38	1	.	.	.	.
<i>Actaea rubra</i>	.	.	25	1	.	.	.	.	.	.
<i>Anemone multifida</i>	.	.	.	.	.	.	.	.	9	3
<i>Angelica genuflexa</i>	.	.	50	1	38	6	.	.	.	.
<i>Angelica lucida</i>	.	.	75	11	75	5	.	.	9	3
<i>Aquilegia formosa</i>	.	.	.	.	13	1	.	.	.	.
<i>Arabis hirsuta</i>	.	.	.	.	.	.	.	.	18	1
<i>Arabis lyrata</i>	.	.	.	.	.	.	25	1	9	1
<i>Artemisia tilesii</i>	.	.	.	.	.	.	25	1	.	.
<i>Aruncus sylvestris</i>	.	.	.	.	13	1	.	.	.	.
<i>Aster subspicatus</i>	.	.	25	2	38	2	.	.	9	1
<i>Astragalus alpinus</i>	.	.	.	.	.	.	75	8	36	11
<i>Caltha palustris asarifolia</i>	8	1	25	1	25	2	.	.	.	.
<i>Cardamine umbellata</i>	.	.	25	1	13	1	.	.	.	.
<i>Castilleja miniata</i>	.	.	.	.	13	1	.	.	.	.
<i>Castilleja unalaschensis</i>	.	.	.	.	.	.	50	1	45	3
<i>Cerastium Beeringianum</i>	.	.	.	.	.	.	25	1	.	.
<i>Cerastium fontanum</i>	.	.	.	.	.	.	25	1	.	.
<i>Cicuta douglasii</i>	75	2	.	.	.	.	.	.	.	.
<i>Circaea alpina</i>	.	.	100	6	.	.	.	.	.	.
<i>Conioselinum chinense</i>	.	.	75	2	75	2	25	1	45	2
<i>Coptis asplenifolia</i>	.	.	.	.	.	.	.	.	9	1
<i>Coptis trifolia</i>	8	1	25	2	25	1	.	.	.	.
<i>Cornus canadensis</i>	8	4	.	.	.	.	.	.	9	1
<i>Dodecatheon jeffreyi</i>	.	.	.	.	13	1	.	.	.	.
<i>Drosera anglica</i>	8	2	.	.	.	.	.	.	.	.
<i>Drosera rotundifolia</i>	8	1	.	.	.	.	.	.	.	.
<i>Epilobium adenocaulon</i>	.	.	25	2	38	6	.	.	9	3
<i>Epilobium alpinum</i>	17	1	.	.	.	.	.	.	.	.
<i>Epilobium angustifolium</i>	.	.	75	9	75	18	.	.	9	1
<i>Epilobium glandulosum</i>	.	.	25	3	13	1	.	.	.	.
<i>Epilobium latifolium</i>	.	.	.	.	.	.	75	21	9	1
<i>Epilobium palustre</i>	8	1	.	.	.	.	.	.	.	.
<i>Epilobium</i> sp.	8	1	.	.	.	.	50	1	.	.
<i>Equisetum arvense</i>	8	5	50	1	25	1	50	3	9	1
<i>Equisetum fluviatile</i>	83	10	.	.	.	.	.	.	.	.

SPECIES	MESIC FORB/ATHFIL				LUPNOO/SALSET				FRACHI-ACHBOR	
	MENTRI-POTPAL				MESIC FORB					
	12 Plots	CON ACOV	4 Plots	CON ACOV	8 Plots	CON ACOV	4 Plots	CON ACOV	11 Plots	CON ACOV
<i>Equisetum palustre</i>	83	8	.	.	13	1	.	.	.	.
<i>Equisetum variegatum</i>	8	2	.	.	.	.	.	.	36	2
<i>Erigeron humilis</i>	.	.	.	.	.	.	25	1	.	.
<i>Erigeron peregrinus</i>	.	.	25	2	.	.	.	.	9	3
<i>Euphrasia mollis</i>	.	.	.	.	.	.	25	1	36	1
<i>Fragaria chiloensis</i>	.	.	25	2	13	1	50	2	100	25
<i>Fritillaria camschatcensis</i>	.	.	50	1	25	2	.	.	18	1
<i>Galium trifidum</i>	17	1	50	2	50	3	.	.	.	.
<i>Galium trifidum trifidum</i>	8	2	.	.	.	.	.	.	.	.
<i>Galium triflorum</i>	8	1	25	1	.	.	.	.	.	.
<i>Gentiana amarella</i>	.	.	.	.	.	.	.	.	.	.
<i>Gentiana douglasiana</i>	.	.	.	.	.	.	25	1	27	2
<i>Geranium erianthum</i>	.	.	25	2	50	5	.	.	9	1
<i>Geum macrophyllum</i>	.	.	100	1	38	5	.	.	9	1
<i>Heracleum lanatum</i>	.	.	75	5	75	14	25	1	9	2
<i>Heuchera glabra</i>	.	.	.	.	13	1	.	.	.	.
<i>Iris setosa</i>	.	.	25	1	38	3	.	.	.	.
<i>Lathyrus maritimus</i>	.	.	.	.	.	.	.	.	36	4
<i>Lathyrus palustris</i>	.	.	50	2	13	3	.	.	9	2
<i>Ligusticum scoticum</i>	.	.	.	.	25	1	.	.	.	.
<i>Listera caurina</i>	.	.	.	.	.	.	.	.	9	1
<i>Listera cordata</i>	8	1	.	.	.	.	.	.	18	8
<i>Lomatogonium rotatum</i>	.	.	.	.	.	.	.	.	9	1
<i>Lupinus nootkatensis</i>	.	.	50	3	63	4	75	7	45	22
<i>Lysimachia thysiflora</i>	25	1	.	.	.	.	.	.	.	.
<i>Maianthemum dilatatum</i>	.	.	25	10	.	.	.	.	.	.
<i>Menyanthes trifoliata</i>	100	38	.	.	.	.	.	.	.	.
<i>Moehringia lateriflora</i>	.	.	.	.	.	.	.	.	18	1
<i>Moneses uniflora</i>	.	.	.	.	.	.	.	.	9	1
<i>Nuphar polysepalum</i>	8	2	.	.	.	.	.	.	.	.
<i>Oxytropis campestris</i>	.	.	.	.	.	.	.	.	9	10
<i>Parnassia palustris</i>	17	2	.	.	13	1	25	5	27	4
<i>Pedicularis parviflora</i>	58	2	.	.	.	.	.	.	.	.
<i>Plantago macrocarpa</i>	.	.	.	.	.	.	.	.	9	1
<i>Platanthera dilatata</i>	8	1	.	.	13	1	.	.	18	1
<i>Platanthera hyperborea</i>	.	.	.	.	.	.	.	.	9	2
<i>Platanthera saccata</i>	.	.	.	.	.	.	.	.	9	3
<i>Platanthera sp.</i>	.	.	.	.	.	.	.	.	9	1
<i>Polemonium scutiflorum</i>	.	.	25	1	38	1	.	.	9	1
<i>Polygonum viviparum</i>	.	.	.	.	25	1	50	2	18	1
<i>Potamogeton granineus</i>	8	1	.	.	.	.	.	.	.	.
<i>Potentilla egedii grandis</i>	.	.	50	3	13	4	.	.	9	5
<i>Potentilla palustris</i>	83	24	25	1	13	4	.	.	.	.
<i>Potentilla villosa</i>	.	.	.	.	.	.	25	1	.	.
<i>Prenanthes alata</i>	.	.	25	2	13	1	.	.	.	.
<i>Pyrola secunda</i>	.	.	25	1	.	.	.	.	.	.
<i>Ranunculus Bongardi</i>	.	.	25	2	38	1	.	.	.	.
<i>Ranunculus flammula</i>	.	.	.	.	13	1	.	.	.	.
<i>Ranunculus pacificus</i>	.	.	25	1	.	.	.	.	.	.
<i>Ranunculus pallasii</i>	8	1	.	.	.	.	.	.	.	.
<i>Rhinanthus minor borealis</i>	.	.	25	1	25	3	75	3	55	9
<i>Rubus arcticus stellatus</i>	8	2	25	7	38	5	50	1	18	9
<i>Rubus pedatus</i>	8	1	.	.	.	.	.	.	9	3
<i>Rumex fenestratus</i>	8	1	25	1	25	1	.	.	.	.
<i>Sanguisorba stipulata</i>	.	.	50	3	100	10	.	.	9	2
<i>Sedum rosea</i>	.	.	.	.	.	.	25	1	.	.
<i>Senecio triangularis</i>	.	.	25	5	13	4	.	.	.	.
<i>Sisyrinchium litorale</i>	.	.	.	.	.	.	.	.	18	2
<i>Solidago lepida</i>	.	.	.	.	63	23	.	.	18	1
<i>Spiranthes romanzoffiana</i>	.	.	.	.	.	.	25	1	18	1
<i>Stellaria borealis</i>	.	.	25	2	25	4	25	1	.	.
<i>Stellaria calycantha</i>	.	.	.	.	13	1	.	.	.	.
<i>Stellaria crassifolia</i>	8	1	25	2	25	6	.	.	.	.

