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

Plant Community Ecology and Classification of the Yakutat Foreland, Alaska

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 Krieckhaus, 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
Alnus sinuata/Salix sitchensis (Sitka Alder/Sitka Willow) 120
Alnus sinuata/Malus fusca (Sitka Alder/Crabapple) 123
Alnus sinuata/Rubus spectabilis (Sitka Alder/Salmonberry) 125
*Alnus sinuata/*Graminoid (Sitka Alder/graminoid) 127
Rubus spectabilis/Athyrium filix-femina (Salmonberry/Lady fern) 129

SHRUB TYPES: WILLOW 131
Salix sitchensis (Sitka willow) 132
Salix hookeriana (Hooker willow) 134
Salix barclayi/Carex pluriflora (Barclay willow/many-flowered sedge) 136
Salix barclayi/Carex sitchensis (Barclay willow/Sitka sedge) 138
*Salix barclayi/*mixed herb (Barclay willow/mixed herb) 140
Salix barclayi/Fragaria chiloensis (Barclay willow/beach strawberry) 142

SHRUB TYPES: SWEETGALE 144
Myrica gale/Carex livida (Sweetgale/livid sedge) 145
Myrica gale/Carex sitchensis (Sweetgale/Sitka sedge) 147
Myrica gale/Carex pluriflora (Sweetgale/many-flowered sedge) 149
Myrica gale/Equisetum variegatum (Sweetgale/variegat. scouring-rush) . . 151

SHRUB TYPES: SUBSHRUBS 153
Empetrum nigrum/Carex pluriflora (Crowberry/many-flowered sedge) . . . 153
Vaccinium uliginosum/Empetrum nigrum (Bog blueberry/crowberry) 156
Andromeda polifolia/Carex pluriflora (Bog rosemary/many-flwd. sedge) . . 158

GRAMINOID TYPES 160
Puccinellia pumila (Dwarf alkali grass) 160
Eleocharis palustris (Spike rush) 162
Carex lyngbyei (Lyngbyei sedge) 164
Carex saxatilis (Russet sedge) 166
Carex pluriflora/Carex lyngbyei (Many-flowered sedge/lyngbyei sedge) . . 168
Carex livida/Trichophorum caespitosum (Livid sedge/tufted clubrush) . . . 170
Trichophorum caespitosum (Tufted clubrush) 173
Carex sitchensis/Oxycoccus palustris (Sitka sedge/bog cranberry) 176
Carex sitchensis/Equisetum fluviatile (Sitka sedge/swamp horsetail) 179
Calamagrostis canadensis/potentilla egedii (Bluejoint/Pacific silverweed) . 181
Elymus arenarius (Beach rye grass) 183
Calamagrostis canadensis (Bluejoint) 185

FORB TYPES 187
Nuphar polysepalum (Pond lily) 187
Myriophyllum alterniflorum (Water-milfoil) 189
Equisetum fluviatile (Swamp horsetai 191
Equisetum variegatum (Variegated scouring-rush) 193
Menyanthes trifoliata/Equisetum variegatum (Buckbean/variegated scouring-rush 195
Menyanthes trifoliata/Potentilla palustris (Buckbean/marsh cinquefoil) . . . 197
Mesic forb/*Athyrium filix-femina* (Mesic forb/lady fern) 199
Mesic forb (Mesic forb) 201
Lupinus nootkatensis/Salix setchelliana (Nootka lupine/setchell willow) . . 203
Fragaria chiloensis/Achillea borealis (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

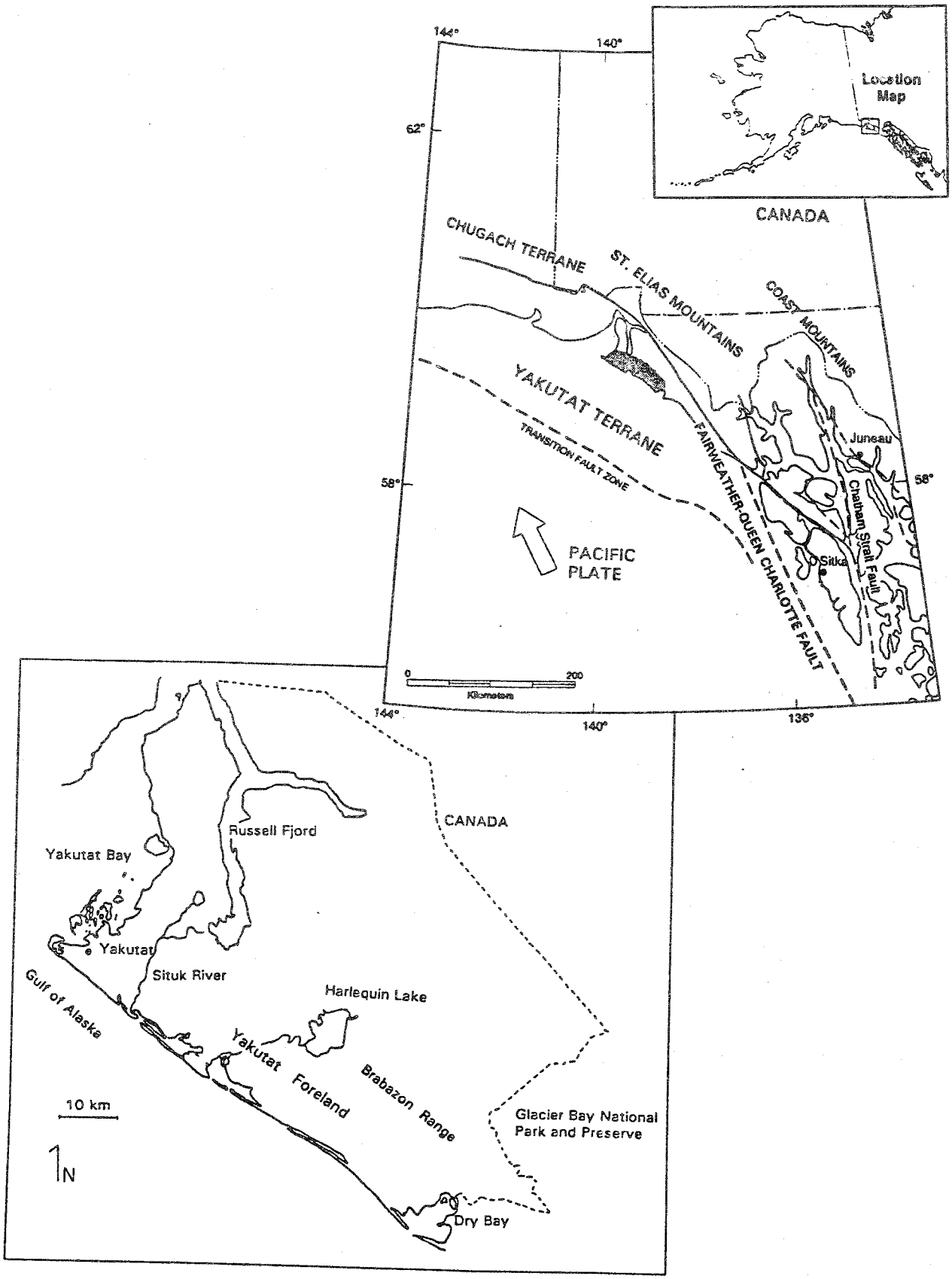


Figure 1. Location of the Yakutat foreland in Southeast Alaska. The central figure illustrates the major tectonic features (after Horner 1990). The arrow indicates relative motion between the Pacific and the North American plates.

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 m^2 (5,370 $feet^2$) 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 $feet^2$) 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 nommunity 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 nutkaenis* 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 ± 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 Ahrnklin 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 ± 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 ± 450	Slate Mesa RL1810	Slate Mesa E. of Russell Fjord	15	Peat (60 cm)	Peteet 1991
9,880 ± 200 AMS radiocarbon dating	Pike Lakes AA4144	Pike Lakes N59°30' W139°10'	30	Pine (210-220 cm)	Peteet 1991
9,560 ± 220	81-8 Beta-3632 Beta Analytic Inc. Coral Gables, FL	Slate Mesa N59°32' W139°10'	375	Peat	Molnia 1986
9,320 ± 350	—	S end of Harlequin Lk.	50	Shells	L.A. Yehle, USGS, reported to Molnia, 1980
6,370 ± 80	81-9 Beta-3633	Tanis Mesa N59°17' W138°34'	245	Peat	Molnia 1986
6,180 ± 100	81-7 Beta-3631	N59°20' W138°52'	335	Peat	Molnia 1986
4,910 ± 85	A-2 USGS-924	*Devils Elbow, Alsek R. N59°12' W138°30'	30	Peat	Molnia 1986
4,700 ± 340	DE 35 Beta-3640	same as above	30	Peaty mud (706 cm)	Molnia 1986
2,560 ± 80	Square Lk. USGS-1227	*Square Lake N58°55' W138°45'	20	Basal sediment (140-150 cm)	Molnia 1986
1,010 ± 50	Square Lk. USGS-1226	same as above	20	(130-137 cm)	Molnia 1986
2,225 ± 300	81-3 Beta-3627	W of Triangle Lk. N59°18' W138°59'	20	Peaty silt (120 cm)	Molnia 1986
1,090 ± 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)	Peteet 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 ± 70 corrected C-13	Lower Dangerous R. #2 Beta-65948	same as above	5	Wood (280 cm)	This study
270 ± 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 ± 70	81-5 Beta-3629	SW of Triangle Lk. N59°17' W138°58'	10	Peat (150 cm)	Molnia 1986
170 ± 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 ± 50 corrected C-13	Tanis River Beta-65951	N59°12' W138°42'	10	Wood	This study
110 ± 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.

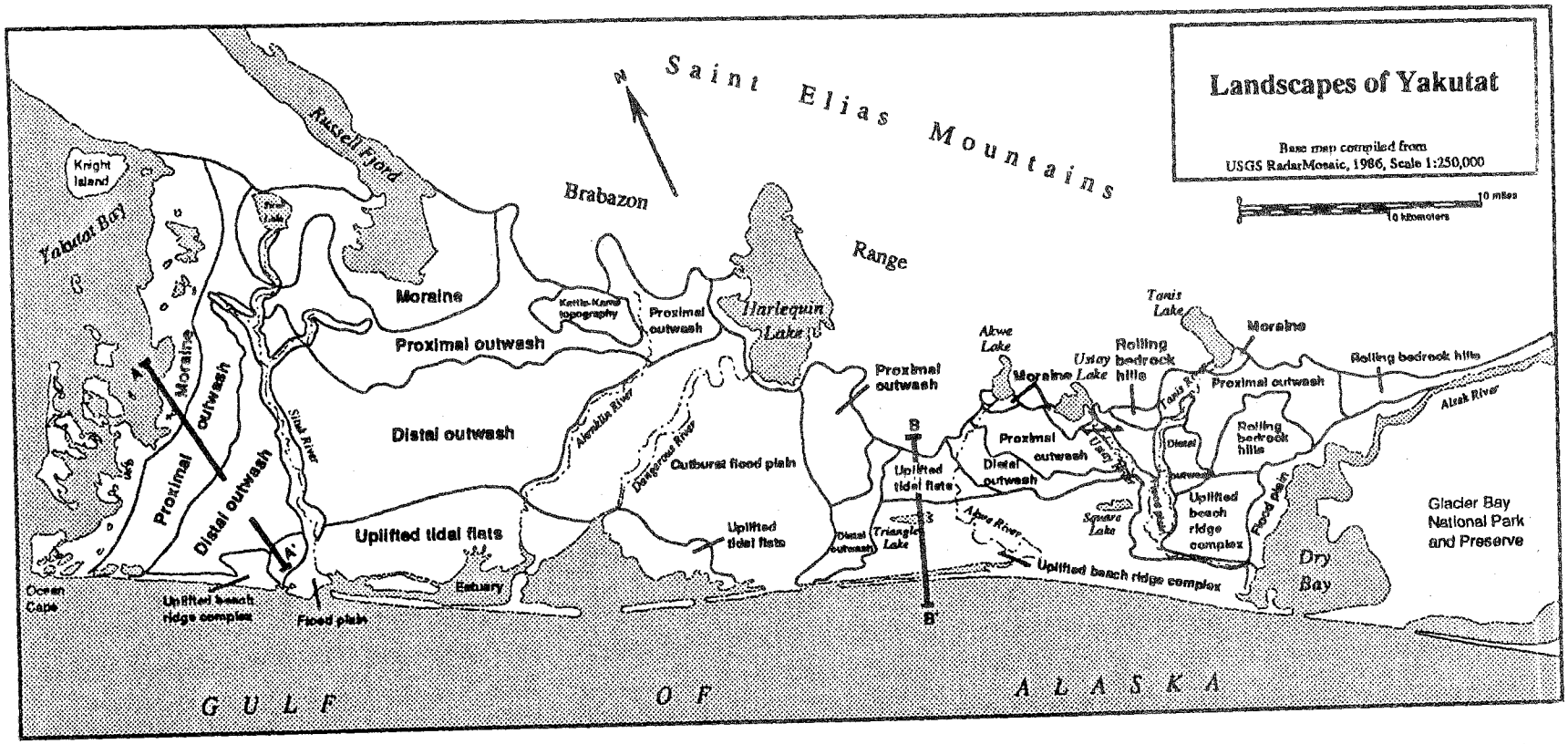


Figure 2. Generalized geomorphic landscapes of the Yakutat foreland (after Yehle 1975 and USFS Integrated Resource Inventory, 1989). See text for landscape descriptions. See Figure 3 for schematic cross-sections A and B.

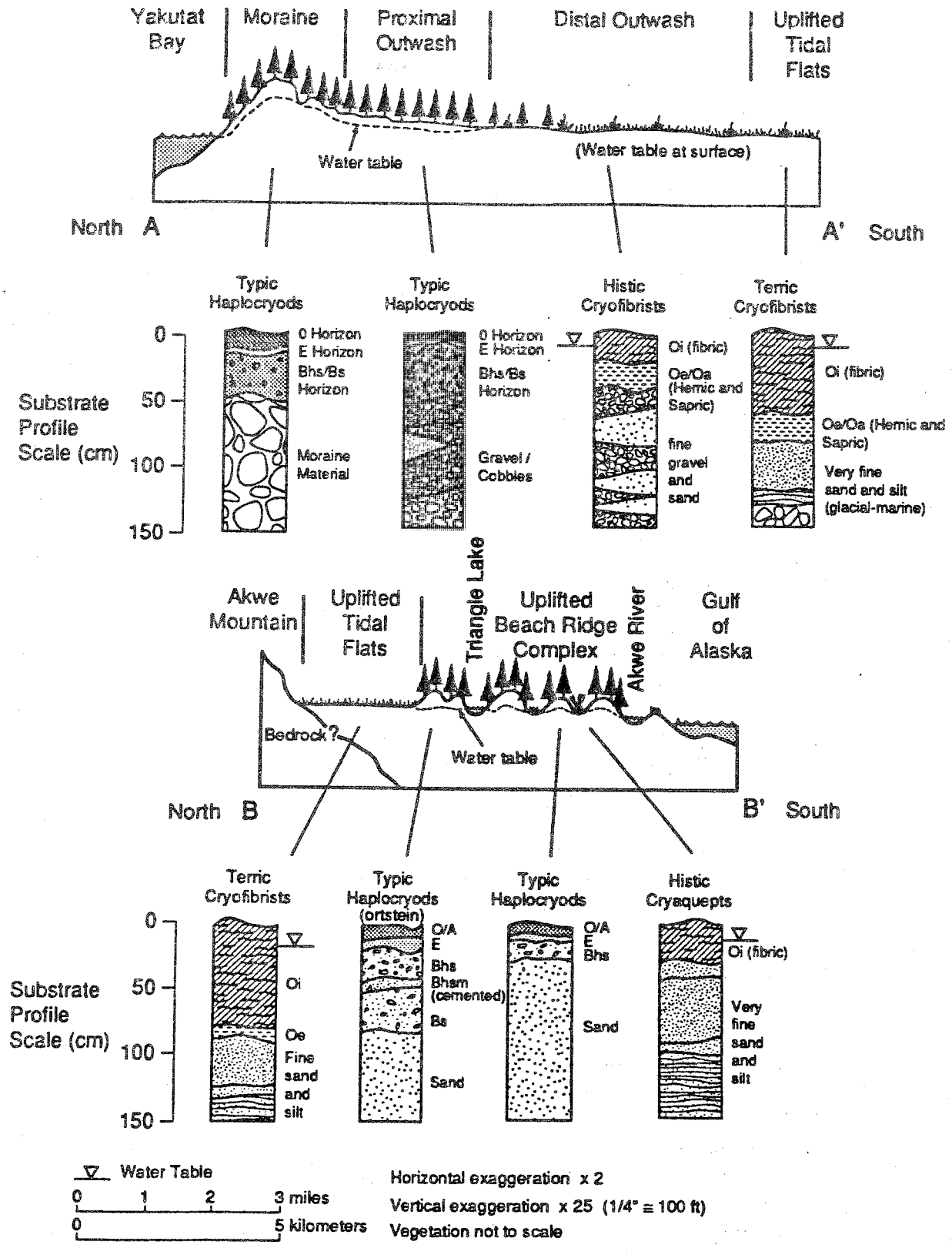


Figure 3. Cross-sectional diagrams across the Yakutat foreland (A-A', B-B'). The principle vegetation growth forms are illustrated in their relation to the landscapes, soils, and water table.

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 m^3/year (183,100 yd^3/yr.) at Palm Beach, Florida and at 566,000 m^3/year (740,300 yd^3/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 Italio Rivers.

Plafker 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 where 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).

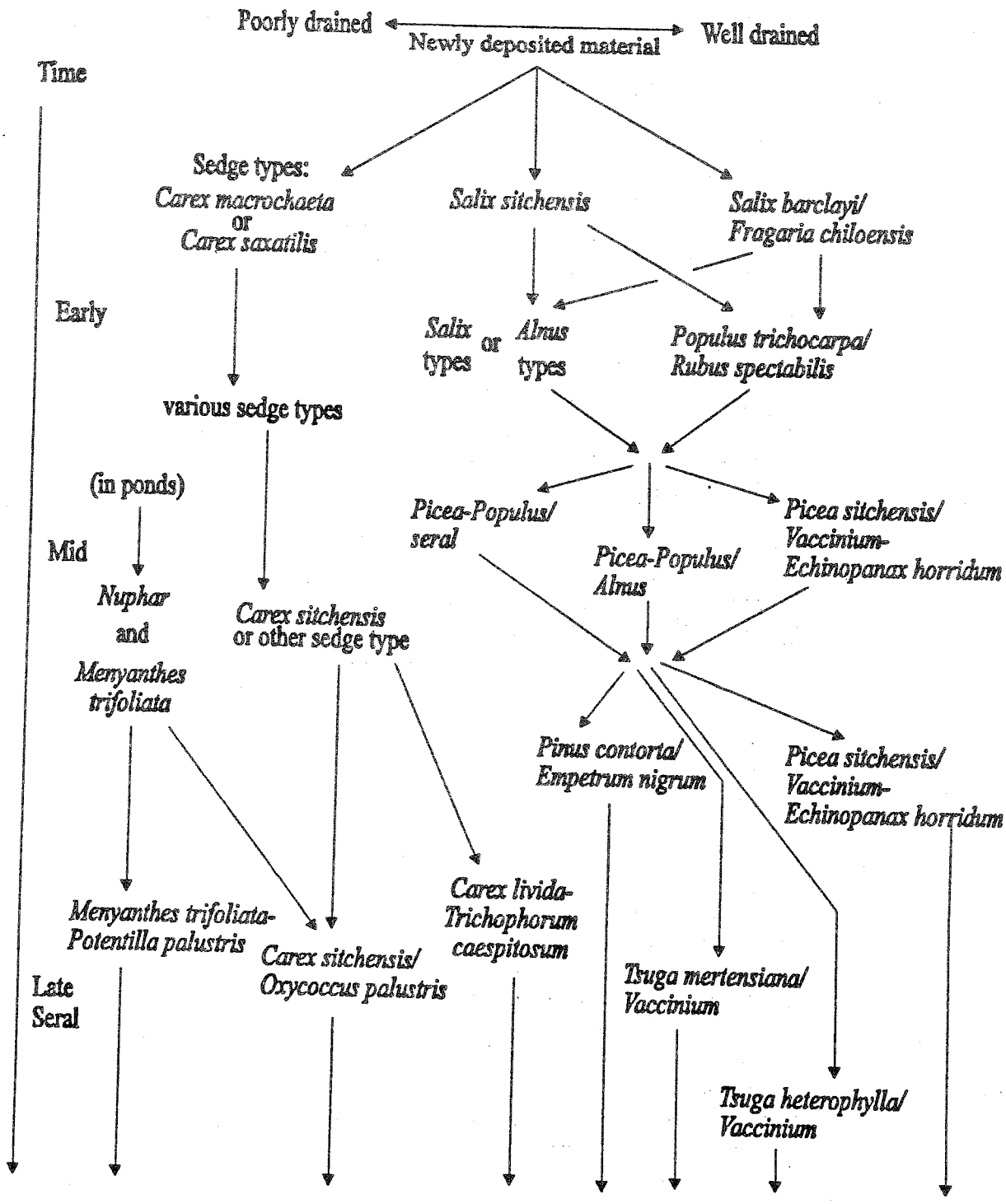
Table 3. Distribution of the 530 plots within the 60 community types across the nine major landscapes of the Yakutat foreland. GM = moraine; PO = proximal outwash; DO = distal outwash; UT = uplifted tidal flats; UB = uplifted beach ridge; FP = flood plain; OF = outburst flood plain; KK = kettle-kame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

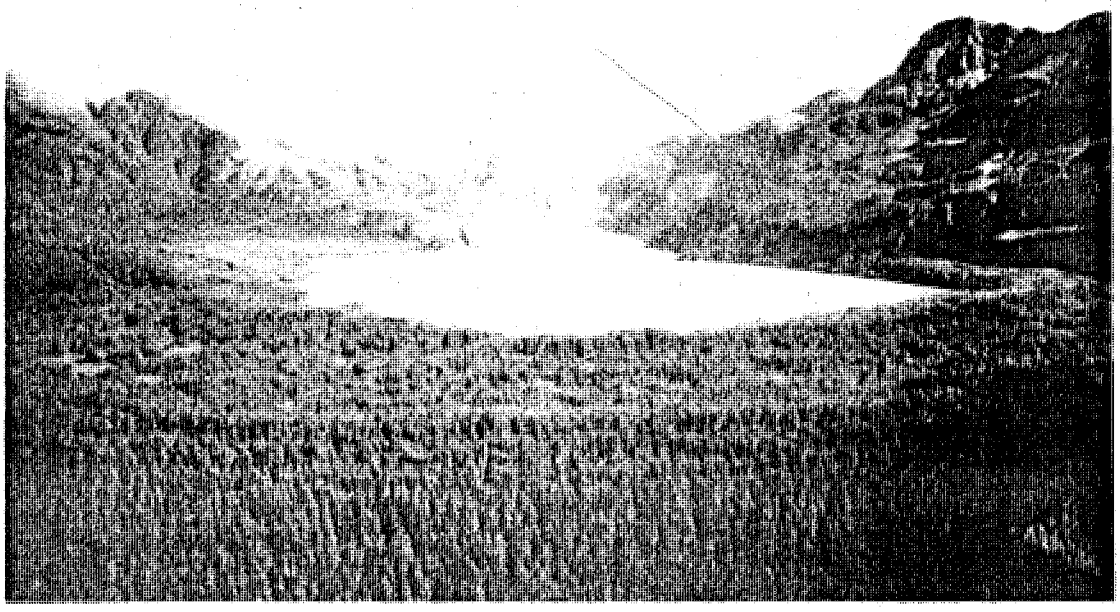


PROXIMAL AND DISTAL OUTWASH PLAINS

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.

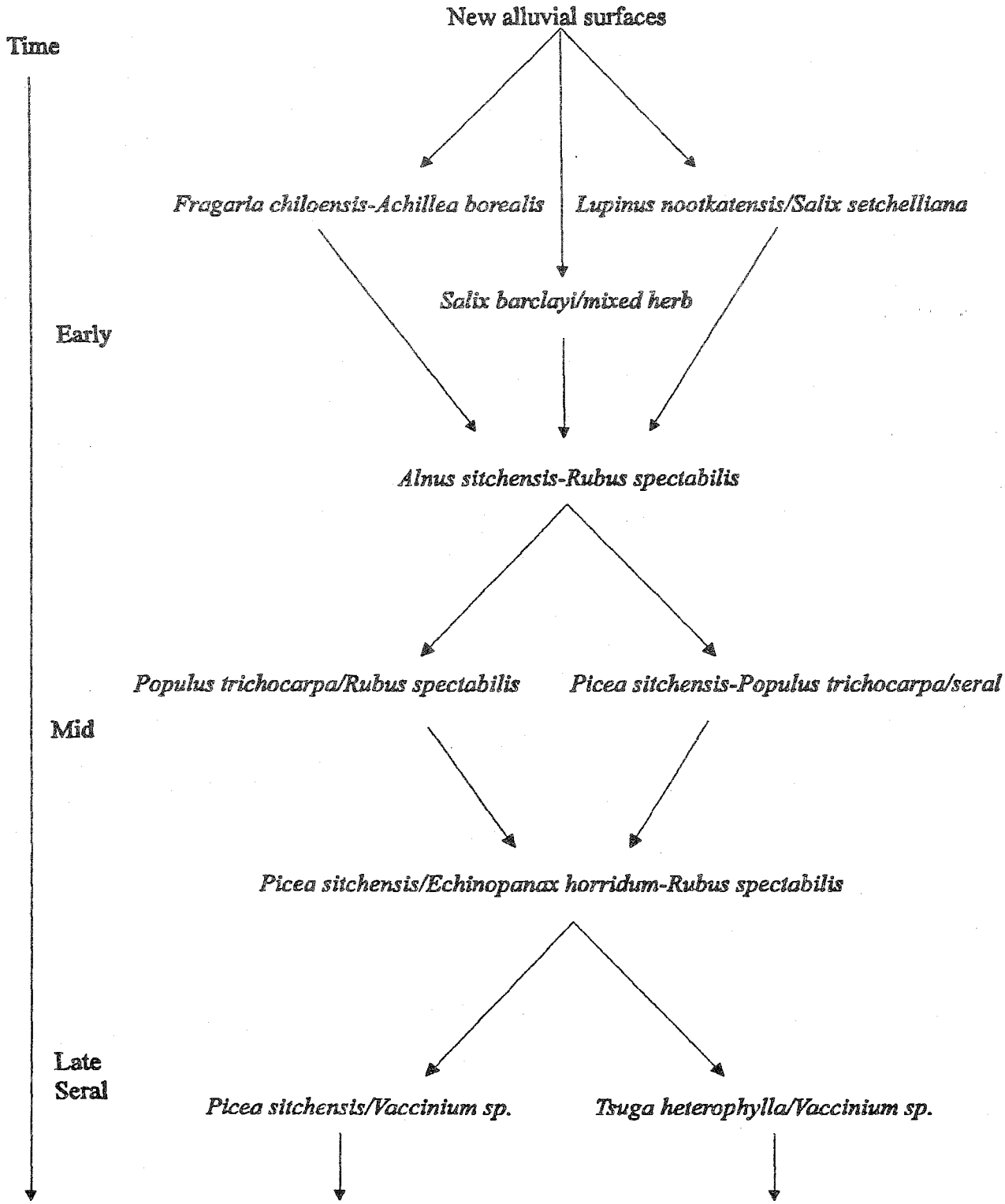
Substrate

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).

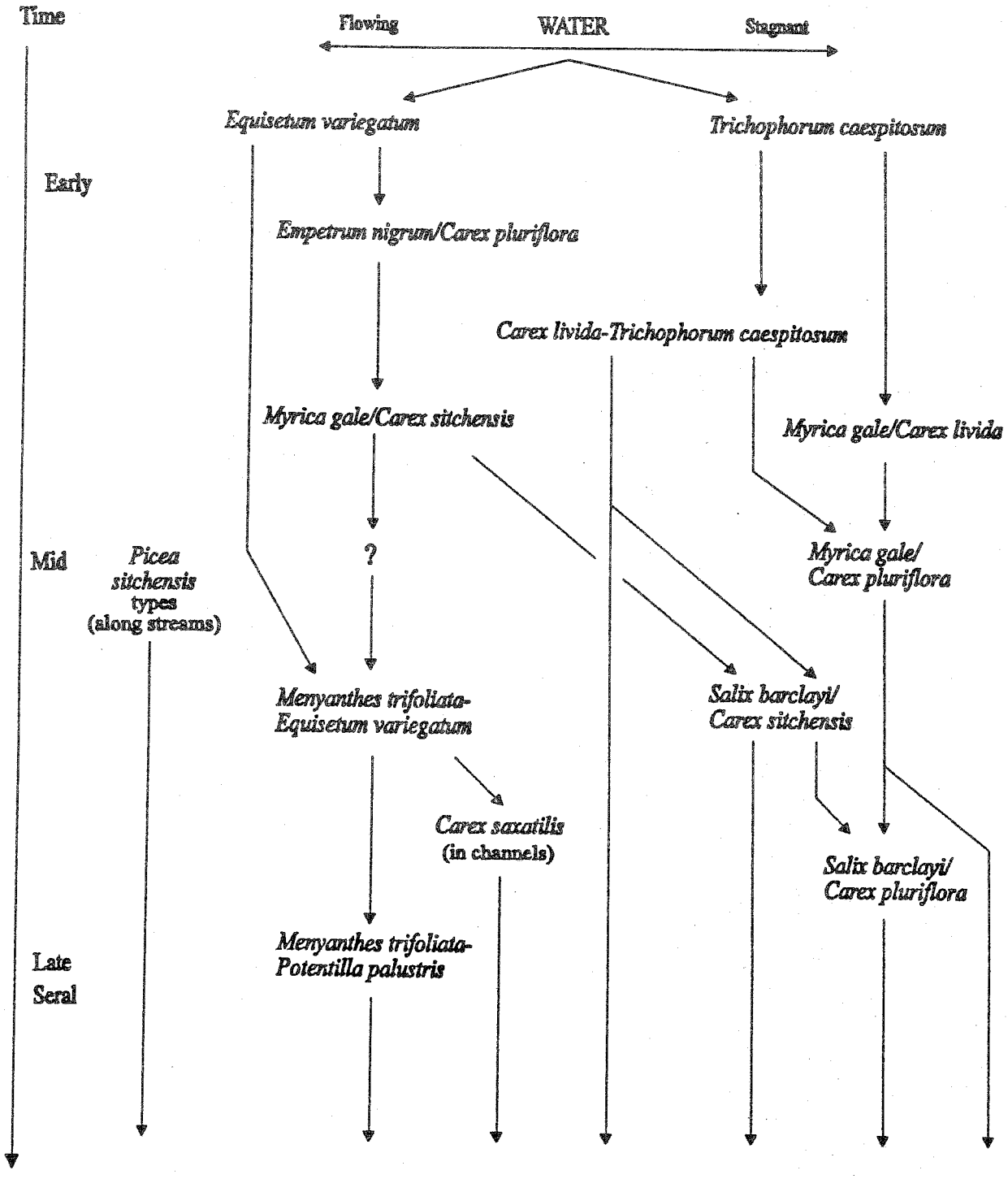
Poor fens or bogs form where subsurface water flow no longer interacts with the surface horizon, due to thick peat accumulation. In these locations are community types such as *Myrica gale/Carex livida* (sweetgale/livid sedge), *Carex livida-Trichophorum caespitosum* (livid sedge-tufted clubrush), and *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 Cryaquents. 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).

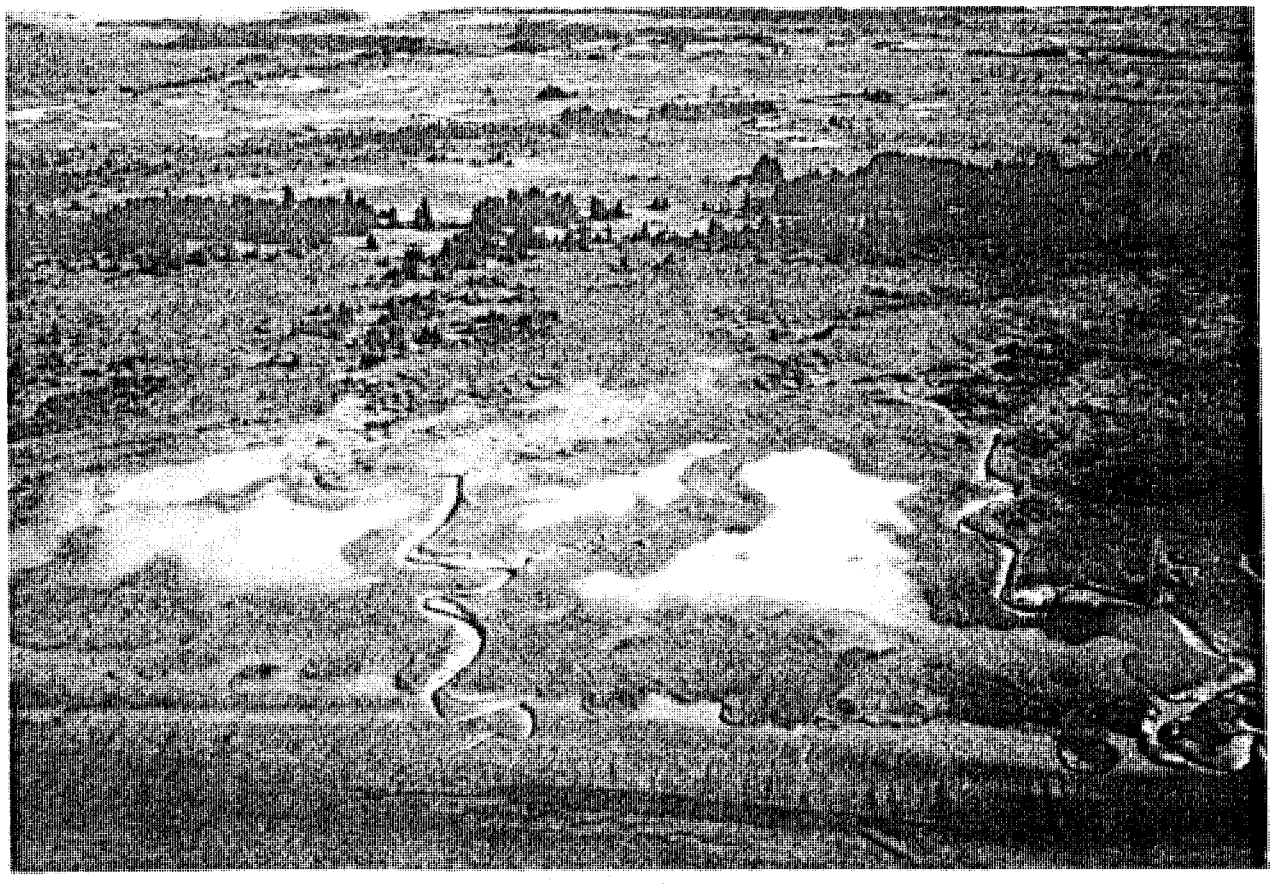
Drainage

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).

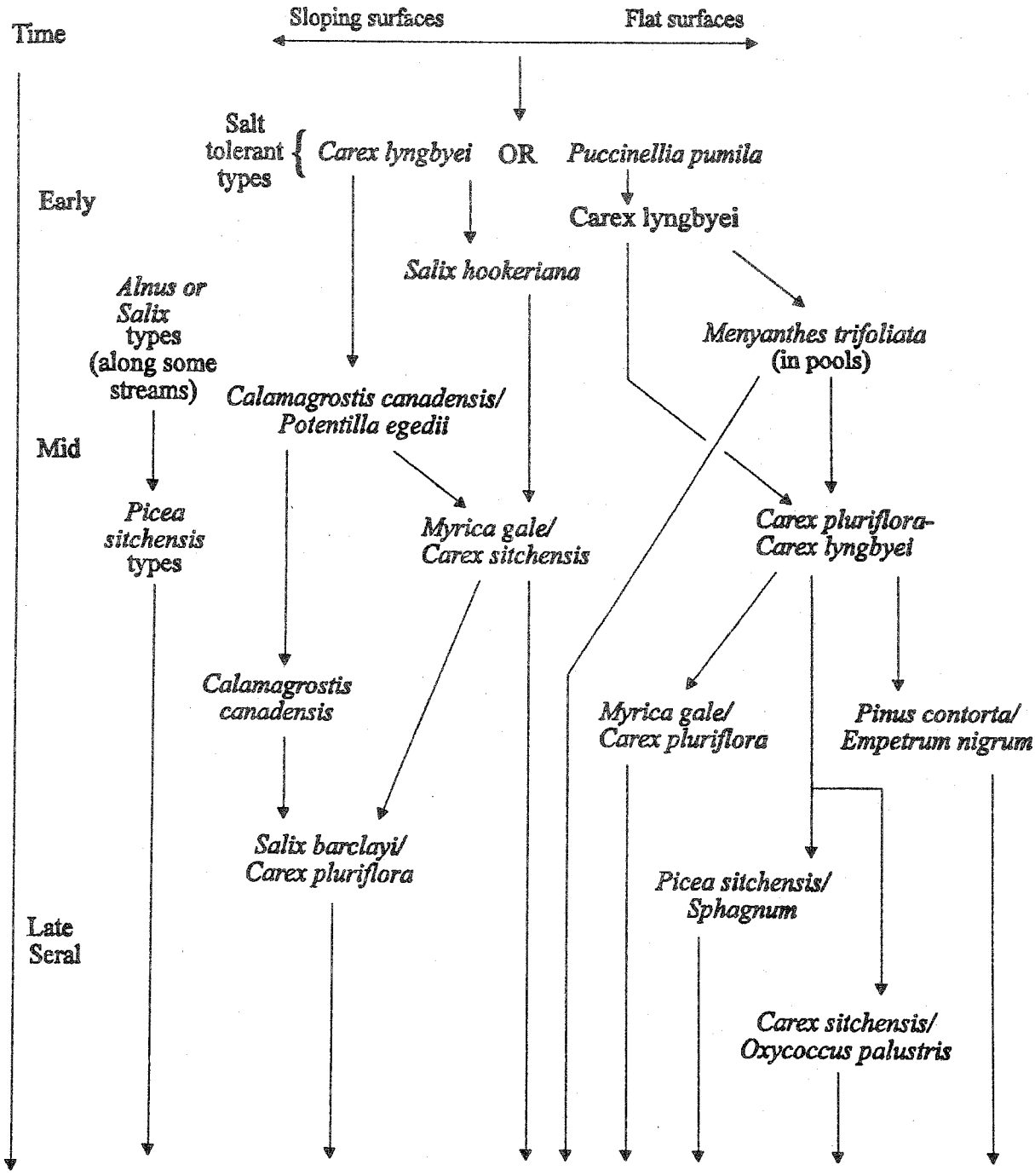


View looking northeast across the tidal flats and uplifted tidal flats between Situk River and Seal Creek. In the foreground are clones of lyngbyei sedge along the small tidal sloughs. Above the tidal influence are sweetgale types and scattered communities of hooker willow. Behind the small beach ridge (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 (Cryaquents; 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 rye-grass) 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 n 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.