SPECIES	MESIC FORB/ATHFIL				LUPNOO/SALSET				FRACHI-ACHBOR			
	MENTBI-FOTPAL		4 Plots		8 Plots		4 Plots		11 Plots			
	12 Plots	CON ACOV	CON ACOV		CON ACOV		CON ACOV		CON ACOV		CON ACOV	
<i>Stellaria crispa</i>	8	1	.	.	.	.	.	.	.	.	.	.
<i>Stellaria longipes</i>	8	1	.	.	.	.	.	.	.	.	.	.
<i>Stellaria sitchana</i>	.	.	.	.	13	5	25	1	9	3	.	.
<i>Stellaria species</i>	8	1	.	.	.	.	.	.	.	.	.	.
<i>Streptopus amplexifolius</i>	8	1	50	2	25	1	.	.	9	1	.	.
<i>Swertia perennis</i>	.	.	.	.	13	3	.	.	.	.	.	.
<i>Tellima grandiflora</i>	.	.	25	10	.	.	.	.	.	.	.	.
<i>Tierella trifoliata</i>	8	1	25	1	.	.	.	.	18	1	.	.
<i>Tofieldia glutinosa</i>	8	1	.	.	.	.	.	.	.	.	.	.
<i>Trientalis europea</i>	.	.	100	1	50	1	.	.	18	2	.	.
<i>Utricularia intermedia</i>	25	2	.	.	.	.	.	.	.	.	.	.
<i>Veratrum viride</i>	.	.	25	3	50	3	.	.	.	.	.	.
<i>Viola epipsila</i>	8	1	.	.	50	3	.	.	.	.	.	.
<i>Viola glabella</i>	8	3	.	.	.	.	.	.	.	.	.	.
<i>Viola langsdorfii</i>	8	1	25	1	13	1	.	.	9	1	.	.
<i>Viola sp.</i>	.	.	25	5	.	.	.	.	.	.	.	.
GRAMINOIDS												
<i>Agrostis alaskana</i>	33	2	.	.	25	1	.	.	9	1	.	.
<i>Agrostis borealis</i>	8	4	.	.	.	.	50	2	9	2	.	.
<i>Agrostis exarata</i>	.	.	25	1	25	2	.	.	.	.	.	.
<i>Calamagrostis canadensis</i>	8	10	75	4	75	10	25	1	.	.	.	.
<i>Calamagrostis neglecta</i>	.	.	.	.	.	.	25	1	9	5	.	.
<i>Carex anthoxanthea</i>	8	3	.	.	.	.	.	.	.	.	.	.
<i>Carex aquatilis</i>	8	1	.	.	.	.	.	.	.	.	.	.
<i>Carex canescens</i>	33	1	.	.	.	.	.	.	.	.	.	.
<i>Carex disperma</i>	8	1	.	.	.	.	.	.	.	.	.	.
<i>Carex eleusinoides</i>	.	.	.	.	.	.	25	1	.	.	.	.
<i>Carex flava</i>	8	4	.	.	.	.	.	.	.	.	.	.
<i>Carex interior</i>	8	5	.	.	.	.	.	.	.	.	.	.
<i>Carex limosa</i>	58	15	.	.	.	.	.	.	.	.	.	.
<i>Carex livida</i>	25	6	.	.	.	.	.	.	.	.	.	.
<i>Carex macrocephala</i>	.	.	.	.	.	.	.	.	9	1	.	.
<i>Carex macrochaeta</i>	.	.	25	2	38	4	.	.	.	.	.	.
<i>Carex maritima</i>	8	5	.	.	.	.	.	.	.	.	.	.
<i>Carex pachystachya</i>	.	.	25	1	25	1	.	.	.	.	.	.
<i>Carex pluriflora</i>	25	5	.	.	.	.	.	.	.	.	.	.
<i>Carex rostrata</i>	17	5	.	.	.	.	.	.	.	.	.	.
<i>Carex saxatilis</i>	8	1	.	.	.	.	.	.	.	.	.	.
<i>Carex sitchensis</i>	17	5	.	.	13	10	.	.	.	.	.	.
<i>Carex stenophylla</i>	8	1	.	.	.	.	.	.	.	.	.	.
<i>Cinna latifolia</i>	.	.	25	1	.	.	.	.	.	.	.	.
<i>Deschampsia caespitosa</i>	8	2	.	.	63	3	75	1	27	1	.	.
<i>Elymus arenarius</i>	.	.	.	.	.	.	.	.	55	8	.	.
<i>Elymus hirsutus</i>	.	.	.	.	13	4	.	.	.	.	.	.
<i>Elymus subsecundus</i>	.	.	25	1	13	2	.	.	.	.	.	.
<i>Eriophorum angustifolium</i>	8	3	.	.	.	.	.	.	.	.	.	.
<i>Eriophorum russeolum</i>	58	2	.	.	.	.	.	.	.	.	.	.
<i>Festuca rubra</i>	.	.	.	.	25	1	25	1	73	10	.	.
<i>Glyceria pauciflora</i>	8	2	.	.	.	.	.	.	.	.	.	.
<i>Hierochloa odorata</i>	.	.	.	.	25	1	.	.	9	1	.	.
<i>Hordeum brachyantherum</i>	.	.	25	2	25	27	.	.	9	2	.	.
<i>Juncus sp.</i>	.	.	25	2	.	.	.	.	.	.	.	.
<i>Luzula multiflora</i>	.	.	.	.	13	1	25	1	36	2	.	.
<i>Luzula parviflora</i>	.	.	25	1	13	2	.	.	.	.	.	.
<i>Phleum commutatum americanum</i>	.	.	.	.	13	1	75	1	18	1	.	.
<i>Poa alpina</i>	.	.	.	.	.	.	50	1	9	1	.	.
<i>Poa arctica</i>	.	.	.	.	.	.	75	1	.	.	.	.
<i>Poa eminens</i>	.	.	.	.	.	.	.	.	9	1	.	.
<i>Poa glauca</i>	.	.	.	.	.	.	25	2	.	.	.	.
<i>Trisetum cernuum</i>	.	.	50	1	25	4	.	.	9	3	.	.
<i>Trisetum spicatum</i>	.	.	.	.	.	.	50	1	.	.	.	.
<i>Vahlodea atropurpurea latifolia</i>	.	.	25	1	25	3	.	.	.	.	.	.

SPECIES	MESIC FORB/ATHFIL						LUPNOO/SALSET			
	NENTRI-POTPAL		4 Plots		MESIC FORB		4 Plots		FRACHI-ACHBOR	
	12 Plots		CON	ACOV	8 Plots		CON	ACOV	11 Plots	
			CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
FERNS AND ALLIES										
Athyrium filix-femina	8	1	100	49	50	6	.	.	.	.
Botrychium lunaria	.	.	.	.	.	.	.	.	9	1
Botrychium multifidum	.	.	.	.	13	1	.	.	.	.
Gymnocarpium dryopteris	.	.	25	1	.	.	.	.	.	.
Thelypteris phegopteris	.	.	.	.	13	1	.	.	.	.
UNKNOWN										
GRAMINOID UNKNOWN	.	.	.	.	.	.	.	.	18	31
SEDGE UNKNOWN	.	.	.	.	.	.	25	1	9	2

APPENDIX 5. SPECIES CODES, SCIENTIFIC NAMES, AND COMMON NAMES FOR VASCULAR AND NONVASCULAR FLORA IDENTIFIED FOR THE YAKUTAT FORELAND DURING THIS STUDY.

SPECIES CODE	SCIENTIFIC NAME	COMMON NAME
TREES		
PICSIT	<i>Picea sitchensis</i>	Sitka spruce
PINCON	<i>Pinus contorta contorta</i>	Shorepine or Lodgepole pine
POPTRI	<i>Populus balsamifera trichocarpa</i>	Black cottonwood
TSUHET	<i>Tsuga heterophylla</i>	Western hemlock
TSUMER	<i>Tsuga mertensiana</i>	Mountain hemlock
TREES-REGENERATION		
PICSITU	<i>Picea sitchensis</i> regen	Sitka spruce regen
PINCONU	<i>Pinus contorta</i> regen	Lodgepole pine regen
POPTRIU	<i>Populus balsamifera trichocarpa</i> regen	Black cottonwood regen
TSUHETU	<i>Tsuga heterophylla</i> regen	Western hemlock regen
TSUMERU	<i>Tsuga mertensiana</i> regen	Mountain hemlock regen
TALL SHRUBS		
ALNSIN	<i>Alnus sinuata</i>	Sitka alder
CLAPYR	<i>Cladanthamnus pyrolaeiflorus</i>	Copperbush
ECHHOR	<i>Echinopanax horridum</i>	Devil's club
MALFUS	<i>Malus fusca</i>	Oregon crab apple
MENFER	<i>Menziesia ferruginea</i>	Rusty menziesia
MYRGAL	<i>Myrica gale</i>	Sweetgale
RIBBRA	<i>Ribes bracteosum</i>	Stink current
RIBLAX	<i>Ribes laxiflorum</i>	Trailing black current
RUBSPE	<i>Rubus spectabilis</i>	Salmonberry
SALBAR	<i>Salix barclayi</i>	Barclay willow
SALALA	<i>Salix alaxensis</i>	Feltleaf willow
SALCOM	<i>Salix commutata</i>	Undergreen willow
SALHOO	<i>Salix hookeriana</i>	Hooker willow
SALSIT	<i>Salix sitchensis</i>	Sitka willow
SAMRAC	<i>Sambucus racemosa</i>	Red elderberry
SORSIT	<i>Sorbus sitchensis</i>	Elder-leaf Mtn.-ash
VACCIN	<i>Vaccinium</i> spp. (oval & alask)	Tall Blueberry spp.
VIBEDU	<i>Viburnum edule</i>	Highbush cranberry
LOW AND SUBSHRUBS		
ANDPOL	<i>Andromeda polifolia</i>	Bog rosemary
EMPNIG	<i>Empetrum nigrum</i>	Crowberry
KALPOL	<i>Kalmia polifolia</i>	Bog kalmia
LEDGRO	<i>Ledum groenlandicum</i>	Labrador-tea
OXPAL	<i>Oxycoccus palustris</i>	Bog cranberry
RHOCAM	<i>Rhododendron camtschaticum</i>	Kamchatka rhododendron
SALARC	<i>Salix arctica</i>	Arctic willow
SALOVA	<i>Salix ovalifolia</i>	
SALRET	<i>Salix reticulata</i>	Netleaf willow
SALSET	<i>Salix setchelliana</i>	Setchell willow
SALSTO	<i>Salix stolonifera</i>	Stoloniferous willow
VACULI	<i>Vaccinium uliginosum</i>	Bog blueberry
VACVIT	<i>Vaccinium vitis-idaea</i>	Mountain cranberry
FORBS		
ACHBOR	<i>Achillea borealis</i>	Yarrow
ACODEL	<i>Aconitum delphinifolium</i>	Monkshood
ACTRUB	<i>Actaea rubra</i>	Baneberry
ALLSCH	<i>Allium schoenoprasum</i>	Wild chive