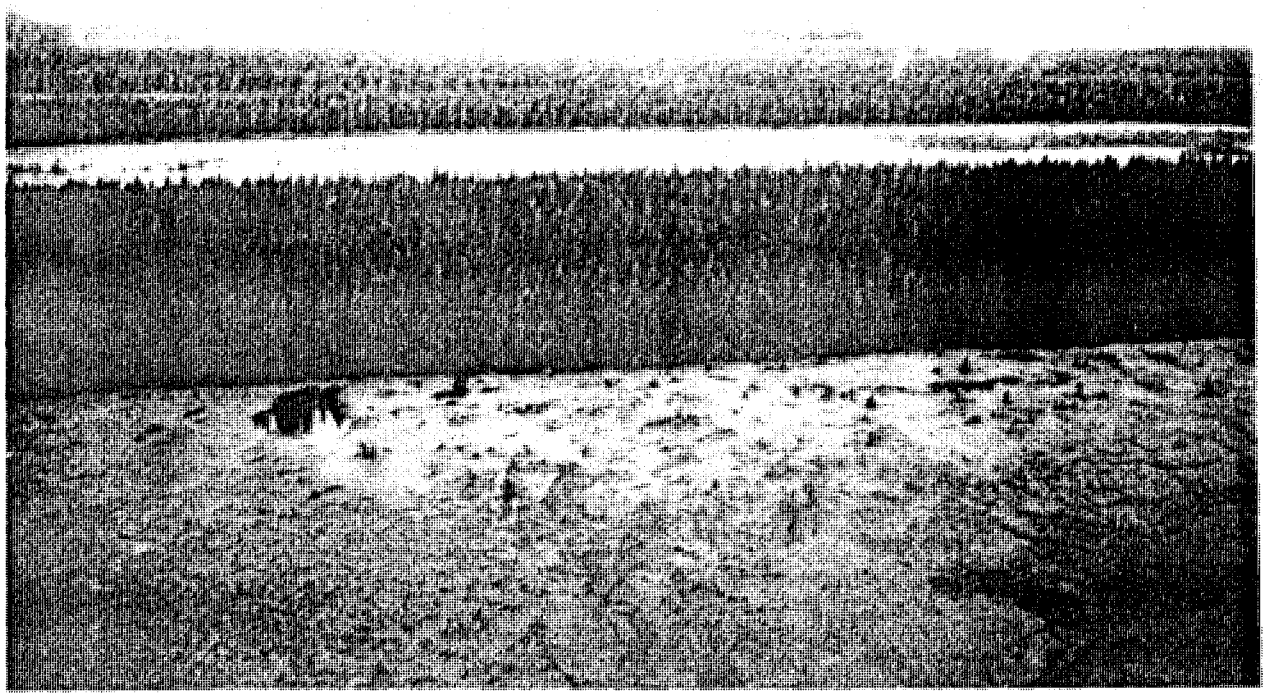
Structural trends between beach ridges showed an increase in mean spruce diameter at breast height (dbh) from 52 ± 22 cm (20 in.) on the young ridges to 69 ± 29 cm (27 in.) on the old ridges (Figure 3). Overall, less than 1% of the spruce tallied was greater than 90 cm (35 in.) dbh on the young ridges,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

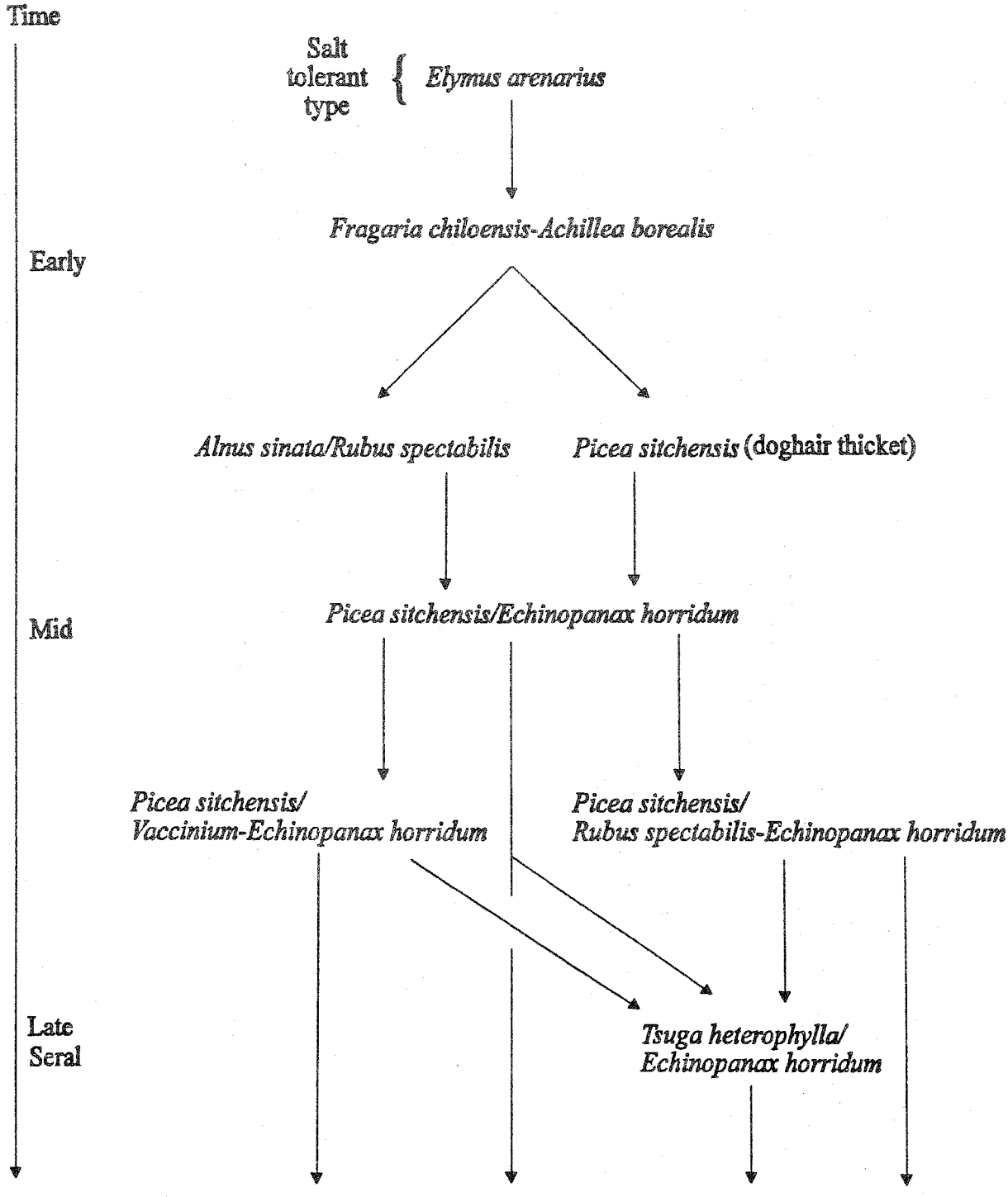
The soils on the beach ridges are primarily Spodosols, and follow a successional sequence across the ridges from immature soils on the youngest ridges (Spodic Cryopsamments) to well-developed Spodosols with an organic-sesquioxide cemented horizon on the oldest ridges (ortstein Typic Haplocryods). B horizon thickness averaged 25 cm ± 6.3 (standard deviation; 9.8 in.) on the youngest beach ridges and increased to 75 cm ± 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 cm ± 1.3 (1.2 in.) when it occurred on the youngest beach ridges. It averaged 8 cm ± 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.



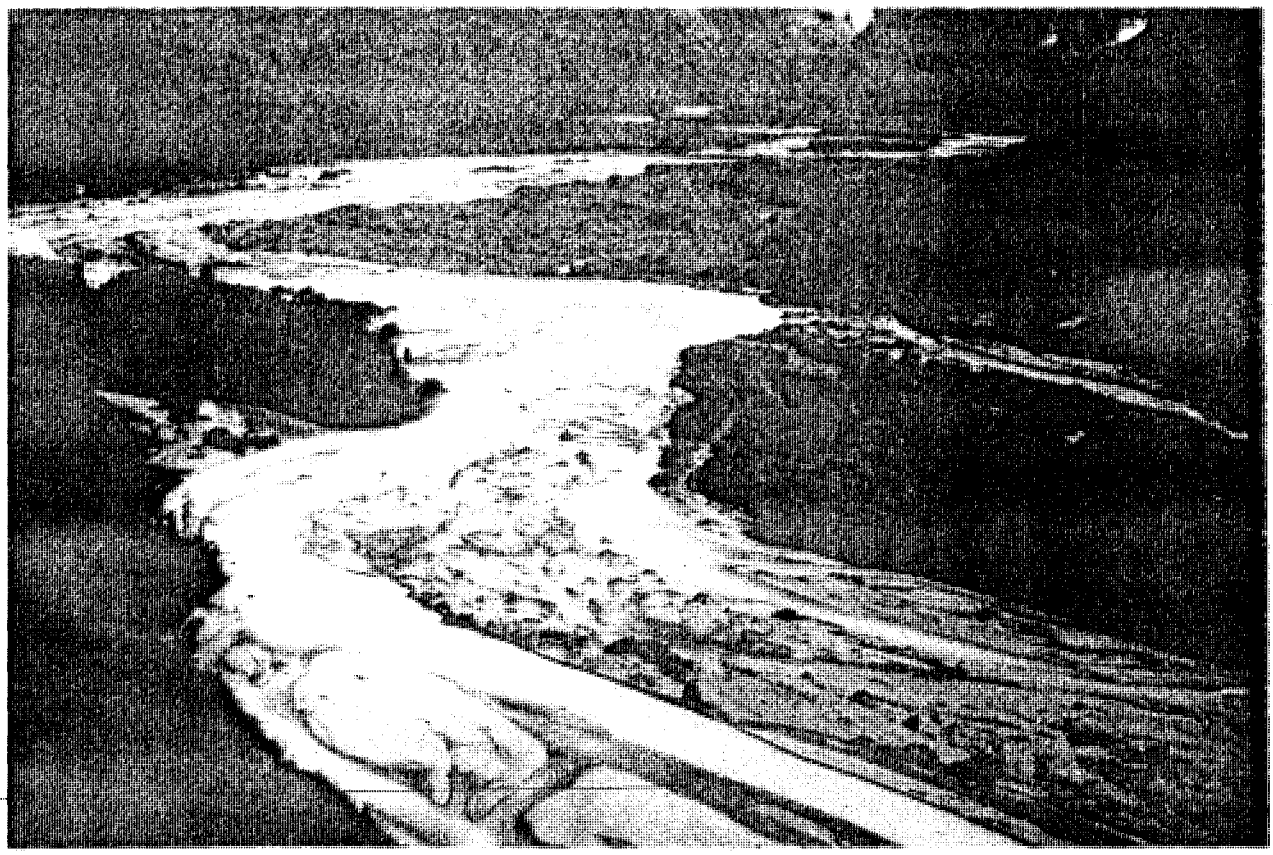
FLOOD PLAINS

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 m^3) per second (Deschu and Thompson 1993), to the Situk where present normal flows do not exceed 500 ft.^{3} (14 m^3) 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.

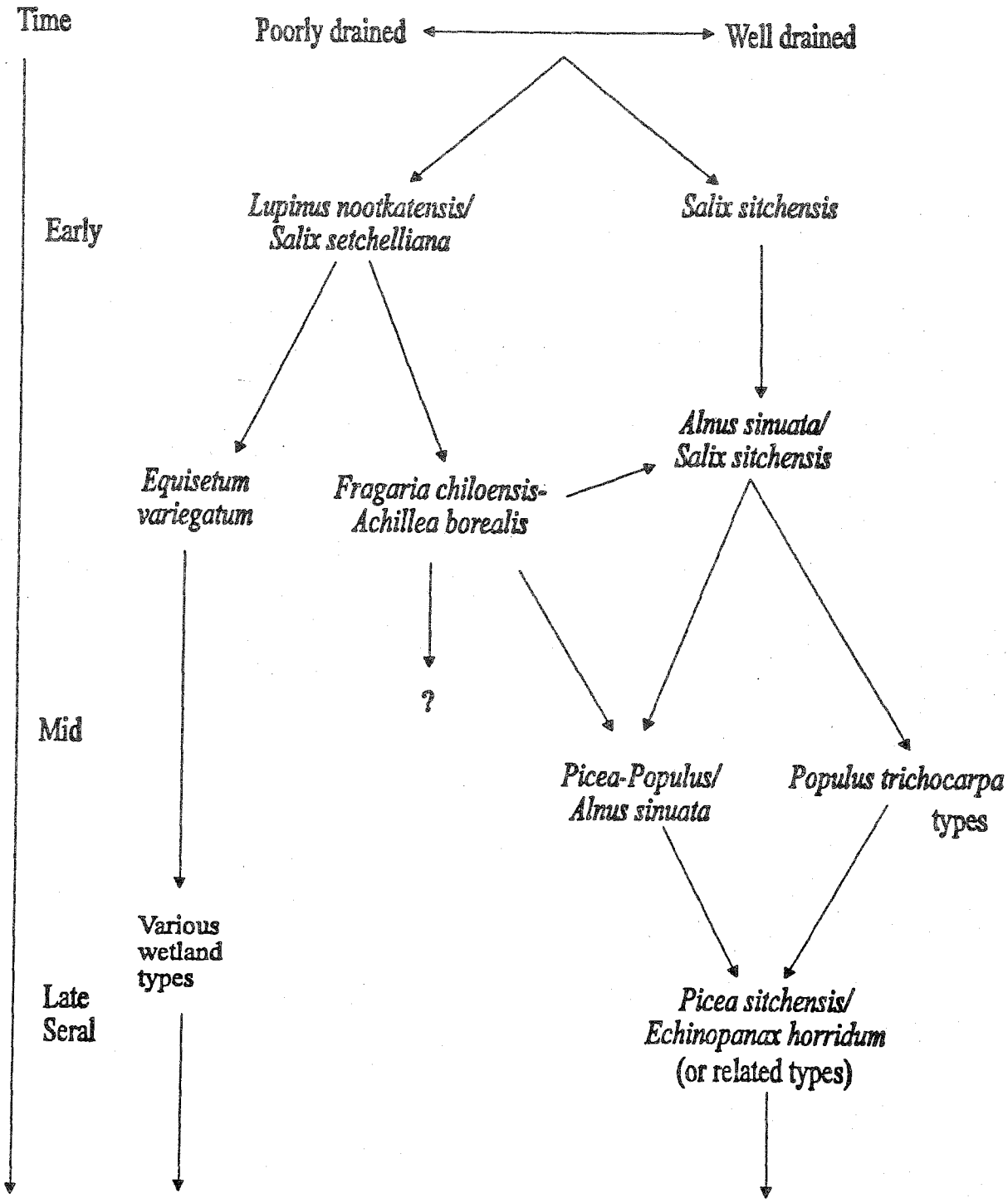
Drainage
Within this landscape, the soils are generally well drained near present channels. Further away from current channels the soils are often somewhat poorly drained because old overbank deposits restrict flow.

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 chiloensis-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.

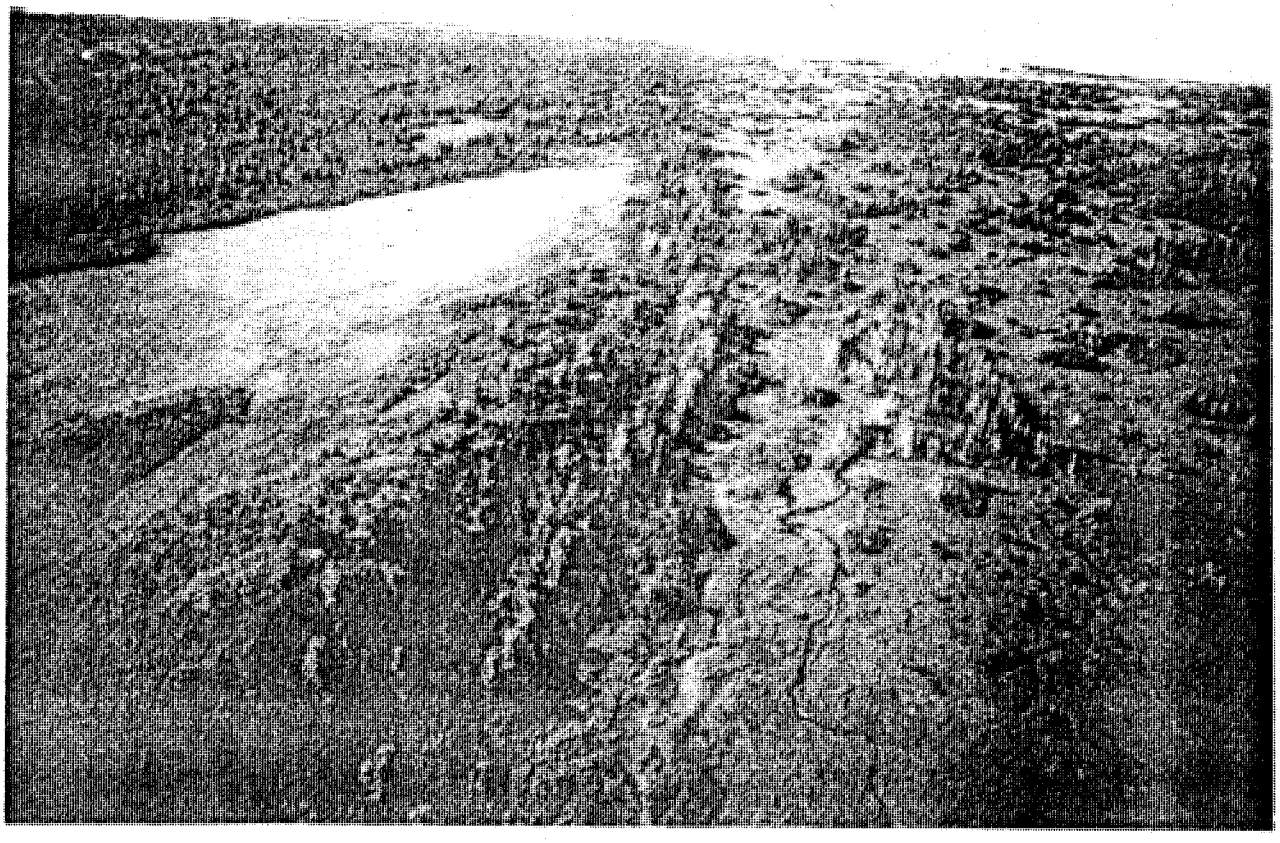
Figure 9. Inferred successional chronosequence for flood plains of the Yakutat foreland.



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 (jøkulhaups) 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 Italio 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 ouburst flood materials were deposited in a short period. The dunes scattered over this landscape are all composed of sand.

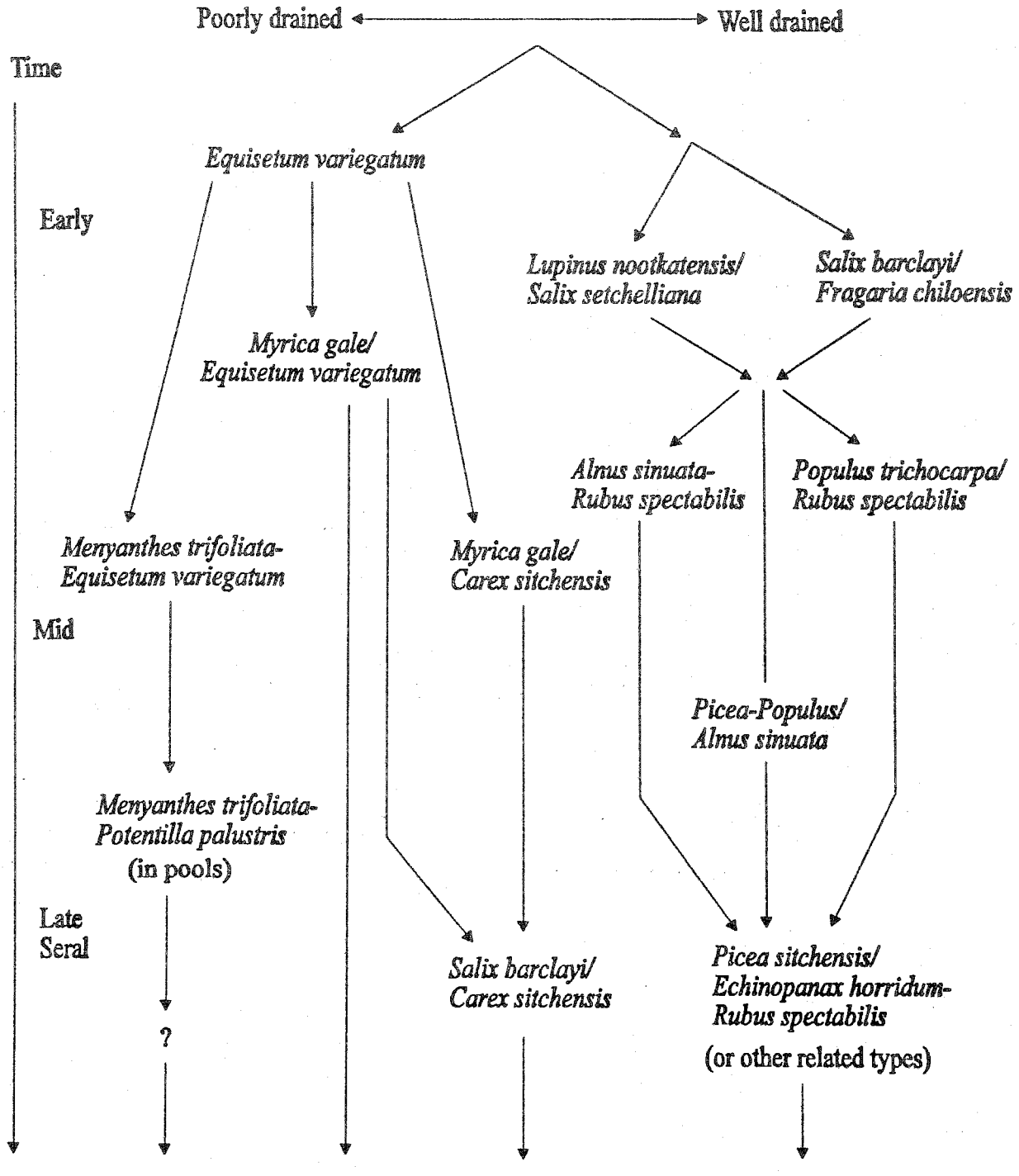
Drainage
Soils are well drained coarse gravel near Harlequin Lake, and grade into poorly drained sand and silts close to the ocean.

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.



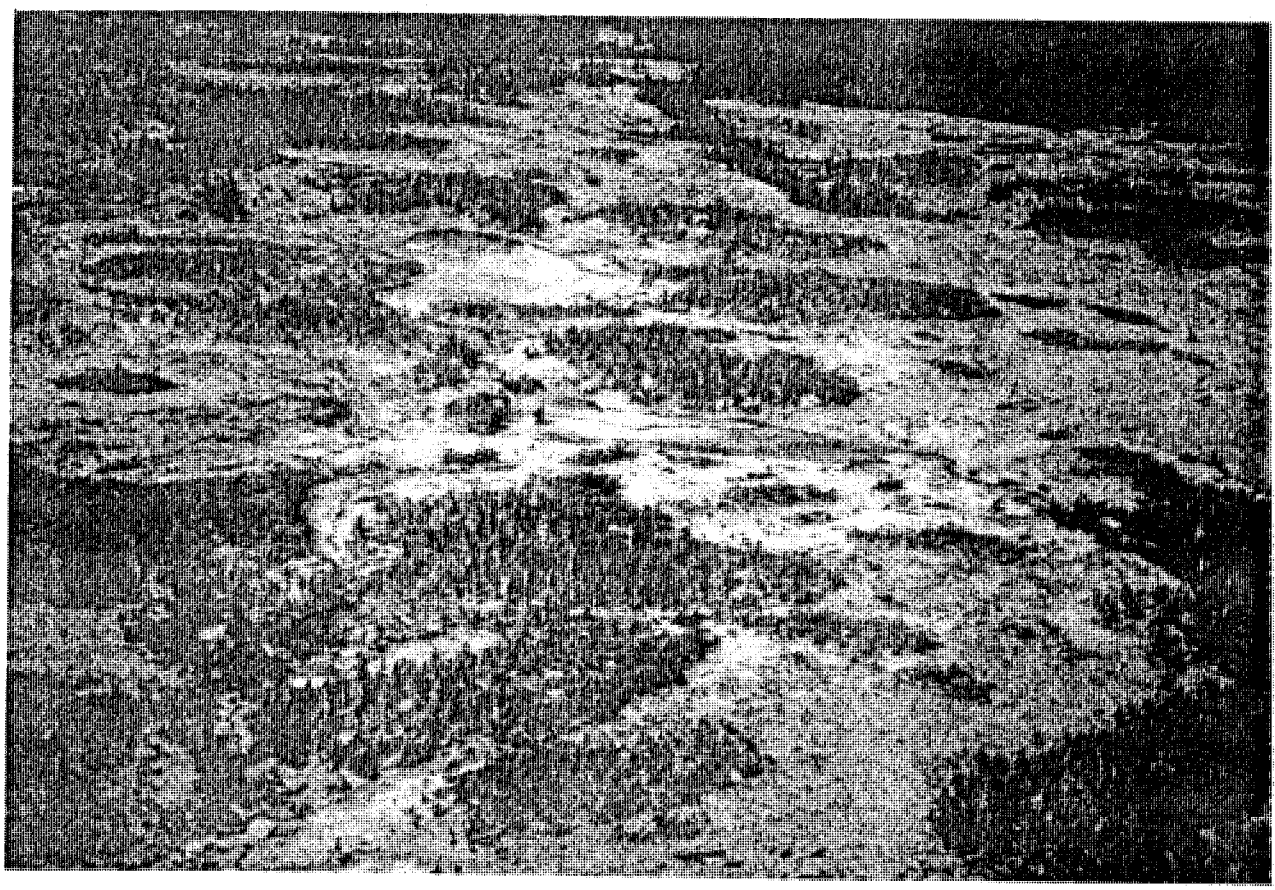
KETTLE AND KAME LANDSCAPE

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.

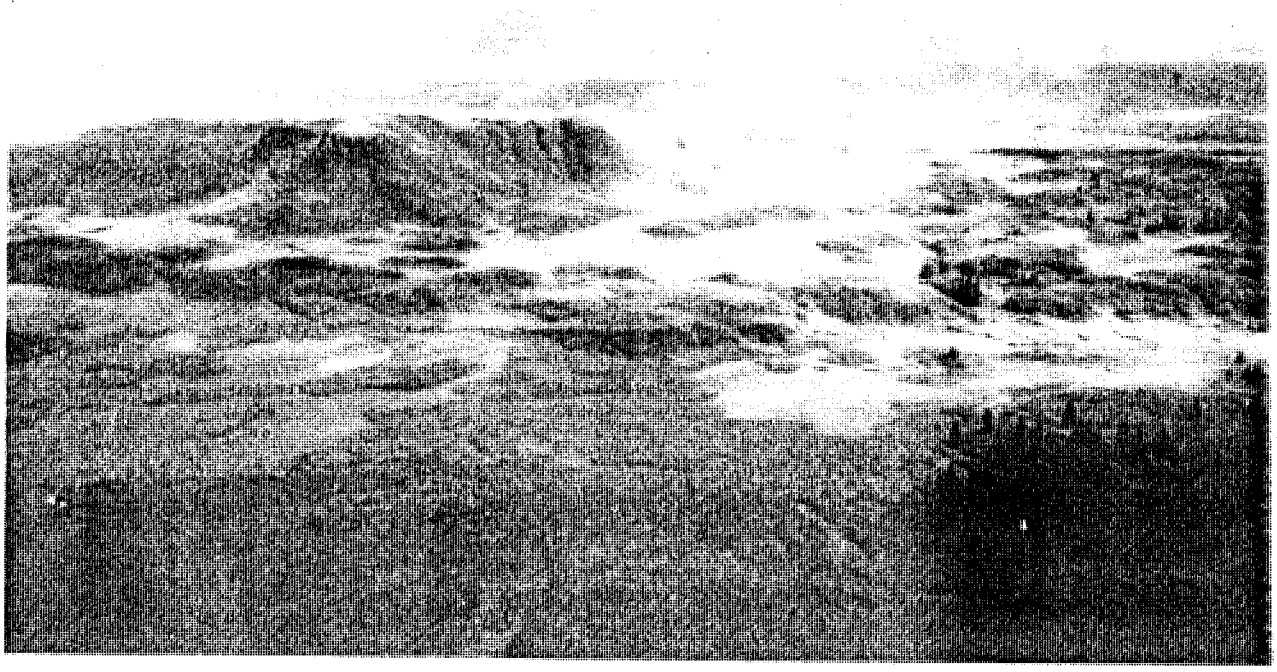
ROLLING BEDROCK HILLS

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 ± 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.



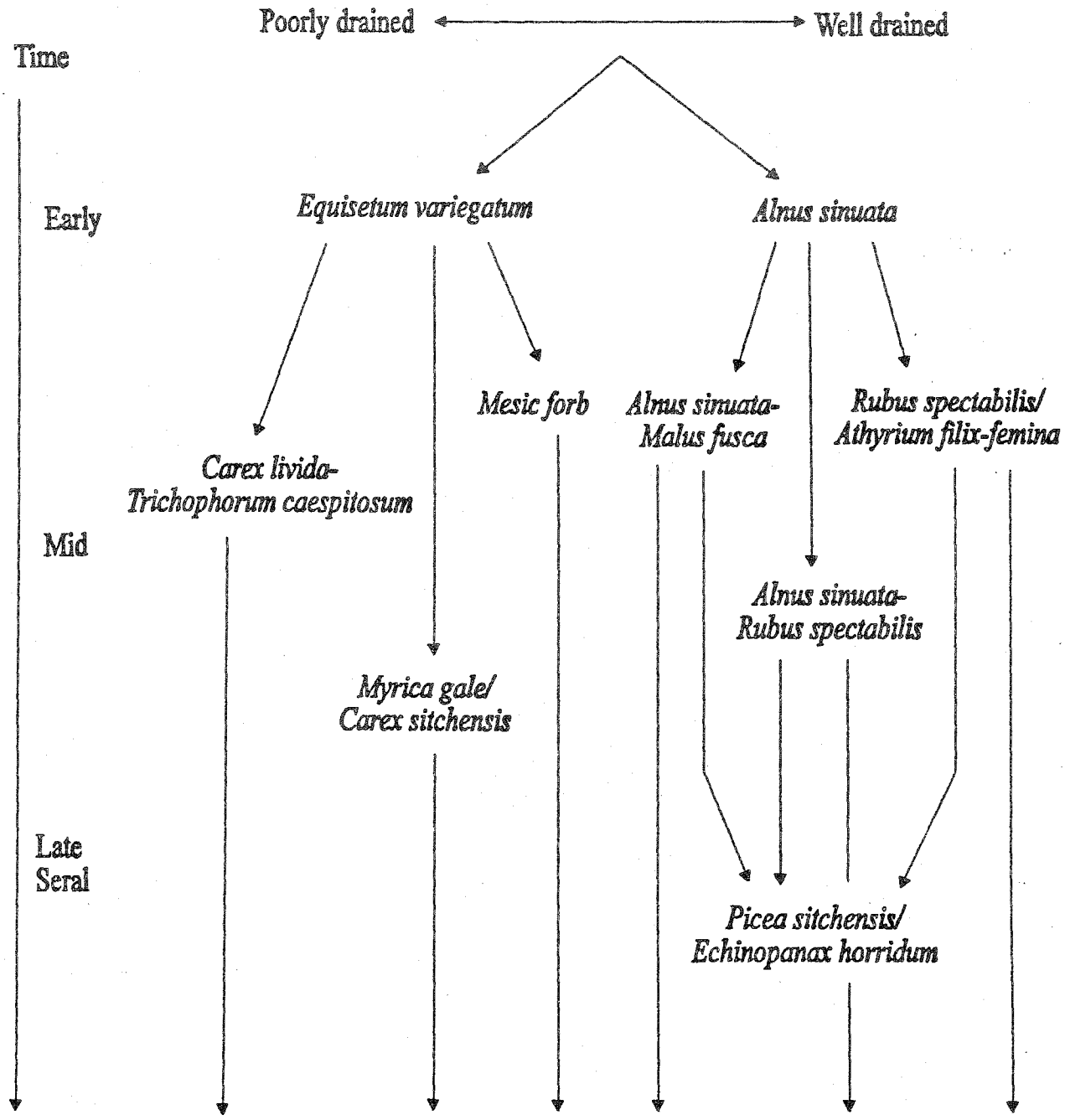
View looking north over the rolling bedrock hills. Tanis Mesa is in the middle right and the Brabazon Range is in the background. The bedrock knolls in the center of the photograph are covered with Sitka alder community types. The gentler slopes are peat-dominated communities such as sweetgale/Sitka 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 chronoseqence 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 Comunities	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	EMPNIG/CARPLU	5
Bog blueberry-crowberry	VACULI-EMPNIG	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-yarrow	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 lynbyei* (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.

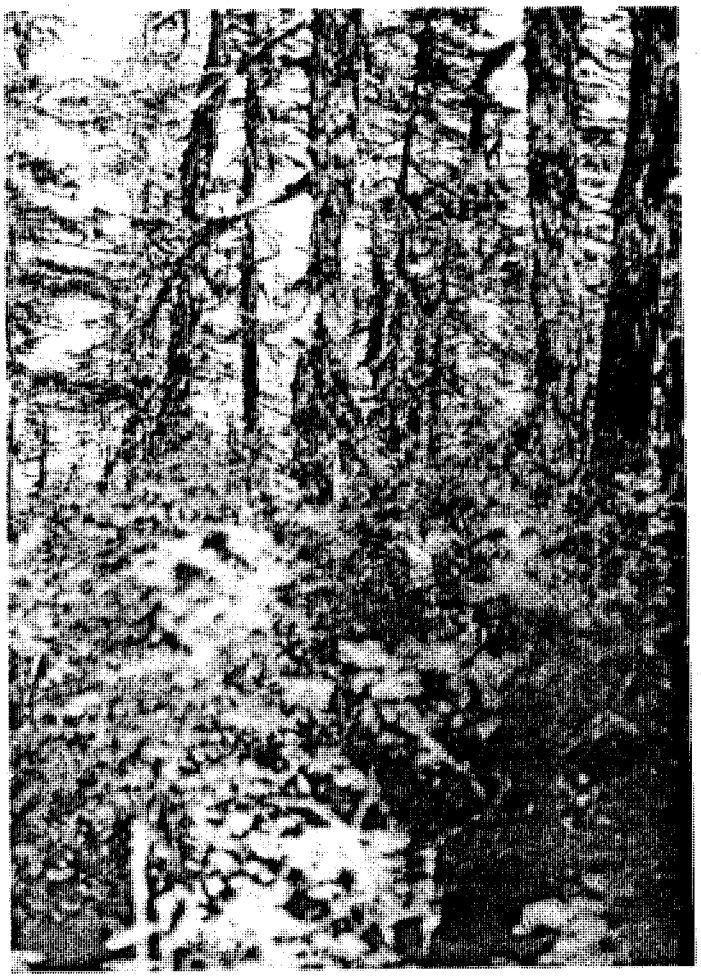
FOREST TYPES

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
Tsuga mertensiana	100	38	15-65
Vaccinium sp.	100	54	15-85
Rubus pedatus	98	10	0-40
Coptis asplenifolia	80	5	0-38
Blechnum spicant	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
Picea sitchensis	100	8	3-15
Tsuga heterophylla	100	23	10-30
Tsuga mertensiana	100	8	5-10
Picea sitchensis regen.	100	4	3-4
Tsuga heterophylla regen.	100	9	8-10
Tsuga mertensiana regen.	100	3	1-7
Vaccinium sp.	100	48	35-70
Menziesia ferruginea	100	6	1-10
Rubus spectabilis	100	7	3-15
Cornus canadensis	100	9	8-10
Lysichitum americanum	100	18	15-25
Rubus pedatus	100	17	15-20
Gymnocarpium dryopteris	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
Picea sitchensis	88	27	10-40
Tsuga heterophylla	75	17	10-40
Tsuga mertensiana	100	18	5-50
Picea sitchensis regen.	100	3	1-10
Tsuga heterophylla regen.	88	5	1-10
Tsuga mertensiana regen.	88	2	1-5
Echinopanax horridum	88	10	1-30
Menziesia ferruginea	63	4	1-15
Rubus spectabilis	100	8	1-25
Vaccinium sp.	100	61	40-80
Cornus canadensis	100	9	3-30
Listera cordata	63	1	-
Rubus pedatus	100	19	10-30
Streptopus amplexifolius	88	2	1-5
Tiarella trifoliata	63	3	1-5
Dryopteris dilatata	88	2	1-5
Gymnocarpium dryopteris	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.

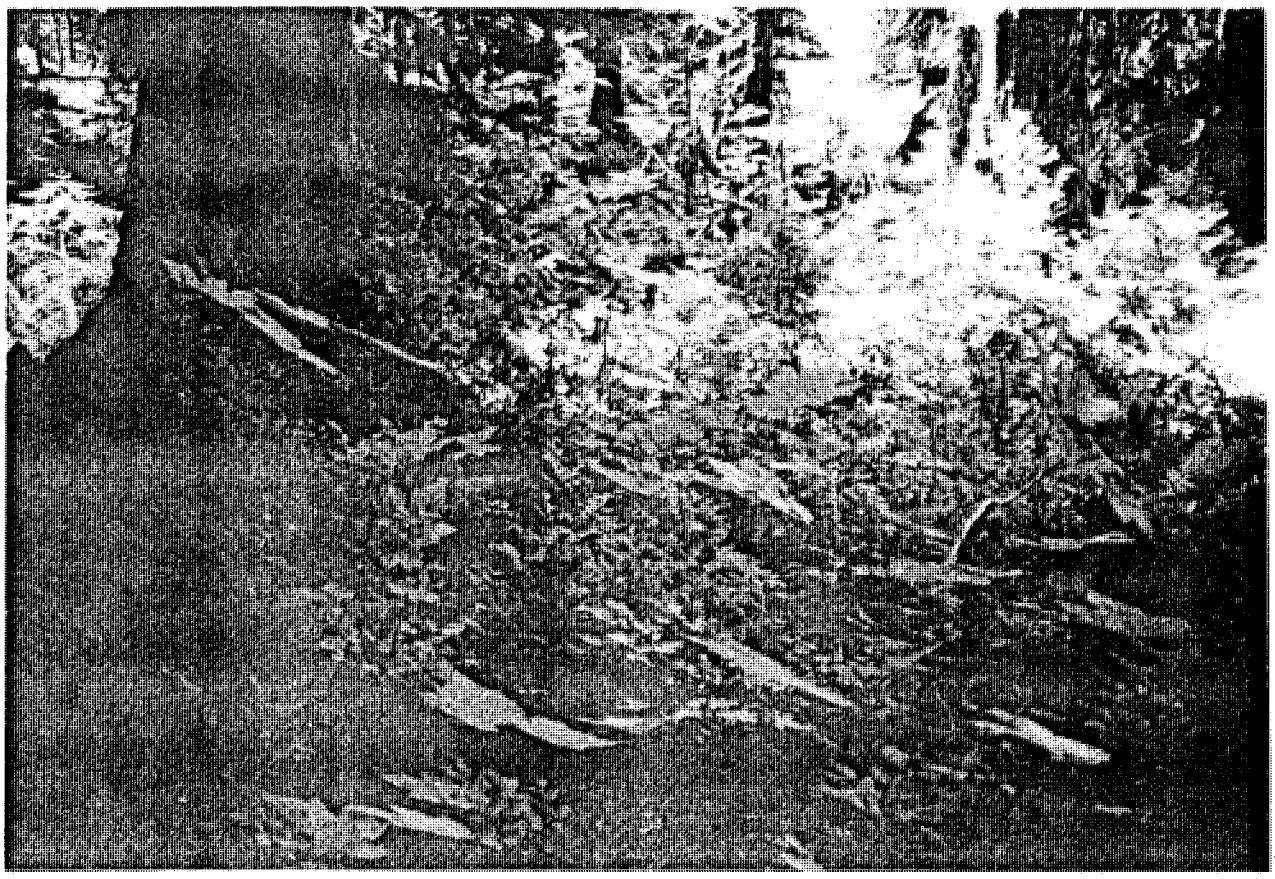
Hikers, skiers, and hunters may use these open stands.