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME -	COMMON NAME
FORBS (continued)		
ANAMAR	<i>Anaphalis margaritacea</i>	Pearly everlasting
ANEMUL	<i>Anemone multifida</i>	Cut-leaf anemone
ANENAR	<i>Anemone narcissiflora</i>	Narcissis anemone
ANEPAR	<i>Anemone parviflora</i>	Northern anemone
ANGGEN	<i>Angelica genuflexa</i>	Bent-leaved angelica
ANGLUC	<i>Angelica lucida</i>	Sea coast angelica
ANTPAL	<i>Antennaria pallida</i>	
APABOR	<i>Apargidium boreale</i>	
AQUFOR	<i>Aquilegia formosa</i>	Western columbine
ARAHIR	<i>Arabis hirsuta</i>	Hairy rockcress
ARALYR	<i>Arabis lyrata</i>	Kamchatka rockcress
ARNLES	<i>Arnica Lessingii</i>	Arnica
ARNAMP	<i>Arnica amplexicaulis amplexicaulis</i>	Clasping arnica
ARNLAT	<i>Arnica latifolia</i>	Mountain arnica
ARNLON	<i>Arnica lonchophylla</i>	
ARTARC	<i>Artemisia arctica arctica</i>	Sage
ARTTIL	<i>Artemisia tilesii</i>	Aleutian mugwort
ARUSYL	<i>Arunus sylvestris</i>	Goatsbeard
ASTSIB	<i>Aster sibiricus</i>	
ASTSUB	<i>Aster subspicatus</i>	Douglas' aster
ASTROB	<i>Astragalus Robbinsii</i>	Robbins milk-vetch
ASTALP	<i>Astragalus alpinus</i>	Alpine milk-vetch
BARORT	<i>Barbarea orthoceras</i>	Wintercress
BOSROS	<i>Boschniakia rossica</i>	Ground-cone
CAKEDE	<i>Cakile edentula</i>	Searocket
CALVER	<i>Callitriche verna</i>	Spring water-starwort
CALPAL	<i>Caltha palustris asarifolia</i>	Marsh marigold
CAMLAS	<i>Campanula lesiocarpa</i>	Mountain harebell
CAMROT	<i>Campanula rotundifolia</i>	Bluebells of Scotland
CARPRA	<i>Cardamine pratensis</i>	Cuckoo flower
CARUMB	<i>Cardamine umbellata</i>	Bittercress
CASMIN	<i>Castilleja miniata</i>	Great red paintbrush
CASUNA	<i>Castilleja unalaschensis</i>	Yellow paintbrush
CERBEE	<i>Cerastium Beeringianum</i>	Bering chickweed
CERFIS	<i>Cerastium fisherianum</i>	Fischer chickweed
CERFON	<i>Cerastium fontanum</i>	Chickweed
CHRARC	<i>Chrysanthemum arcticum</i>	Arctic daisy
CICDOU	<i>Cicuta douglasii</i>	Water hemlock
CIRALP	<i>Circaea alpina</i>	Enchanter's nightshade
CLASIB	<i>Claytonia sibirica</i>	Siberian spring-beauty
COEVIRB	<i>Coeloglossum viride bracteatum</i>	Frog orchis
CONCHI	<i>Conioselinum chinense</i>	Western hemlock-parsley
COPASP	<i>Coptis asplenifolia</i>	Fern-leaf goldthread
COPTRI	<i>Coptis trifolia</i>	Trifoliate goldthread
CORTRI	<i>Corallorrhiza trifida</i>	Early coral-root
CORCAN	<i>Cornus canadensis</i>	Bunchberry
CORSUE	<i>Cornus suecica</i>	Lapland cornel
DODJEF	<i>Dodecatheon jeffreyi</i>	Jeffrey shooting-star
DODPUL	<i>Dodecatheon pulchellum</i>	Pretty shooting-star
DRABA	<i>Draba</i> spp.	Whitlow-grass
DROANG	<i>Drosera anglica</i>	Long-leaf sundew
DROROT	<i>Drosera rotundifolia</i>	Round-leaf sundew
EPIADE	<i>Epilobium adenocaulon</i>	Northern willow-herb
EPIALP	<i>Epilobium alpinum</i>	Alpine willow-herb
EPIANG	<i>Epilobium angustifolium</i>	Fireweed
EPIBEH	<i>Epilobium behringianum</i>	Willowherb
EPIGLA	<i>Epilobium glandulosum</i>	Glandular willow-herb

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME	COMMON NAME
FORBS (continued)		
EPIHOR	<i>Epilobium hornemannii</i>	Willowherb
EPILAT	<i>Epilobium latifolium</i>	Dwarf fireweed
EPILEP	<i>Epilobium leptocarpum</i>	Willowherb
EPILUT	<i>Epilobium luteum</i>	Yellow willow-herb
EPIPAL	<i>Epilobium palustre</i>	Swamp willow-herb
EQUARV	<i>Equisetum arvense</i>	Meadow horsetail
EQUFLU	<i>Equisetum fluviatile</i>	Swamp horsetail
EQUPAL	<i>Equisetum palustre</i>	Marsh horsetail
EQUpra	<i>Equisetum pratense</i>	Meadow horsetail
EQUVAR	<i>Equisetum variegatum</i>	Northern horsetail
ERIHUM	<i>Erigeron humilis</i>	Arctic-alpine daisy
ERIPER	<i>Erigeron peregrinus</i>	Subalpine daisy
EUPMOL	<i>Euphrasia mollis</i>	Arctic eyebright
FAUCRI	<i>Fauria crista-galli</i>	Deer cabbage
FRACHI	<i>Frageria chiloensis</i>	Beach strawberry
FRICAM	<i>Fritillaria camschatcensis</i>	Chocolate lily
GALTRI	<i>Galium trifidum</i>	Small bedstraw
GALTRIC	<i>Galium trifidum columbicum</i>	Small bedstraw
GALTRIT	<i>Galium trifidum trifidum</i>	Small bedstraw
GALTRIL	<i>Galium triflorum</i>	Sweet-scented bedstraw
GENAMA	<i>Gentiana amarella</i>	Gentian
GENDOU	<i>Gentiana douglasiana</i>	Swamp gentian
GENPLA	<i>Gentiana platypetala</i>	
GENPRO	<i>Gentiana propinqua</i>	Four-parted gentian
GERERI	<i>Geranium erianthum</i>	Northern geranium
GEUCAL	<i>Geum calthifolium</i>	Caltha-leaf avens
GEUMAC	<i>Geum macrophyllum</i>	Large-leaf avens
GLAMAR	<i>Glaux maritima</i>	Sea milkwort
GLELIT	<i>Glehnia littoralis</i>	Glehnia
GOOBL	<i>Goodyera oblongifolia</i>	Menzies' rattlesnake
HEDALP	<i>Hedysarum alpinum</i>	Alpine sweet-vetch
HERLAN	<i>Heracleum lanatum</i>	Cow parsnip
HEUGLA	<i>Heuchera glabra</i>	Alpine heuchera
HIPVUL	<i>Hippuris vulgaris</i>	Common mareetail
HIPTET	<i>Hippuris tetraphylla</i>	Four-leaf mareetail
HONPEP	<i>Honckenya peploides major</i>	Seabeach sandwort
IRISET	<i>Iris setosa</i>	Wild iris
LATMAR	<i>Lathyrus maritimus</i>	Beach pea
LATPAL	<i>Lathyrus palustris</i>	Wild-pea
LEPPYR	<i>Leptarrhena pyrolifolia</i>	Leatherleaf saxifrage
LIGSCO	<i>Ligusticum scoticum</i>	Hulten sea-lovage
LISCAU	<i>Listera caurina</i>	Western twayblade
LISCOR	<i>Listera cordata</i>	Heart-leaved twayblade
LOMROT	<i>Lomatogonium rotatum</i>	Marsh felwort
LUPKUS	<i>Lupinus Kuschei</i>	Lupine
LUPNOO	<i>Lupinus nootkatensis</i>	Nootka lupine
LYSAME	<i>Lysichitum americanum</i>	Yellow skunk-cabbage
LYSTHY	<i>Lysimachia thyrsiflora</i>	Tufted loosestrife
MAIDIL	<i>Maianthemum dilatatum</i>	Deerberry
MALMON	<i>Malaxis monophylla</i>	White adder's-tongue
MENARV	<i>Mentha arvensis</i>	Field mint
MENTRI	<i>Menyanthes trifoliata</i>	Buckbean
MERMAR	<i>Mertensia maritima</i>	Oysterplant
MIMGUT	<i>Mimulus guttatus</i>	Monkey flower
MOELAT	<i>Moehringia lateriflora</i>	Grove sandwort
MONUNI	<i>Moneses uniflora</i>	Single delight

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME	COMMON NAME
FORBS (continued)		
MYRALT	Myriophyllum alterniflorum	Water-milfoil
MYRSPI	Myriophyllum spicatum	Water-milfoil
NUPPOL	Nuphar polysepalum	Yellow water lily
OSMCHI	Osmorhiza chilensis	Sweet cicely
OSMDEP	Osmorhiza depauperata	Sweet cicely
OSMPUR	Osmorhiza purpurea	Sweet cicely
OXYDIG	Oxyria digyna	
OXYCAM	Oxytropis campestris	
PARFIM	Parnassia fimbriata	Grass of Parnassus
PARKOT	Parnassia kotzebuei	Grass of Parnassus
PARPAL	Parnassia palustris	Grass of Parnassus
PEDOED	Pedicularis oederi	Lousewort
PEDPAR	Pedicularis parviflora	Lousewort
PEDSUD	Pedicularis sudetica	Lousewort
PETHYP	Petasites hyperboreus	Cocksfoot
PINVUL	Pinguicula vulgaris	Common butterwort
PLAMAC	Plantago macrocarpa	Plantain
PLAMAJ	Plantago major var. major	Common plantain
PLAMAR	Plantago maritima	Plantain
PLADIL	Platanthera dilatata	White bog-orchid
PLAHYP	Platanthera hyperborea	Northern bog-orchid
PLASAC	Platanthera saccata	Slender bog-orchid
POLACU	Polemonium acutiflorum	Jacob's ladder
POLVIV	Polygonum viviparum	Bistort
POTBER	Potamogeton Berchtoldi	Pondweed
POTALP	Potamogeton alpinus	Pondweed
POTGRA	Potamogeton gramineus	Pondweed
POTNAT	Potamogeton natans	Pondweed
POTPEC	Potamogeton pectinatus	Pondweed
POTRIC	Potamogeton richardsonii	Pondweed
POTFIL	Potamogeton filiformis	Pondweed
POTEGE	Potentilla egedii grandis	Pacific silverweed
POTPAL	Potentilla palustris	Marsh cinquefoil
POTVIL	Potentilla villosa	Marsh cinquefoil
POTVIR	Potentilla virgulata	Marsh cinquefoil
PREALA	Prenanthes alata	Rattlesnake root
PRIEGA	Primula egaliksensis	
PYRASA	Pyrola asarifolia	Wintergreen
PYRGRA	Pyrola grandiflora	Wintergreen
PYRMIN	Pyrola minor	Wintergreen
PYRSEC	Pyrola secunda	One-sided wintergreen
RANBON	Ranunculus Bongardi	Buttercup
RANMAC	Ranunculus Macounii	Buttercup
RANCON	Ranunculus confervoides	Buttercup
RANCYM	Ranunculus cymbalaria	Buttercup
RANESC	Ranunculus eschscholtzii	Buttercup
RANFLA	Ranunculus flammula	Buttercup
RANNIV	Ranunculus nivalis	Buttercup
RANOCC	Ranunculus occidentalis Nelsoni	Buttercup
RANPAC	Ranunculus pacificus	Buttercup
RANPAL	Ranunculus pallasii	Buttercup
RANTRI	Ranunculus trichophyllus	Buttercup
RHIMIN	Rhinanthus minor borealis	Yellow rattle box
ROMSIT	Romanzoffia sitchensis	
RUBARCS	Rubus arcticus spp. stellatus	Nagoonberry
RUBPED	Rubus pedatus	Five-fingered bramble