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
Tsuga heterophylla	100	55	45-70
Picea sitchensis	100	7	1-10
Tsuga heterophylla regen.	100	7	4-10
Echinopanax horridum	100	11	8-15
Vaccinium sp.	100	47	35-65
Cornus canadensis	100	5	1-11
Rubus pedatus	100	12	6-20
Streptopus amplexifolius	100	1	-
Dryopteris dilatata	100	6	4-8
Gymnocarpium dryopteris	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
Tsuga heterophylla	100	55	40-60
Tsuga heterophylla regen.	100	8	1-25
Echinopanax horridum	100	3	1-4
Vaccinium sp.	100	64	30-80
Cornus canadensis	100	4	1-10
Rubus pedatus	100	25	15-40
Dryopteris dilatata	100	7	4-10
Gymnocarpium dryopteris	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
Tsuga heterophylla	100	55	35-80
Picea sitchensis	100	8	3-10
Tsuga heterophylla regen.	100	12	2-25
Vaccinium sp.	100	63	45-80
Cornus canadensis	100	7	3-10
Rubus pedatus	100	25	10-40
Gymnocarpium dryopteris	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.

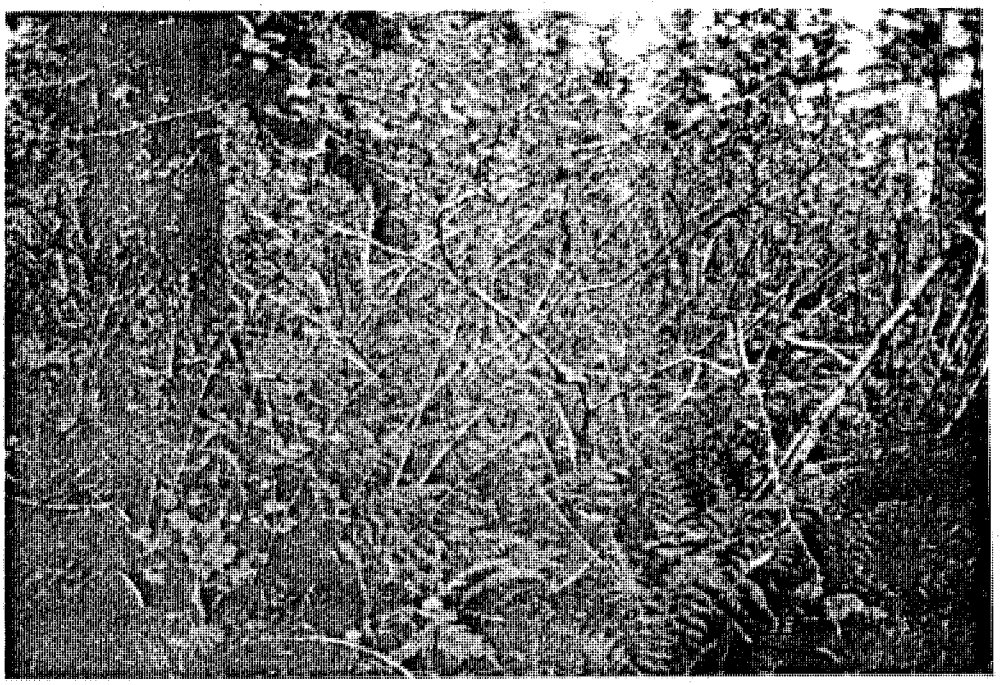
Subsistence uses include blueberry picking and collection of hemlock bark and pitch for medicinal, food, and dye uses.

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* ate the understory. *Vaccinium* sp. (blueberry) is usually present in limited egeneration 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 re 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

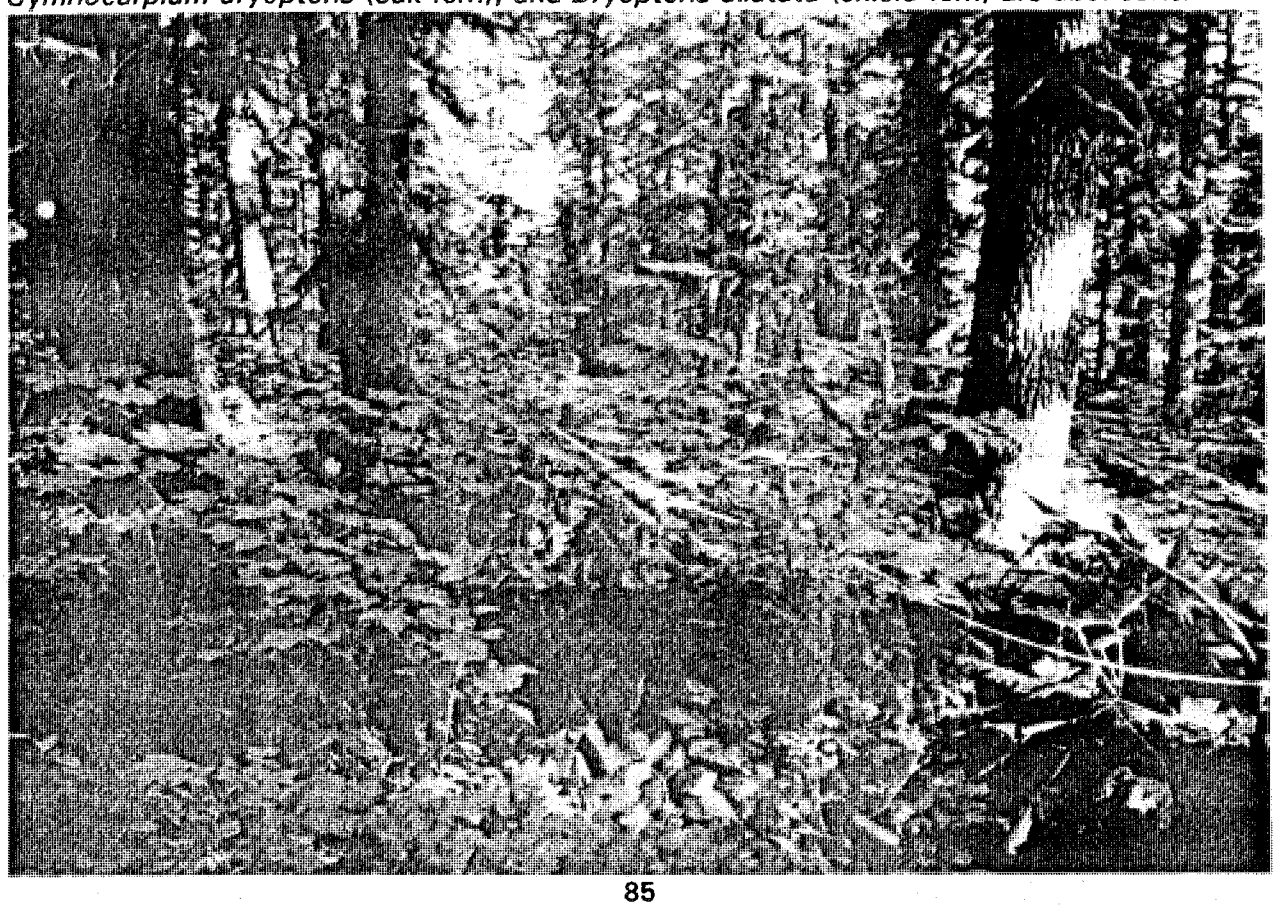
Number of Stands Sampled: Yakutat-26; Chatham Area-5

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
Picea sitchensis	100	46	20-70
Picea sitchensis regen.	85	4	1-10
Tsuga heterophylla regen.	54	3	1-15
Echinopanax horridum	100	33	7-80
Rubus spectabilis	100	24	15-50
Vaccinium sp.	88	26	1-65
Circaea alpina	77	16	1-60
Cornus canadensis	54	4	1-10
Rubus pedatus	88	20	4-45
Streptopus amplexifolius	100	2	1-6
Tiarella trifoliata	92	9	2-30
Athyrium filix-femina	88	11	1-30
Dryopteris dilatata	92	9	1-20
Gymnocarpium dryopteris	81	10	2-20
Thelypteris phegopteris	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
Picea sitchensis	100	42	15-75
Picea sitchensis regen.	90	3	1-15
Tsuga heterophylla regen.	56	6	1-20
Echinopanax horridum	100	27	6-85
Rubus spectabilis	69	4	1-10
Vaccinium sp.	100	38	15-80
Cornus canadensis	90	3	1-10
Listera cordata	67	1	1-3
Rubus pedatus	100	25	6-70
Streptopus amplexifolius	82	1	1-4
Tiarella trifoliata	87	6	1-40
Dryopteris dilatata	82	6	1-30
Gymnocarpium dryopteris	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
Picea sitchensis	100	42	15-80
Picea sitchensis regen	89	4	1-15
Echinopanax horridum	100	47	6-90
Rubus spectabilis	82	5	1-14
Vaccinium sp.	89	6	1-14
Cornus canadensis	57	1	1-3
Rubus pedatus	100	26	1-65
Streptopus amplexifolius	100	1	1-3
Tiarella trifoliata	93	8	1-25
Athyrium filix-femina	82	6	1-40
Dryopteris dilatata	93	8	1-55
Gymnocarpium dryopteris	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
Picea sitchensis	100	46	15-70
Tsuga heterophylla	61	22	1-55
Picea sitchensis regen.	91	6	1-25
Tsuga heterophylla regen.	65	9	1-32
Echinopanax horridum	87	2	1-4
Rubus spectabilis	96	10	1-45
Vaccinium sp.	100	46	2-85
Cornus canadensis	87	7	1-20
Listera cordata	61	2	1-6
Rubus pedatus	91	26	2-50
Streptopus amplexifolius	57	3	1-10
Tiarella trifoliata	61	3	1-10
Dryopteris dilatata	65	5	1-8
Gymnocarpium dryopteris	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
Picea sitchensis	100	56	30-80
Picea sitchensis regen.	75	8	1-20
Circaea alpina	75	3	1-6
Pyrola secunda	75	1	-
Rubus pedatus	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
Picea sitchensis	100	27	15-35
Populus trichocarpa trichocarpa	100	29	8-55
Picea sitchensis regen	100	14	1-30
Alnus sinuata	100	22	6-60
Echinopanax horridum	100	8	1-30
Rubus spectabilis	100	10	1-40
Viburnum edule	83	2	1-5
Actaea rubra	83	1	-
Circaea alpina	67	25	1-35
Listera cordata	67	2	1-3
Pyrola asarifolia	100	2	1-4
Pyrola secunda	83	5	1-10
Rubus pedatus	67	12	1-20
Streptopus amplexifolius	100	2	1-5
Athyrium filix-femina	83	2	1-5
Dryopteris dilatata	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
Picea sitchensis	100	41	15-65
Populus trichocarpa trichocarpa	100	12	5-35
Picea sitchensis regen.	100	21	1-75
Echinopanax horridum	100	15	5-30
Rubus spectabilis	80	3	1-6
Vaccinium sp.	80	26	1-25
Viburnum edule	60	1	1-2
Circaea alpina	80	6	1-10
Cornus canadensis	100	2	1-3
Listera cordata	80	1	1-2
Pyrola asarifolia	60	1	-
Pyrola secunda	60	2	1-5
Rubus pedatus	100	31	15-40
Streptopus amplexifolius	80	1	-
Tiarella trifoliata	100	8	1-30
Athyrium filix-femina	80	3	1-10
Dryopteris dilatata	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
Picea sitchensis	100	36	15-90
Populus trichocarpa trichocarpa	100	15	5-40
Picea sitchensis regen.	100	16	1-50
Echinopanax horridum	71	2	1-4
Salix sitchensis	57	5	1-15
Vaccinium sp.	86	3	1-10
Cornus canadensis	57	12	1-25
Fragaria chiloensis	57	8	1-25
Listera cordata	86	1	1-3
Lupinus nootkatensis	57	13	2-40
Pyrola asarifolia	71	5	1-20
Pyrola secunda	100	3	1-4
Rubus pedatus	86	8	1-25
Streptopus amplexifolius	71	1	-
Athyrium filix-femina	57	2	1-4
Gymnocarpium dryopteris	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

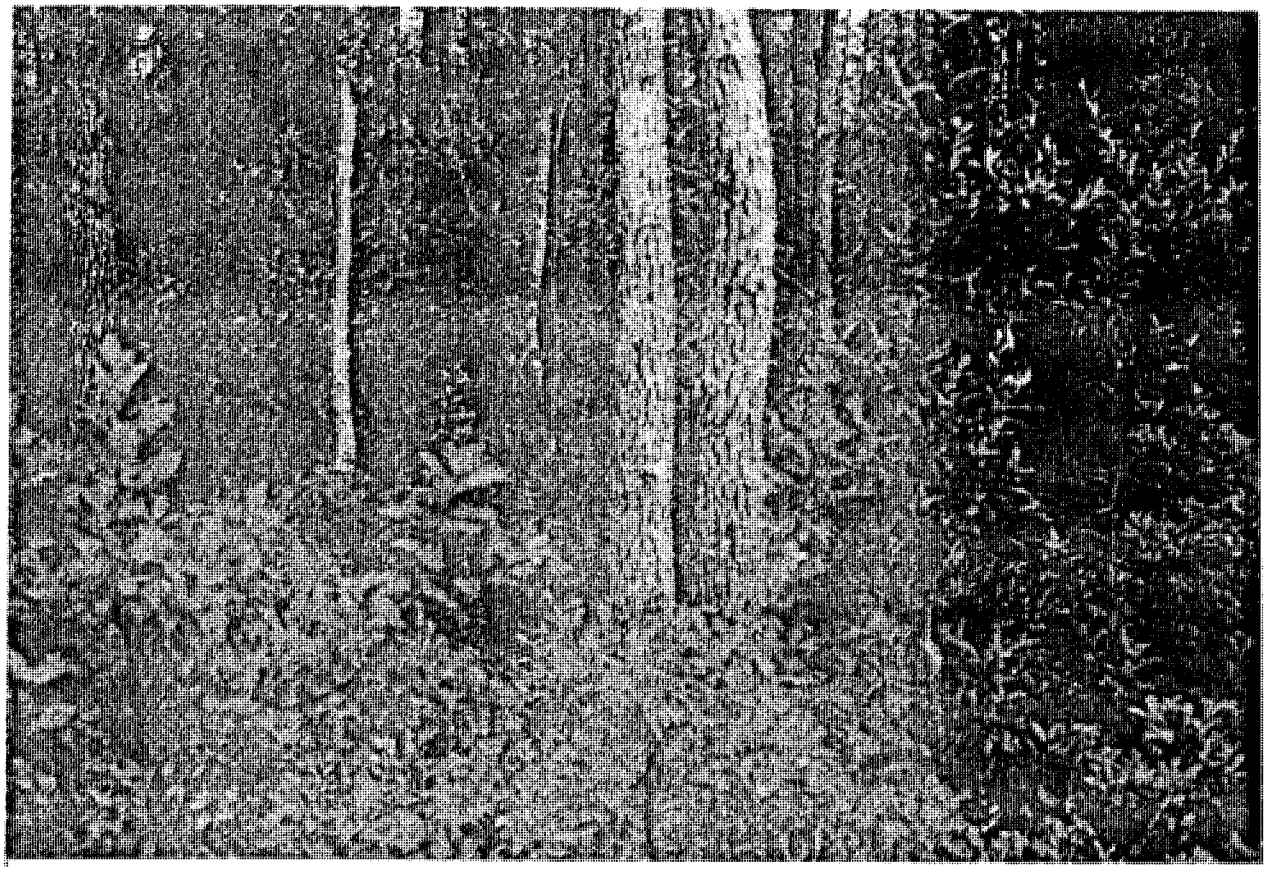
Number of Stands Sampled: 8

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
Picea sitchensis	63	8	1-14
Populus trichocarpa trichocarpa	100	23	5-60
Picea sitchensis regen.	88	3	1-5
Alnus sinuata	75	46	5-80
Rubus spectabilis	63	8	1-20
Salix barclayi	88	12	2-30
Salix sitchensis	88	12	3-20
Viburnum edule	63	2	1-2
Achillea borealis	75	1	1-3
Actaea rubra	63	2	1-6
Circaea alpina	75	15	1-60
Epilobium angustifolium	63	4	1-8
Pyrola asarifolia	88	7	1-20
Pyrola secunda	75	3	1-8
Rubus arcticus spp. stellatus	63	6	1-20
Streptopus amplexifolius	75	1	1-2
Trientalis europaea	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
Populus trichocarpa trichocarpa	100	23	7-35
Alnus sinuata	100	50	17-90
Echinopanax horridum	91	23	1-60
Rubus spectabilis	100	51	20-85
Sambucus racemosa	73	7	1-20
Viburnum edule	73	3	1-15
Circaea alpina	91	14	1-65
Pyrola asarifolia	64	4	1-10
Streptopus amplexifolius	82	1	1-2
Calamagrostis canadensis	55	2	1-5
Athyrium filix-femina	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
Populus trichocarpa trichocarpa	100	26	10-45
Alnus sinuata	100	44	10-70
Echinopanax horridum	100	22	1-40
Ribes bracteosum	80	1	1-2
Rubus spectabilis	100	7	2-15
Sambucus racemosa	80	13	1-23
Actaea rubra	80	1	-
Circaea alpina	100	13	3-30
Heracleum lanatum	60	2	1-5
Streptopus amplexifolius	80	1	1-2
Athyrium filix-femina	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 Commnity Type
Lodgepole pine/peatmoss: PINCON/SPHAGN

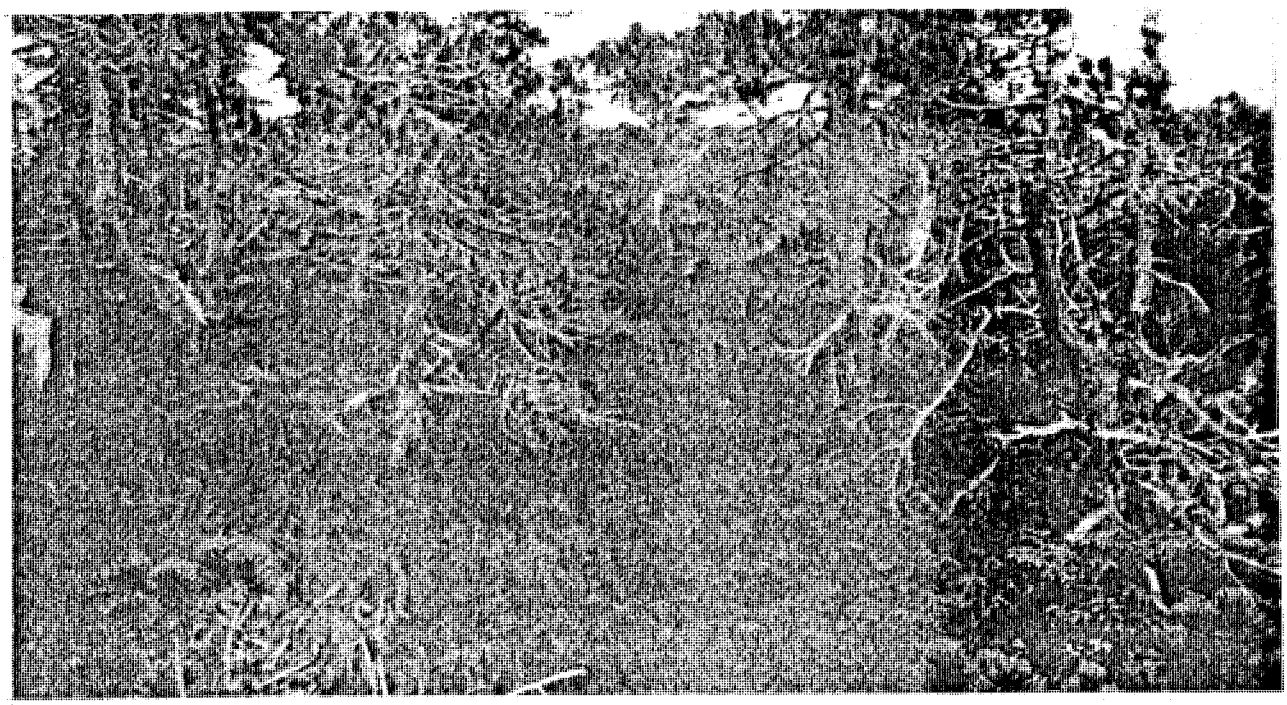
Number of Stands Sampled: 7

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

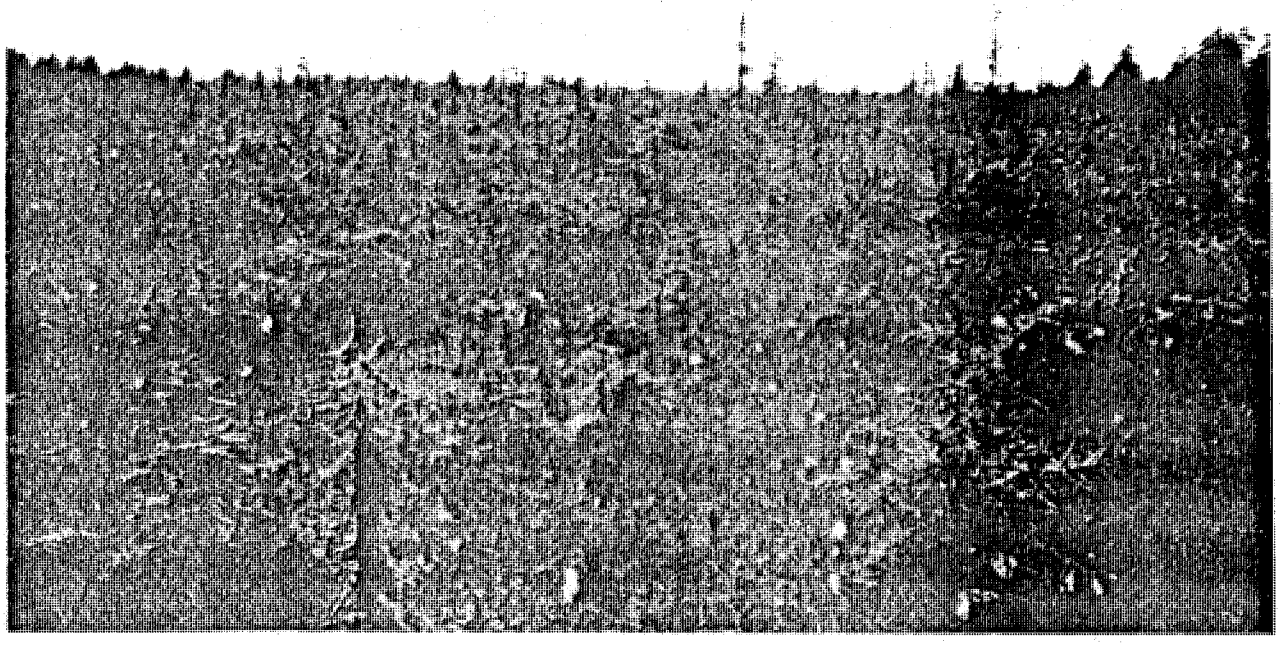
Number of Stands Sampled: 7

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
Picea sitchensis	71	10	2-15
Picea sitchensis regen.	86	7	1-20
Myrica gale	86	17	1-65
Vaccinium sp.	57	7	1-20
Empetrum nigrum	57	13	1-25
Oxycoccus palustris	57	11	3-25
Cornus canadensis	57	8	2-15
Gentiana douglasiana	57	1	-
Platanthera dilatata	57	2	1-5
Rubus arcticus spp. stellatus	86	2	1-5
Streptopus amplexifolius	71	1	1-2
Carex sitchensis	57	48	5-85
Eriophorum angustifolium	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
Alnus sinuata	100	52	25-65
Rubus spectabilis	80	27	1-40
Salix sitchensis	100	21	5-45
Sambucus racemosa	60	2	1-4
Viburnum edule	80	1	-
Angelica genuflexa	60	5	1-9
Circaea alpina	80	12	2-25
Equisetum arvense	80	5	1-15
Geum macrophyllum	60	8	5-15
Heracleum lanatum	60	22	2-50
Stellaria crispa	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.

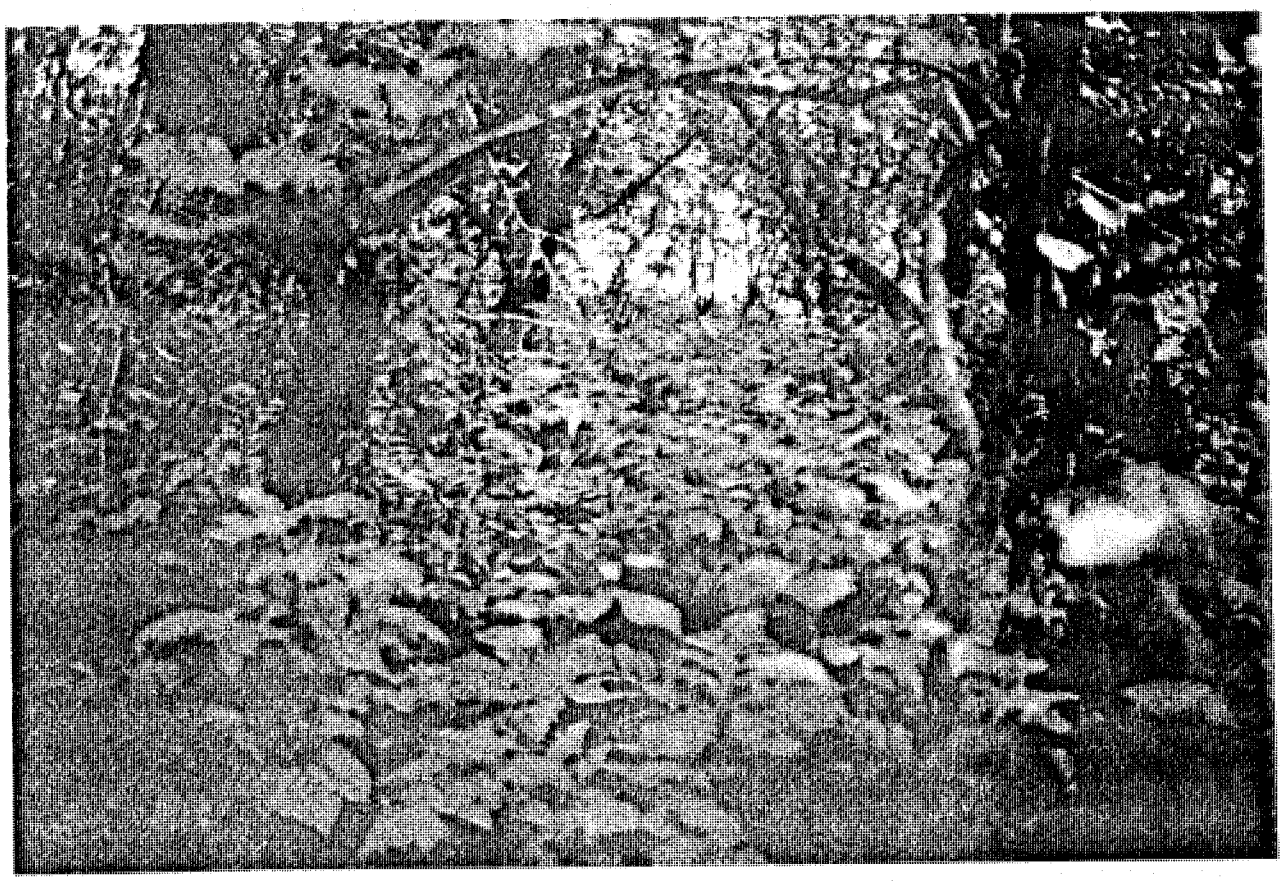
Alnus sinuata-Malus fusca Community Type
Sitka alder-crabapple: ALNSIN-MALFUS

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
Alnus sinuata	100	42	20-60
Malus fusca	100	36	10-60
Rubus spectabilis	100	58	20-80
Boschniakia rossica	80	1	-
Circaea alpina	80	2	1-3
Epilobium angustifolium	60	1	1-2
Heracleum lanatum	60	1	1-3
Maianthemum dilatatum	60	8	2-20
Streptopus amplexifolius	80	1	-
Veratrum viride	100	1	1-2
Viola epipsila	60	1	-
Calamagrostis canadensis	80	4	1-10
Athyrium filix-femina	100	22	8-40
Gymnocarpium dryopteris	60	1	-
Thelypteris phegopteris	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
Alnus sinuata	100	76	50-99
Echinopanax horridum	57	11	1-25
Rubus spectabilis	100	56	15-95
Sambucus racemosa	79	11	1-25
Circaea alpina	86	5	1-25
Athyrium filix-femina	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 Cryopsamments 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
Alnus sinuata	100	66	20-90
Salix barclayi	80	10	2-30
Achillea borealis	60	5	1-15
Angelica genuflexa	60	7	1-10
Lysichitum americanum	60	14	1-30
Calamagrostis canadensis	60	9	1-20
Deschampsia caespitosa	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
Echinopanax horridum	100	3	1-4
Rubus spectabilis	100	80	70-90
Cardamine umbellata	100	1	-
Circaea alpina	100	2	1-2
Heracleum lanatum	100	3	-
Stellaria crispa	100	28	15-40
Streptopus amplexifolius	100	1	-
Veratrum viride	100	3	2-3
Calamagrostis canadensis	100	5	1-10
Athyrium filix-femina	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
Rubus spectabilis	60	25	8-70
Salix barclayi	70	15	2-40
Salix sitchensis	100	57	30-80
Angelica genuflexa	60	1	1-3
Circaea alpina	70	6	1-20
Equisetum arvense	60	20	1-70
Streptopus amplexifolius	60	1	-
Calamagrostis canadensis	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.

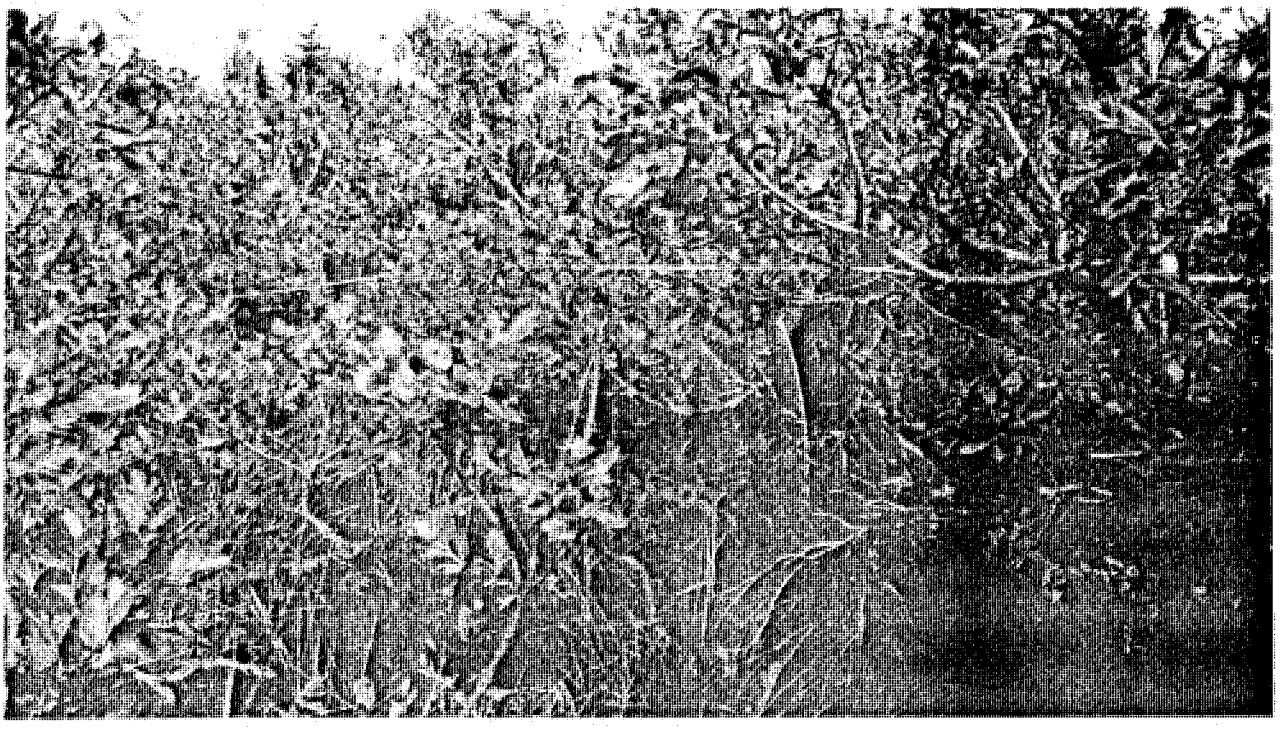
Salix hookeriana Community Type
Hooker willow: SALHOO

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
Rubus spectabilis	100	21	1-60
Salix hookeriana	100	48	45-50
Angelica genuflexa	100	3	1-5
Caltha palustris asarifolia	67	1	-
Circaea alpina	67	5	2-8
Conioselinum chinense	67	1	-
Equisetum arvense	67	25	10-40
Fritillaria camschatcensis	67	1	1-2
Geum macrophyllum	67	2	1-3
Heracleum lanatum	67	2	1-3
Solidago lepida	67	1	-
Streptopus amplexifolius	67	1	-
Thalictrum sparsiflorum	67	1	-
Trientalis europaea	67	3	1-5
Calamagrostis canadensis	67	10	1-20
Athyrium filix-femina	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.

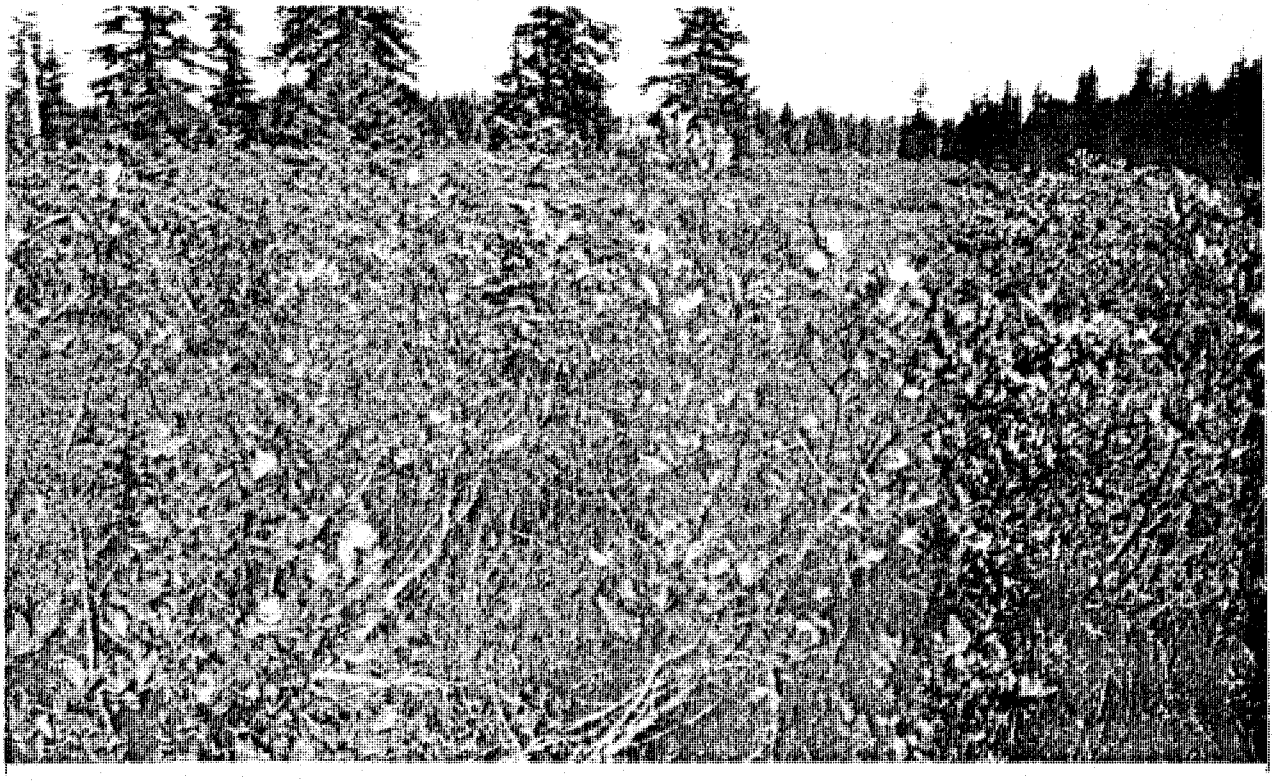
Salix barclayi/Carex pluriflora Community Type
Barclay willow/many-flowered sedge: SALBAR/CARPLU

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
Salix barclayi	100	26	5-50
Salix commutata	83	28	20-40
Equisetum arvense	67	12	1-30
Platanthera dilatata	67	1	-
Potentilla palustris	83	3	1-5
Rubus arcticus stellatus	83	1	1-2
Trientalis europaea	67	1	-
Calamagrostis canadensis	83	12	1-40
Carex pluriflora	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
Myrica gale	55	32	1-40
Salix barclayi	100	45	15-80
Angelica genuflexa	91	3	1-10
Equisetum palustre	73	1	1-2
Potentilla palustris	55	6	1-10
Rubus arcticus stellatus	73	2	1-7
Trientalis europaea	91	1	1-3
Calamagrostis canadensis	73	9	1-50
Carex sitchensis	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.

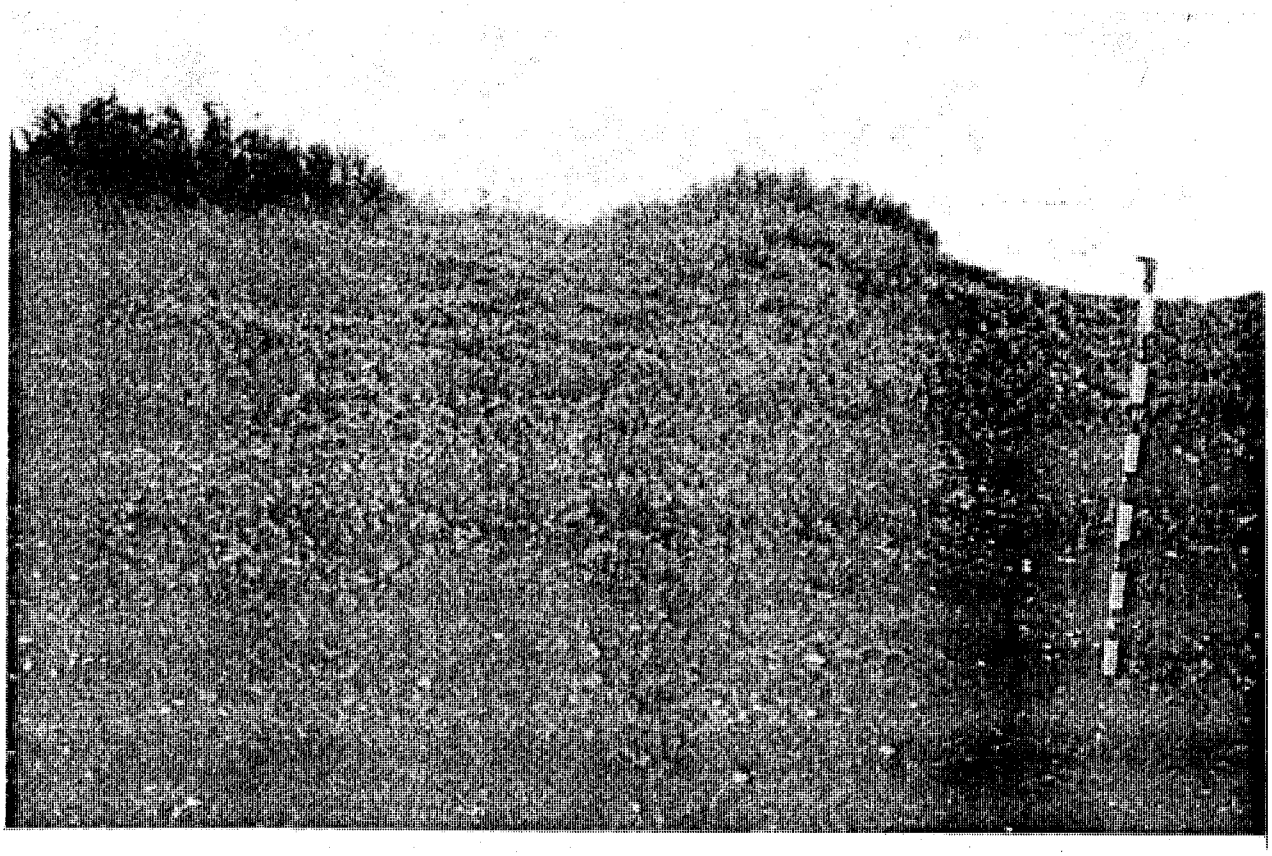
Salix barclayi/mixed herb Community Type
Barclay willow/mixed herb: SALBAR/MIXED HERB

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
Salix barclayi	100	64	40-80
Salix commutata	60	11	3-20
Sambucus racemosa	60	4	1-10
Viburnum edule	80	1	1-2
Angelica genuflexa	80	3	1-5
Angelica lucida	60	7	2-10
Circaea alpina	60	19	1-40
Equisetum arvense	100	6	1-15
Geum macrophyllum	80	3	1-10
Heracleum lanatum	60	3	2-4
Pyrola asarifolia	60	1	-
Rubus arcticus stellatus	60	2	1-4
Sanguisorba stipulata	60	1	-
Streptopus amplexifolius	60	1	-
Trientalis europaea	80	1	1-3
Calamagrostis canadensis	100	3	1-5
Athyrium filix-femina	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
Salix barclayi	100	35	2-85
Salix commutata	75	21	1-65
Achillea borealis	100	6	2-25
Epilobium angustifolium	63	8	1-35
Fragaria chiloensis	81	12	1-45
Lupinus nootkatensis	81	10	1-35
Rubus arcticus stellatus	88	3	1-7
Solidago lepida	69	3	1-10
Trientalis europaea	75	1	1-5
Deschampsia caespitosa	69	3	1-10
Festuca rubra	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.