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME	COMMON NAME
FORBS (continued)		
RUMFEN	<i>Rumex fenestratus</i>	Dock
SAGCRA	<i>Sagina crassicaulis</i>	
SAGOCC	<i>Sagina occidentalis</i>	
SANMEN	<i>Sanguisorba menziesii</i>	Burnet
SANSTI	<i>Sanguisorba stipulata</i>	Burnet
SAUAME	<i>Saussurea americana</i>	
SAXLYA	<i>Saxifraga Lyallii</i>	Saxifrage
SAXMER	<i>Saxifraga Mertensiana</i>	Saxifrage
SAXRIV	<i>Saxifraga rivularis</i>	Saxifrage
SCHPAL	<i>Scheuchzeria palustris</i>	
SEDROS	<i>Sedum rosea</i>	Sneezeweed
SENPAU	<i>Senecio pauciflorus</i>	Sneezeweed
SENPSE	<i>Senecio pseudo-Arnica</i>	Sneezeweed
SENTRI	<i>Senecio triangularis</i>	Arrowleaf Groundsel
SENVUL	<i>Senecio vulgaris</i>	
SIBPRO	<i>Sibbaldia procumbens</i>	
SILACA	<i>Silene acaulis</i>	
SISLIT	<i>Sisyrinchium litorale</i>	
SOLCAN	<i>Solidago canadensis</i>	Goldenrod
SOLLEP	<i>Solidago lepida</i>	Goldenrod
SOLMUL	<i>Solidago multiradiata</i>	Goldenrod
SPAANG	<i>Sparganium angustifolium</i>	Bur-reed
SPAHYP	<i>Sparganium hyperboreum</i>	Bur-reed
SPECAN	<i>Spergularia canadensis</i>	
SPIROM	<i>Spiranthes romanzoffiana</i>	
STEBOR	<i>Stellaria borealis</i>	Chickweed
STECAL	<i>Stellaria calycantha</i>	Chickweed
STECRA	<i>Stellaria crassifolia</i>	Chickweed
STECRI	<i>Stellaria crispa</i>	Chickweed
STEHUM	<i>Stellaria humifusa</i>	Chickweed
STELON	<i>Stellaria longipes</i>	Chickweed
STESIT	<i>Stellaria sitchana</i>	Chickweed
STELLA	<i>Stellaria species</i>	Chickweed
STRAMP	<i>Streptopus amplexifolius</i>	Clasping twisted stalk
STRROS	<i>Streptopus roseus</i>	Rosy bells
SWEPER	<i>Swertia perennis</i>	Swertia
TARAXA	<i>Taraxacum</i> spp.	Dandelion
TELGRA	<i>Tellima grandiflora</i>	
THAALP	<i>Thalictrum alpinum</i>	Alpine meadow rue
THASPA	<i>Thalictrum sparsiflorum</i>	Meadow rue
TIATRI	<i>Tiarella trifoliata</i>	Foam flower
TIAUNI	<i>Tiarella unifoliata</i>	Foam flower
TOFGLU	<i>Tofieldia glutinosa</i>	Sticky asphodel
TRIEUR	<i>Trientalis europea</i>	Star flower
TRIMAR	<i>Triglochin maritimum</i>	Arrowgrass
TRIPAL	<i>Triglochin palustre</i>	Arrowgrass
URTLYA	<i>Urtica Lyallii</i>	Nettle
UTRINT	<i>Utricularia intermedia</i>	Bladderwort
VALSIT	<i>Valeriana sitchensis</i>	Valerian
VERVIR	<i>Veratrum viride</i>	False hellebore
VERSER	<i>Veronica serpyllifolia</i>	Veronica
VIOEPI	<i>Viola epipsila</i>	Violet
VIOGLA	<i>Viola glabella</i>	Violet
VIOLAN	<i>Viola langsdorfii</i>	Violet

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME -	COMMON NAME
GRAMINOIDS		
AGRAEQ	<i>Agrostis aequivalvis</i>	
AGRALA	<i>Agrostis alaskana</i>	
AGRBOR	<i>Agrostis borealis</i>	
AGREXA	<i>Agrostis exarata</i>	
AGRSCA	<i>Agrostis scabra</i>	
BROCIL	<i>Bromus ciliatus</i>	
CALCAN	<i>Calamagrostis canadensis</i>	
CALINE	<i>Calamagrostis inexpectata</i>	
CALNEG	<i>Calamagrostis neglecta</i>	
CALNUT	<i>Calamagrostis nutkanaensis</i>	
CARBIG	<i>Carex Bigelowii</i>	
CARMER	<i>Carex Mertensii</i>	
CARANT	<i>Carex anthoxanthae</i>	
CARAQU	<i>Carex aquatilis</i>	
CARATR	<i>Carex atrata</i>	
CARCAN	<i>Carex canescens</i>	
CARCAP	<i>Carex capillaris</i>	
CARDIA	<i>Carex diandra</i>	
CARDIO	<i>Carex dioica</i>	
CARDIS	<i>Carex disperma</i>	
CARELE	<i>Carex eleusinoides</i>	
CARFLA	<i>Carex flava</i>	
CARGME	<i>Carex gmelini</i>	
CARINT	<i>Carex interior</i>	
CARLAC	<i>Carex lachenalii</i> (bipartita)	
CARLEP	<i>Carex leptalea</i>	
CARLIM	<i>Carex limosa</i>	
CARLIV	<i>Carex livida</i>	
CARLYN	<i>Carex lyngbyei</i>	
CARMACL	<i>Carex macloviana</i>	
CARMACE	<i>Carex macrocephala</i>	
CARMACH	<i>Carex macrochaeta</i>	
CARMAR	<i>Carex maritima</i>	
CARMICG	<i>Carex microglochin</i>	
CARMUR	<i>Carex muricata</i>	
CAROED	<i>Carex oederi</i>	
CARPAC	<i>Carex pachystachya</i>	
CARPAU	<i>Carex pauciflora</i>	
CARPHY	<i>Carex phyllomenica</i>	
CARPLU	<i>Carex pluriflora</i>	
CARPRE	<i>Carex preslii</i>	
CARPYR	<i>Carex pyrenaica</i>	
CARROS	<i>Carex rostrata</i>	
CARSAX	<i>Carex saxatilis</i>	
CARSIT	<i>Carex sitchensis</i>	
CARSTE	<i>Carex stenophylla</i>	
CARSTY	<i>Carex stylosa</i>	
CINLAT	<i>Cinna latifolia</i>	
DESBER	<i>Deschampsia beringensis</i>	
DESCAE	<i>Deschampsia caespitosa</i>	
DESELO	<i>Deschampsia elongata</i>	
ELEKAM	<i>Eleocharis kamtschatica</i>	
ELENIT	<i>Eleocharis nitida</i>	
ELEPAL	<i>Eleocharis palustris</i>	
ELEQUI	<i>Eleocharis quinqueflora</i>	
ELYARE	<i>Elymus arenarius mollis</i>	