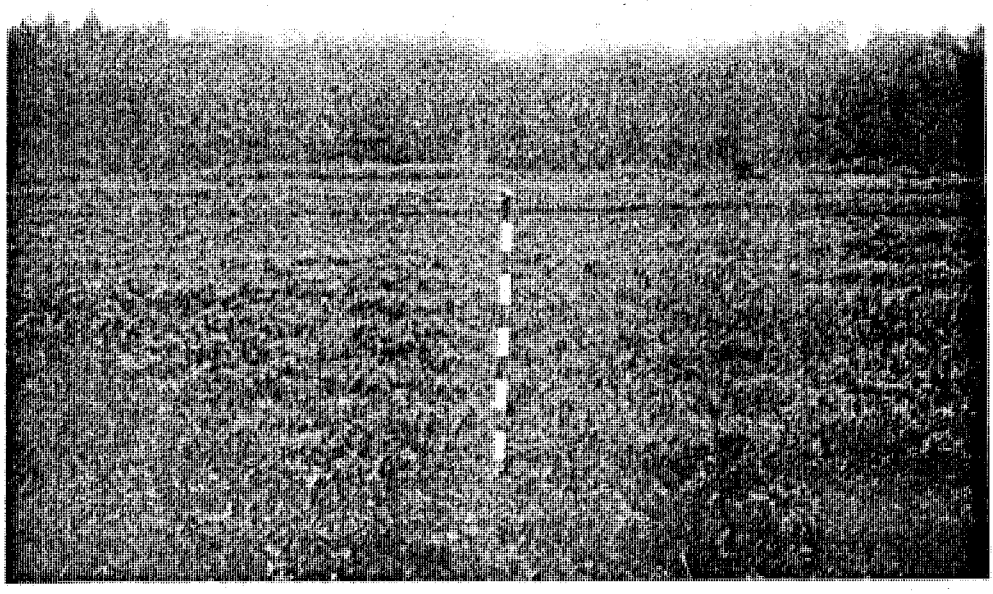
Myrica gale/Carex livida Community Type
Sweetgale/livid sedge: MYRGAL/CARLIV

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
Myrica gale	100	47	25-80
Oxycoccus palustris	60	2	1-5
Equisetum palustre	80	2	1-7
Erigeron peregrinus	60	1	1-2
Menyanthes trifoliata	80	19	1-65
Platanthera dilatata	60	1	-
Tofieldia glutinosa	60	1	1-2
Carex livida	80	15	1-40
Deschampsia caespitosa	60	2	1-6
Eriophorum angustifolium	80	10	2-30
Trichophorum caespitosum	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.

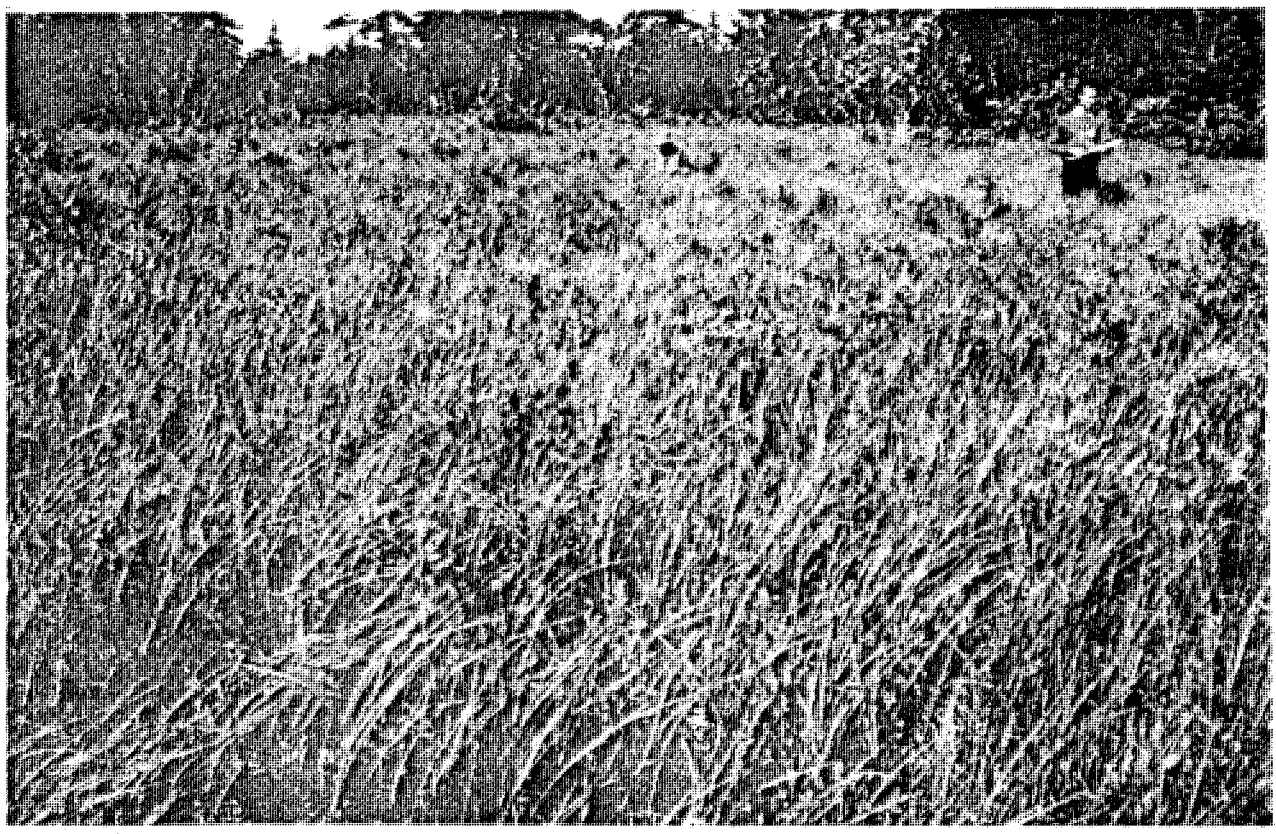
Myrica gale/Carex sitchensis Community Type
Sweetgale/Sitka sedge: MYRGAL/CARSIT

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. warnstorfii,* 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
Myrica gale	100	52	35-85
Potentilla palustris	56	10	1-55
Rubus arcticus stellatus	94	2	1-3
Trientalis europaea	69	1	1-3
Carex sitchensis	100	45	15-80
Deschampsia caespitosa	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
Myrica gale	100	58	40-70
Oxycoccus palustris	75	3	1-8
Angelica genuflexa	75	2	1-4
Polemonium acutiflorum	100	3	1-5
Potentilla palustris	100	2	1-2
Rubus arcticus stellatus	100	2	1-3
Agrostis alaskana	100	2	1-3
Carex pluriflora	100	45	30-70
Deschampsia caespitosa	100	4	1-10
Luzula multiflora	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).

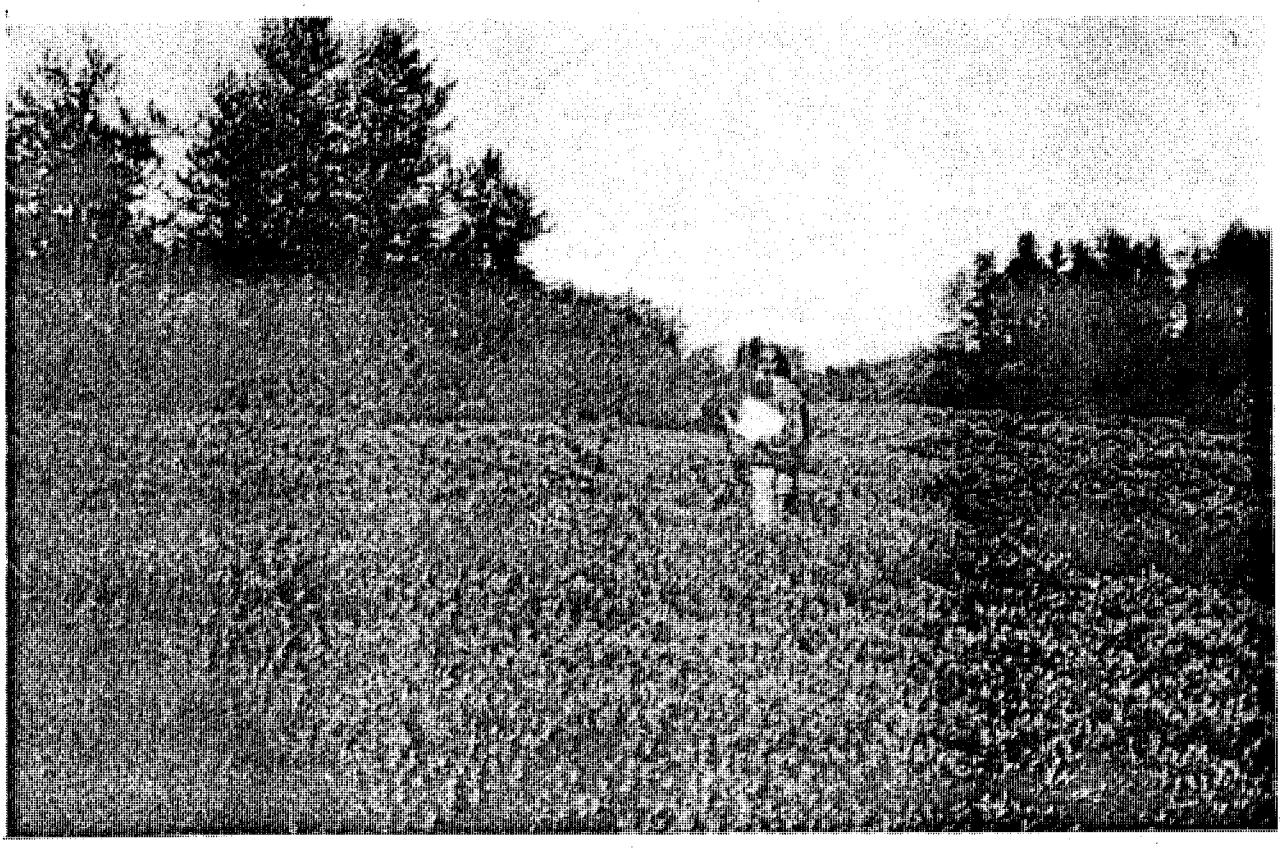
Myrica gale/Equisetum variegatum Community Type
Sweetgale/variegated scouring-rush: MYRGAL/EQUVAR

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
Myrica gale	100	56	35-90
Salix barclayi	86	2	1-5
Salix commutata	71	1	-
Achillea borealis	57	1	-
Aster subspicatus	86	4	1-10
Conioselinum chinense	57	1	-
Equisetum variegatum	86	20	1-60
Parnassia palustris	71	1	1-2
Potentilla egedii grandis	71	4	1-8
Sanguisorba stipulata	57	5	1-15
Tofieldia glutinosa	57	1	1-2
Calamagrostis canadensis	57	2	1-3
Carex flava	71	5	1-15
Carex livida	57	5	1-10
Deschampsia caespitosa	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
Picea sitchensis regen.	80	1	-
Empetrum nigrum	100	34	20-70
Oxycoccus palustris	100	5	2-10
Vaccinium uliginosum	60	12	5-25
Drosera rotundifolia	100	3	1-10
Tofieldia glutinosa	80	1	-
Trientalis europaea	60	1	-
Carex pluriflora	100	18	1-30
Carex sitchensis	80	9	1-20
Eriophorum angustifolium	80	7	1-20

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

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

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

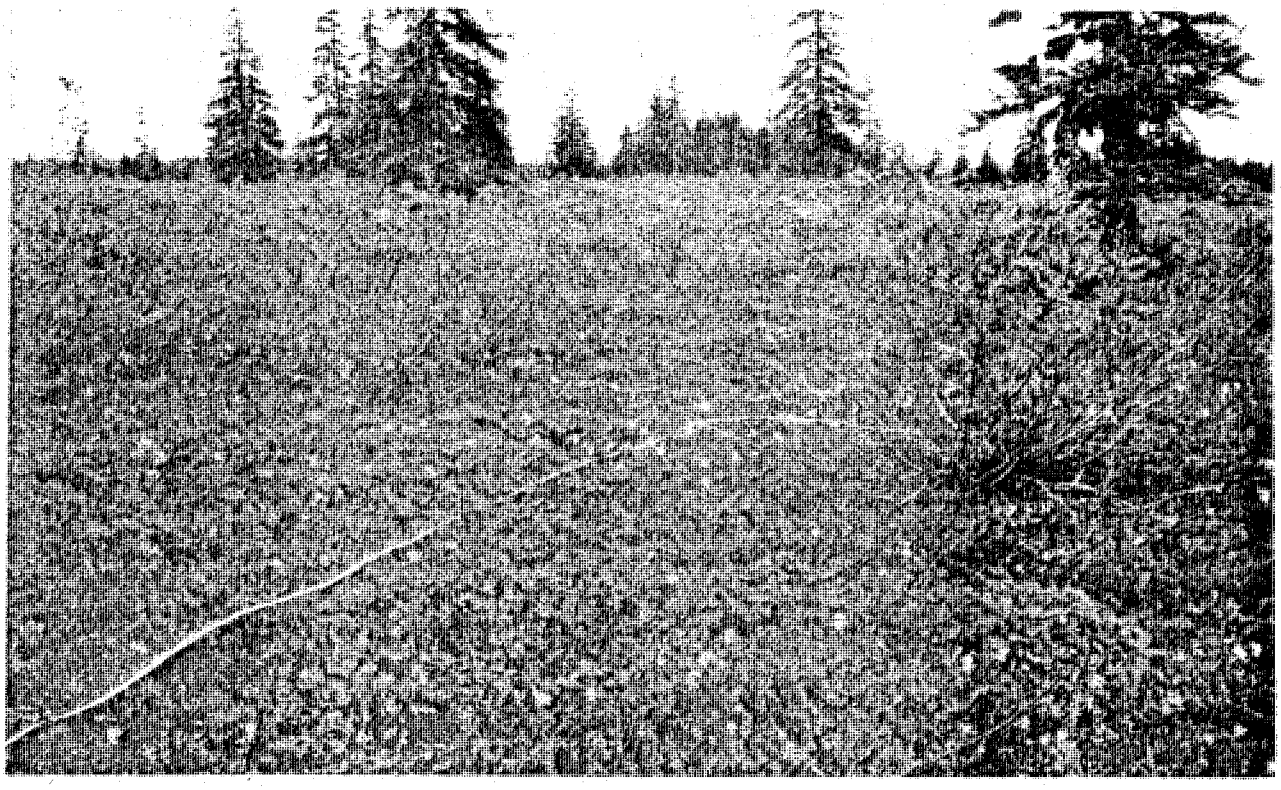
Vaccinium uliginosum-Empetrum nigrum Community Type
Bog blueberry-crowberry: VACULI-EMPNIG

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
Salix barclayi	88	4	1-8
Salix commutata	75	3	1-5
Empetrum nigrum	100	28	1-60
Vaccinium uliginosum	100	37	15-80
Equisetum arvense	63	1	-
Platanthera dilatata	63	1	1-2
Polygonum viviparum	75	5	1-20
Rubus arcticus stellatus	88	2	1-5
Deschampsia caespitosa	88	3	1-5
Eriophorum angustifolium	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
Andromeda polifolia	100	25	-
Empetrum nigrum	100	2	1-2
Oxycoccus palustris	100	8	5-10
Vaccinium uliginosum	100	7	5-8
Drosera rotundifolia	100	2	1-4
Equisetum palustre	100	6	1-10
Gentiana douglasiana	100	1	-
Platanthera dilatata	100	1	-
Carex lyngbyei	100	13	10-15
Carex pluriflora	100	23	15-30
Eriophorum russeolum	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).

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

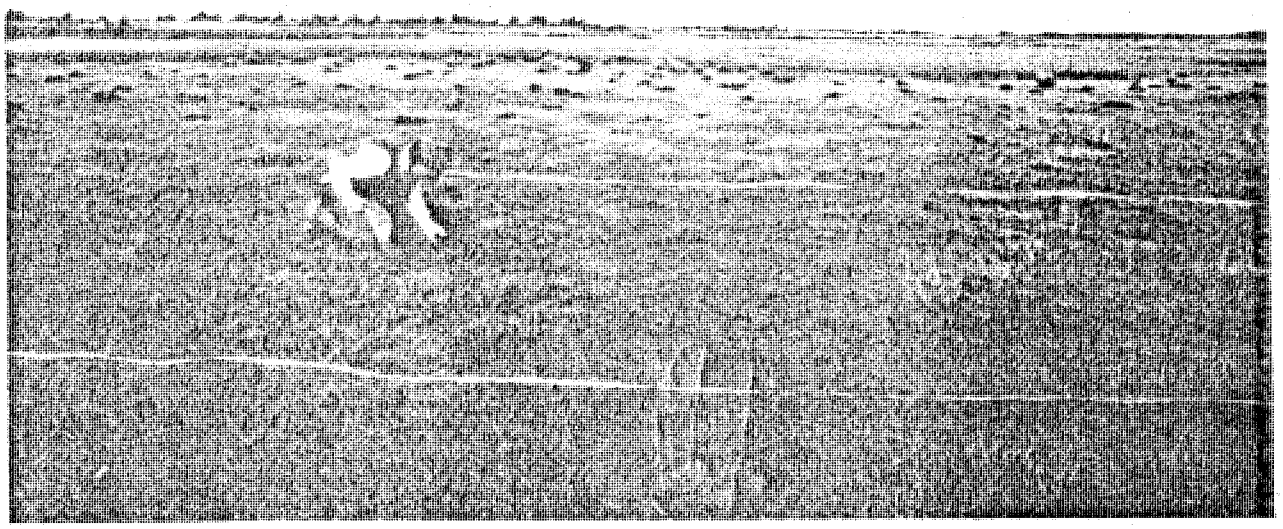
Other Studies:
Batten et al. (1978) described a similar type for Yakutat, and Boggs (1994) described a *Puccinellia pumila* (dwarf alkali grass) c.t. for the Copper River Delta. Other *Puccinellia* types have been described for many coastal areas of Alaska (Viereck et al. 1992). This type is classified 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 nutkaenis* 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
Ranunculus cymbalaria	100	1	-
Triglochin maritimum	100	5	-
Puccinellia pumila	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.

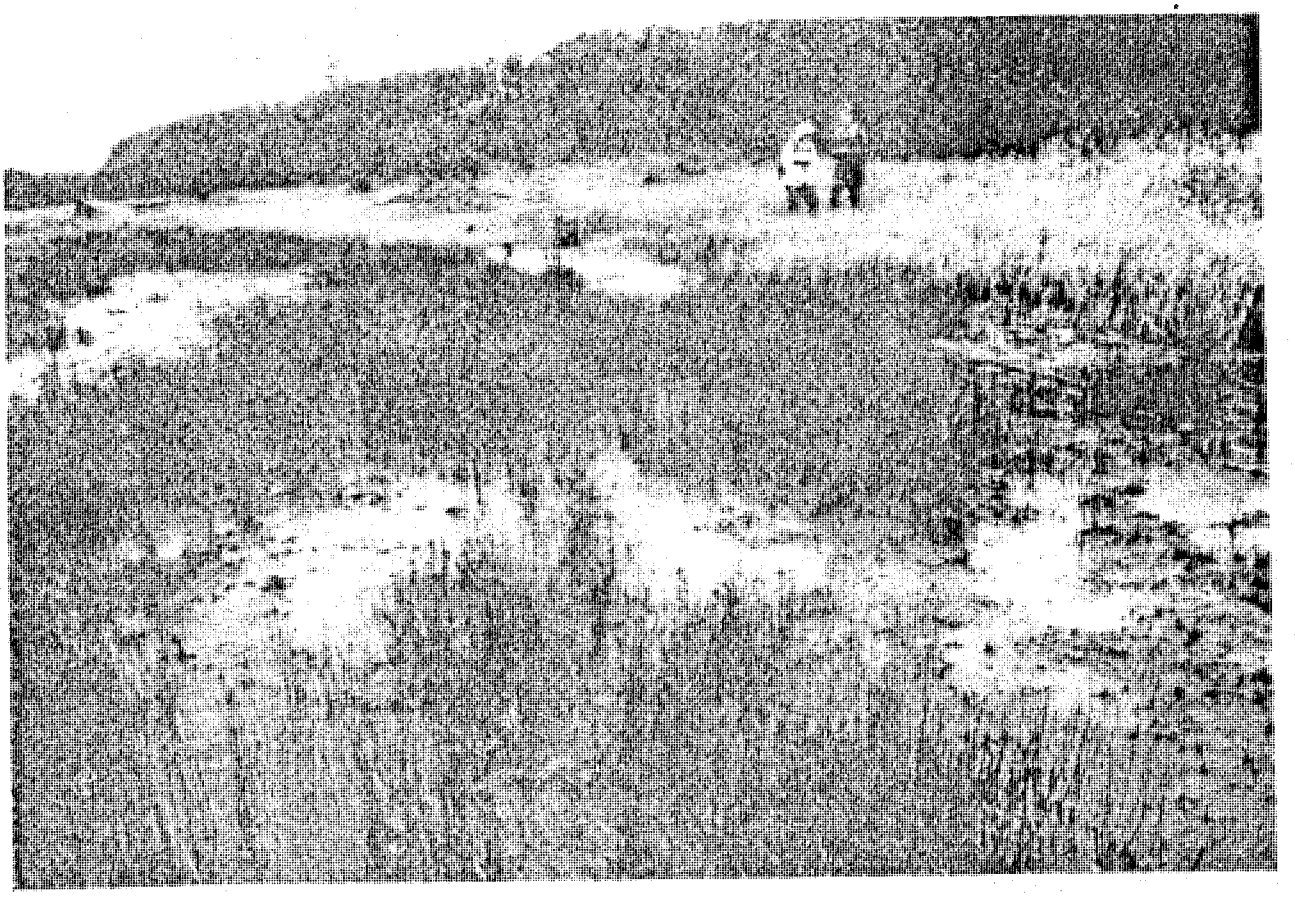
Eleocharis palustris Community Type
Spike rush: ELEPAL

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 (Viereck et al. 1992). This type is classified at level IV as herbaceous, graminoid, wet, fresh sedge meadow by Viereck 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
Potentilla egedii grandis	67	4	3-4
Ranunculus cymbalaria	67	2	-
Deschampsia caespitosa	67	2	-
Eleocharis palustris	100	48	15-80
Juncus bufonius	67	3	1-5
Puccinellia nutkaenis	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.

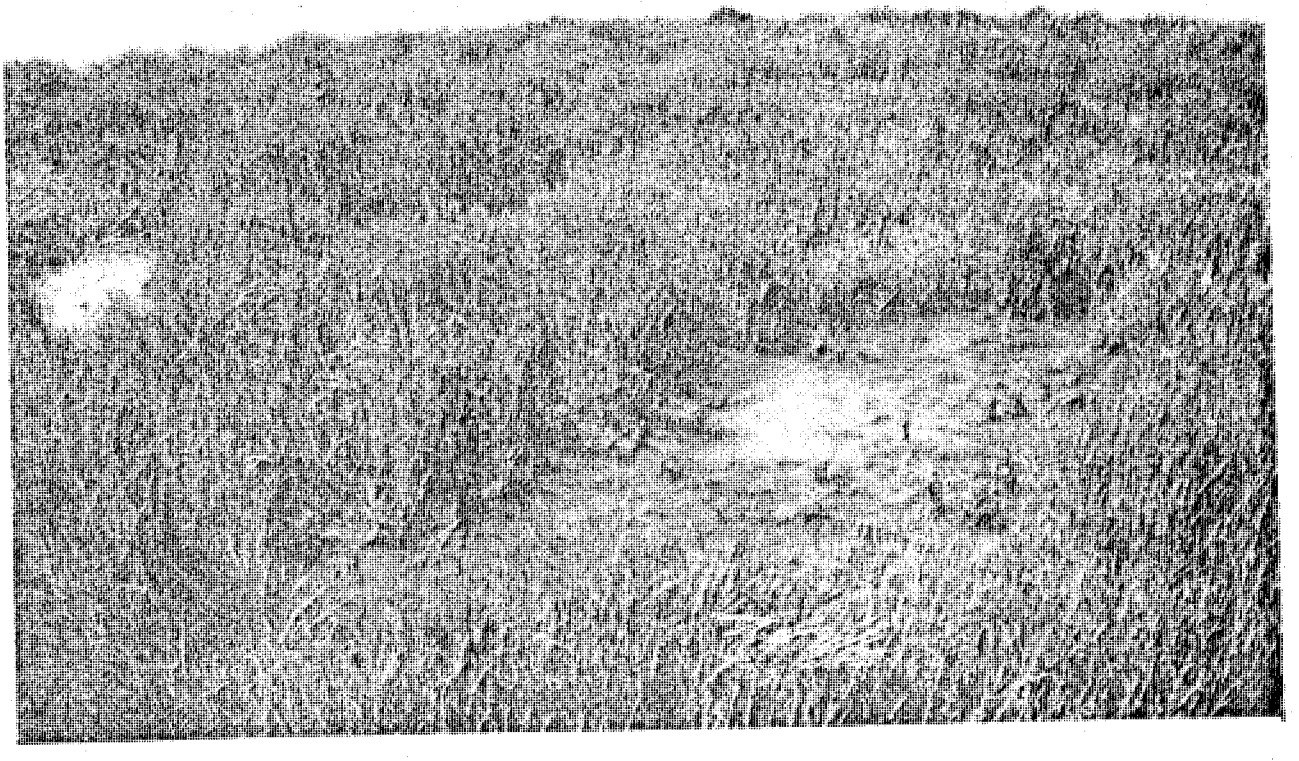
Carex lyngbyei Community Type
Lyngbyei sedge: CARLYN

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
Carex lyngbyei	100	78	55-95
Deschampsia caespitosa	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
Equisetum variegatum	67	2	1-3
Carex saxatilis	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
Picea sitchensis regen.	58	1	1-7
Oxycoccus palustris	58	6	1-15
Drosera rotundifolia	67	4	1-15
Iris setosa	58	13	1-60
Platanthera dilatata	67	1	1-3
Rubus arcticus stellatus	75	2	1-4
Trientalis europaea	67	1	-
Carex lyngbyei	67	18	1-30
Carex pluriflora	100	30	15-60
Deschampsia caespitosa	58	5	1-20
Eriophorum russeolum	67	7	1-15
Luzula multiflora	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.

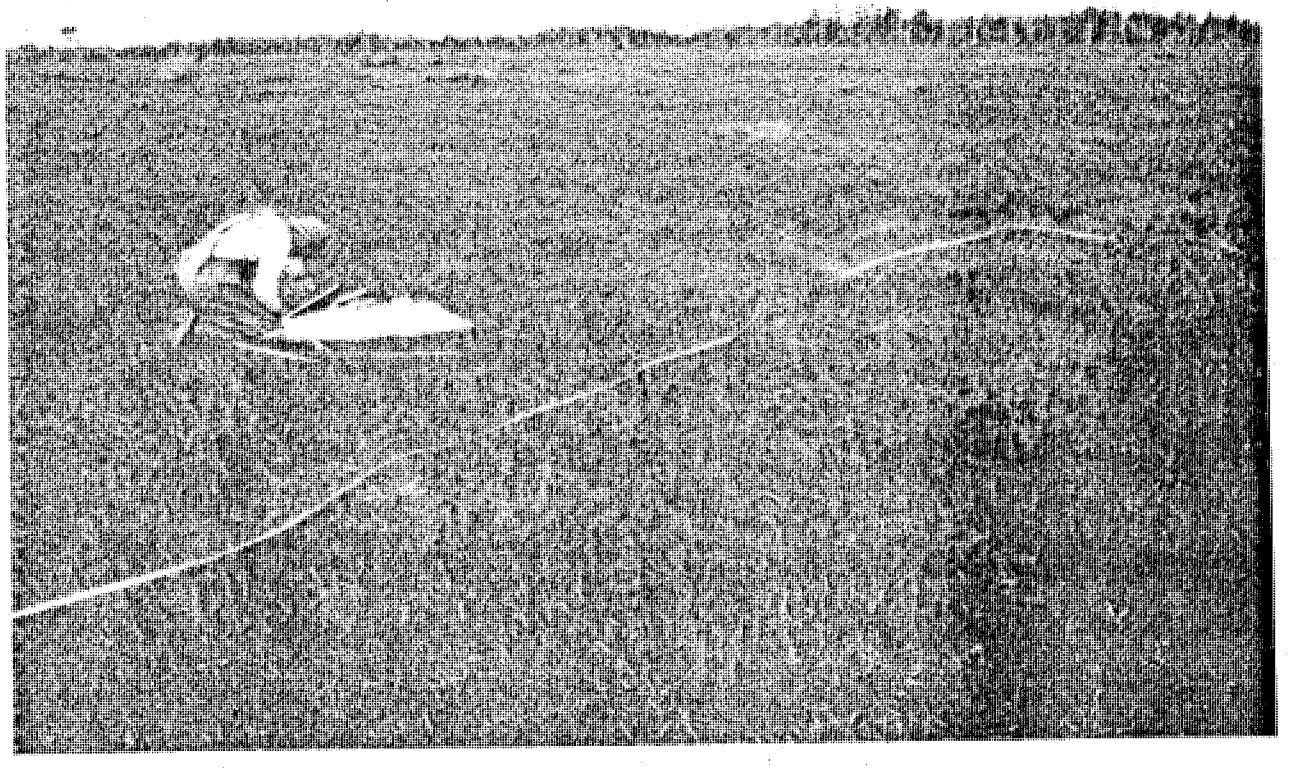
Adjacent Communities:
This community often occurs adjacent to *Myrica gale/Carex pluriflora* (sweetgale/many-flowered sedge) and *Carex sitchensis/Oxycoccus palustris* (Sitka sedge/bog cranberry) on older uplifted tidal flats.

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

Environmental Factors (landscape, soils, and hydrology):
Soils are typically classified as Histic Cryaquepts and Terric Cryohemists. 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 warnstorfii* 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
Myrica gale	57	9	1-20
Salix barclayi	57	2	1-5
Salix commutata	71	2	1-5
Empetrum nigrum	86	5	1-10
Oxycoccus palustris	86	1	1-3
Vaccinium uliginosum	71	4	1-8
Achillea borealis	57	2	1-3
Coptis trifolia	57	2	1-4
Equisetum arvense	57	1	-
Geum calthifolium	57	1	1-2
Lupinus nootkatensis	57	4	1-8
Pinguicula vulgaris	57	1	-
Platanthera dilatata	86	1	1-2
Polygonum viviparum	86	2	1-5
Rubus arcticus stellatus	86	3	1-15
Sanguisorba stipulata	57	2	1-2
Swertia perennis	86	5	1-8
Tofieldia glutinosa	100	1	1-4
Trientalis europaea	57	1	1-3
Carex flava	57	2	1-3
Deschampsia caespitosa	71	4	1-10
Festuca rubra	57	2	1-3
Trichophorum caespitosum	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
Empetrum nigrum	59	3	1-8
Oxycoccus palustris	94	4	1-20
Vaccinium uliginosum	59	3	1-15
Drosera rotundifolia	82	3	1-10
Menyanthes trifoliata	53	3	1-4
Platanthera dilatata	71	1	-
Carex pluriflora	71	9	2-25
Carex sitchensis	94	33	15-60
Eriophorum angustifolium	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 Cryohemists 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 warnstorfii,* 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
Caltha palustris asarifolia	57	6	1-10
Equisetum fluviatile	86	5	1-10
Potentilla palustris	71	5	2-10
Carex sitchensis	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
Achillea borealis	83	6	1-15
Conioselinum chinense	67	4	1-5
Epilobium glandulosum	67	3	2-5
Lathyrus palustris	67	6	4-10
Lupinus nootkatensis	83	21	2-80
Potentilla egedii grandis	100	12	2-20
Rumex fenestratus	83	1	1-2
Calamagrostis canadensis	83	31	10-60
Deschampsia caespitosa	83	9	5-15
Festuca rubra	67	2	1-5
Hordeum brachyantherum	67	4	1-10
Poa eminens	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
Glehnia littoralis	75	2	1-5
Lathyrus maritimus	75	8	2-15
Elymus arenarius	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
Angelica genuflexa	78	5	1-15
Galium trifidum	56	3	1-5
Iris setosa	67	4	1-10
Trientalis europaea	56	2	1-5
Calamagrostis canadensis	100	44	15-
Carex sitchensis	78	31	1-70
Deschampsia caespitosa	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 [illegible]ally 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
Menyanthes trifoliata	100	1	-
Nuphar polysepalum	100	40	-
Sparganium angustifolium	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
Myriophyllum alterniflorum	67	73	50-95
Myriophyllum spicatum	67	25	10-40
Potamogeton pectinatus	67	10	1-20
Ranunculus confervoides	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.

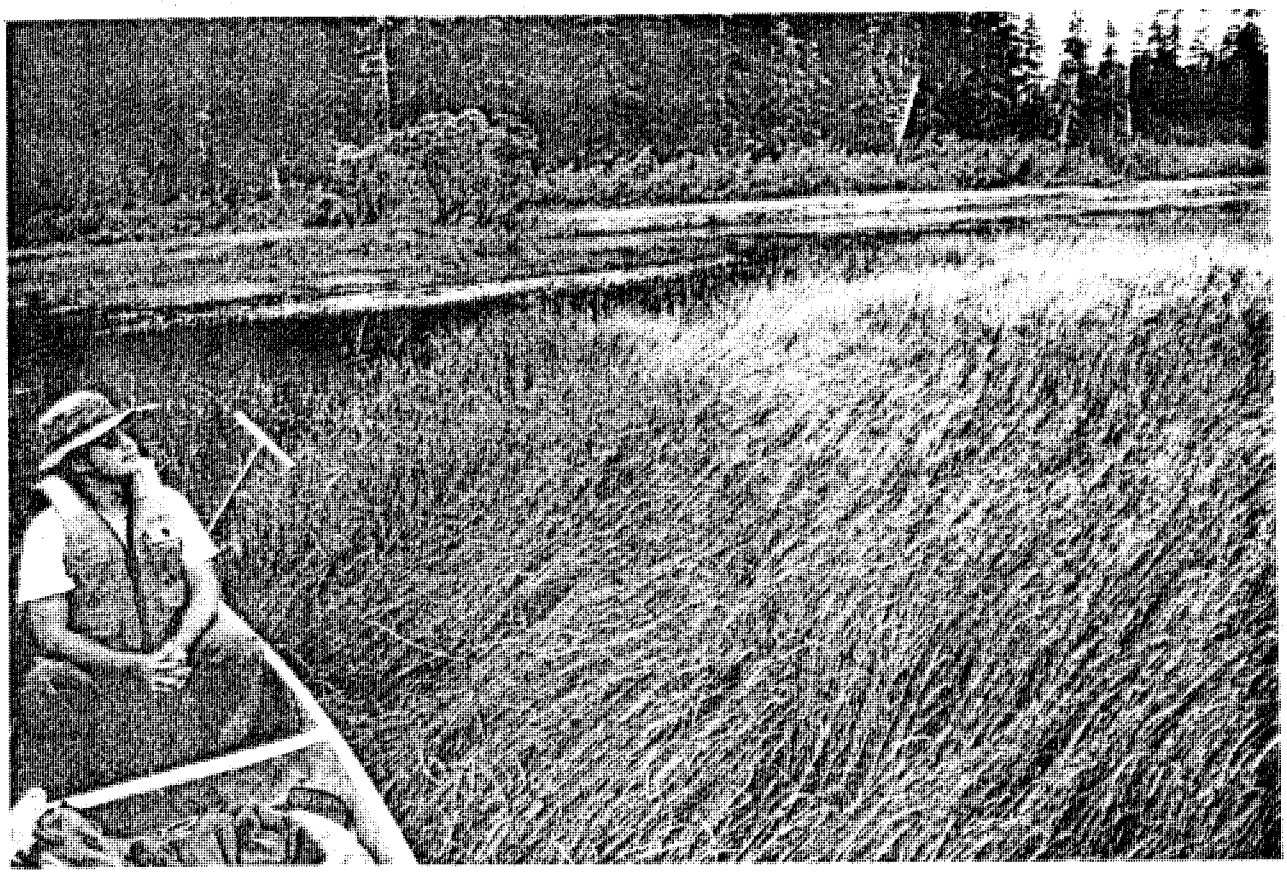
Equisetum fluviatile Community Type
Swamp horsetail: EQUFLU

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
Equisetum fluviatile	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.

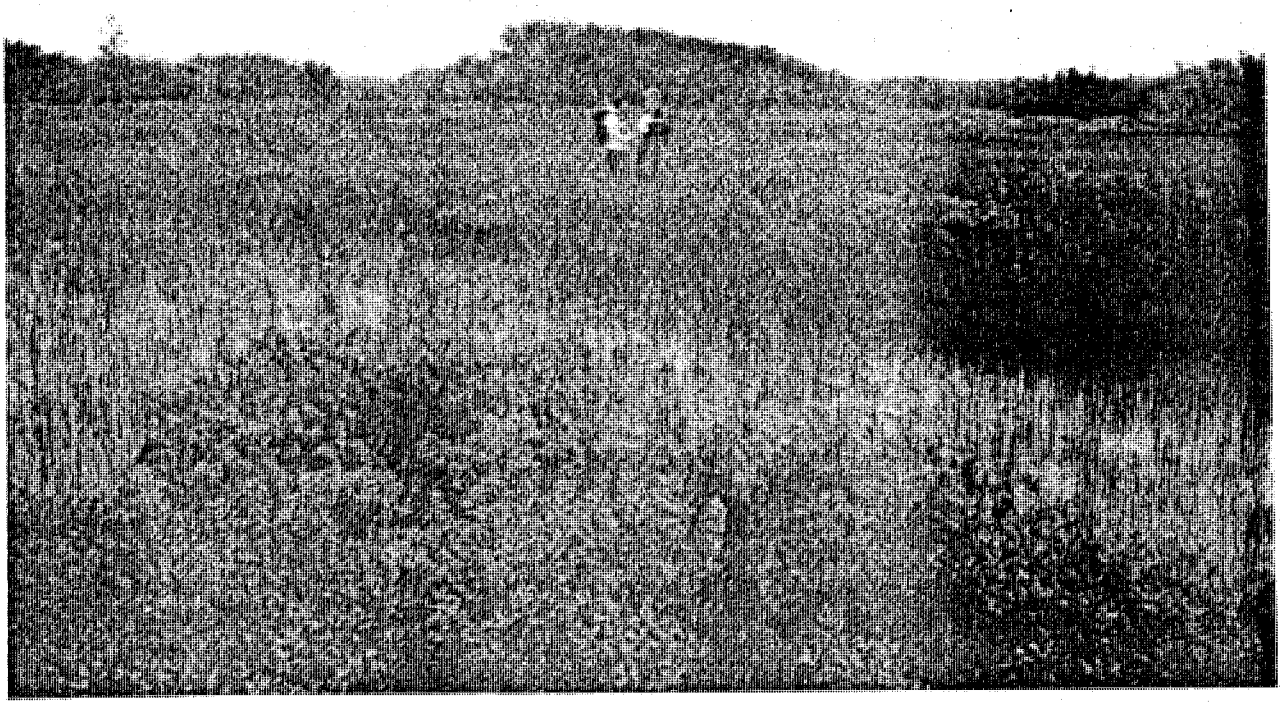
Equisetum variegatum Community Type
Variegated scouring-rush: EQUVAR

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
Myrica gale	67	5	1-15
Salix barclayi	100	2	1-7
Salix commutata	67	3	1-8
Equisetum arvense	67	2	1-4
Equisetum variegatum	100	43	35-70
Pinguicula vulgaris	67	1	-
Tofieldia glutinosa	67	1	-
Carex lyngbyei	67	3	1-8
Deschampsia caespitosa	83	2	1-3
Juncus arcticus spp. sitchensis	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.

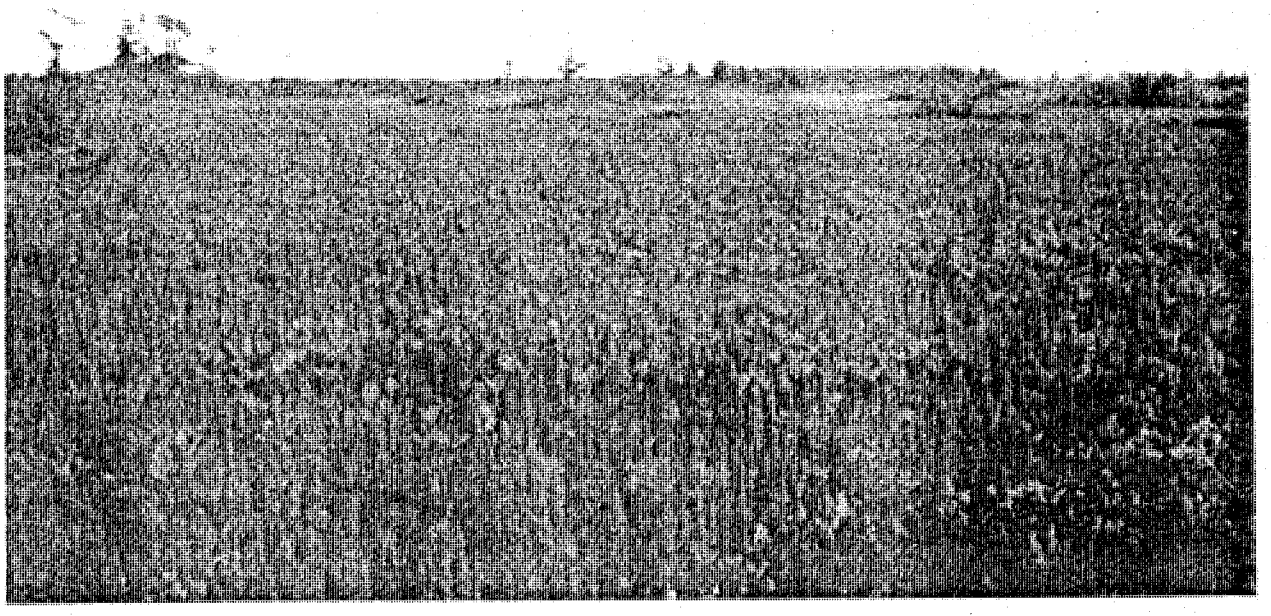
Menyanthes trifoliata-Equisetum variegatum Community Type
Buckbean-variegated scouring-rush: MENTRI-EQUVAR

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
Myrica gale	100	3	1-10
Cicuta douglasii	71	1	-
Equisetum palustre	57	8	3-10
Equisetum variegatum	86	9	1-20
Menyanthes trifoliata	100	28	10-60
Parnassia palustris	57	1	-
Pedicularis parviflora	86	4	1-10
Polygonum viviparum	57	1	1-2
Tofieldia glutinosa	57	1	-
Carex flava	57	1	1-2
Carex interior	57	5	1-10
Carex limosa	57	15	10-20
Eriophorum angustifolium	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
Cicuta douglasii	75	2	1-5
Equisetum fluviatile	83	10	1-20
Equisetum palustre	83	8	1-25
Menyanthes trifoliata	100	38	15-60
Pedicularis parviflora	58	2	1-7
Potentilla palustris	83	24	1-55
Carex limosa	58	15	5-35
Eriophorum russeolum	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
Rubus spectabilis	75	9	2-15
Angelica lucida	75	11	3-20
Circaea alpina	100	6	1-15
Conioselinum chinense	75	2	1-3
Epilobium angustifolium	75	9	2-15
Geum macrophyllum	100	1	-
Heracleum lanatum	75	5	1-8
Trientalis europaea	100	1	1-3
Calamagrostis canadensis	75	4	1-6
Athyrium filix-femina	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
Achillea borealis	100	4	1-20
Angelica lucida	75	5	2-10
Conioselinum chinense	75	2	1-4
Epilobium angustifolium	75	18	3-40
Heracleum lanatum	75	14	1-50
Lupinus nootkatensis	63	4	2-10
Sanguisorba stipulata	100	10	1-50
Solidago lepida	63	23	10-40
Calamagrostis canadensis	75	10	1-40
Deschampsia caespitosa	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.

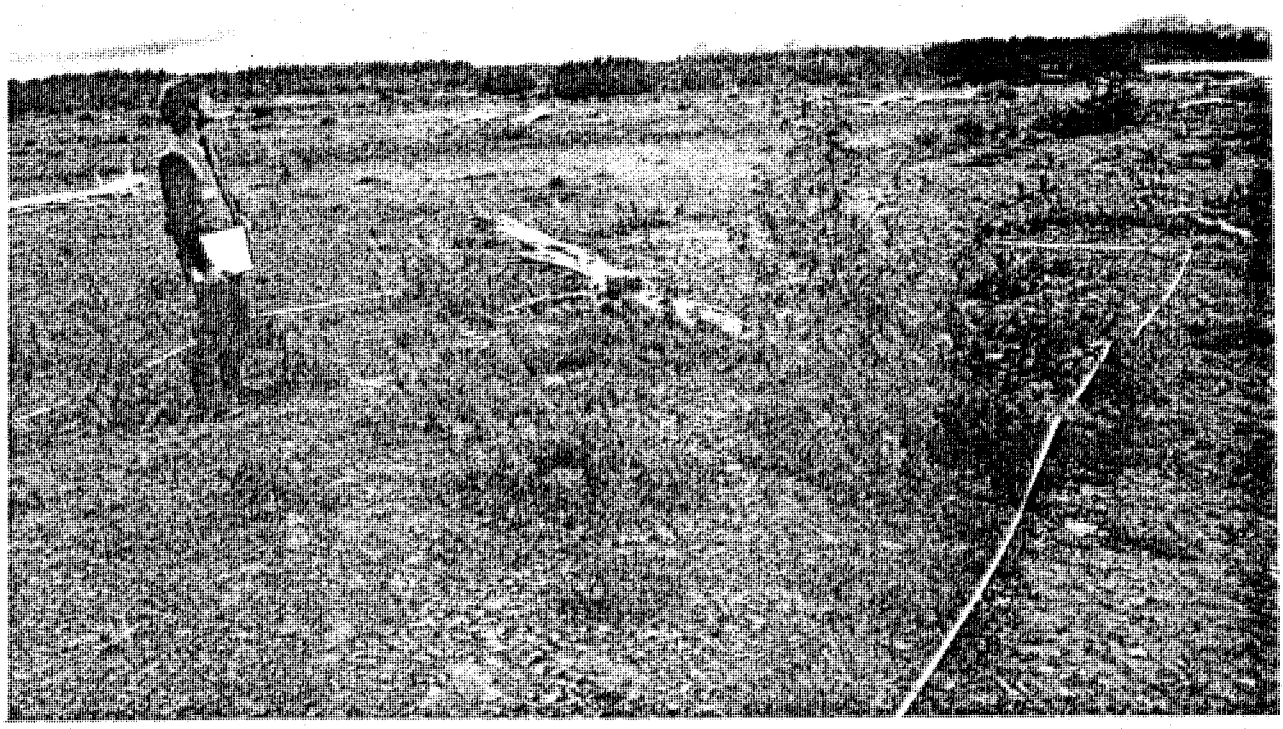
Lupinus nootkatensis/Salix setchelliana Community Type
Nootka lupine/setchell willow: LUPNOO/SALSET

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
Salix barclayi	75	1	1-2
Salix alaxensis	75	2	2-3
Salix setchelliana	75	4	1-10
Achillea borealis	100	2	1-4
Astragalus alpinus	75	8	5-15
Epilobium latifolium	75	21	1-60
Lupinus nootkatensis	75	7	2-15
Rhinanthus minor borealis	75	3	1-8
Deschampsia caespitosa	75	1	-
Phleum commutatum	75	1	-
Poa arctica	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.

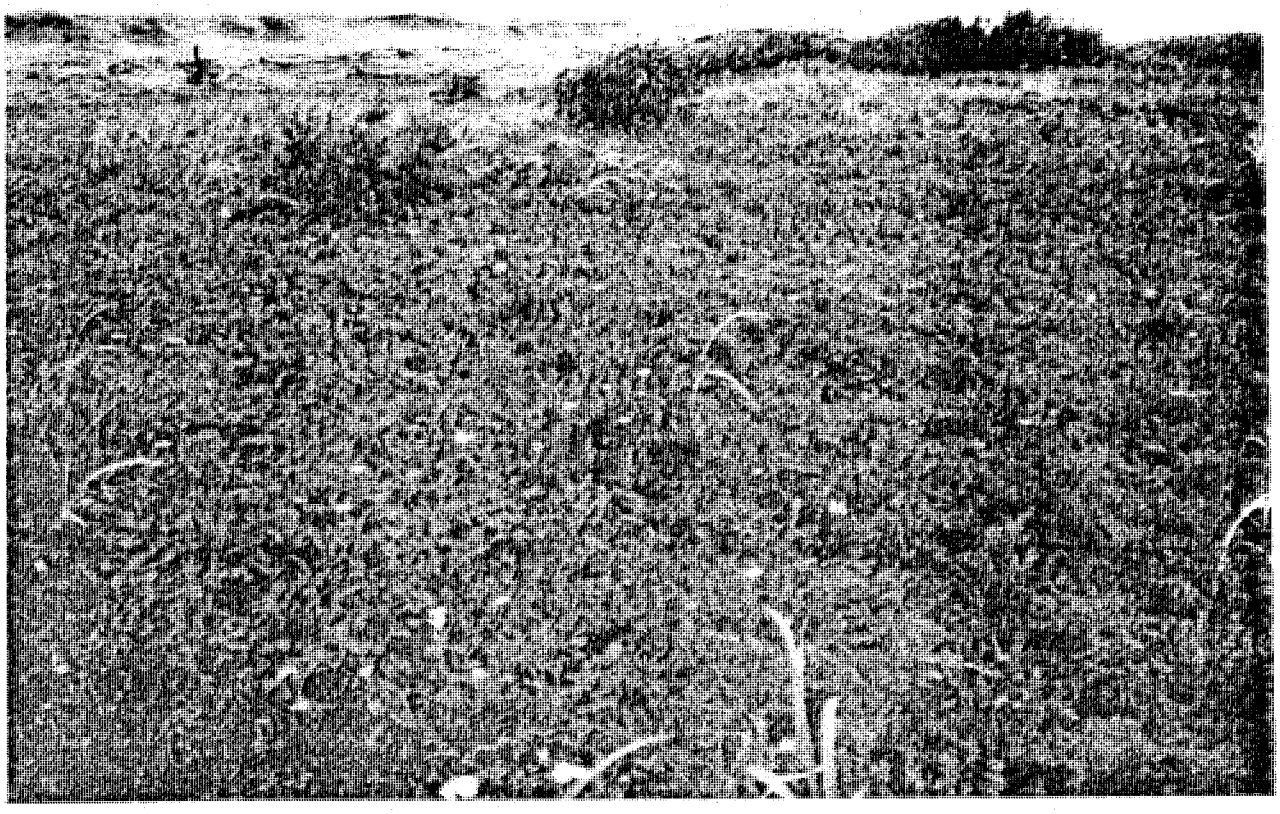
Fragaria chiloensis-Achillea borealis Community Type
Beach strawberry-yarrow: FRACHI-ACHBOR

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 (Viereck et al. 1992). This community is classified at level IV as herbaceous, forb, dry and mesic, mixed herb type by Viereck 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. *Rhytidiadelphus 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
Picea sitchensis regen.	55	1	1-3
Achillea borealis	91	5	1-10
Fragaria chiloensis	100	25	2-60
Rhinanthus minor borealis	55	9	2-15
Festuca rubra	73	10	1-40
Elymus arenarius	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.

LITERATURE CITED

Alaback, P.B. 1975. A preliminary checklist of the vascular flora of the Yakutat forelands, Alaska. Timber Inventory Report, U.S. Forest Service Report. Juneau, AK. 16 pp.

_____. 1982. Dynamics of understory biomass in Sitka spruce-western hemlock forests of Southeast Alaska. Ecology 63(6):1932-1948.

_____. 1984. Secondary succession following logging in the Sitka spruce-western hemlock forests of Southeast Alaska: Implications for wildlife management. USDA For. Ser. Gen. Tech. Rep. PNW-173. Pac. NW For. and Range Exp. Sta., Portland, OR. 26 pp.

Bailey, R.G. 1983. Delineation of ecosystem regions. Environmental Management 7:365-73.

Bailey, R.G., et al. (eds.). 1994. Ecoregions and Subregions of the United States. USDA Forest Service, map.

Banner, A., J. Pojar, and R. Trowbridge. 1986. Representative wetland types of the northern part of the Pacific Oceanic Wetland Region. British Columbia Ministry of Forests, Research Report RR85008-PR. 45 pp.

Batten, A.R., S. Murphy and D.F. Murray. 1978. Definition of Alaskan coastal wetland by floristic criteria. EPA Rep. No. 804965-01. Corvallis, OR: Corvallis Environmental Research Laboratory. 490 pp.

Beavan, J., R. Bilman, J. Mori, S. Wesnousky, and M. Winslow. 1979. Tree rings reveal Gulf of Alaska earthquakes in 1300, 1390, 1560 and 1899, Eos Trans. AGU, 60, 884-885 pp.

Blackwelder, E. 1907. Reconnaissance on the Pacific coast from Yakutat to Alsek River. Bull. Geol. Soc. Am. 314d:82-88.

_____. 1909. The Yakutat coastal plain of Alaska: a combined terrestrial and marine formation. Am. J. Sci. 27:459-466.

Boggs, K. 1994. Hierarchical classification of community types, successional sequences and land associations of the Copper River Delta: 2nd year progress report. Alaska Natural Heritage Program. Anchorage, AK. 177 pp.

Bond, G. 1951. The fixation of nitrogen associated with the root nodules of *Myrica gale* L. with special reference to its pH relations and ecological significance. Ann. Bot. 15:447-459.

Boothroyd, J.C. and G.M. Ashley. 1975. Processes, bar morphology and sedimentary structures on braided outwash fans, northeastern Gulf of Alaska. Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 23, Tulsa, Oklahoma, 193-222 pp.

Borland International. 1990. Paradox Relational Database, Version 3.5. Scotts Valley, CA.

Bosworth, K.S. 1985. Vegetation dynamics and habitat use by sandhill cranes on the Dude Creek flats, Gustavus, Alaska. University of Vermont. Unpublished report. 123 pp.

Brew, D.A. 1990. Plate-tectonic Setting of Glacier Bay National Park and Preserve and of Admiralty Island National Monument, Southeastern Alaska. *In* A. M. Milner and J. D. Wood, Jr., eds., Proceedings of the Second Glacier Bay Science Symposium. U.S. Department of the Interior, National Park Service, Alaska Regional Office, Anchorage, Alaska. 1-5 pp.

Chapin, III, F.S., L.R. Walker, C.L. Fastie and L.C. Sharman. In press. Mechanisms of primary succession following deglaciation at Glacier Bay, Alaska. Ecological Monographs.

Chorley, R.J., S.T. Schumm, and D.E. Sugden. 1984. Geomorphology. Methuen and Co., New York. 605 pp.

Clague, J.J. and V.N. Rampton. 1982. Neoglacial Lake Alsek. Can. J. Earth Sci. 19:94-117.

Clark, M.D. and S.J. Paustian. 1990. Hydrology of the Russell Lake-Old Situk River Watershed, *In* E.B. Alexander, ed., Proceedings: Watershed '89, USDA Forest Service, Alaska Region, Juneau, AK, 103-111 pp.

Clements, F.C. 1916. Plant succession: An analysis of the development of vegetation. Carnegie Institute of Washington, Pub. 242, Stanford, CA.

Clymo, R.S. and P.M. Hayward. 1983. The Ecology of *Sphagnum, In* A.J.E. Smith ed., Bryophyte Ecology, Chapman and Hall, London, New York, 229-289 pp.

Cooper, S.V., K.E. Neiman and D.W. Roberts. 1991. Forest habitat types of Northern Idaho: A second approximation. Gen. Tech. Rep. INT-236. Ogden, UT. U.S. Department of Agriculture, Forest Service. Intermountain Research Station. 143 pp.

Coville, F.V. 1895. Botany of Yakutat Bay, Alaska, with a field report by F. Funston. U.S. Nat. Herb. Contrib. 3:325-350.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. Office of Biol. Services, USDI Fish and Wildlife Service. Washington, D.C. FWS/OBS-79-31. 131 pp.

Curtis, J.C. 1993. Southeast Alaska Forecasting Problems. *In* T. Brock, ed., Proceedings: Watershed '91, R10-MB-217. U.S. Department of Agriculture, Forest Service, Alaska Region. Juneau, AK, 20-26 pp.

Daubenmire, R.D. 1952. Forest vegetation of northern Idaho and adjacent Washington and its bearing on concepts of vegetation classification. Ecological Monographs. 22:301-330.

Daubenmire, R. and J.B. Daubenmire. 1968. Forest vegetation of eastern Washington and northern Idaho. Tech. Bull. 60. Pullman, WA. Washington Agricultural Exp. Station. 104 pp.

Davis, R.A. 1983. Depositional Systems: A genetic approach to sedimentary geology. Prentice-Hall, Inc. NY. 669 pp.

Davis, S. in prep. Archaeology of the Lost River Area, Yakutat, Alaska (title unknown). Ph.D. thesis. Texas A & M. TX.

de Laguna, F. 1972. Under Mount Saint Elias: The history and culture of the Yakutat Tlingit. Smithsonian Institution press, Washington, 547 pp.

DeMeo, T.E., and W.D. Loggy. 1989. Identification, classification, and delineation of wetlands using soils and vegetation data. Unpublished report, USDA Forest Service, Tongass N.F. 59 pp.

DeMeo, T.E. 1991. Preliminary second growth response summaries for selected plant associations. Review draft report. USDA Forest Service, Tongass NF, Ketchikan Area. 55 pp.

DeMeo, T.E., J.R. Martin, and R.A. West. 1992. Forest Plant Association Mangagement Guide: Ketchikan Area, Tongass National Forest. USDA Forest Service, Alaska Region. Juneau, AK. 405 pp.

Deschu, N. and K. Thompson. 1993. International gaging station established on the Alsek River. Third Glacier Bay Science Symposium. USDI National Park Sevice, Alaska Regional Office, Anchorage, Alaska. In press.

Douglas, G.W. 1974. Montane zone vegetation of the Alsek River region, Southwestern Yukon. Can. J. Bot. 52:2505-2532.

Drury Jr., W.H. 1956. Bog flats and physiographic processes in the upper Kuskokwim River region, Alaska. Harvard Univ. Contrib. Gray Herb. 178. 130 pp.

Farr, W.A. and J.S. Hard. 1987. Multivariate analysis of climate along the southern coast of Alaska-some forestry implications. Res. Pap. PNW-RP-372. Portland, OR. USDA Forest Service, Pacific Northwest Research Station. 38 pp.

Fastie, C.L. 1990. Inference and verification in chronosequence studies at Glacier Bay. *In* A. M. Milner and J. D. Wood, Jr., eds., Proceedings of the Second Glacier Bay Science Symposium. USDI National Park Service, Alaska Regional Office, Anchorage, Alaska. 147-149 pp.

_____. 1994. Two centuries of primary succession at Glacier Bay, Alaska: A test of a classic glacial retreat chronosequence. Ph.D. Thesis. University of Alaska, Fairbanks. 101 pp.

Glaser, P.H. 1987. The development of streamlined bog islands in ithe continental interior of North America. Arctic and Alpine Research, Vol. 19, No. 4, 402-413 pp.

Gleason, H.A. 1926. The individualistic concept of the plant association. Bull. Torrey Bot. Club 53:7-26.

Goetzmann, W.H. and K. Sloan. 1982. Looking far north: The Harriman expedition to Alaska, 1899. Viking. 244 pp.

Hampton, M.A., et al. 1987. Geomorphology, sediment, and sedimentary processes. *In* D.W. Hood, and S.T. Zimmerman, eds. The Gulf of Alaska. Physical environment and biological resources. U.S. Dept. of Commerce and U.S. Dept. of the Interior, Washington, DC. 93-144 pp.

Hicks, S.D. and J.E. Crosby. 1974. Trends and variability of yearly mean sea level 1893-1972: U.S. Natl. Oceanic Survey, NOAA tech. Mem. NOS 13, 14 pp.

Hill, M.O. 1979a. TWINSPAN: a Fortran program for arranging mutivariant data in an ordered two-way table by classification of the individuals and attributes. Cornell University, Ithaca, NY.

_____. 1979b. DECORANA: a Fortran program for detrended correspondence analysis and reciprocal averaging. Ecology and Systematics, Cornell University, Ithaca, NY.

Hine, A.C. and J.C. Boothroyd. 1978. Morphology, processes and recent sedimentary history of a glacial-outwash plain shoreline, southern Iceland. J. Sedimentary Petrology. 48(3):901-920.

Hitchcock, C.L. and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press. Seattle, WA. 730 pp.

Holloway, R.G. 1990. Pollen and plant macrofossil analyses of 49YAK19 (D'yaguna'et) and 49YAK20 (Shallow Water Town) Yakutat, Alaska. Castetter labortory for ethnobotanical studies technical series. Report no. 283. Report for USDA Forest Service. 30 pp.

Hulten, E. 1968. Flora of Alaska and neighboring territories; a manual of the vascular plants. Stanford University Press. Standford, CA. 1008 pp.

Jacob, K.H. 1986. Seismicity, tectonics, and geohazards of the gulf of Alaska regions. *In* D. Wood and S. Zimmerman, eds., The Gulf of Alaska: Physical Environs and Biological Resources. National Oceanic and Atmospheric Administration, 145-183 pp.

Johnson, P.R. and C.W. Hartman. 1969. Environmental atlas of Alaska. Inst. Arct. Environ. Eng. and Inst. Water Resour., Univ. Alaska, College. 111 pp.

Kemnitz, R.T. et al. 1993. Water Resources Data for Alaska, Water Year 1992. U.S. Department of Interior, U.S. Geological Survey, USGS/WRD-AK-92-1, Water Resources Division, Anchorage, AK. 417 pp.

Lamke, R.D. et al. 1992. Water Resources Data for Alaska, Water Year 1991. U.S. Department of Interior, U.S. Geological Survey, USGS/WRD AK-91-1, Water Resources Division, Anchorage, AK. 415 pp.

Lawrence, D.B. 1951. Recent glacier history of Glacier Bay, Alaska, and development of vegetation on deglaciated terrain with special reference to the importance of alder in the succession. Yearbook of the American Philosophical Society 1950:175-176.

MacKevett Jr., E.M. and G. Plafker. 1970. Geochemical and Geophysical Reconnaissance of Parts of the Yakutat and Mount Saint Elias Quadrangles, Alaska. Contributions to Economic Geology. Geological Survey Bulletin 1312-L.

Mann, D.M. 1986. Reliability of a fjord glacier's fluctuations for paleoclimatic reconstructions. Quat. Res. 25:10-24.

Martin, J.R. and S.L. Borchers. 1991. Plant association reconnaissance level sampling procedure. Alaska Region 10, U. S. Forest Service. Juneau, AK. 16 pp.

Martin, J.R., S.J. Trull, W.W. Brady, R.A. West, and J.M. Downs. 1995. Forest plant association management guide: Chatham Area, Tongass National Forest. USDA Forest Service, Alaska Region. Juneau, AK.

Matthews, J.A. 1992. The Ecology of Recently Deglaciated Terrain. Cambridge University Press, Cambridge. 386 pp.

Mayo, L.R. 1988. Advance of Hubbard Glacier and closure of Russell Fjord, Alaska, environmental effects and hazards in the Yakutat area. *In* J.P. Galloway and T.D. Hamilton, eds., Geologic studies in Alaska by the U.S. Geological Survey during 1987. U.S. Geological Survey Circular 1016:4-16.

Miller, D.J. 1961. Geology of the Yakutat District, Gulf of Alaska tertiary province, Alaska. U.S. Geological Survey. Preliminary map.

Molnia, B.F. 1986. Glacial history of the northeastern Gulf of Alaska - a synthesis. *In* T.D. Hamilton, K.M. Reed and R.M. Thorson, eds., Glaciation in Alaska, the geologic record. Alaska Geological Society. Anchorage, AK. 219-236 pp.

Mueller-Dombois, D. and H. Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley and Sons. New York. 547 pp.

National Climatic Data Center. 1993. Local climatological data for Yakutat, Alaska. Environmental Data Service, National Oceanic and Atmospheric Administration, Ashville, NC.

National Wetland Working Group. 1988. Wetlands of Canada. Ecological Land Classification Series, No. 24. Sustainable Development Branch, Environment Canada, Ottawa, Ontario, and Polyscience Publications Inc., Montreal, Quebec. 452 pp.

Neiland, B.J. 1971. The Forest-Bog Complex of Southeast Alaska. Vegetatio 22:1-63.

Nelson, D., G.A. Harris and T.E. Hamilton. 1978. Land and resource classification - who cares? J. For. 76(10):644-676.

Nummedal, D., et al. 1974. (Article not reviewed; Information taken from Hine and Boothroyd 1978) Recent migrations of the Skeidararsandur coastline, Southeast Iceland. Final Report for contract N60921-73-C-0258, Naval Ordnance Laboratory, Washington, DC. 183 pp.

Padgett, W.G., A.P. Youngblood and A.H. Winward. 1989. Riparian community type classification of Utah and southeastern Idaho. USDA Forest Service, Intermountain Region. Ogden, UT. 191 pp.

Patric, J.H. and P.E. Black. 1968. Potential evapotranspiration and climate in Alaska by Thornthwaite's classification. USDA Forest Serv. Res. Pap. PNW-71. Pacific Northwest Forest & Range Experiment Station, Portland, OR. 28 pp.

Pawuk, W. and E. Kissinger. In prep. Forest plant association mangagement guide: Stikine Area, Tongass National Forest. USDA Forest Service, Alaska Region. Juneau, AK.

Peteet, D.M. 1983. Holocene vegetational history of the Malaspina Glacier district, Alaska. Ph.D. thesis. New York University. NY. 88 pp.

_____. 1991. Postglacial migration history of lodgepole pine near Yakutat, Alaska. Can. J. Bot. 69:786-796.

Peteet, D.M. and J. Bolivar. 1983. Russell Fjord, Alaska, vegetation map and key. USDA Forest Service Report. Yakutat, AK. 8 pp.

Petersen, M.R., J.C. Greilich, and N.M. Harrison. 1981. Spring and fall migration, and habitat use by water birds in the Yakutat forelands, Alaska - 1980. National Fishery Research Center. Anchorage, AK. 106 pp.

Plafker, G., T. Hudson, M. Rubin, and K.L. Dixon. 1980. Holocene marine terraces and uplift history in the Yakataga seismic gap near Icy Cape, Alaska. *In* W.L. Conrad, ed., The USGS in Alaska: Accomplishments during 1980. U.S. Geological Survey Circular 844:111-115.

Plafker, G. and D. Miller. 1958. Glacial features and surficial deposits of the Malaspina district, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-271., scale 1:125,000.

Porter, S.C. 1986. Pattern and forcing of Northern Hemishere glacier variations during the last millennium. Quaternary Research 26:27-48.

Racine, C.H. and J.C. Walters. 1991. Groundwater-discharge wetlands in the Tanana flats, interior Alaska. US Army Corps of Engineers, CRREL report 91-14. 10 pp.

Rigg, G.B. 1914. Notes on the flora of some Alaskan Sphagnum bogs. The Plant World. 17(6):167-182.

Schoen, J.W. and L.R. Beier. 1990. Brown bear habitat preferences and brown bear logging and mining relationships in Southeast Alaska. AK dept. of Fish and Game, Federal Aid in Wildlife Restoration Research, Final Report. 90 pp.

Schofield, W.B. 1992. Some common mosses of British Columbia. 2nd edition. Royal British Columbian Museum. Victoria, Canada. 394 pp.

Schrader, B.A. 1992. Vegetation and conifer seedling response to clearcutting of alluvial spruce sites in Southeast Alaska. MS thesis, Univ. of WA, Seattle, WA. 71 pp.

Schwintzer, C.R. and S.A. Lancelle. 1983. Effect of water-table depth on shoot growth, root growth, and nodulation of *Myrica gale* seedlings. J. Ecology. 71:489-501.

Siegel, D.I. 1988. The Recharge-Discharge Function of Wetlands near Juneau, Alaska: part I. Hydrogeological Investigations. Groundwater 26(4):427-434.

Sjors, H. 1985. A comparison between mires of southern Alaska and Fennoscandia. Aquilo Ser. Bot. 21:89-94.

Smith, B. 1991. ECOAID ecology program for the micro-computer. USDA Forest Service Region 6. Okanogan, WA.

Sparks, L.H., R. del Moral, A.F. Watson, and A.R. Kruckeberg. 1977. The distribution of vascular plant species on Sergief Island, Southeast Alaska. Syesis. 10:1-9.

Stair, L. and F.W. Pennell. 1946. A collection of plants from Yakutat, Alaska. Bartonia 24:9-21.

Stone, C.S. 1993. Vegetation of coastal marshes near Juneau, Alaska. Northwest Science, 67(4):215-231.

Tarr, R.S. and L. Martin. 1906. Recent changes of level in the Yakutat Bay region, Alaska. Bull. Geo. Soc. of Am. 17:29-64.

Tarr, R.S. 1907. Recent advance of glaciers in the Yakutat Bay region, Alaska. Bull. Geo. Soc. of Am. 18:257-286.

Thedinga, J.F., S.W. Johnson, K.V. Koski, J.M. Lorenz and M.L. Murphy. 1993. Potential effects of flooding from Russell Fjord on salmonids and habitat in the Situk River, Alaska. U.S. dept. Commerce, Auke Bay laboratory. AFSC processed report 93-01. 228 pp.

Thilenius, J.F. 1990. Dimensional weights and forage of Barclay willow and sweetgale on moose ranges in the wetlands of the Copper River Delta, Alaska. Forest Eco. and Man. 33/34:463-483.

Thomas, B.I. and R.V. Berryhill. 1962. Reconnaissance studies of Alaskan beach sands, Eastern Gulf of Alaska. U.S. Dept. of the Interior, Bureau of Mines Report of investigations 5986. 38 pp.

Viereck, L.A., C.T. Dryness, A.R. Batten and K.J. Wenzlick. 1992. The Alaska vegetation classification. Gen. Tech. Rep. PNW-GTR-286. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 278 pp.

Vitt, D.H. and W. Chee. 1990. The relationship of vegetation to surface water chemistry and peat chemistry in fens of Alberta, Canada. Vegetatio 89:87-106.

Watson, S. 1981. Wetlands habitat investigations in Sitka Sound, Alaska. Unpublished. Alaska Dept. of Fish and Game. Anchorage, AK. 126 pp.

Welsh, S.L. 1974. Anderson's flora of Alaska and adjacent parts of Canada. Bringham Young University Press. Provo, UT. 724 pp.

Worley, I.A. 1977. Plant Community Analysis. *In* G.P. Streveler and I.A. Worley, eds., Dixon Harbor biological survey: final report on the summer phase of 1975 research. USDI National Park Service. Juneau, AK. 126-237 pp.

_____. 1980. Plant Community Analysis. *In* G.P. Strevler, I.A. Worley and B.F. Molnia, eds., Lituya Bay environmental survey. USDI National Park Service. 92-192 pp.

Yehle, L.A. 1975. Preliminary report on the reconnaissance engineering geology of the Yakutat area, Alaska, with emphasis on evaluation of earthquake and other geologic hazards. U.S. Geological Survey. Open-file report 75-529.

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) *NOTE: These forest types also occur in the open needleleaf forest category*	Sitka spruce	*Picea sitchensis/Alnus sinuata* *Picea sitchensis/Echinopanax horridum-Rubus spectabilis* *Picea sitchensis/Vaccinium-Echinopanax horridum* *Picea sitchensis/Echinopanax horridum* *Picea sitchensis/Vaccinium* *Picea sitchensis/*seral
			Western hemlock	*Tsuga heterophylla/Vaccinium-Echinopanax horridum* *Tsuga heterophylla/Vaccinium/Dryopteris dilatata* *Tsuga heterophylla/Vaccinium*
			Mountain hemlock	*Tsuga mertensiana/Vaccinium*
			Mixed conifer	Mixed conifer/*Vaccinium/Lysichitum americanum* Mixed conifer/*Vaccinium*
		Needleleaf woodland (canopy 10-25 percent)	Lodgepole pine	*Pinus contorta/Sphagnum*
			Sitka spruce bog	*Picea sitchensis/Sphagnum*
	Broadleaf forest	Open broadleaf forest (canopy 25-60 percent)	Black cottonwood	*Populus trichocarpa/Salix* *Populus trichocarpa/Rubus spectabilis* *Populus trichocarpa/Echinopanax horridum*
		Broadleaf woodland (canopy 10-25 percent)	Black Cottonwood	*Populus trichocarpa/Salix* *Populus trichocarpa/Rubus spectabilis* *Populus trichocarpa/Echinopanax horridum*
	Mixed forest	Closed mixed forest (canopy 60-100 percent)	Sitka spruce-black cottonwood (new level)	*Picea sitchensis-Populus trichocarpa/Alnus sinuata* *Picea sitchensis-Populus trichocarpa/Echinopanax horridum* *Picea sitchensis-Populus trichocarpa/*seral
		Open mixed forest (canopy 25-60 percent)	Sitka spruce-black cottonwood (new level)	*Picea sitchensis-Populus trichocarpa/Alnus sinuata* *Picea sitchensis-Populus trichocarpa/Echinopanax horridum* *Picea sitchensis-Populus trichocarpa/*seral
Scrub	Dwarf tree	Dwarf tree scrub woodland (canopy 10-25 percent)	Sitka spruce-bog (new level)	*Picea sitchensis/Sphagnum*

Appendix 1. (continued)

Level I[1]	Level II	Level III	Level IV	Level V
Scrub (cont.)	Tall scrub	Closed tall scrub (canopy 75-100 percent)	Willow	*Salix sitchensis* *Salix hookeriana* *Salix barclayi/Carex pluriflora* *Salix barclayi/Carex sitchensis* *Salix barclayi/Fragaria chiloensis* *Salix sitchensis*
			Alder	*Alnus sinuata-Rubus spectabilis*
			Alder-willow	*Alnus sinuata-Salix sitchensis*
			Shrub swamp	*Alnus sinuata*/graminoid
			Alder-crabapple (new level)	*Alnus sinuata-Malus fusca*
		Open tall scrub (canopy 25-75 percent, less than 3 m tall)	Willow	*Salix sitchensis* *Salix hookeriana* *Salix barclayi/Carex pluriflora* *Salix barclayi/Carex sitchensis* *Salix barclayi*/mixed herbs *Salix barclayi/Fragaria chiloensis*
			Alder	*Alnus sinuata-Rubus spectabilis*
			Alder-willow	*Alnus sinuata-Salix sitchensis*
			Shrub swamp	*Alnus sinuata*/graminoid
			Alder-crabapple (new level)	*Alnus sinuata-Malus fusca*
			Salmonberry (new level)	*Rubus spectabilis/Athyrium filix-femina*
	Low scrub	Open low scrub (canopy 25-75 percent, shrubs 20 cm to 1.5 m tall)	Ericaceous shrub bog	*Vaccinium uliginosum-Empetrum nigrum* *Empetrum nigrum/Carex pluriflora* *Andromeda polifolia/Carex pluriflora*
			Sweetgale-graminoid bog	*Myrica gale/Carex livida* *Myrica gale/Carex sitchensis* *Myrica gale/Carex pluriflora* *Myrica gale/Equisetum variegatum*
Herbaceous				
	Graminoid herbaceous	Dry graminoid herbaceous	*Elymus*	*Elymus arenarius*
		Mesic graminoid herbaceous	Bluejoint meadow	*Calamagrostis canadensis*
			Bluejoint-herb	*Calamagrostis canadensis/Potentilla egedii*

Appendix 1. (concluded)

Level I[1]	Level II	Level III	Level IV	Level V
Herbaceous (cont.)	Graminoid herbaceous	Wet graminoid herbaceous	Fresh sedge marsh	*Eleocharis palustris*
			Subarctic lowland sedge wet meadow	*Carex lyngbyei* *Carex saxatilis* *Carex livida-Trichophorum caespitosum* *Trichophorum caespitosum* *Carex sitchensis/Equisetum fluviatile*
			Halophytic grass wet meadow	*Puccinellia pumila*
			Halophytic sedge wet meadow	*Carex lyngbyei* *Carex pluriflora-Carex lyngbyei*
			Subarctic lowland sedge bog meadow	*Carex pluriflora-Carex lyngbyei* *Carex livida-Trichophorum caespitosum* *Carex sitchensis/Oxycoccus palustris*
	Forb herbaceous	Dry forb herbaceous	Seral herbs	*Lupinus nootkatensis/Salix setchelliana* *Fragaria chiloensis-Achillea borealis* *Equisetum variegatum*
		Mesic forb herbaceous	Mixed herbs	*Fragaria chiloensis/Achillea borealis*
			Large umbel	Mesic forb/*Athyrium filix-femina* Mesic forb
		Wet forb herbaceous	Fresh herb marsh	*Equisetum fluviatile*
			Subarctic lowland herb wet meadow	*Equisetum variegatum* *Menyanthes trifoliata/Equisetum variegatum*
			Subarctic lowland herb bog meadow	*Menyanthes trifoliata/Potentilla palustris*
	Aquatic herbaceous (floating and submerged)	Freshwater aquatic herbaceous	Pondlily	*Nuphar polysepalum*
			Water milfoil	*Myriophyllum alterniflorum*

[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	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)
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 herbacous, 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	—	—	—

[1]NOTE: Some of these community types are not wetlands.