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME	COMMON NAME
GRAMINOIDS (continued)		
ELYGLA	<i>Elymus glaucus</i>	
ELYHIR	<i>Elymus hirsutus</i>	
ELYSUB	<i>Elymus subsecundus</i>	
ERIANG	<i>Eriophorum angustifolium</i>	
ERIRUS	<i>Eriophorum russeolum</i>	
FESBRA	<i>Festuca brachyphylla</i>	
FESRUB	<i>Festuca rubra</i>	
GLYBOR	<i>Glyceria borealis</i>	
GLYPAU	<i>Glyceria pauciflora</i>	
HIEODO	<i>Hierochloa odorata</i>	
HORBRA	<i>Hordeum brachyantherum</i>	
HORJUB	<i>Hordeum jubatum</i>	
JUNALP	<i>Juncus alpinus</i>	
JUNARCS	<i>Juncus ercticus</i> spp. <i>sitchensis</i>	
JUNBUF	<i>Juncus bufonius</i>	
JUNCAS	<i>Juncus cestaneus</i>	
JUNFAL	<i>Juncus falcatus</i>	
JUNFIL	<i>Juncus filiformis</i>	
JUNTRI	<i>Juncus triglumis</i>	
LUZMUL	<i>Luzula multiflora</i>	
LUZPAR	<i>Luzula parviflora</i>	
LUZRUF	<i>Luzula rufescens</i>	
LUZSPI	<i>Luzula spicata</i>	
PHAARU	<i>Phalaris arundinacea</i>	
PHLCOM	<i>Phleum commutatum americanum</i>	
POAALP	<i>Poa alpina</i>	
POAARC	<i>Poa arctica</i>	
POAEMI	<i>Poa eminens</i>	
POAGLA	<i>Poa glauca</i>	
POALAX	<i>Poa laxiflora</i>	
POAPAL	<i>Poa palustris</i>	
POAPRA	<i>Poa pratensis</i>	
PUCMAR	<i>Puccinellia maritima</i>	
PUCNUT	<i>Puccinellia nutkaensis</i>	
PUCPUM	<i>Puccinellia pumila</i>	
SCIMIC	<i>Scirpus microcarpus</i>	
TRICAE	<i>Trichophorum cespitosum</i>	
TRICER	<i>Trisetum cernuum</i>	
TRISPI	<i>Trisetum spicatum</i>	
VAHATR	<i>Vahlodea atropurpurea latifolia</i>	

FERNS AND ALLIES

ADIPED	<i>Adiantum pedatum</i>
ATHFIL	<i>Athyrium filix-femina</i>
BLESPI	<i>Blechnum spicant</i>
BOTLUN	<i>Botrychium lunaria</i>
BOTMUL	<i>Botrychium multifidum</i>
CRYCRI	<i>Cryptogramma crispa</i>
CYSFRA	<i>Cystopteris fragilis</i>
DRYDIL	<i>Dryopteris dilatata</i>
GYMDRY	<i>Gymnocarpium dryopteris</i>
ISOTRU	<i>Isoetes truncata</i>
LYCANN	<i>Lycopodium annotinum</i>
LYCSEL	<i>Lycopodium selago</i>
POLGLY	<i>Polypodium glycyrrhiza</i>
POLBRA	<i>Polystichum Braunii</i>
THEPHE	<i>Thelypteris phegopteris</i>

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME -	COMMON NAME
MOSSES		
ANTCUR	<i>Antitrichia curtipendula</i>	
AULPAL	<i>Aulecomium palustre</i>	
BRAHYL	<i>Brachythecium hylotepetum</i>	
BRAPLU	<i>Brachythecium plumosum</i>	
CALGIG	<i>Celligeron giganteum</i>	
CAMSTE	<i>Campylium stellatum</i>	
CERPUR	<i>Ceratodon purpureus</i>	
CLIDEN	<i>Climecium dendroides</i>	
DICACU	<i>Dicranium acutifolium</i>	
DICHOW	<i>Dicranium howellii</i>	
DICMAJ	<i>Dicranium majus</i>	
DREADU	<i>Drepanocladus aduncus</i>	
DREREV	<i>Drepanocladus revolvens</i>	
DREUNC	<i>Drepanocladus unceriatus</i>	
EURPRA	<i>Eurhynchium praelongum</i>	
FISADI	<i>Fissidens adianthoides</i>	
FISOSM	<i>Fissidens osmundoides</i>	
HELBLA	<i>Helodium blandowii</i>	
HOMFUL	<i>Homolotriecium Fulgens</i>	
HYGOCH	<i>Hygrohypnum ochraceum</i>	
HYLSPL	<i>Hylacomium splendens</i>	
HYPCAL	<i>Hypnum callichroum</i>	
HYPCUP	<i>Hypnum cupressiforme</i>	
HYPREV	<i>Hypnum revolutum</i>	
ISOSEL	<i>Isopterygium seligeri</i>	
ISOSTO	<i>Isothecium stoloniferum</i>	
MEETRI	<i>Meesia triquetra</i>	
MNIUM	<i>Mnium spp.</i>	
ONCWAH	<i>Oncophorus wahlenbergii</i>	
ORTCON	<i>Orthotrichum consimile</i>	
ORTHOT	<i>Orthotrichum spp.</i>	
PALSQU	<i>Paludella squarrosa</i>	
PHIFON	<i>Philonotis fontana</i>	
PLAINS	<i>Plagiomnium insignis</i>	
PLAMED	<i>Plagiomnium medium</i>	
PLARUG	<i>Plagiomnium rugicum</i>	
PLAGIO	<i>Plagiomnium spp.</i>	
PLAPIL	<i>Plagiothecium piliferum</i>	
PLAUND	<i>Plagiothecium undulatum</i>	
PLESCH	<i>Pleurozium schreberi</i>	
POGALP	<i>Pogonatum alpinus</i>	
POGCON	<i>Pogonatum contortum</i>	
POHDRU	<i>Pohlia drummondii</i>	
POLCOM	<i>Polytrichum commune</i>	
POLSTR	<i>Polytrichum strictum</i>	
PTICRI	<i>Ptilium crista-castrensis</i>	
RACCAN	<i>Racomitrium canescens</i>	
RACHET	<i>Racomitrium heterostichum</i>	
RACLAN	<i>Racomitrium lanuginosum</i>	
RHIGLA	<i>Rhizomnium glabrescens</i>	
RHINUD	<i>Rhizomnium nudum</i>	
RHIPSE	<i>Rhizomnium pseudopunctatum</i>	
RHYLOR	<i>Rhytidiadelphus loreus</i>	
RHYSQU	<i>Rhytidiadelphus squarrosus</i>	
RHYTRI	<i>Rhytidiadelphus triquetrus</i>	
SCLCES	<i>Scleropodium cespitans</i> var. <i>sublaeve</i>	
SCOSCO	<i>Scorpidium scorpioides</i>	