APPENDIX 3. INDICATOR SPECIES FOR COMMUNITY TYPES OF THE YAKUTAT FORELAND.

SCIENTIFIC NAME	COMMON NAME
TREES	
Picea sitchensis	Sitka spruce
Pinus contorta contorta	Shorepine or lodgepole pine
Populus balsamifera trichocarpa	Black cottonwood
Tsuga heterophylla	Western hemlock
Tsuga mertensiana	Mountain hemlock
TALL SHRUBS (≥30 cm [1 ft.])	
Alnus sinuata	Sitka alder
Echinopanax horridum	Devil's club
Malus fusca	Oregon crab apple
Myrica gale	Sweetgale
Rubus spectabilis	Salmonberry
Salix barclayi	Barclay willow
Salix hookeriana	Hooker willow
Salix sitchensis	Sitka willow
Sambucus racemosa	Red elderberry
Vaccinium sp. (oval. & alask.)	Tall Blueberry sp.
LOW AND SUBSHRUBS (<30 cm [1 ft.])	
Andromeda polifolia	Bog rosemary
Empetrum nigrum	Crowberry
Oxycoccus palustris	Bog cranberry
Salix setchelliana	Setchell willow
Vaccinium uliginosum	Bog blueberry
FORBS	
Achillea borealis	Yarrow
Angelica genuflexa	Bent-leaved angelica
Aster subspicatus	Douglas' aster
Astragalus alpinus	Alpine milk-vetch
Drosera rotundifolia	Round-leaf sundew
Epilobium angustifolium	Fireweed
Epilobium latifolium	Dwarf fireweed
Equisetum arvense	Meadow horsetail
Equisetum fluviatile	Swamp horsetail
Equisetum variegatum	Northern horsetail
Fragaria chiloensis	Beach strawberry
Heracleum lanatum	Cow parsnip
Hippuris vulgaris	Common marestail
Lupinus nootkatensis	Nootka lupine
Lysichitum americanum	Yellow skunk-cabbage
Menyanthes trifoliata	Buckbean
Myriophyllum alterniflorum	Water-milfoil
Myriophyllum spicatum	Water-milfoil
Nuphar polysepalum	Yellow water lily
Potentilla egedii grandis	Pacific silverweed
Potentilla palustris	Marsh cinquefoil
Rhinanthus minor borealis	Yellow rattle
Sanguisorba stipulata	Burnet
Solidago canadensis	Goldenrod

Appendix 3. (concluded)

SCIENTIFIC NAME	COMMON NAME
GRAMINOIDS	
Calamagrostis canadensis	Bluejoint
Calamagrostis inexpansa	Bluejoint
Carex capillaris	Hair-like sedge
Carex flava	Yellow sedge
Carex livida	Livid sedge
Carex lyngbyei	Lyngbyei sedge
Carex macrochaeta	Alaska long-awn sedge
Carex pluriflora	Many-flowered sedge
Carex rostrata	Beaked sedge
Carex saxatilis	Russet sedge
Carex sitchensis	Sitka sedge
Deschampsia beringensis	Hairgrass
Deschampsia caespitosa	Hairgrass
Eleocharis palustris	Spike rush
Elymus arenarius mollis	Beach-rye grass
Eriophorum angustifolium	Cottongrass
Eriophorum russeolum	Cottongrass
Hordeum brachyantherum	Meadow barley
Puccinellia pumila	Alkali grass
Trichophorum caespitosum	Tufted clubrush
FERNS AND ALLIES	
Athyrium filix-femina	Lady fern
Dryopteris dilatata	Shield fern
MOSSES	
Sphagnum spp.	Peat moss

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/DRYDIL	
	1 Plot		3 Plots		8 Plots		3 Plots		4 Plots	
SPECIES	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV	CON	ACOV
TREES										
Picea sitchensis	100	1	67	11	88	22	100	7	50	4
Tsuga heterophylla	.	.	67	20	88	17	100	55	100	55
Tsuga mertensiana	100	40	67	10	100	14	.	.	.	.
TREES-REGENERATION										
Picea sitchensis regen	100	1	67	4	100	1	100	2	75	1
Tsuga heterophylla regen	.	.	67	9	88	3	100	7	100	8
Tsuga mertensiana regen	100	3	67	4	88	2	.	.	.	.
TALL SHRUBS										
Alnus sinuata	.	.	33	20	50	8	.	.	.	.
Cladothamnus pyrolaeflorus	100	4	.	.	13	1	.	.	.	.
Echinopanax horridum	.	.	33	1	88	8	100	11	100	3
Malus fusca	100	5	.	.	.	.	.	.	.	.
Menziesia ferrugines	100	5	67	6	75	5	33	1	50	3
Ribes bracteosum	.	.	.	.	13	1	.	.	50	1
Rubus spectabilis	100	2	67	10	100	9	100	5	75	2
Sambucus racemosa	.	.	.	.	.	.	33	1	25	1
Sorbus sitchensis	.	.	.	.	.	.	.	.	25	1
Vaccinium sp. (oval & alask)	100	20	67	53	100	53	100	47	100	64
Viburnum edule	.	.	33	1	25	3	.	.	.	.
LOW AND SUBSHRUBS										
Empetrum nigrum	100	4	.	.	.	.	.	.	.	.
FORBS										
Angelica lucida	.	.	.	.	13	1	.	.	.	.
Boschniakia rossica	.	.	33	1	.	.	.	.	.	.
Caltha palustris asarifolia	.	.	.	.	13	2	.	.	.	.
Cardamine umbellata	.	.	.	.	13	1	.	.	.	.
Circaea alpina	.	.	.	.	38	2	.	.	.	.
Coptis asplenifolia	100	5	67	6	38	13	.	.	25	6
Coptis trifolia	.	.	.	.	13	1	33	1	.	.
Cornus canadensis	100	8	67	10	100	9	100	5	100	4
Dodecatheon jeffreyi	.	.	33	1	.	.	.	.	.	.
Epilobium angustifolium	.	.	.	.	13	1	.	.	.	.
Epilobium sp.	.	.	.	.	13	1	.	.	.	.
Equisetum arvense	.	.	.	.	25	2	.	.	.	.
Equisetum pratense	.	.	.	.	13	4	.	.	.	.
Equisetum sp.	.	.	.	.	.	.	33	1	.	.
Erigeron peregrinus	.	.	.	.	13	1	.	.	.	.
Fauria crista-galli	100	7	33	1	13	1	.	.	.	.
Galium trifidum	.	.	.	.	13	1	.	.	.	.
Geum macrophyllum	.	.	.	.	13	1	.	.	.	.
Listera caurina	.	.	.	.	13	1	.	.	.	.
Listera cordata	.	.	33	1	63	1	100	1	75	1
Lysichitum americanum	100	2	67	20	38	1	.	.	.	.
Mimulus guttatus	.	.	.	.	13	1	.	.	.	.
Moneses uniflora	.	.	.	.	13	1	67	1	25	1
Parnassia palustris	.	.	.	.	13	2	.	.	.	.
Petasites hyperboreus	.	.	.	.	13	1	.	.	.	.
Platanthera saccata	.	.	.	.	25	1	.	.	.	.
Prenanthes alata	.	.	.	.	13	1	.	.	.	.
Rubus arcticus stellatus	100	1	.	.	.	.	.	.	.	.
Rubus pedatus	100	8	67	18	100	19	100	12	100	25
Sanguisorba menziesii	.	.	33	1	.	.	.	.	.	.
Sanguisorba stipulata	.	.	.	.	13	2	.	.	.	.
Stellaria sitchana	.	.	.	.	13	1	.	.	.	.
Streptopus amplexifolius	100	1	67	1	88	2	100	1	75	1

SPECIES	TSUMER/VACCIN 1 Plot CON	TSUMER/VACCIN 1 Plot ACOV	MIXED CON/VACCIN/LYSAME 3 Plots CON	MIXED CON/VACCIN/LYSAME 3 Plots ACOV	MIXED CON/VACCIN 8 Plots CON	MIXED CON/VACCIN 8 Plots ACOV	TSUHET/VACCIN/ECHNOR 3 Plots CON	TSUHET/VACCIN/ECHNOR 3 Plots ACOV	TSUHET/VACCIN/DRYDIL 4 Plots CON	TSUHET/VACCIN/DRYDIL 4 Plots ACOV
Tiarella trifoliata	.	.	67	2	50	2	67	1	50	3
Trientalis europea	.	.	.	.	13	1	.	.	.	.
Veratrum viride	100	2	67	1	.	.	.	.	.	.
Viola epipsila	.	.	33	1	25	2	.	.	.	.
Viola langsdorfii	.	.	.	.	13	1	.	.	.	.
GRAMINOIDS										
Agrostis sp.	.	.	.	.	13	1	.	.	.	.
Calamagrostis nutkaensis	100	5	.	.	13	25	.	.	.	.
Carex anthoxanthea	.	.	.	.	13	1	.	.	.	.
Carex disperma	.	.	.	.	25	3	.	.	.	.
Carex macrochaeta	.	.	.	.	25	2	.	.	.	.
Carex sitchensis	100	8	67	1	13	1	.	.	.	.
Cinna latifolia	.	.	.	.	25	2	.	.	25	1
Luzula parviflora	.	.	.	.	25	1	.	.	50	1
Poa arctica	.	.	.	.	13	3	.	.	.	.
Vahlodea atropurpurea latifolia	.	.	.	.	13	1	.	.	.	.
FERNS AND ALLIES										
Athyrium filix-femina	.	.	67	2	38	10	.	.	25	1
Blechnum spicant	.	.	.	.	13	1	.	.	.	.
Dryopteris dilatata	.	.	67	1	75	1	100	6	100	7
Gymnocarpium dryopteris	100	1	67	13	100	6	100	6	100	8
Lycopodium annotinum	.	.	.	.	38	1	67	1	25	1
Lycopodium selago	.	.	.	.	13	4	.	.	.	.
Thelypteris phegopteris	.	.	33	1	13	1	.	.	.	.
UNKNOWN										
GRAMINOID UNKNOWN	.	.	33	1	13	1	.	.	.	.
SEDGE UNKNOWN	.	.	33	4	.	.	.	.	.	.

TREE COMMUNITIES (CONTINUED)

SPECIES	TSUHET/VACCIN 3 Plots CON	ACOV	PICSIT/ALNSIN 17 Plots CON	ACOV	PICSIT/ECHHOR-RUBSPE 25 Plots CON	ACOV	PICSIT/ECHHOR-VACCIN 37 Plots CON	ACOV	PICSIT/ECHHOR 27 Plots CON	ACOV
TREES										
Picea sitchensis	100	8	100	41	100	47	100	43	100	41
Populus balsamifera trichocarpa	.	.	6	30	4	5	16	3	4	2
Tsuga heterophylla	100	55	6	10	40	18	46	18	37	20
Tsuga mertensiana	.	.	6	2	.	.	3	2	4	Tr
TREES-REGENERATION										
Picea sitchensis regen	100	2	59	12	84	4	92	3	89	4
Populus balsamifera trichocarpa regen	.	.	6	5	.	.	.	.	.	.
Tsuga heterophylla regen	100	12	18	6	52	3	54	5	48	8
Tsuga mertensiana regen	.	.	6	1	.	.	5	Tr	4	2
TALL SHRUBS										
Alnus sinuata	33	1	100	22	24	1	22	2	19	1
Echinopanax horridum	33	1	88	19	100	33	100	27	100	46
Menziesia ferruginea	33	1	6	2	20	3	11	1	11	1
Ribes bracteosum	.	.	6	6	8	11	3	1	4	1
Ribes laxiflorum	.	.	6	1	8	1	.	.	.	.
Rubus spectabilis	67	3	76	28	100	25	70	4	81	5
Salix barclayi	.	.	12	11	.	.	.	.	.	.
Salix commutata	.	.	6	3	.	.	.	.	.	.
Salix hookeriana	.	.	6	1	.	.	.	.	.	.
Salix sitchensis	.	.	6	1	.	.	3	1	4	1
Sambucus racemosa	.	.	29	1	20	3	.	.	7	1
Vaccinium sp. (oval & alask)	100	63	76	12	88	25	100	37	89	6
Viburnum edule	33	1	59	3	24	4	30	1	33	2
LOW AND SUBSHRUBS										
Empetrum nigrum	.	.	18	4	.	.	.	.	.	.
Oxycoccus palustris	.	.	6	1	.	.	.	.	.	.
Vaccinium uliginosum	.	.	6	2	.	.	.	.	.	.
Vaccinium vitis-idaea	.	.	6	5	.	.	.	.	.	.
FORBS										
Achillea borealis	.	.	6	1	.	.	.	.	.	.
Aconitum delphinifolium	.	.	6	1	.	.	.	.	.	.
Actaea rubra	.	.	6	1	8	3	5	1	.	.
Angelica genuflexa	.	.	29	1	.	.	.	.	4	1
Angelica lucida	.	.	6	2	.	.	.	.	.	.
Arnica latifolia	.	.	.	.	.	.	3	1	.	.
Aruncus sylvester	.	.	24	1	.	.	3	1	7	1
Aster subspicatus	.	.	6	1	.	.	.	.	.	.
Caltha palustris asarifolia	.	.	24	2	.	.	.	.	.	.
Cicuta douglasii	.	.	6	1	.	.	.	.	.	.
Circaea alpina	.	.	65	11	76	17	24	4	74	7
Conioselinum chinense	.	.	6	1	.	.	.	.	.	.
Coptis asplenifolia	33	15	.	.	4	3	5	6	11	5
Coptis trifolia	.	.	6	1	4	1	3	1	4	1
Cornus canadensis	100	7	59	3	52	4	89	3	59	1
Cornus suecica	.	.	6	3	.	.	.	.	.	.
Epilobium angustifolium	.	.	24	1	.	.	8	1	4	1
Epilobium glandulosum	.	.	6	1	.	.	.	.	.	.
Epilobium latifolium	.	.	.	.	.	.	3	1	.	.
Epilobium palustre	.	.	6	2	.	.	.	.	.	.
Equisetum arvense	.	.	35	5	8	1	3	1	15	3
Equisetum fluviatile	.	.	6	1	.	.	.	.	.	.
Equisetum palustre	.	.	12	1	.	.	.	.	.	.
Equisetum pratense	.	.	6	2	.	.	5	1	4	1
Equisetum sp.	33	2	24	4	12	3	5	2	7	4
Equisetum variegatum	.	.	6	1	.	.	.	.	.	.
Fragaria chiloensis	.	.	6	1	.	.	.	.	.	.

SPECIES	TSUHET/VACCIN 3 Plots CON	ACOV	PICSIT/ALNSIN 17 Plots CON	ACOV	PICSIT/ECHHOR-RUBSPE 25 Plots CON	ACOV	PICSIT/ECHHOR-VACCIN 37 Plots CON	ACOV	PICSIT/ECHHOR 27 Plots CON	ACOV
Galium trifidum	.	.	12	1	.	.	.	.	.	.
Galium triflorum	.	.	12	1	.	.	.	.	.	.
Goodyera oblongifolia	.	.	.	.	.	.	.	.	4	1
Heracleum lanatum	.	.	6	2	.	.	.	.	4	1
Heuchera glabra	.	.	6	1	.	.	.	.	.	.
Lathyrus palustris	.	.	6	1	.	.	.	.	.	.
Listera caurina	33	1	12	1	8	1	16	1	4	1
Listera cordata	67	1	18	7	24	1	68	1	37	1
Lupinus nootkatensis	.	.	6	3	.	.	.	.	.	.
Lysichitum americanum	.	.	41	14	20	2	8	1	.	.
Maianthemum dilatatum	.	.	18	4	20	2	3	1	7	6
Moneses uniflora	33	1	12	1	4	1	22	1	22	1
Osmorhiza chilensis	.	.	.	.	4	5	.	.	.	.
Platanthera dilatata	.	.	6	1	.	.	3	1	.	.
Platanthera saccata	.	.	29	1	.	.	14	1	.	.
Platanthera sp.	.	.	6	1	.	.	.	.	.	.
Potentilla palustris	.	.	18	2	.	.	.	.	.	.
Prenanthes alata	.	.	24	12	20	1	5	1	22	1
Pyrola asarifolia	.	.	12	5	.	.	3	1	4	1
Pyrola secunda	.	.	18	3	.	.	8	1	7	1
Rubus arcticus stelletus	.	.	24	1	4	5	.	.	.	.
Rubus pedatus	100	25	59	10	88	20	100	26	100	26
Sanguisorba stipulata	.	.	18	3	.	.	.	.	4	1
Stellaria crispa	.	.	6	1	.	.	.	.	4	2
Streptopus amplexifolius	.	.	82	2	100	2	81	1	100	1
Tiarella trifoliata	.	.	82	4	92	9	89	6	93	7
Trientalis europea	.	.	35	1	.	.	.	.	.	.
Valeriana sitchensis	.	.	6	1	.	.	.	.	.	.
Veratrum viride	.	.	29	1	4	1	11	1	.	.
Viola epipsila	.	.	12	2	12	1	16	1	4	2
Viola glabella	.	.	6	1	16	2	5	3	15	1
Viola langsdorfii	.	.	35	1	8	3	11	1	4	1
Viola sp.	.	.	6	3	.	.	5	1	.	.
GRAMINOIDS										
Calamagrostis canadensis	.	.	29	1	.	.	.	.	4	1
Calamagrostis nutkaensis	.	.	6	2	.	.	.	.	.	.
Carex Mertensii	.	.	.	.	4	1	.	.	.	.
Carex anthoxanthea	.	.	6	3	.	.	.	.	.	.
Carex aquatilis	.	.	.	.	.	.	3	1	.	.
Carex canescens	.	.	12	1	.	.	3	1	.	.
Carex disperma	.	.	6	1	.	.	.	.	.	.
Carex interior	.	.	6	1	.	.	.	.	.	.
Carex macrochaeta	.	.	18	8	.	.	.	.	.	.
Carex pluriflora	.	.	6	15	.	.	.	.	.	.
Carex sitchensis	.	.	18	30	.	.	.	.	.	.
Cinna latifolia	.	.	6	1	.	.	11	1	7	1
Deschampsia caespitosa	.	.	6	3	.	.	.	.	.	.
Elymus hirsutus	.	.	18	1	.	.	3	1	4	1
Eriophorum angustifolium	.	.	6	1	.	.	3	1	.	.
Eriophorum russeolum	.	.	6	1	.	.	.	.	.	.
Glyceria pauciflora	.	.	.	.	.	.	5	1	.	.
Luzula multiflora	.	.	6	1	.	.	.	.	.	.
Luzula parviflora	.	.	6	1	8	1	8	1	15	1
Luzula rufescens	.	.	.	.	.	.	.	.	7	2
Scirpus microcarpus	.	.	12	10	.	.	.	.	.	.
Trisetum cernuum	.	.	12	1	12	1	5	1	11	2
Trisetum spicatum	.	.	.	.	.	.	3	1	.	.
Vahlodea atropurpurea latifolia	.	.	6	1	.	.	5	1	.	.

SPECIES	TSUHET/VACCIN 3 Plots CON	ACOV	PICSIT/ALNSIN 17 Plots CON	ACOV	PICSIT/ECHHOR-RUBSPE 25 Plots CON	ACOV	PICSIT/ECHHOR-VACCIN 37 Plots CON	ACOV	PICSIT/ECHHOR 27 Plots 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 23 Plots CON	ACOV	PICSIT/SERAL 4 Plots CON	ACOV	PICSIT-POPTRI/ALNSIN 6 Plots CON	ACOV	PICSIT-POPTRI/ECHHOR 5 Plots CON	ACOV	PICSIT-POPTRI/SERAL 8 Plots CON	ACOV
TREES										
Picea sitchensis	100	46	100	56	100	27	100	41	100	34
Populus balsamifera trichocarpa	.	.	.	.	100	29	100	12	100	15
Tsuga heterophylla	61	22	.	.	17	1	20	1	13	1
TREES-REGENERATION										
Picea sitchensis regen	91	6	75	8	100	14	100	21	100	16
Populus balsamifera trichocarpa regen	.	.	.	.	17	5	.	.	25	2
Tsuga heterophylla regen	65	9	.	.	.	.	.	.	38	6
TALL SHRUBS										
Alnus sinuata	43	2	.	.	100	22	40	5	50	1
Echinopanax horridum	87	2	50	3	100	8	100	15	63	2
Menziesia ferruginea	35	1	.	.	.	.	.	.	13	1
Ribes bracteosum	.	.	.	.	17	1	.	.	.	.
Rubus spectabilis	96	10	25	20	100	10	80	3	25	1
Salix barclayi	.	.	.	.	33	5	.	.	50	8
Salix alaxensis	.	.	.	.	33	2	.	.	.	.
Salix commutata	.	.	.	.	33	1	.	.	25	1
Salix sitchensis	.	.	.	.	33	2	20	8	50	5
Sambucus racemosa	.	.	25	3	17	1	.	.	13	1
Vaccinium sp. (oval & alask)	100	46	50	1	50	1	80	26	75	3
Viburnum edule	39	2	50	2	83	2	60	1	38	2
LOW AND SUBSHRUBS										
Empetrum nigrum	.	.	.	.	.	.	.	.	13	4
Vaccinium uliginosum	.	.	.	.	17	1	.	.	13	1
FORBS										
Achillea borealis	4	1	.	.	17	1	.	.	38	2
Actaea rubra	.	.	.	.	83	1	20	1	25	1
Angelica lucida	.	.	.	.	33	1	20	1	.	.
Aruncus sylvester	.	.	.	.	33	1	20	1	25	1
Boschniakia rossica	.	.	.	.	50	1	40	1	.	.
Cardamine umbellata	.	.	.	.	17	1	.	.	.	.
Castilleja miniata	.	.	.	.	.	.	.	.	13	1
Castilleja unalaschensis	.	.	.	.	.	.	.	.	13	1
Cicuta douglasii	.	.	.	.	.	.	.	.	13	1
Circaea alpina	4	1	75	3	67	25	80	6	13	1
Coeloglossum viride bracteatum	.	.	.	.	.	.	.	.	13	1
Conioselinum chinense	.	.	.	.	17	1	20	1	.	.
Coptis asplenifolia	9	11	.	.	.	.	.	.	.	.
Coptis trifolia	9	3	.	.	.	.	.	.	.	.
Cornus canadensis	87	7	25	1	50	6	100	2	50	12
Epilobium alpinum	.	.	.	.	17	2	.	.	.	.
Epilobium angustifolium	.	.	.	.	50	1	40	1	25	5
Epilobium glandulosum	.	.	.	.	17	1	.	.	.	.
Epilobium leptocarpum	.	.	.	.	.	.	.	.	13	1
Epilobium sp.	4	7	.	.	17	1	.	.	25	7
Equisetum arvense	4	1	.	.	33	3	.	.	.	.
Equisetum sp.	26	7	25	1	17	1	.	.	13	1
Equisetum variegatum	.	.	.	.	33	1	.	.	.	.
Fragaria chiloensis	4	1	25	1	33	1	.	.	50	8
Galium triflorum	.	.	.	.	33	1	.	.	.	.
Geranium erianthum	.	.	.	.	17	1	40	1	.	.
Geum calthifolium	.	.	.	.	.	.	.	.	13	2
Geum macrophyllum	.	.	.	.	50	1	.	.	.	.
Goodyera oblongifolia	.	.	.	.	17	2	40	1	38	1
Hedysarum alpinum	.	.	.	.	17	1	.	.	.	.
Heracleum lanatum	.	.	25	1	.	.	.	.	13	1
Heuchera glabra	.	.	.	.	.	.	20	1	.	.
Listera caurina	4	1	.	.	17	1	40	1	.	.
Listera cordata	61	2	50	2	67	2	80	1	75	1

SPECIES	PICSIT/VACCIN 23 Plots CON	ACOV	PICSIT/SERAL 4 Plots CON	ACOV	PICSIT-POPTRI/ALNSIN 6 Plots CON	ACOV	PICSIT-POPTRI/ECHHOR 5 Plots CON	ACOV	PICSIT-POPTRI/SERAL 8 Plots CON	ACOV
Lupinus nootkatensis	4	2	25	3	17	1	20	1	50	13
Lysichitum americanum	.	.	.	.	.	.	.	.	13	1
Maianthemum dilatatum	.	.	.	.	.	.	.	.	13	1
Moehringia lateriflora	.	.	.	.	.	.	.	.	13	1
Moneses uniflora	22	1	.	.	17	1	40	1	25	1
Osmorhiza chilensis	.	.	.	.	33	1	20	1	.	.
Parnassia fimbriata	.	.	.	.	.	.	.	.	25	1
Pedicularis parviflora	.	.	.	.	17	1	.	.	.	.
Platanthera dilatata	.	.	.	.	17	1	.	.	13	1
Platanthera saccata	4	1	.	.	17	1	.	.	25	1
Polygonum viviparum	.	.	.	.	17	1	.	.	.	.
Prenanthes alata	4	1	.	.	33	1	40	1	38	1
Pyrola asarifolia	.	.	25	2	100	2	60	1	63	5
Pyrola minor	.	.	.	.	17	1	.	.	.	.
Pyrola secunda	9	2	75	1	83	5	60	2	88	3
Ranunculus Bongardi	.	.	.	.	17	1	.	.	.	.
Rubus arcticus stellatus	9	1	.	.	17	3	.	.	38	1
Rubus pedatus	91	26	100	3	67	12	100	31	88	7
Sanguisorba stipulata	4	1	25	1	50	1	40	1	.	.
Stellaria crispa	.	.	.	.	50	2	.	.	.	.
Stellaria sitchana	.	.	.	.	17	5	.	.	.	.
Streptopus amplexifolius	57	3	50	1	100	2	80	1	63	1
Tiarella trifoliata	61	3	25	2	50	1	100	8	25	1
Trientalis europea	.	.	.	.	33	1	.	.	38	1
Veratrum viride	.	.	.	.	.	.	40	1	.	.
Viola glabella	4	2	.	.	.	.	.	.	13	2
Viola langsdorfii	.	.	.	.	.	.	40	1	13	1
GRAMINOIDS										
Agrostis borealis	.	.	.	.	17	1	.	.	.	.
Calamagrostis canadensis	4	8	.	.	33	1	.	.	25	1
Carex canescens	4	1	.	.	.	.	.	.	.	.
Carex macrochaeta	4	1	.	.	17	1	20	1	13	1
Carex sp.	9	3	.	.	.	.	.	.	13	10
Carex stylosa	4	1	.	.	.	.	.	.	.	.
Cinna latifolia	.	.	.	.	.	.	20	2	.	.
Deschampsia caespitosa	.	.	.	.	.	.	20	1	.	.
Elymus hirsutus	.	.	.	.	17	1	.	.	.	.
Elymus subsecundus	.	.	.	.	17	1	.	.	.	.
Festuca rubra	.	.	.	.	17	1	.	.	.	.
Luzula multiflora	.	.	.	.	17	1	.	.	.	.
Phleum commutatum americanum	.	.	.	.	17	1	.	.	38	1
Poa arctica	.	.	.	.	17	1	.	.	.	.
Trisetum cernuum	9	3	.	.	50	1	20	2	25	1
Trisetum spicatum	.	.	.	.	.	.	.	.	13	1
Vahlodea atropurpurea latifolia	4	1	.	.	.	.	.	.	.	.
FERNS AND ALLIES										
Athyrium filix-femina	43	5	50	3	83	2	80	3	50	2
Blechnum spicant	4	1	.	.	.	.	.	.	.	.
Dryopteris dilatata	65	5	.	.	67	1	60	1	38	1
Gymnocarpium dryopteris	87	5	.	.	33	2	40	1	50	6
Lycopodium annotinum	26	2	.	.	.	.	20	1	.	.
Lycopodium selago	22	3	.	.	17	1	.	.	25	1
Polypodium glycyrrhiza	22	1	.	.	.	.	20	1	.	.
Thelypteris phegopteris	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 7 Plots CON	ACOV	POPTRI/RUBSPE 11 Plots CON	ACOV	POPTRI/ECHHOR 5 Plots CON	ACOV	PINCON/SPHAGN 7 Plots CON	ACOV	PICSIT/SPHAGN 7 Plots CON	ACOV
TREES										
Picea sitchensis	57	9	18	6	20	2	57	1	71	10
Pinus contorta contorta	.	.	.	.	.	.	100	10	14	1
Populus balsamifera trichocarpa	100	26	100	23	100	26	.	.	.	.
Tsuga heterophylla	.	.	.	.	.	.	14	1	.	.
Tsuga mertensiana	.	.	.	.	.	.	43	1	14	15
TREES-REGENERATION										
Picea sitchensis regen	86	2	45	8	40	6	71	2	86	7
Pinus contorta regen	.	.	.	.	.	.	100	10	.	.
Populus balsamifera trichocarpa regen	.	.	27	3	.	.	.	.	.	.
Tsuga heterophylla regen	.	.	.	.	20	1	57	1	14	10
Tsuga mertensiana regen	.	.	.	.	.	.	71	3	14	2
TALL SHRUBS										
Alnus sinuata	86	46	100	50	100	44	29	1	29	13
Echinopanax horridum	57	1	91	23	100	22	.	.	.	.
Malus fusca	14	1	.	.	.	.	.	.	.	.
Menziesia ferruginea	.	.	.	.	.	.	71	1	29	4
Myrica gale	.	.	.	.	.	.	43	10	86	17
Ribes bracteosum	.	.	9	2	80	1	.	.	.	.
Rubus spectabilis	71	8	100	51	100	7	14	1	14	1
Salix barclayi	86	12	18	1	.	.	14	4	.	.
Salix alaxensis	43	2	.	.	.	.	.	.	.	.
Salix commutata	29	23	.	.	.	.	14	2	.	.
Salix sitchensis	100	12	36	1	.	.	.	.	.	.
Sambucus racemosa	14	1	73	7	80	13	.	.	.	.
Sorbus sitchensis	.	.	.	.	.	.	14	1	14	1
Vaccinium sp. (ovat & alask)	.	.	9	1	.	.	71	1	57	7
Viburnum edule	71	2	73	3	40	1	14	1	43	1
LOW AND SUBSHRUBS										
Andromeda polifolia	.	.	.	.	.	.	29	1	29	2
Empetrum nigrum	.	.	.	.	.	.	100	7	57	13
Kalmia polifolia	.	.	.	.	.	.	71	2	29	2
Ledum groenlandicum	.	.	.	.	.	.	86	5	29	1
Oxycoccus palustris	.	.	.	.	.	.	86	12	57	11
Vaccinium uliginosum	14	1	.	.	.	.	86	5	29	21
Vaccinium vitis-idaea	.	.	.	.	.	.	14	2	.	.
FORBS										
Achillea borealis	71	1	18	1	40	1	.	.	.	.
Actaea rubra	71	2	45	1	80	1	.	.	.	.
Angelica genuflexa	29	6	9	1	20	1	.	.	.	.
Angelica lucida	29	1	27	1	.	.	.	.	.	.
Aquilegia formosa	14	1	.	.	.	.	.	.	.	.
Artemisia tilesii	29	1	.	.	.	.	.	.	.	.
Aruncus sylvester	57	5	45	2	20	5	.	.	.	.
Aster subspicatus	29	2	9	1	.	.	14	4	.	.
Boschniakia rossica	57	1	18	1	20	1	.	.	.	.
Cardamine umbellata	.	.	9	1	20	1	.	.	.	.
Cicuta douglasii	.	.	9	4	.	.	.	.	14	5
Circaea alpina	86	15	91	14	100	13	.	.	.	.
Conioselinum chinense	43	1	.	.	.	.	.	.	.	.
Coptis asplenifolia	.	.	.	.	.	.	29	1	14	4
Coptis trifolia	.	.	.	.	.	.	71	2	.	.
Cornus canadensis	29	3	.	.	.	.	100	2	57	8
Cornus suecica	.	.	.	.	.	.	29	3	14	1
Dodecatheon jeffreyi	.	.	.	.	.	.	57	1	.	.
Drosera rotundifolia	.	.	.	.	.	.	71	2	29	1
Epilobium adenocaulon	14	1	.	.	.	.	.	.	.	.
Epilobium alpinum	14	1	9	1	.	.	.	.	.	.
Epilobium angustifolium	71	4	27	2	20	1	14	3	.	.

SPECIES	POPTRI/SALIX 7 Plots CON	ACOV	POPTRI/RUBSPE 11 Plots CON	ACOV	POPTRI/ECHHOR 5 Plots CON	ACOV	PINCON/SPHAGN 7 Plots CON	ACOV	PICSIT/SPHAGN 7 Plots 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
Swertia 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 7 Plots CON	ACOV	POPTRI/RUBSPE 11 Plots CON	ACOV	POPTRI/ECHHOR 5 Plots CON	ACOV	PINCON/SPHAGN 7 Plots CON	ACOV	PICSIT/SPHAGN 7 Plots CON	ACOV
Viola epipsila	.	.	.	.	.	.	14	1	14	1
Viola glabella	.	.	.	.	.	.	.	.	14	1
Viola langsdorfii	43	1	.	.	.	.	.	.	.	.
GRAMINOIDS										
Agrostis aequivalvis	.	.	.	.	.	.	29	1	14	3
Agrostis alaskana	.	.	.	.	.	.	14	1	29	1
Agrostis borealis	14	1	.	.	.	.	.	.	.	.
Agrostis exarata	14	4	.	.	.	.	.	.	.	.
Calamagrostis canadensis	57	6	55	2	20	1	71	1	29	8
Calamagrostis inexpansa	14	1	.	.	.	.	.	.	.	.
Carex anthoxanthea	.	.	.	.	.	.	14	1	29	2
Carex canescens	.	.	.	.	.	.	.	.	29	1
Carex capillaris	.	.	.	.	.	.	14	4	.	.
Carex disperma	14	1	.	.	.	.	.	.	.	.
Carex flava	.	.	.	.	.	.	14	3	.	.
Carex livida	.	.	.	.	.	.	29	1	14	1
Carex lyngbyei	.	.	.	.	.	.	.	.	14	40
Carex macrochaeta	57	2	9	1	.	.	14	1	14	1
Carex muricata	.	.	.	.	.	.	14	1	.	.
Carex pauciflora	.	.	.	.	.	.	71	8	.	.
Carex pluriflora	.	.	.	.	.	.	71	9	43	9
Carex saxatilis	.	.	.	.	.	.	14	2	.	.
Carex sitchensis	.	.	.	.	.	.	86	8	57	48
Carex sp.	.	.	.	.	20	3	.	.	14	25
Cinna latifolia	14	1	18	1	.	.	.	.	.	.
Deschampsia caespitosa	14	1	.	.	20	1	57	4	14	1
Deschampsia sp.	.	.	.	.	.	.	14	1	.	.
Elymus hirsutus	29	3	9	2	20	1	.	.	.	.
Elymus subsecundus	29	1	.	.	.	.	.	.	.	.
Eriophorum angustifolium	.	.	.	.	.	.	71	12	71	10
Eriophorum russeolum	.	.	.	.	.	.	.	.	29	2
Festuca rubra	.	.	.	.	.	.	14	1	.	.
Hordeum brachyantherum	.	.	9	6	.	.	.	.	.	.
Phleum commutatum americanum	29	1	.	.	20	1	.	.	.	.
Poa arctica	14	1	.	.	.	.	.	.	.	.
Poa sp.	14	1	.	.	.	.	.	.	.	.
Trichophorum caespitosum	.	.	.	.	.	.	71	17	.	.
Trisetum cernuum	14	1	9	1	20	1	.	.	14	10
Vahlodea atropurpurea latifolia	.	.	.	.	.	.	14	1	.	.
FERNS AND ALLIES										
Athyrium filix-femina	57	4	82	10	100	12	.	.	14	1
Blechnum spicant	.	.	.	.	.	.	14	1	.	.
Dryopteris dilatata	14	1	45	2	20	2	.	.	.	.
Gymnocarpium dryopteris	14	2	36	5	60	3	.	.	14	1
Lycopodium annotinum	.	.	.	.	.	.	.	.	14	1
Polypodium glycyrrhiza	.	.	9	1	.	.	.	.	.	.
Polystichum Braunii	.	.	9	1	.	.	.	.	.	.
Thelypteris phegopteris	14	1	9	1	.	.	.	.	.	.
UNKNOWN										
GRAMINOID UNKNOWN	.	.	18	7	.	.	.	.	29	18
SEDGE UNKNOWN	.	.	.	.	20	3	14	70	29	55

SHRUB COMMUNITIES

SPECIES	RUBSPE/ATHFIL 2 Plots CON	ACOV	ALNSIN-SALSIT 5 Plots CON	ACOV	ALNSIN-MALFUS 5 Plots CON	ACOV	ALNSIN-RUBSPE 14 Plots CON	ACOV	ALNSIN/GRAMINOID 5 Plots CON	ACOV
TREES										
Picea sitchensis	.	.	.	.	20	2	.	.	.	.
Populus balsamifera trichocarpa	.	.	40	2	.	.	14	2	.	.
TREES-REGENERATION										
Picea sitchensis regen	.	.	40	2	.	.	.	.	.	.
Populus balsamifera trichocarpa regen	.	.	20	15	.	.	7	1	.	.
TALL SHRUBS										
Alnus sinuata	50	1	100	52	100	42	100	76	100	66
Echinopanax horridum	100	3	40	5	20	2	57	11	.	.
Malus fusca	.	.	.	.	100	36	.	.	.	.
Ribes bracteosum	.	.	20	2	.	.	7	2	.	.
Rubus spectabilis	100	80	80	27	100	58	100	56	20	3
Salix barclayi	.	.	20	2	20	5	.	.	80	10
Salix alaxensis	.	.	.	.	.	.	.	.	20	3
Salix commutata	.	.	.	.	.	.	.	.	20	1
Salix hookeriana	.	.	20	3	.	.	7	2	20	2
Salix sitchensis	.	.	100	21	.	.	29	2	40	3
Sambucus racemosa	50	2	60	2	20	1	79	11	20	1
Vaccinium sp. (oval & alask)	.	.	.	.	20	1	.	.	.	.
Viburnum edule	.	.	80	1	40	1	29	2	40	3
LOW AND SUBSHRUBS										
Salix setchelliana	.	.	.	.	.	.	.	.	20	4
FORBS										
Achillea borealis	.	.	20	1	20	1	.	.	60	5
Aconitum delphinifolium	.	.	.	.	.	.	.	.	20	1
Actaea rubra	.	.	20	1	.	.	21	1	.	.
Angelica genuflexa	50	2	60	5	.	.	43	2	60	7
Angelica lucida	.	.	20	20	40	2	7	1	20	15
Aquilegia formosa	.	.	20	1	.	.	.	.	.	.
Arabis hirsuta	.	.	20	1	.	.	.	.	.	.
Arabis lyrata	.	.	.	.	.	.	.	.	20	1
Artemisia tilesii	.	.	20	1	.	.	.	.	20	3
Aruncus sylvester	.	.	20	3	20	20	7	5	40	3
Aster subspicatus	.	.	20	1	.	.	.	.	40	4
Astragalus alpinus	.	.	.	.	.	.	.	.	20	1
Boschniakia rossica	.	.	40	1	80	1	14	1	.	.
Caltha palustris asarifolia	.	.	20	1	.	.	.	.	.	.
Cardamine umbellata	100	1	20	1	20	1	7	1	.	.
Castilleja unalaschensis	.	.	.	.	.	.	.	.	20	30
Cerastium Beeringianum	.	.	.	.	.	.	.	.	20	1
Cicuta douglasii	.	.	.	.	.	.	7	3	.	.
Circaea alpina	100	2	80	12	80	2	86	5	40	4
Claytonia sibirica	.	.	20	2	.	.	.	.	.	.
Conioselinum chinense	.	.	40	1	.	.	.	.	40	2
Epilobium alpinum	.	.	.	.	.	.	7	1	20	1
Epilobium angustifolium	50	1	20	1	60	1	7	2	.	.
Epilobium glandulosum	.	.	.	.	.	.	7	1	20	1
Epilobium latifolium	.	.	.	.	.	.	.	.	20	25
Epilobium sp.	.	.	20	1	.	.	7	1	.	.
Equisetum arvense	.	.	80	5	.	.	21	20	40	2
Equisetum palustre	.	.	20	25	.	.	7	2	20	1
Equisetum pratense	.	.	.	.	.	.	14	4	.	.
Equisetum sp.	.	.	.	.	.	.	7	1	.	.
Equisetum variegatum	.	.	20	1	.	.	.	.	40	4
Fragaria chiloensis	.	.	.	.	.	.	.	.	20	1
Fritillaria camschatcensis	.	.	20	1	20	1	.	.	.	.
Galium trifidum	.	.	20	1	.	.	.	.	40	1

SPECIES	RUBSPE/ATHFIL 2 Plots CON	ACOV	ALNSIN-SALSIT 5 Plots CON	ACOV	ALNSIN-HALFUS 5 Plots CON	ACOV	ALNSIN-RUBSPE 14 Plots CON	ACOV	ALNSIN/GRAMINOID 5 Plots CON	ACOV
Galium trifidum columbianum	.	.	.	.	20	1	.	.	.	.
Galium trifidum trifidum	.	.	.	.	.	.	7	1	.	.
Galium triflorum	.	.	20	1	.	.	7	1	20	1
Gentiana amarella	.	.	.	.	.	.	.	.	20	1
Geum macrophyllum	.	.	60	8	.	.	43	2	40	
Hedysarum alpinum	.	.	.	.	.	.	.	.	20	1
Heracleum lanatum	100	3	60	22	60	1	43	3	20	1
Lathyrus maritimus	.	.	.	.	.	.	.	.	20	1
Ligusticum scoticum	.	.	.	.	.	.	.	.	20	4
Lysichitum americanum	.	.	20	1	.	.	7	1	60	14
Maianthemum dilatatum	.	.	.	.	60	8	29	3	.	.
Parnassia palustris	.	.	.	.	.	.	.	.	40	1
Platanthera hyperborea	.	.	20	1	.	.	.	.	.	.
Platanthera saccata	.	.	.	.	.	.	7	1	.	.
Polygonum viviparum	.	.	.	.	.	.	.	.	40	2
Potentilla palustris	.	.	.	.	.	.	7	1	20	1
Potentilla villosa	.	.	.	.	.	.	.	.	20	1
Prenanthes alata	.	.	20	1	.	.	.	.	.	.
Pyrola asarifolia	.	.	40	8	.	.	14	1	.	.
Ranunculus Bongardi	.	.	40	2	.	.	.	.	20	1
Ranunculus Macounii	.	.	.	.	.	.	.	.	20	2
Rhinanthus minor borealis	.	.	.	.	.	.	.	.	20	15
Rubus arcticus stellatus	.	.	.	.	.	.	7	1	.	.
Rubus pedatus	50	1	.	.	.	.	.	.	.	.
Sanguisorba stipulata	.	.	20	2	20	1	.	.	20	4
Saussurea americana	.	.	.	.	.	.	7	2	.	.
Senecio triangularis	.	.	20	1	.	.	.	.	.	.
Sibbaldia procumbens	.	.	.	.	.	.	.	.	20	1
Solidago lepida	.	.	.	.	20	1	.	.	.	.
Stellaria calycantha	50	1	.	.	20	1	.	.	.	.
Stellaria crassifolia	.	.	.	.	.	.	.	.	20	50
Stellaria crispa	100	28	60	1	.	.	21	1	.	.
Stellaria sitchana	.	.	.	.	.	.	.	.	40	3
Streptopus amplexifolius	100	1	40	1	80	1	43	1	20	1
Tellima grandiflora	.	.	20	1	.	.	14	3	.	.
Tiarella trifoliata	.	.	.	.	20	1	7	1	.	.
Trientalis europea	50	1	.	.	40	1	7	1	40	1
Veratrum viride	100	3	.	.	100	1	43	2	.	.
Viola epipsila	.	.	.	.	60	1	7	4	40	1
Viola glabella	.	.	.	.	.	.	7	1	.	.
GRAMINOIDS										
Agrostis alaskana	.	.	.	.	.	.	.	.	20	1
Agrostis borealis	.	.	.	.	.	.	.	.	20	2
Agrostis exarata	.	.	.	.	.	.	.	.	40	8
Calamagrostis canadensis	100	5	40	3	80	4	29	3	60	9
Carex Mertensii	.	.	20	1	.	.	.	.	.	.
Carex disperma	50	1	.	.	.	.	.	.	.	.
Carex eleusinoides	.	.	.	.	.	.	.	.	20	1
Carex lyngbyei	.	.	.	.	.	.	7	1	.	.
Carex macrochaeta	.	.	.	.	40	3	.	.	.	.
Carex maritima	.	.	.	.	.	.	.	.	20	1
Carex sitchensis	.	.	.	.	20	1	.	.	40	25
Carex sp.	.	.	.	.	.	.	7	1	.	.
Cinna latifolia	.	.	20	1	.	.	14	1	.	.
Deschampsia caespitosa	.	.	.	.	.	.	.	.	60	18
Elymus hirsutus	.	.	40	4	20	3	7	5	20	10
Festuca rubra	.	.	20	1	.	.	.	.	40	11
Hordeum brachyantherum	.	.	.	.	.	.	.	.	20	2
Luzula parviflora	.	.	20	1	.	.	7	1	.	.
Phleum commutatum americanum	.	.	.	.	.	.	.	.	20	1
Poa arctica	.	.	.	.	.	.	.	.	20	1
Scirpus microcarpus	.	.	.	.	.	.	.	.	20	60

SPECIES	RUBSPE/ATHFIL 2 Plots CON	RUBSPE/ATHFIL 2 Plots ACOV	ALNSIN-SALSIT 5 Plots CON	ALNSIN-SALSIT 5 Plots ACOV	ALNSIN-MALFUS 5 Plots CON	ALNSIN-MALFUS 5 Plots ACOV	ALNSIN-RUBSPE 14 Plots CON	ALNSIN-RUBSPE 14 Plots ACOV	ALNSIN/GRAMINOID 5 Plots CON	ALNSIN/GRAMINOID 5 Plots 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 10 Plots CON	SALSIT 10 Plots ACOV	SALHOO 3 Plots CON	SALHOO 3 Plots ACOV	SALBAR/CARPLU 6 Plots CON	SALBAR/CARPLU 6 Plots ACOV	SALBAR/CARSIT 11 Plots CON	SALBAR/CARSIT 11 Plots ACOV	SALBAR/MIXED HERB 5 Plots CON	SALBAR/MIXED HERB 5 Plots ACOV
TREES-REGENERATION										
Picea sitchensis regen	10	2	.	.	17	2	18	1	20	1
Populus balsamifera trichocarpa regen	20	11	.	.	.	.	.	.	.	.
TALL SHRUBS										
Alnus sinuata	50	16	33	1	33	3	18	1	.	.
Myrica gale	.	.	.	.	50	26	55	32	40	7
Rubus spectabilis	60	25	100	21	.	.	.	.	40	18
Salix barclayi	70	15	33	10	100	26	100	45	100	64
Salix alaxensis	30	3	.	.	.	.	.	.	.	.
Salix commutata	10	3	.	.	83	28	45	21	60	11
Salix hookeriana	.	.	100	48	17	5	.	.	20	1
Salix sitchensis	100	57	33	7	.	.	18	3	20	1
Sambucus racemosa	10	5	33	5	.	.	.	.	60	4
Viburnum edule	40	2	33	1	33	1	27	2	80	1
LOW AND SUBSHRUBS										
Empetrum nigrum	.	.	.	.	17	20	.	.	.	.
Oxycoccus palustris	.	.	.	.	17	1	.	.	.	.
Vaccinium uliginosum	.	.	.	.	17	60	.	.	.	.
FORBS										
Achillea borealis	10	3	33	1	17	1	.	.	20	1
Actaea rubra	.	.	33	1	.	.	.	.	40	1
Angelica genuflexa	60	1	100	3	33	2	91	3	80	3
Angelica lucida	10	2	.	.	.	.	9	2	60	7
Arabis lyrata	.	.	.	.	.	.	.	.	20	1
Aruncus sylvester	10	2	.	.	.	.	.	.	.	.
Aster subspicatus	.	.	.	.	33	1	36	3	40	1
Caltha palustris asarifolia	20	6	67	1	50	2	27	2	20	1
Cardamine umbellata	10	1	33	1	.	.	.	.	.	.
Cicuta douglasii	10	1	33	1	50	2	18	1	.	.
Circaea alpina	70	6	67	5	.	.	.	.	60	19
Conioselinum chinense	40	1	67	1	.	.	.	.	20	1
Cornus canadensis	10	1	.	.	.	.	.	.	20	1
Dodecatheon jeffreyi	.	.	.	.	.	.	9	1	.	.
Drosera rotundifolia	.	.	.	.	17	1	.	.	.	.
Epilobium adenocaulon	.	.	.	.	17	2	.	.	.	.
Epilobium angustifolium	30	3	.	.	17	1	18	1	40	3
Epilobium behringianum	.	.	33	2	.	.	9	1	.	.
Epilobium glandulosum	20	1	.	.	.	.	.	.	40	1
Epilobium latifolium	10	1	.	.	.	.	.	.	.	.
Epilobium palustre	.	.	.	.	17	1	18	1	.	.
Epilobium sp.	20	1	33	1	17	1	9	1	.	.
Equisetum arvense	60	20	67	25	67	12	9	1	100	6
Equisetum fluviatile	10	40	.	.	17	1	.	.	.	.
Equisetum palustre	.	.	33	3	33	1	73	1	.	.
Equisetum pratense	10	1	33	3	.	.	.	.	.	.
Equisetum variegatum	.	.	.	.	17	1	.	.	20	2
Erigeron peregrinus	.	.	.	.	17	1	.	.	20	1
Fragaria chiloensis	.	.	33	1	.	.	.	.	.	.
Fritillaria camschatcensis	30	1	67	1	.	.	.	.	40	1
Galium trifidum	20	1	33	1	33	2	18	1	.	.
Galium trifidum columbianum	.	.	.	.	.	.	.	.	20	5
Galium trifidum trifidum	.	.	33	1	.	.	9	1	.	.
Galium triflorum	.	.	.	.	.	.	9	1	40	3
Geranium erianthum	.	.	.	.	.	.	18	1	.	.
Geum calthifolium	.	.	.	.	17	1	9	1	.	.
Geum macrophyllum	40	1	67	2	.	.	.	.	80	3
Heracleum lanatum	50	5	67	2	.	.	.	.	60	3
Iris setosa	.	.	33	1	17	3	9	3	20	1
Lathyrus palustris	.	.	33	6	17	2	.	.	.	.

SPECIES	SALSIT 10 Plots CON	SALSIT 10 Plots ACOV	SALHOO 3 Plots CON	SALHOO 3 Plots ACOV	SALBAR/CARPLU 6 Plots CON	SALBAR/CARPLU 6 Plots ACOV	SALBAR/CARSIT 11 Plots CON	SALBAR/CARSIT 11 Plots ACOV	SALBAR/MIXED HERB 5 Plots CON	SALBAR/MIXED HERB 5 Plots 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 acutiflorum	.	.	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 lepida	.	.	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 sitchana	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 inexpansa	.	.	.	.	.	.	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 10 Plots CON	ACOV	SALHOO 3 Plots CON	ACOV	SALBAR/CARPLU 6 Plots CON	ACOV	SALBAR/CARSIT 11 Plots CON	ACOV	SALBAR/MIXED HERB 5 Plots CON	ACOV
Elymus subsecundus	.	.	.	.	.	.	.	.	20	3
Eriophorum angustifolium	.	.	.	.	17	5	.	.	.	.
Eriophorum russeolum	.	.	.	.	17	1	9	1	.	.
Festuca rubra	10	1	33	1	17	1	18	1	20	2
Hierochloe odorata	.	.	.	.	.	.	.	.	20	1
Hordeum brachyantherum	.	.	.	.	.	.	.	.	20	1
Luzula multiflora	10	1	.	.	.	.	9	1	.	.
Luzula parviflora	30	2	.	.	.	.	9	2	.	.
Phleum commutatum americanum	20	1	.	.	.	.	.	.	.	.
Poa sp.	10	1	.	.	.	.	.	.	.	.
Trichophorum caespitosum	.	.	.	.	17	1	.	.	.	.
Trisetum cernuum	.	.	.	.	.	.	.	.	20	3
Vahlodea atropurpurea latifolia	.	.	33	1	.	.	.	.	.	.
FERNS AND ALLIES										
Athyrium filix-femina	40	24	100	6	17	1	9	1	80	21
Dryopteris dilatata	10	1	.	.	.	.	.	.	.	.
Gymnocarpium dryopteris	40	4	.	.	.	.	.	.	.	.
Polystichum Braunii	10	1	.	.	.	.	.	.	.	.

SHRUB COMMUNITIES (CONTINUED)

SPECIES	SALBAR/FRACHI 16 Plots CON	ACOV	MYRGAL/CARLIV 10 Plots CON	ACOV	MYRGAL/CARSIT 16 Plots CON	ACOV	MYRGAL/CARPLU 4 Plots CON	ACOV	MYRGAL/EQUVAR 7 Plots CON	ACOV
TREES										
Picea sitchensis	19	4	.	.	.	.	.	.	.	.
Pinus contorta contorta	.	.	10	1	.	.	.	.	.	.
Populus balsamifera trichocarpa	6	5	.	.	.	.	.	.	.	.
TREES-REGENERATION										
Picea sitchensis regen	38	2	10	1	.	.	50	1	29	2
Populus balsamifera trichocarpa regen	31	2	.	.	.	.	.	.	14	1
TALL SHRUBS										
Alnus sinuata	25	5	.	.	.	.	.	.	14	2
Myrica gale	.	.	100	47	100	52	100	58	100	56
Rubus spectabilis	6	1	.	.	.	.	.	.	.	.
Salix barclayi	100	35	.	.	13	3	.	.	86	2
Salix alaxensis	13	2	.	.	.	.	.	.	29	1
Salix commutata	75	21	.	.	6	1	.	.	71	1
Salix hookeriana	6	5	.	.	13	1	.	.	14	1
Salix sitchensis	19	6	.	.	.	.	.	.	29	1
Viburnum edule	6	1	.	.	.	.	.	.	29	1
LOW AND SUBSHRUBS										
Andromeda polifolia	.	.	40	3	6	1	.	.	.	.
Empetrum nigrum	31	9	40	1	13	5	.	.	29	1
Kalmia polifolia	.	.	.	.	.	.	25	1	.	.
Ledum groenlandicum	.	.	10	1	.	.	.	.	.	.
Oxycoccus palustris	.	.	60	2	19	3	75	3	29	2
Salix setchelliana	6	15	.	.	.	.	.	.	.	.
Vaccinium uliginosum	44	2	40	2	6	5	.	.	14	1
Vaccinium vitis-idaea	.	.	.	.	6	1	.	.	.	.
FORBS										
Achillea borealis	100	6	10	1	.	.	.	.	57	1
Allium schoenoprasum	6	1	.	.	.	.	.	.	.	.
Anemone narcissiflora	6	1	.	.	.	.	.	.	.	.
Angelica genuflexa	38	10	.	.	13	1	75	2	43	1
Angelica lucida	25	1	.	.	6	1	.	.	14	1
Aquilegia formosa	6	1	.	.	.	.	.	.	.	.
Artemisia arctica arctica	6	1	.	.	.	.	.	.	.	.
Aster subspicatus	31	1	20	2	13	1	25	4	86	4
Astragalus alpinus	13	4	.	.	.	.	.	.	.	.
Caltha palustris asarifolia	.	.	.	.	6	1	25	1	43	1
Campanula rotundifolia	13	2	.	.	.	.	.	.	.	.
Castilleja miniata	6	3	.	.	.	.	.	.	.	.
Castilleja unalaschensis	19	2	.	.	.	.	.	.	.	.
Cerastium Beeringianum	6	15	.	.	.	.	.	.	.	.
Cicuta douglasii	.	.	.	.	38	1	50	2	43	4
Conioselinum chinense	25	2	.	.	13	1	.	.	57	1
Coptis trifolia	.	.	40	3	.	.	.	.	29	1
Cornus canadensis	.	.	.	.	.	.	.	.	14	1
Dodecatheon jeffreyi	6	2	20	2	.	.	.	.	.	.
Dodecatheon pulchellum	.	.	10	1	.	.	.	.	14	1
Drosera anglica	.	.	30	3	.	.	.	.	.	.
Drosera rotundifolia	.	.	50	3	6	1	50	1	.	.
Epilobium alpinum	6	1	.	.	.	.	.	.	.	.
Epilobium angustifolium	63	8	.	.	.	.	.	.	.	.
Epilobium glandulosum	.	.	.	.	.	.	.	.	14	1
Epilobium latifolium	19	4	.	.	.	.	.	.	14	1
Epilobium palustre	6	1	.	.	6	1	25	1	.	.
Epilobium sp.	.	.	.	.	6	1	.	.	.	.
Equisetum arvense	13	23	.	.	6	1	25	1	43	1
Equisetum fluviatile	.	.	30	3	.	.	50	1	.	.
Equisetum palustre	.	.	80	2	25	1	50	4	29	2

SPECIES	SALBAR/FRACHI 16 Plots CON	ACOV	MYRGAL/CARLIV 10 Plots CON	ACOV	MYRGAL/CARSIT 16 Plots CON	ACOV	MYRGAL/CARPLU 4 Plots CON	ACOV	MYRGAL/EQUVAR 7 Plots 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 camschatcensis	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 romanzoffiana	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	.	.	.	.
Tiarella trifoliata	.	.	.	.	6	1	.	.	.	.
Tofieldia glutinosa	.	.	60	1	13	1	.	.	57	1

SPECIES	SALBAR/FRACHI 16 Plots CON	ACOV	MYRGAL/CARLIV 10 Plots CON	ACOV	MYRGAL/CARSIT 16 Plots CON	ACOV	MYRGAL/CARPLU 4 Plots CON	ACOV	MYRGAL/EQUVAR 7 Plots CON	ACOV
Trientalis europea	75	1	30	1	69	1	50	2	29	1
Triglochin maritimum	.	.	30	1	6	1	.	.	29	2
Utricularia intermedia	.	.	20	1	.	.	25	1	14	1
Viola epipsila	13	4	20	1	19	5	50	1	.	.
Viola glabella	.	.	.	.	6	3	.	.	14	2
Viola langsdorfii	19	4	40	1	25	3	25	4	29	3
Viola sp.	6	1	10	5	6	1	.	.	14	2
GRAMINOIDS										
Agrostis aequivalvis	.	.	30	1	6	1	.	.	.	.
Agrostis alaskana	31	2	20	3	19	1	100	2	14	5
Agrostis borealis	6	2	.	.	6	1	.	.	.	.
Agrostis scabra	6	3	.	.	6	10	.	.	.	.
Agrostis sp.	6	10	.	.	13	7	.	.	.	.
Bromus ciliatus	6	1	.	.	.	.	.	.	.	.
Calamagrostis canadensis	50	3	.	.	44	3	50	1	57	2
Calamagrostis inexpansa	.	.	10	1	6	5	.	.	.	.
Calamagrostis neglecta	6	2	.	.	.	.	.	.	.	.
Carex anthoxanthea	6	5	.	.	6	20	.	.	.	.
Carex canescens	.	.	.	.	19	3	.	.	.	.
Carex capillaris	6	1	.	.	.	.	.	.	.	.
Carex dioica	6	1	.	.	.	.	.	.	.	.
Carex flava	.	.	30	9	6	5	.	.	71	5
Carex gmelini	6	1	.	.	.	.	.	.	.	.
Carex interior	.	.	10	1	.	.	.	.	29	1
Carex leptalea	6	1	.	.	.	.	.	.	14	3
Carex limosa	.	.	20	6	6	1	.	.	14	1
Carex livida	.	.	80	15	38	14	50	14	57	5
Carex lyngbyei	6	1	.	.	.	.	50	17	14	1
Carex macloviana	6	1	.	.	.	.	.	.	.	.
Carex macrochaeta	13	6	.	.	.	.	.	.	.	.
Carex microglochin	.	.	.	.	.	.	.	.	14	1
Carex muricata	.	.	30	3	.	.	.	.	.	.
Carex pauciflora	6	1	20	8	.	.	.	.	.	.
Carex phyllomanica	.	.	10	1	.	.	.	.	.	.
Carex pluriflora	.	.	10	1	44	6	100	45	.	.
Carex saxatilis	13	9	10	10	6	1	.	.	43	3
Carex sitchensis	.	.	30	7	100	45	25	20	.	.
Cinna latifolia	6	1	.	.	.	.	.	.	.	.
Deschampsia caespitosa	69	3	60	2	75	4	100	4	86	5
Elymus hirsutus	6	4	.	.	.	.	.	.	.	.
Eriophorum angustifolium	6	1	80	10	31	5	25	1	43	1
Eriophorum russeolum	.	.	10	1	6	2	50	1	.	.
Festuca rubra	63	3	20	2	19	1	25	3	29	2
Hierochloe odorata	25	1	.	.	.	.	.	.	14	1
Hordeum brachyantherum	6	5	.	.	.	.	.	.	.	.
Juncus alpinus	.	.	.	.	.	.	.	.	29	1
Juncus arcticus sitchensis	6	2	.	.	.	.	.	.	43	1
Juncus falcatus	.	.	.	.	.	.	.	.	14	2
Juncus triglumis	13	10	.	.	.	.	.	.	.	.
Luzula multiflora	50	1	.	.	25	1	75	1	.	.
Luzula parviflora	.	.	.	.	6	2	.	.	.	.
Luzula sp.	.	.	10	1	.	.	.	.	.	.
Phleum commutatum americanum	31	2	.	.	.	.	.	.	.	.
Poa alpina	13	1	.	.	.	.	.	.	.	.
Poa arctica	13	2	.	.	.	.	.	.	.	.
Poa sp.	6	1	.	.	.	.	.	.	.	.
Trichophorum caespitosum	6	2	60	23	25	8	.	.	29	3
Trisetum cernuum	6	1	.	.	.	.	.	.	.	.
Trisetum spicatum	25	1	.	.	.	.	.	.	.	.
FERNS AND ALLIES										
Athyrium filix-femina	6	1	.	.	.	.	.	.	.	.
UNKNOWN										
GRAMINOID UNKNOWN	6	1	.	.	19	9	.	.	14	5
SEDGE UNKNOWN	.	.	.	.	19	58	.	.	14	6

SHRUB COMMUNITIES (CONTINUED)

SPECIES	EMPNIG/CARPLU 5 Plots CON	ACOV	VACULI-EMPNIG 8 Plots CON	ACOV	ANDPOL/CARPLU 2 Plots CON	ACOV
TREES						
Picea sitchensis	20	4	13	1	.	.
TREES-REGENERATION						
Picea sitchensis regen	80	1	50	2	50	2
Tsuga heterophylla regen	20	1	.	.	.	.
TALL SHRUBS						
Myrica gale	20	10	.	.	.	.
Salix barclayi	.	.	88	4	.	.
Salix commutata	.	.	75	3	.	.
Viburnum edule	.	.	25	1	.	.
LOW AND SUBSHRUBS						
Andromeda polifolia	20	1	13	4	100	25
Empetrum nigrum	100	34	100	28	100	2
Oxycoccus palustris	100	5	50	3	100	8
Vaccinium uliginosum	60	12	100	37	100	7
Vaccinium vitis-idaea	20	1	.	.	.	.
FORBS						
Achillea borealis	.	.	25	6	.	.
Angelica genuflexa	.	.	13	1	.	.
Antennaria pallida	.	.	13	1	.	.
Aster subspicatus	.	.	13	1	.	.
Coptis trifolia	20	1	25	1	.	.
Cornus canadensis	40	2	38	3	.	.
Drosera rotundifolia	100	3	25	1	100	2
Epilobium angustifolium	.	.	38	2	.	.
Epilobium latifolium	.	.	13	10	.	.
Epilobium palustre	.	.	13	2	.	.
Equisetum arvense	.	.	63	1	.	.
Equisetum fluviatile	.	.	13	5	.	.
Equisetum palustre	.	.	.	.	100	6
Equisetum variegatum	.	.	50	2	.	.
Erigeron peregrinus	.	.	25	1	.	.
Erigeron sp.	.	.	13	3	.	.
Euphrasia mollis	.	.	13	1	.	.
Fragaria chiloensis	.	.	38	2	.	.
Fritillaria camschatcensis	.	.	13	1	.	.
Gentiana douglasiana	20	1	13	1	100	1
Geum calthifolium	40	1	.	.	.	.
Hedysarum alpinum	.	.	13	1	.	.
Heracleum lanatum	.	.	13	1	.	.
Listera cordata	.	.	13	1	.	.
Lupinus nootkatensis	.	.	25	2	.	.
Lysimachia thyrsiflora	.	.	.	.	50	1
Maianthemum dilatatum	20	1	.	.	.	.
Menyanthes trifoliata	.	.	.	.	50	1
Parnassia palustris	.	.	38	1	.	.
Pedicularis oederi	.	.	25	2	.	.
Pedicularis parviflora	20	1	38	1	50	2
Platanthera dilatata	40	1	63	1	100	1
Platanthera saccata	20	1	13	1	.	.
Polygonum viviparum	.	.	75	5	.	.
Potentilla palustris	.	.	13	3	50	1
Primula egaliksensis	.	.	13	1	.	.
Rhinanthus minor borealis	.	.	25	1	.	.
Rubus arcticus stellatus	.	.	88	2	50	1
Sanguisorba stipulata	.	.	13	1	.	.
Senecio pauciflorus	.	.	13	1	.	.
Solidago lepida	20	1	13	3	.	.

SPECIES	VACULI-EMPNIG					
	EMPNIG/CARPLU				ANDPOL/CARPLU	
	5 Plots		8 Plots		2 Plots	
	CON	ACOV	CON	ACOV	CON	ACOV
Spiranthes romanzoffiana	.	.	13	1	.	.
Swertia perennis	.	.	38	2	.	.
Tofieldia glutinosa	80	1	50	1	50	1
Trientalis europea	60	1	38	1	50	1
Viola epipsila	.	.	13	1	.	.
Viola glabella	.	.	13	1	.	.
Viola langsdorfii	.	.	13	4	.	.
Viola sp.	.	.	13	1	.	.
GRAMINOIDS						
Agrostis aequivalvis	40	1	13	1	.	.
Agrostis alaskana	.	.	38	2	.	.
Calamagrostis canadensis	.	.	25	2	.	.
Calamagrostis inexpansa	.	.	13	1	.	.
Carex anthoxanthea	.	.	38	6	.	.
Carex capillaris	.	.	13	5	.	.
Carex livida	40	15	13	1	.	.
Carex lyngbyei	.	.	.	.	100	13
Carex macrochaeta	.	.	13	2	.	.
Carex pauciflora	40	1	.	.	.	.
Carex pluriflora	100	18	50	10	100	23
Carex saxatilis	.	.	13	1	.	.
Carex sitchensis	80	9	25	18	.	.
Carex sp.	.	.	13	1	.	.
Carex stylosa	20	1	.	.	.	.
Deschampsia caespitosa	20	1	88	3	.	.
Eriophorum angustifolium	80	7	75	15	.	.
Eriophorum russeolum	20	1	25	2	100	6
Festuca rubra	.	.	25	1	.	.
Juncus arcticus sitchensis	.	.	13	1	.	.
Juncus falcatus	.	.	13	1	.	.
Luzula multiflora	.	.	38	1	50	1
Phleum commutatum americanum	.	.	13	1	.	.
Poa arctica	.	.	13	1	.	.
Trichophorum caespitosum	20	1	25	5	.	.
Trisetum cernuum	.	.	13	4	.	.
Vahlodea atropurpurea latifolia	.	.	13	1	.	.

GRAMINOID COMMUNITIES

SPECIES	PUCPUM 1 Plot CON	PUCPUM 1 Plot ACOV	ELEPAL 3 Plots CON	ELEPAL 3 Plots ACOV	CARLYN 5 Plots CON	CARLYN 5 Plots ACOV	CARSAX 6 Plots CON	CARSAX 6 Plots ACOV
TREES								
Picea sitchensis	.	.	.	.	.	.	.	.
TREES-REGENERATION								
Picea sitchensis regen	.	.	.	.	.	.	17	1
TALL SHRUBS								
Alnus sinuata	.	.	.	.	.	.	.	.
Myrica gale	.	.	.	.	.	.	33	5
Salix barclayi	.	.	.	.	20	1	33	6
Salix alaxensis	.	.	33	1	.	.	.	.
Salix commutata	.	.	.	.	.	.	.	.
Viburnum edule	.	.	.	.	.	.	17	1
LOW AND SUBSHRUBS								
Andromeda polifolia	.	.	.	.	.	.	.	.
Empetrum nigrum	.	.	.	.	.	.	.	.
Kalmia polifolia	.	.	.	.	.	.	.	.
Ledum groenlandicum	.	.	.	.	.	.	.	.
Oxycoccus palustris	.	.	.	.	.	.	.	.
Vaccinium uliginosum	.	.	.	.	.	.	.	.
FORBS								
Achillea borealis	.	.	.	.	.	.	.	.
Angelica genuflexa	.	.	.	.	.	.	17	1
Angelica lucida	.	.	.	.	.	.	.	.
Aster subspicatus	.	.	.	.	.	.	.	.
Callitriche verna	.	.	33	2	.	.	.	.
Caltha palustris asarifolia	.	.	.	.	20	2	33	2
Cicuta douglasii	.	.	.	.	20	1	17	2
Conioselinum chinense	.	.	.	.	.	.	.	.
Cornus canadensis	.	.	.	.	.	.	.	.
Drosera rotundifolia	.	.	.	.	.	.	.	.
Epilobium alpinum	.	.	.	.	.	.	.	.
Epilobium glandulosum	.	.	.	.	20	1	.	.
Epilobium palustre	.	.	.	.	20	2	.	.
Epilobium sp.	.	.	.	.	.	.	.	.
Equisetum arvense	.	.	.	.	.	.	17	1
Equisetum fluviatile	.	.	33	2	20	15	17	20
Equisetum palustre	.	.	.	.	20	15	33	9
Equisetum pratense	.	.	.	.	.	.	.	.
Equisetum sp.	.	.	.	.	.	.	.	.
Equisetum variegatum	.	.	33	3	20	20	67	2
Erigeron peregrinus	.	.	.	.	.	.	33	1
Fritillaria camschatcensis	.	.	.	.	.	.	.	.
Galium trifidum	.	.	.	.	.	.	.	.
Gentiana douglasiana	.	.	.	.	.	.	.	.
Geum calthifolium	.	.	.	.	.	.	.	.
Hippuris vulgaris	.	.	.	.	20	1	17	2
Iris setosa	.	.	.	.	.	.	17	1
Lathyrus maritimus	.	.	33	1	.	.	.	.
Lathyrus palustris	.	.	.	.	.	.	.	.
Ligusticum scoticum	.	.	.	.	.	.	.	.
Lupinus nootkatensis	.	.	.	.	.	.	17	4
Lysichitum americanum	.	.	.	.	.	.	17	1
Lysimachia thyrsiflora	.	.	.	.	20	2	17	1
Menyanthes trifoliata	.	.	.	.	.	.	33	7
Parnassia palustris	.	.	33	1	20	1	.	.
Pedicularis parviflora	.	.	.	.	.	.	17	2
Plantago macrocarpa	.	.	.	.	.	.	.	.
Platanthera dilatata	.	.	.	.	20	1	17	1
Polemonium acutiflorum	.	.	.	.	.	.	.	.

SPECIES	PUCPUM 1 Plot CON	PUCPUM 1 Plot ACOV	ELEPAL 3 Plots CON	ELEPAL 3 Plots ACOV	CARLYN 5 Plots CON	CARLYN 5 Plots ACOV	CARSAX 6 Plots CON	CARSAX 6 Plots ACOV
Polygonum viviparum	.	.	.	.	20	1	.	.
Potentilla egedii grandis	.	.	67	4	20	1	.	.
Potentilla palustris	.	.	.	.	.	.	33	5
Ranunculus cymbalaria	100	1	67	2	.	.	.	.
Ranunculus flammula	.	.	.	.	20	1	.	.
Ranunculus pallasii	.	.	.	.	20	2	.	.
Rhinanthus minor borealis	.	.	33	1	20	1	.	.
Rubus arcticus stellatus	.	.	.	.	.	.	.	.
Rumex fenestratus	.	.	.	.	.	.	.	.
Sanguisorba stipulata	.	.	.	.	.	.	17	1
Solidago lepida	.	.	.	.	.	.	.	.
Sparganium angustifolium	.	.	33	2	.	.	.	.
Thalictrum sparsiflorum	.	.	.	.	.	.	17	1
Tofieldia glutinosa	.	.	.	.	.	.	.	.
Trientalis europea	.	.	.	.	.	.	17	1
Triglochin maritimum	100	5	33	1	20	2	17	1
Triglochin palustre	.	.	33	1	.	.	.	.
Viola epipsila	.	.	.	.	.	.	.	.
Viola sp.	.	.	.	.	20	2	.	.
GRAMINOIDS								
Agrostis aequivalvis	.	.	.	.	.	.	.	.
Agrostis alaskana	.	.	.	.	40	3	.	.
Calamagrostis canadensis	.	.	.	.	.	.	.	.
Calamagrostis inexpansa	.	.	.	.	20	1	.	.
Calamagrostis neglecta	.	.	.	.	.	.	.	.
Carex canescens	.	.	.	.	.	.	.	.
Carex flava	.	.	.	.	.	.	33	7
Carex interior	.	.	.	.	.	.	17	3
Carex limosa	.	.	.	.	.	.	.	.
Carex livida	.	.	.	.	.	.	50	1
Carex lyngbyei	.	.	.	.	100	78	.	.
Carex oederi	.	.	33	1	.	.	.	.
Carex pluriflora	.	.	.	.	.	.	.	.
Carex saxatilis	.	.	.	.	20	35	100	63
Carex sitchensis	.	.	.	.	.	.	33	19
Carex sp.	.	.	.	.	.	.	.	.
Deschampsia caespitosa	.	.	67	2	60	3	17	2
Eleocharis palustris	.	.	100	48	20	1	.	.
Eriophorum russeolum	.	.	.	.	.	.	.	.
Festuca rubra	.	.	.	.	20	2	.	.
Hierochloe odorata	.	.	.	.	.	.	.	.
Hordeum brachyantherum	.	.	.	.	20	1	.	.
Juncus alpinus	.	.	33	1	.	.	.	.
Juncus arcticus sitchensis	.	.	33	1	.	.	.	.
Juncus bufonius	.	.	67	3	.	.	.	.
Luzula multiflora	.	.	.	.	.	.	17	1
Poa eminens	.	.	33	2	.	.	.	.
Puccinellia nutkaenis	.	.	67	1	.	.	.	.
Puccinellia pumila	100	50	.	.	.	.	.	.
Trichophorum caespitosum	.	.	.	.	.	.	.	.
UNKNOWN								
SEDGE UNKNOWN	.	.	.	.	.	.	.	.

GRAMINOID COMMUNITIES (CONTINUED)

SPECIES	CARPLU-CARLYN 11 Plots CON	ACOV	CARLIV-TRICAE 17 Plots CON	ACOV	TRICAE 7 Plots CON	ACOV	CARSIT/OXYPAL 19 Plots CON	ACOV
TREES								
Picea sitchensis	9	2	.	.	.	.	11	1
TREES-REGENERATION								
Picea sitchensis regen	55	2	41	2	29	1	26	1
Pinus contorta regen	.	.	12	1	.	.	.	.
Tsuga mertensiana regen	.	.	12	1	.	.	.	.
TALL SHRUBS								
Alnus sinuata	27	1	6	1	14	1	11	1
Myrica gale	27	11	35	12	57	9	32	7
Salix barclayi	9	10	.	.	57	2	5	6
Salix commutata	9	1	.	.	71	2	11	1
Salix sitchensis	.	.	.	.	.	.	5	1
Vaccinium sp. (oval & alask)	.	.	.	.	.	.	5	1
Viburnum edule	.	.	6	1	.	.	.	.
LOW AND SUBSHRUBS								
Andromeda polifolia	18	5	59	1	29	1	26	5
Empetrum nigrum	36	1	88	3	86	5	58	4
Kalmia polifolia	9	1	29	2	.	.	5	4
Ledum groenlandicum	9	1	24	1	14	1	.	.
Oxycoccus palustris	55	6	100	2	86	1	89	4
Salix reticulata	.	.	.	.	14	1	.	.
Vaccinium uliginosum	27	1	41	2	71	4	58	3
FORBS								
Achillea borealis	18	1	.	.	57	2	5	1
Actaea rubra	.	.	6	2	.	.	.	.
Angelica genuflexa	.	.	6	1	14	1	5	2
Angelica lucida	9	1	.	.	.	.	.	.
Aster subspicatus	18	1	18	1	29	1	.	.
Caltha palustris asarifolia	9	2	.	.	.	.	5	1
Cicuta douglasii	18	11	.	.	.	.	.	.
Conioselinum chinense	9	2	6	2	14	1	.	.
Coptis trifolia	.	.	53	2	57	2	11	1
Cornus canadensis	9	1	35	1	.	.	21	2
Cornus suecica	.	.	18	4	.	.	.	.
Dodecatheon jeffreyi	.	.	35	1	.	.	5	1
Dodecatheon pulchellum	.	.	.	.	14	1	.	.
Drosera anglica	.	.	59	5	.	.	.	.
Drosera rotundifolia	64	4	94	4	43	1	79	3
Epilobium adenocaulon	.	.	.	.	14	2	.	.
Epilobium alpinum	9	1	.	.	.	.	.	.
Epilobium angustifolium	.	.	.	.	14	1	.	.
Epilobium glandulosum	9	1	.	.	.	.	.	.
Epilobium palustre	9	1	.	.	14	1	.	.
Epilobium sp.	9	1	.	.	.	.	.	.
Equisetum arvense	18	1	6	1	57	1	.	.
Equisetum fluviatile	.	.	12	2	.	.	.	.
Equisetum palustre	36	1	41	2	14	1	37	3
Equisetum pratense	9	1	6	1	.	.	.	.
Equisetum sp.	9	2	6	1	.	.	16	1
Equisetum variegatum	.	.	.	.	71	3	5	1
Erigeron peregrinus	.	.	29	1	43	4	5	1
Fauria crista-galli	.	.	18	1	.	.	.	.
Fragaria chiloensis	.	.	6	1	29	1	.	.
Fritillaria camschatcensis	36	1	18	1	29	1	5	1
Galium trifidum	18	1	.	.	14	2	.	.
Gentiana douglasiana	27	1	82	2	14	1	37	1
Geum calthifolium	9	1	41	3	57	1	5	3
Geum macrophyllum	.	.	6	1	.	.	.	.