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME	COMMON NAME
MOSSES (continued)		
SPHAGN	<i>Sphagnum</i> spp.	
SPHAND	<i>Sphagnum andersonianum</i>	
SPHANG	<i>Sphagnum angustifolium</i>	
SPHAUS	<i>Sphagnum austinii</i>	
SPHBAL	<i>Sphagnum balticum</i>	
SPHBAR	<i>Sphagnum bartlettianum</i>	
SPHCOM	<i>Sphagnum compactum</i>	
SPHFIM	<i>Sphagnum fimbriatum</i>	
SPHFUS	<i>Sphagnum fuscum</i>	
SPHGIR	<i>Sphagnum girgensohnii</i>	
SPHHEN	<i>Sphagnum henryense</i>	
SPHLIN	<i>Sphagnum Lindbergii</i>	
SPHMAG	<i>Sphagnum magellanicum</i>	
SPHMEN	<i>Sphagnum mendocinum</i>	
SPHPAC	<i>Sphagnum pacificum</i>	
SPHPAP	<i>Sphagnum papillosum</i>	
SPHPLA	<i>Sphagnum platyphyllum</i>	
SPHRIP	<i>Sphagnum riparium</i>	
SPHRUB	<i>Sphagnum rubellum</i>	
SPHRUS2	<i>Sphagnum rubiginosum</i>	
SPHRUS	<i>Sphagnum russowii</i>	
SPHSQU	<i>Sphagnum squarrosum</i>	
SPHSUB	<i>Sphagnum subnitens</i>	
SPHSUB3	<i>Sphagnum subobesum</i>	
SPHSUB2	<i>Sphagnum subsecundum</i>	
SPHTEN	<i>Sphagnum tenellum</i>	
SPHTER	<i>Sphagnum teres</i>	
SPHWAR	<i>Sphagnum warnetorffii</i>	
SPHWIL	<i>Sphagnum wilffii</i>	
SPHZIC	<i>Sphagnum zickendrethii</i>	
ULOCRI	<i>Ulota crispa</i>	
ULOPHY	<i>Ulota phyllantha</i>	
LICHENS		
ALESAR	<i>Alectoria sarmentosa</i>	
BRYBIC	<i>Bryoria bicolor</i>	
BRYCAR	<i>Bryoria carlottae</i>	
BRYTRI	<i>Bryoria trichoclea</i>	
CAVHUL	<i>Cavernularia hultenii</i>	
CAVLOP	<i>Cavernularia lophyrea</i>	
CETCHL	<i>Cetraria chlorophylla</i>	
CETISL	<i>Cetraria islandica</i>	
CLAARB	<i>Cladonia arbuscula</i>	
CLARAN	<i>Cladonia rangiferina</i>	
CLABEL	<i>Cladonia bellidiflora</i>	
CLAFIM	<i>Cladonia fimbriata</i> (group)	
CLAGRA	<i>Cladonia gracilis</i>	
CLAMAX	<i>Cladonia maxima</i>	
CLAUNC	<i>Cladonia uncialis</i>	
DENINT	<i>Dendriocaulon intracaulum</i>	
HYPDUP	<i>Hypogymnia duplicata</i>	
HYPENT	<i>Hypogymnia enteromorpha</i>	
ICMERI	<i>Imadophila ericetrum</i>	
LEPSAT	<i>Leptogium saturnium</i>	
LOBLAL	<i>Lobaria lallii</i>	
LOBLIN	<i>Lobaria linia</i>	

Appendix 5. (concluded)

SPECIES CODE	SCIENTIFIC NAME	COMMON NAME
LICHENS (continued)		
LOBORE	<i>Lobaria oregania</i>	
LOBPUL	<i>Lobaria pulmonaria</i>	
LOBRET	<i>Lobaria retigera</i>	
LOBSCR	<i>Lobaria scrobiculata</i>	
LOXOSP	<i>Loxospora</i> spp.	
NEPBEL	<i>Nephroma bellum</i>	
NEPHEL	<i>Nephroma helveticum</i>	
NEPISI	<i>Nephroma isidiosum</i>	
NEPRES	<i>Nephroma resupinatum</i>	
PARSAX	<i>Parmelia saxatilis</i>	
PARSQU	<i>Parmelia squarrosa</i>	
PARSUL	<i>Parmelia sulcata</i>	
PELAPT	<i>Peltigera apthosa</i>	
PELCAN	<i>Peltigera canina</i>	
PELCOL	<i>Peltigera collina</i>	
PELMEM	<i>Peltigera membranacea</i>	
PELPOL	<i>Peltigera polydactyla</i>	
PELSCA	<i>Peltigera scabrosa</i>	
PLAGLA	<i>Platismatia glauca</i>	
PLAHER	<i>Platismatia herrei</i>	
PLALAC	<i>Platismatia lacunosa</i>	
PLANOR	<i>Platismatia norvegica</i>	
PSEANO	<i>Pseudocyphellaria anomala</i>	
PSEANT	<i>Pseudocyphellaria anthopsis</i>	
PSECRO	<i>Pseudocyphellaria crocata</i>	
RAUNAR	<i>Raunaria</i> spp.	
SIP CER	<i>Siphula ceratites</i>	
SPHGLO	<i>Sphaerophorus globosus</i>	
SPHMEL	<i>Sphaerophorus melanocarpa</i>	
STEREO	<i>Stereocaulon</i> spp.	
STIFUL	<i>Sticta fuliginosa</i>	
STIWEI	<i>Sticta weigellii</i>	
USNLON	<i>Usnea longissima</i>	
ALGAE		
	<i>Chara</i> spp.	