SPECIES	CARPLU-CARLYN 11 Plots CON	ACOV	CARLIV-TRICAE 17 Plots CON	ACOV	TRICAE 7 Plots CON	ACOV	CARSIT/OXYPAL 19 Plots CON	ACOV
Hedysarum alpinum	.	.	.	.	14	1	.	.
Iris setosa	64	13	6	2	14	3	5	6
Lathyrus palustris	27	13	.	.	.	.	.	.
Ligusticum scoticum	9	1	.	.	.	.	.	.
Lupinus nootketensis	36	2	6	4	57	4	11	5
Lysimachia thyrsiflora	9	1	.	.	.	.	.	.
Menyanthes trifoliata	18	28	29	6	14	2	47	3
Parnassia fimbriata	.	.	.	.	14	1	.	.
Parnassia palustris	.	.	.	.	29	1	5	1
Pedicularis oederi	.	.	.	.	29	1	.	.
Pedicularis parviflora	9	1	94	1	43	1	47	1
Petasites hyperboreus	.	.	.	.	14	8	.	.
Pinguicula vulgaris	.	.	6	1	57	1	.	.
Plantago macrocarpa	9	1	6	1	14	1	5	1
Platanthera dilatata	64	1	71	1	86	1	68	1
Platanthera hyperborea	.	.	.	.	14	1	.	.
Platanthera saccata	.	.	.	.	.	.	5	1
Platanthera sp.	.	.	.	.	.	.	5	1
Polemonium acutiflorum	36	2	6	1	.	.	5	2
Polygonum viviparum	9	2	12	1	86	2	21	1
Potentilla egedii grandis	9	2	.	.	.	.	.	.
Potentilla palustris	45	2	.	.	.	.	21	1
Rhinanthus minor borealis	.	.	.	.	43	1	.	.
Rubus arcticus stellatus	73	2	18	1	86	3	42	2
Rubus pedatus	.	.	6	1	.	.	5	1
Rumex fenestratus	9	2	.	.	.	.	.	.
Sanguisorba menziesii	.	.	6	2	.	.	.	.
Sanguisorba stipulata	.	.	18	4	57	2	5	3
Senecio pauciflorus	.	.	.	.	14	1	.	.
Solidago lepida	9	1	6	1	14	6	5	1
Spiranthes romanzoffiana	.	.	6	1	29	1	5	1
Stellaria borealis	.	.	.	.	14	1	.	.
Streptopus amplexifolius	.	.	6	1	.	.	.	.
Swertia perennis	.	.	6	1	86	5	5	6
Thalictrum alpinum	.	.	6	5	.	.	.	.
Thalictrum sparsiflorum	.	.	.	.	14	1	.	.
Tofieldia glutinosa	9	1	82	1	100	1	16	1
Trientalis europea	64	1	47	1	57	1	42	1
Triglochin maritimum	27	5	6	1	43	2	.	.
Utricularia intermedia	.	.	18	3	14	1	.	.
Viola epipsila	27	1	.	.	.	.	5	2
Viola langsdorfii	.	.	.	.	29	7	5	1
Viola sp.	.	.	.	.	29	1	.	.
GRAMINOIDS								
Agrostis aequivalvis	9	1	53	2	14	2	16	1
Agrostis alaskana	45	3	18	3	14	2	.	.
Agrostis sp.	.	.	6	2	.	.	5	1
Calamagrostis canadensis	45	5	6	1	43	1	26	2
Calamagrostis neglecta	9	3	.	.	.	.	.	.
Calamagrostis nutkaensis	.	.	.	.	.	.	5	20
Carex anthoxanthea	.	.	12	4	29	12	.	.
Carex canescens	18	2	.	.	.	.	.	.
Carex capillaris	.	.	6	4	43	7	.	.
Carex flava	.	.	.	.	57	2	.	.
Carex leptalea	.	.	6	1	14	1	.	.
Carex limosa	9	20	18	16	.	.	5	1
Carex livida	.	.	94	12	43	2	32	7
Carex lyngbyei	73	18	6	1	14	10	.	.
Carex macrochaeta	.	.	.	.	14	1	.	.
Carex microglochin	.	.	6	1	.	.	.	.
Carex muricata	.	.	24	4	.	.	.	.
Carex pauciflora	.	.	65	15	.	.	.	.

SPECIES	CARPLU-CARLYN 11 Plots CON	ACOV	CARLIV-TRICAE 17 Plots CON	ACOV	TRICAE 7 Plots CON	ACOV	CARSIT/OXYPAL 19 Plots CON	ACOV
Carex phyllomanica	.	.	29	2	.	.	.	.
Carex pluriflora	100	29	35	7	29	2	68	11
Carex pyrenaica	.	.	.	.	14	15	.	.
Carex saxatilis	.	.	.	.	43	1	5	2
Carex sitchensis	.	.	47	7	14	3	95	34
Carex sp.	18	13	.	.	.	.	.	.
Deschampsia caespitosa	55	6	29	2	71	4	16	2
Elymus hirsutus	.	.	.	.	14	1	.	.
Eriophorum angustifolium	.	.	82	16	43	1	79	14
Eriophorum russeolum	64	7	12	2	.	.	32	3
Festuca rubra	9	2	6	1	57	2	.	.
Hierochloe odorata	27	1	.	.	14	1	.	.
Juncus arcticus sitchensis	.	.	.	.	14	1	.	.
Juncus castaneus	.	.	6	10	14	15	.	.
Juncus falcatus	.	.	.	.	14	1	.	.
Juncus triglumis	.	.	6	1	.	.	.	.
Luzula multiflora	64	3	12	1	43	1	16	4
Phleum commutatum americanum	.	.	.	.	14	1	.	.
Trichophorum caespitosum	9	5	76	11	100	31	5	2
FERNS AND ALLIES								
Athyrium filix-femina	.	.	.	.	.	.	5	1
Lycopodium selago	.	.	.	.	29	1	.	.
UNKNOWN								
GRAMINOID UNKNOWN	.	.	.	.	.	.	5	20
SEDGE UNKNOWN	.	.	6	3	.	.	.	.

GRAMINOID COMMUNITIES (CONTINUED)

SPECIES	CARSIT/EQUFLU 6 Plots CON	ACOV	CALCAN/POTEGE 6 Plots CON	ACOV	ELYARE 4 Plots CON	ACOV	CALCAN 9 Plots CON	ACOV
TALL SHRUBS								
Myrica gale	17	2	.	.	.	.	22	11
Rubus spectabilis	.	.	.	.	.	.	11	2
Salix barclayi	17	1	.	.	.	.	22	5
Salix commutata	.	.	17	2	.	.	.	.
Salix sitchensis	.	.	17	2	.	.	.	.
Sambucus racemosa	.	.	.	.	.	.	11	1
LOW AND SUBSHRUBS								
Salix setchelliana	.	.	17	1	.	.	.	.
FORBS								
Achillea borealis	.	.	83	6	50	2	44	2
Actaea rubra	.	.	.	.	.	.	11	10
Angelica genuflexa	50	4	50	3	.	.	78	5
Angelica lucida	.	.	50	9	25	10	11	1
Aster sibiricus	.	.	.	.	.	.	11	2
Aster subspicatus	.	.	.	.	.	.	33	4
Caltha palustris asarifolia	67	6	33	2	.	.	33	1
Castilleja unalaschensis	.	.	.	.	25	1	.	.
Cicuta douglasii	33	4	50	5	.	.	44	2
Conioselinum chinense	.	.	67	4	25	1	33	2
Epilobium adenocaulon	.	.	.	.	.	.	11	1
Epilobium angustifolium	.	.	.	.	.	.	22	1
Epilobium glandulosum	.	.	67	3	.	.	33	3
Epilobium palustre	.	.	17	1	.	.	.	.
Epilobium sp.	.	.	17	1	.	.	11	4
Equisetum arvense	17	1	33	25	.	.	44	19
Equisetum fluviatile	100	5	.	.	.	.	11	1
Equisetum palustre	50	1	.	.	.	.	22	2
Equisetum sp.	.	.	.	.	.	.	11	1
Equisetum variegatum	.	.	33	2	.	.	.	.
Erigeron peregrinus	.	.	17	2	.	.	11	2
Fragaria chiloensis	.	.	.	.	.	.	11	1
Fritillaria camschatcensis	.	.	33	3	.	.	22	1
Galium trifidum	17	1	33	5	.	.	56	3
Galium trifidum columbianum	.	.	50	6	.	.	.	.
Galium trifidum trifidum	.	.	33	5	.	.	11	3
Galium triflorum	17	1	.	.	.	.	.	.
Geranium erianthum	.	.	.	.	.	.	22	2
Geum macrophyllum	.	.	33	7	.	.	22	2
Glehnia littoralis	.	.	.	.	75	2	.	.
Heracleum lanatum	.	.	33	18	.	.	44	2
Hippuris vulgaris	17	2	.	.	.	.	.	.
Honckenya peploides major	.	.	.	.	25	1	.	.
Iris setosa	.	.	50	8	.	.	67	4
Lathyrus maritimus	.	.	17	1	75	8	.	.
Lathyrus palustris	.	.	67	6	.	.	44	9
Ligusticum scoticum	.	.	.	.	.	.	11	1
Lupinus nootkatensis	17	1	83	21	.	.	44	7
Lysimachia thyrsiflora	17	30	.	.	.	.	11	5
Menyanthes trifoliata	50	1	.	.	.	.	22	13
Plantago macrocarpa	.	.	17	1	.	.	.	.
Plantago maritima	.	.	17	1	.	.	.	.
Platanthera dilatata	.	.	17	1	.	.	33	2
Polemonium acutiflorum	.	.	17	2	.	.	33	3
Polygonum viviparum	.	.	17	1	.	.	.	.
Potamogeton natans	17	2	.	.	.	.	.	.
Potentilla egedii grandis	.	.	100	12	25	5	.	.
Potentilla palustris	83	5	50	2	.	.	33	10
Ranunculus Macounii	.	.	.	.	.	.	11	5
Ranunculus pacificus	.	.	33	1	.	.	.	.

SPECIES	CARSIT/EQUFLU 6 Plots CON	ACOV	CALCAN/POTEGE 6 Plots CON	ACOV	ELYARE 4 Plots CON	ACOV	CALCAN 9 Plots CON	ACOV
Rhinanthus minor borealis	.	.	33	2	.	.	.	.
Rubus arcticus stellatus	.	.	33	2	.	.	44	3
Rumex fenestratus	.	.	83	1	.	.	44	1
Rumex species	17	1	.	.	.	.	.	.
Sanguisorba stipulata	.	.	.	.	.	.	33	1
Senecio pseudo-Arnica	.	.	.	.	25	1	.	.
Solidago lepida	.	.	17	5	.	.	33	1
Stellaria borealis	.	.	33	3	.	.	.	.
Stellaria crassifolia	.	.	.	.	.	.	22	3
Stellaria sitchana	.	.	33	2	.	.	22	3
Stellaria species	50	1	.	.	.	.	.	.
Thalictrum sparsiflorum	.	.	.	.	.	.	11	1
Trientalis europea	17	1	50	1	.	.	56	2
Viola epipsila	.	.	.	.	.	.	11	1
Viola glabella	17	1	.	.	.	.	.	.
Viola langsdorfii	.	.	.	.	.	.	33	1
Viola sp.	.	.	.	.	.	.	11	1
GRAMINOIDS								
Agrostis alaskana	.	.	.	.	.	.	11	1
Agrostis borealis	.	.	.	.	.	.	11	1
Agrostis scabra	.	.	17	2	.	.	.	.
Calamagrostis canadensis	17	1	83	31	.	.	100	44
Calamagrostis inexpansa	.	.	17	25	.	.	11	10
Calamagrostis nutkaensis	.	.	50	3	.	.	.	.
Carex aquatilis	.	.	17	1	.	.	.	.
Carex canescens	17	1	33	2	.	.	.	.
Carex livida	.	.	.	.	.	.	11	2
Carex lyngbyei	.	.	50	3	.	.	11	3
Carex macloviana	.	.	33	2	.	.	.	.
Carex macrocephala	.	.	.	.	50	17	.	.
Carex pachystachya	.	.	17	2	.	.	11	2
Carex pluriflora	.	.	.	.	.	.	33	4
Carex saxatilis	.	.	17	1	.	.	22	1
Carex sitchensis	100	71	.	.	.	.	78	31
Deschampsia caespitosa	.	.	83	9	25	3	56	21
Eleocharis palustris	.	.	17	4	.	.	11	1
Elymus arenarius	.	.	33	4	100	40	.	.
Festuca rubra	17	1	67	2	.	.	.	.
Hierochloe odorata	.	.	50	3	.	.	11	1
Hordeum brachyantherum	.	.	67	4	25	5	.	.
Juncus falcatus	.	.	17	1	.	.	.	.
Luzula sp.	.	.	17	4	.	.	.	.
Phleum commutatum americanum	.	.	33	1	.	.	.	.
Poa eminens	.	.	67	3	.	.	.	.
Poa laxiflora	.	.	17	1	.	.	.	.
Poa palustris	.	.	17	3	.	.	.	.
Poa pratensis	.	.	17	1	.	.	.	.
Poa sp.	.	.	33	1	.	.	.	.
Scirpus microcarpus	.	.	.	.	.	.	11	1
Trisetum cernuum	.	.	17	5	.	.	11	1
Vahlodea atropurpurea latifolia	.	.	.	.	.	.	11	1
FERNS AND ALLIES								
Athyrium filix-femina	33	1	.	.	.	.	.	.

FORB COMMUNITIES

SPECIES	NUPPOL 1 Plots CON	NUPPOL 1 Plots ACOV	MYRALT 3 Plots CON	MYRALT 3 Plots ACOV	EQUFLU 4 Plots CON	EQUFLU 4 Plots ACOV	EQUVAR 6 Plots CON	EQUVAR 6 Plots ACOV	MENTRI-EQUVAR 7 Plots CON	MENTRI-EQUVAR 7 Plots ACOV
TREES-REGENERATION										
Populus balsamifera trichocarpa regen	.	.	.	.	.	.	17	1	.	.
TALL SHRUBS										
Alnus sinuata	.	.	.	.	.	.	17	2	29	1
Myrica gale	.	.	.	.	.	.	67	5	100	3
Salix barclayi	.	.	.	.	.	.	100	2	43	3
Salix alaxensis	.	.	.	.	.	.	33	1	.	.
Salix commutata	.	.	.	.	.	.	67	3	43	2
Salix hookeriana	.	.	.	.	.	.	17	1	14	1
Salix sitchensis	.	.	.	.	.	.	17	1	29	1
LOW AND SUBSHRUBS										
Andromeda polifolia	.	.	.	.	.	.	.	.	29	3
Empetrum nigrum	.	.	.	.	.	.	17	1	.	.
Oxycoccus palustris	.	.	.	.	.	.	.	.	43	2
Vaccinium uliginosum	.	.	.	.	.	.	17	1	14	5
FORBS										
Achillea borealis	.	.	.	.	.	.	50	1	.	.
Angelica genuflexa	.	.	.	.	.	.	17	2	.	.
Aster subspicatus	.	.	.	.	.	.	33	4	.	.
Caltha palustris asarifolia	.	.	.	.	25	5	17	1	14	1
Cicuta douglasii	.	.	.	.	50	1	50	2	71	1
Conioselinum chinense	.	.	.	.	.	.	33	1	.	.
Dodecatheon pulchellum	.	.	.	.	.	.	17	1	14	1
Drosera anglica	.	.	.	.	.	.	.	.	43	2
Drosera rotundifolia	.	.	.	.	.	.	17	1	43	1
Epilobium palustre	.	.	.	.	25	1	17	1	.	.
Epilobium sp.	.	.	.	.	.	.	.	.	14	1
Equisetum arvense	.	.	.	.	.	.	67	2	43	5
Equisetum fluviatile	.	.	.	.	100	38	.	.	14	5
Equisetum palustre	.	.	.	.	.	.	33	1	57	8
Equisetum sp.	.	.	.	.	.	.	.	.	14	1
Equisetum variegatum	.	.	.	.	25	1	100	43	86	9
Fragaria chiloensis	.	.	.	.	.	.	17	1	.	.
Galium trifidum	.	.	.	.	.	.	50	1	14	1
Geum calthifolium	.	.	.	.	.	.	17	1	.	.
Hippuris vulgaris	.	.	33	1	25	30	.	.	.	.
Lupinus nootkatensis	.	.	.	.	.	.	50	4	.	.
Lysimachia thyrsiflora	.	.	.	.	25	1	.	.	.	.
Menyanthes trifoliata	100	1	.	.	25	15	17	2	100	28
Myriophyllum alterniflorum	.	.	67	73	.	.	.	.	.	.
Myriophyllum spicatum	.	.	67	25	25	5	.	.	.	.
Nuphar polysepalum	100	40	33	1	.	.	.	.	.	.
Parnassia palustris	.	.	.	.	.	.	50	1	57	1
Pedicularis parviflora	.	.	.	.	.	.	50	1	86	4
Pinguicula vulgaris	.	.	.	.	.	.	67	1	29	1
Platanthera dilatata	.	.	.	.	.	.	50	1	29	1
Platanthera hyperborea	.	.	.	.	.	.	17	1	29	1
Platanthera sp.	.	.	.	.	.	.	.	.	29	1
Polygonum viviparum	.	.	.	.	.	.	50	3	57	1
Potamogeton Berchtoldi	.	.	33	1	.	.	.	.	.	.
Potamogeton alpinus	.	.	.	.	25	5	.	.	.	.
Potamogeton gramineus	.	.	.	.	.	.	17	1	14	1
Potamogeton pectinatus	.	.	67	10	25	1	.	.	.	.
Potamogeton richardsonii	.	.	33	1	.	.	.	.	.	.
Potentilla egedii grandis	.	.	.	.	.	.	50	3	14	1
Potentilla palustris	.	.	.	.	.	.	17	1	43	2
Primula egaliksensis	.	.	.	.	.	.	50	1	29	1
Pyrola asarifolia	.	.	.	.	.	.	17	1	.	.
Ranunculus confervoides	.	.	67	6	.	.	.	.	.	.

SPECIES	NUPPOL 1 Plots CON	NUPPOL 1 Plots ACOV	MYRALT 3 Plots CON	MYRALT 3 Plots ACOV	EQUFLU 4 Plots CON	EQUFLU 4 Plots ACOV	EQUVAR 6 Plots CON	EQUVAR 6 Plots ACOV	MENTRI-EQUVAR 7 Plots CON	MENTRI-EQUVAR 7 Plots ACOV
Rhinanthus minor borealis	.	.	.	.	.	.	33	1	.	.
Rubus arcticus stellatus	.	.	.	.	.	.	17	2	29	1
Rumex fenestratus	.	.	.	.	25	1	.	.	.	.
Sanguisorba stipulata	.	.	.	.	.	.	.	.	14	1
Sparganium angustifolium	100	1	33	1	25	3	.	.	.	.
Spiranthes romanzoffiana	.	.	.	.	.	.	17	1	.	.
Swertia perennis	.	.	.	.	.	.	17	3	.	.
Thalictrum sparsiflorum	.	.	.	.	.	.	17	1	.	.
Tofieldia glutinosa	.	.	.	.	.	.	67	1	57	1
Trientalis europea	.	.	.	.	.	.	.	.	14	1
Triglochin maritimum	.	.	.	.	.	.	17	1	14	1
Utricularia intermedia	.	.	.	.	.	.	17	3	43	1
Viola epipsila	.	.	.	.	.	.	.	.	14	1
Viola glabella	.	.	.	.	.	.	.	.	14	1
Viola sp.	.	.	.	.	.	.	17	1	.	.
GRAMINOIDS										
Agrostis alaskana	.	.	.	.	25	1	.	.	29	4
Agrostis borealis	.	.	.	.	.	.	17	2	.	.
Calamagrostis canadensis	.	.	.	.	.	.	50	1	.	.
Calamagrostis neglecta	.	.	.	.	.	.	17	1	.	.
Carex anthoxanthea	.	.	.	.	.	.	17	10	.	.
Carex aquatilis	.	.	.	.	25	1	33	5	14	1
Carex canescens	.	.	.	.	.	.	.	.	29	1
Carex capillaris	.	.	.	.	.	.	.	.	29	1
Carex diandra	.	.	.	.	.	.	17	Tr	.	.
Carex dioica	.	.	.	.	.	.	17	5	.	.
Carex flava	.	.	.	.	.	.	50	3	57	1
Carex interior	.	.	.	.	.	.	.	.	57	5
Carex limosa	.	.	.	.	.	.	17	2	57	15
Carex livida	.	.	.	.	.	.	.	.	29	3
Carex lyngbyei	.	.	.	.	.	.	67	3	29	9
Carex macrochaeta	.	.	.	.	.	.	17	1	.	.
Carex maritima	.	.	.	.	.	.	17	1	.	.
Carex microglochin	.	.	.	.	.	.	17	1	.	.
Carex oederi	.	.	.	.	.	.	50	12	29	1
Carex pachystachya	.	.	.	.	.	.	.	.	14	1
Carex pauciflora	.	.	.	.	.	.	17	2	.	.
Carex pluriflora	.	.	.	.	.	.	.	.	29	2
Carex pyrenaica	.	.	.	.	.	.	.	.	14	1
Carex saxatilis	.	.	.	.	50	10	17	10	29	2
Carex sitchensis	.	.	.	.	.	.	17	2	.	.
Carex stylosa	.	.	.	.	.	.	.	.	14	1
Deschampsia caespitosa	.	.	.	.	25	1	83	2	.	.
Deschampsia sp.	.	.	.	.	.	.	17	1	.	.
Eleocharis kamtschatica	.	.	.	.	.	.	17	3	.	.
Eleocharis nitida	.	.	.	.	.	.	17	1	.	.
Eleocharis palustris	.	.	.	.	.	.	17	1	14	1
Eriophorum angustifolium	.	.	.	.	.	.	33	2	71	5
Eriophorum russeolum	.	.	.	.	.	.	.	.	43	1
Festuca rubra	.	.	.	.	.	.	.	.	14	2
Glyceria borealis	.	.	33	1	.	.	.	.	.	.
Hierochloe odorata	.	.	.	.	.	.	.	.	14	1
Juncus alpinus	.	.	.	.	.	.	33	1	.	.
Juncus arcticus sitchensis	.	.	.	.	.	.	67	1	.	.
Juncus castaneus	.	.	.	.	.	.	17	1	.	.
Juncus triglumis	.	.	.	.	.	.	.	.	43	1
Luzula multiflora	.	.	.	.	.	.	.	.	14	1
Luzula parviflora	.	.	.	.	.	.	17	1	.	.
Puccinellia maritima	.	.	.	.	25	2	.	.	.	.
Trichophorum caespitosum	.	.	.	.	.	.	17	3	.	.
UNKNOWN										
SEDGE UNKNOWN	.	.	.	.	.	.	.	.	14	4

FORB COMMUNITIES (CONTINUED)

SPECIES	MENTRI-POTPAL 12 Plots CON	ACOV	MESIC FORB/ATHFIL 4 Plots CON	ACOV	MESIC FORB 8 Plots CON	ACOV	LUPNOO/SALSET 4 Plots CON	ACOV	FRACHI-ACHBOR 11 Plots CON	ACOV
TREES-REGENERATION										
Picea sitchensis regen	8	1	.	.	.	.	.	.	55	1
Populus balsamifera trichocarpa regen	.	.	.	.	.	.	75	2	9	2
TALL SHRUBS										
Alnus sinuata	17	2	.	.	25	1	50	2	45	2
Echinopanax horridum	.	.	.	.	.	.	.	.	18	1
Myrica gale	17	1	.	.	.	.	.	.	.	.
Rubus spectabilis	.	.	75	9	38	2	.	.	.	.
Salix barclayi	17	1	.	.	25	1	75	1	9	3
Salix alaxensis	.	.	.	.	.	.	75	2	9	3
Salix commutata	.	.	.	.	.	.	50	1	18	1
Salix hookeriana	8	5	.	.	.	.	.	.	.	.
Salix sitchensis	.	.	.	.	.	.	50	2	.	.
Sambucus racemosa	.	.	50	4	13	1	.	.	.	.
Vaccinium sp. (oval & alask)	.	.	.	.	.	.	.	.	18	2
Viburnum edule	.	.	.	.	13	1	.	.	9	1
LOW AND SUBSHRUBS										
Empetrum nigrum	.	.	.	.	13	1	.	.	9	2
Salix arctica	.	.	.	.	.	.	50	1	.	.
Salix ovalifolia	.	.	.	.	.	.	25	1	.	.
Salix setchelliana	.	.	.	.	.	.	75	4	9	6
FORBS										
Achillea borealis	.	.	50	2	100	4	100	2	91	5
Aconitum delphinifolium	.	.	.	.	38	1	.	.	.	.
Actaea rubra	.	.	25	1	.	.	.	.	.	.
Anemone multifida	.	.	.	.	.	.	.	.	9	3
Angelica genuflexa	.	.	50	1	38	6	.	.	.	.
Angelica lucida	.	.	75	11	75	5	.	.	9	3
Aquilegia formosa	.	.	.	.	13	1	.	.	.	.
Arabis hirsuta	.	.	.	.	.	.	.	.	18	1
Arabis lyrata	.	.	.	.	.	.	25	1	9	1
Artemisia tilesii	.	.	.	.	.	.	25	1	.	.
Aruncus sylvester	.	.	.	.	13	1	.	.	.	.
Aster subspicatus	.	.	25	2	38	2	.	.	9	1
Astragalus alpinus	.	.	.	.	.	.	75	8	36	11
Caltha palustris asarifolia	8	1	25	1	25	2	.	.	.	.
Cardamine umbellata	.	.	25	1	13	1	.	.	.	.
Castilleja miniata	.	.	.	.	13	1	.	.	.	.
Castilleja unalaschensis	.	.	.	.	.	.	50	1	45	3
Cerastium Beeringianum	.	.	.	.	.	.	25	1	.	.
Cerastium fontanum	.	.	.	.	.	.	25	1	.	.
Cicuta douglasii	75	2	.	.	.	.	.	.	.	.
Circaea alpina	.	.	100	6	.	.	.	.	.	.
Conioselinum chinense	.	.	75	2	75	2	25	1	45	2
Coptis asplenifolia	.	.	.	.	.	.	.	.	9	1
Coptis trifolia	8	1	25	2	25	1	.	.	.	.
Cornus canadensis	8	4	.	.	.	.	.	.	9	1
Dodecatheon jeffreyi	.	.	.	.	13	1	.	.	.	.
Drosera anglica	8	2	.	.	.	.	.	.	.	.
Drosera rotundifolia	8	1	.	.	.	.	.	.	.	.
Epilobium adenocaulon	.	.	25	2	38	6	.	.	9	3
Epilobium alpinum	17	1	.	.	.	.	.	.	.	.
Epilobium angustifolium	.	.	75	9	75	18	.	.	9	1
Epilobium glandulosum	.	.	25	3	13	1	.	.	.	.
Epilobium latifolium	.	.	.	.	.	.	75	21	9	1
Epilobium palustre	8	1	.	.	.	.	.	.	.	.
Epilobium sp.	8	1	.	.	.	.	50	1	.	.
Equisetum arvense	8	5	50	1	25	1	50	3	9	1
Equisetum fluviatile	83	10	.	.	.	.	.	.	.	.

SPECIES	MENTRI-POTPAL 12 Plots CON	ACOV	MESIC FORB/ATHFIL 4 Plots CON	ACOV	MESIC FORB 8 Plots CON	ACOV	LUPNOO/SALSET 4 Plots CON	ACOV	FRACHI-ACHBOR 11 Plots CON	ACOV
Equisetum palustre	83	8	.	.	13	1	.	.	.	.
Equisetum variegatum	8	2	.	.	.	.	.	.	36	2
Erigeron humilis	.	.	.	.	.	.	25	1	.	.
Erigeron peregrinus	.	.	25	2	.	.	.	.	9	3
Euphrasia mollis	.	.	.	.	.	.	25	1	36	1
Fragaria chiloensis	.	.	25	2	13	1	50	2	100	25
Fritillaria camschatcensis	.	.	50	1	25	2	.	.	18	1
Galium trifidum	17	1	50	2	50	3	.	.	.	.
Galium trifidum trifidum	8	2	.	.	.	.	.	.	.	.
Galium triflorum	8	1	25	1	.	.	.	.	.	.
Gentiana amarella	.	.	.	.	.	.	.	.	27	2
Gentiana douglasiana	.	.	.	.	.	.	25	1	9	1
Geranium erianthum	.	.	25	2	50	5	.	.	.	.
Geum macrophyllum	.	.	100	1	38	5	.	.	9	1
Heracleum lanatum	.	.	75	5	75	14	25	1	9	2
Heuchera glabra	.	.	.	.	13	1	.	.	.	.
Iris setosa	.	.	25	1	38	3	.	.	.	.
Lathyrus maritimus	.	.	.	.	.	.	.	.	36	4
Lathyrus palustris	.	.	50	2	13	3	.	.	9	2
Ligusticum scoticum	.	.	.	.	25	1	.	.	.	.
Listera caurina	.	.	.	.	.	.	.	.	9	1
Listera cordata	8	1	.	.	.	.	.	.	18	8
Lomatogonium rotatum	.	.	.	.	.	.	.	.	9	1
Lupinus nootkatensis	.	.	50	3	63	4	75	7	45	22
Lysimachia thyrsiflora	25	1	.	.	.	.	.	.	.	.
Maianthemum dilatatum	.	.	25	10	.	.	.	.	.	.
Menyanthes trifoliata	100	38	.	.	.	.	.	.	.	.
Moehringia lateriflora	.	.	.	.	.	.	.	.	18	1
Moneses uniflora	.	.	.	.	.	.	.	.	9	1
Nuphar polysepalum	8	2	.	.	.	.	.	.	.	.
Oxytropis campestris	.	.	.	.	.	.	.	.	9	10
Parnassia palustris	17	2	.	.	13	1	25	5	27	4
Pedicularis parviflora	58	2	.	.	.	.	.	.	.	.
Plantago macrocarpa	.	.	.	.	.	.	.	.	9	1
Platanthera dilatata	8	1	.	.	13	1	.	.	18	1
Platanthera hyperborea	.	.	.	.	.	.	.	.	9	2
Platanthera saccata	.	.	.	.	.	.	.	.	9	3
Platanthera sp.	.	.	.	.	.	.	.	.	9	1
Polemonium acutiflorum	.	.	25	1	38	1	.	.	9	1
Polygonum viviparum	.	.	.	.	25	1	50	2	18	1
Potamogeton gramineus	8	1	.	.	.	.	.	.	.	.
Potentilla egedii grandis	.	.	50	3	13	4	.	.	9	5
Potentilla palustris	83	24	25	1	13	4	.	.	.	.
Potentilla villosa	.	.	.	.	.	.	25	1	.	.
Prenanthes alata	.	.	25	2	13	1	.	.	.	.
Pyrola secunda	.	.	25	1	.	.	.	.	.	.
Ranunculus Bongardi	.	.	25	2	38	1	.	.	.	.
Ranunculus flammula	.	.	.	.	13	1	.	.	.	.
Ranunculus pacificus	.	.	25	1	.	.	.	.	.	.
Ranunculus pallasii	8	1	.	.	.	.	.	.	.	.
Rhinanthus minor borealis	.	.	25	1	25	3	75	3	55	9
Rubus arcticus stellatus	8	2	25	7	38	5	50	1	18	9
Rubus pedatus	8	1	.	.	.	.	.	.	9	3
Rumex fenestratus	8	1	25	1	25	1	.	.	.	.
Sanguisorba stipulata	.	.	50	3	100	10	.	.	9	2
Sedum rosea	.	.	.	.	.	.	25	1	.	.
Senecio triangularis	.	.	25	5	13	4	.	.	.	.
Sisyrinchium litorale	.	.	.	.	.	.	.	.	18	2
Solidago lepida	.	.	.	.	63	23	.	.	18	1
Spiranthes romanzoffiana	.	.	.	.	.	.	25	1	18	1
Stellaria borealis	.	.	25	2	25	4	25	1	.	.
Stellaria calycantha	.	.	.	.	13	1	.	.	.	.
Stellaria crassifolia	8	1	25	2	25	6	.	.	.	.

SPECIES	MESIC FORB/ATHFIL MENTRI-POTPAL 12 Plots CON	ACOV	4 Plots CON	ACOV	MESIC FORB 8 Plots CON	ACOV	LUPNOO/SALSET 4 Plots CON	ACOV	FRACHI-ACHBOR 11 Plots CON	ACOV
Stellaria crispa	8	1	.	.	.	.	.	.	.	.
Stellaria longipes	8	1	.	.	.	.	.	.	.	.
Stellaria sitchana	.	.	.	.	13	5	25	1	9	3
Stellaria species	8	1	.	.	.	.	.	.	.	.
Streptopus amplexifolius	8	1	50	2	25	1	.	.	9	1
Swertia perennis	.	.	.	.	13	3	.	.	.	.
Tellima grandiflora	.	.	25	10	.	.	.	.	.	.
Tiarella trifoliata	8	1	25	1	.	.	.	.	18	1
Tofieldia glutinosa	8	1	.	.	.	.	.	.	.	.
Trientalis europea	.	.	100	1	50	1	.	.	18	2
Utricularia intermedia	25	2	.	.	.	.	.	.	.	.
Veratrum viride	.	.	25	3	50	3	.	.	.	.
Viola epipsila	8	1	.	.	50	3	.	.	.	.
Viola glabella	8	3	.	.	.	.	.	.	.	.
Viola langsdorfii	8	1	25	1	13	1	.	.	9	1
Viola sp.	.	.	25	5	.	.	.	.	.	.
GRAMINOIDS										
Agrostis alaskana	33	2	.	.	25	1	.	.	9	1
Agrostis borealis	8	4	.	.	.	.	50	2	9	2
Agrostis exarata	.	.	25	1	25	2	.	.	.	.
Calamagrostis canadensis	8	10	75	4	75	10	25	1	.	.
Calamagrostis neglecta	.	.	.	.	.	.	25	1	9	5
Carex anthoxanthea	8	3	.	.	.	.	.	.	.	.
Carex aquatilis	8	1	.	.	.	.	.	.	.	.
Carex canescens	33	1	.	.	.	.	.	.	.	.
Carex disperma	8	1	.	.	.	.	.	.	.	.
Carex eleusinoides	.	.	.	.	.	.	25	1	.	.
Carex flava	8	4	.	.	.	.	.	.	.	.
Carex interior	8	5	.	.	.	.	.	.	.	.
Carex limosa	58	15	.	.	.	.	.	.	.	.
Carex livida	25	6	.	.	.	.	.	.	.	.
Carex macrocephala	.	.	.	.	.	.	.	.	9	1
Carex macrochaeta	.	.	25	2	38	4	.	.	.	.
Carex maritima	8	5	.	.	.	.	.	.	.	.
Carex pachystachya	.	.	25	1	25	1	.	.	.	.
Carex pluriflora	25	5	.	.	.	.	.	.	.	.
Carex rostrata	17	5	.	.	.	.	.	.	.	.
Carex saxatilis	8	1	.	.	.	.	.	.	.	.
Carex sitchensis	17	5	.	.	13	10	.	.	.	.
Carex stenophylla	8	1	.	.	.	.	.	.	.	.
Cinna latifolia	.	.	25	1	.	.	.	.	.	.
Deschampsia caespitosa	8	2	.	.	63	3	75	1	27	1
Elymus arenarius	.	.	.	.	.	.	.	.	55	8
Elymus hirsutus	.	.	.	.	13	4	.	.	.	.
Elymus subsecundus	.	.	25	1	13	2	.	.	.	.
Eriophorum angustifolium	8	3	.	.	.	.	.	.	.	.
Eriophorum russeolum	58	2	.	.	.	.	.	.	.	.
Festuca rubra	.	.	.	.	25	1	25	1	73	10
Glyceria pauciflora	8	2	.	.	.	.	.	.	.	.
Hierochloe odorata	.	.	.	.	25	1	.	.	9	1
Hordeum brachyantherum	.	.	25	2	25	27	.	.	9	2
Juncus sp.	.	.	25	2	.	.	.	.	.	.
Luzula multiflora	.	.	.	.	13	1	25	1	36	2
Luzula parviflora	.	.	25	1	13	2	.	.	.	.
Phleum commutatum americanum	.	.	.	.	13	1	75	1	18	1
Poa alpina	.	.	.	.	.	.	50	1	9	1
Poa arctica	.	.	.	.	.	.	75	1	.	.
Poa eminens	.	.	.	.	.	.	.	.	9	1
Poa glauca	.	.	.	.	.	.	25	2	.	.
Trisetum cernuum	.	.	50	1	25	4	.	.	9	3
Trisetum spicatum	.	.	.	.	.	.	50	1	.	.
Vahlodea atropurpurea latifolia	.	.	25	1	25	3	.	.	.	.

SPECIES	MESIC FORB/ATHFIL MENTRI-POTPAL 12 Plots CON	ACOV	4 Plots CON	ACOV	MESIC FORB 8 Plots CON	ACOV	LUPNOO/SALSET 4 Plots CON	ACOV	FRACHI-ACHBOR 11 Plots 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	Picea sitchensis	Sitka spruce
PINCON	Pinus contorta contorta	Shorepine or Lodgepole pine
POPTRI	Populus balsamifera trichocarpa	Black cottonwood
TSUHET	Tsuga heterophylla	Western hemlock
TSUMER	Tsuga mertensiana	Mountain hemlock
TREES-REGENERATION		
PICSITU	Picea sitchensis regen	Sitka spruce regen
PINCONU	Pinus contorta regen	Lodgepole pine regen
POPTRIU	Populus balsamifera trichocarpa regen	Black cottonwood regen
TSUHETU	Tsuga heterophylla regen	Western hemlock regen
TSUMERU	Tsuga mertensiana regen	Mountain hemlock regen
TALL SHRUBS		
ALNSIN	Alnus sinuata	Sitka alder
CLAPYR	Cladothamnus pyrolaeflorus	Copperbush
ECHHOR	Echinopanax horridum	Devil's club
MALFUS	Malus fusca	Oregon crab apple
MENFER	Menziesia ferruginea	Rusty menziesia
MYRGAL	Myrica gale	Sweetgale
RIBBRA	Ribes bracteosum	Stink current
RIBLAX	Ribes laxiflorum	Trailing black currant
RUBSPE	Rubus spectabilis	Salmonberry
SALBAR	Salix barclayi	Barclay willow
SALALA	Salix alaxensis	Feltleaf willow
SALCOM	Salix commutata	Undergreen willow
SALHOO	Salix hookeriana	Hooker willow
SALSIT	Salix sitchensis	Sitka willow
SAMRAC	Sambucus racemosa	Red elderberry
SORSIT	Sorbus sitchensis	Elder-leaf Mtn.-ash
VACCIN	Vaccinium spp. (ovai & alask)	Tall Blueberry spp.
VIBEDU	Viburnum edule	Highbush cranberry
LOW AND SUBSHRUBS		
ANDPOL	Andromeda polifolia	Bog rosemary
EMPNIG	Empetrum nigrum	Crowberry
KALPOL	Kalmia polifolia	Bog kalmia
LEDGRO	Ledum groenlandicum	Labrador-tea
OXYPAL	Oxycoccus palustris	Bog cranberry
RHOCAM	Rhododendron camtschaticum	Kamchatka rhododendron
SALARC	Salix arctica	Arctic willow
SALOVA	Salix ovalifolia	
SALRET	Salix reticulata	Netleaf willow
SALSET	Salix setchelliana	Setchell willow
SALSTO	Salix stolonifera	Stoloniferous willow
VACULI	Vaccinium uliginosum	Bog blueberry
VACVIT	Vaccinium vitis-idaea	Mountain cranberry
FORBS		
ACHBOR	Achillea borealis	Yarrow
ACODEL	Aconitum delphinifolium	Monkshood
ACTRUB	Actaea rubra	Baneberry
ALLSCH	Allium schoenoprasum	Wild chive

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME -	COMMON NAME
FORBS (continued)		
ANAMAR	Anaphalis margaritacea	Pearly everlasting
ANEMUL	Anemone multifida	Cut-leaf anemone
ANENAR	Anemone narcissiflora	Narcissis anemone
ANEPAR	Anemone parviflora	Northern anemone
ANGGEN	Angelica genuflexa	Bent-leaved angelica
ANGLUC	Angelica lucida	Sea coast angelica
ANTPAL	Antennaria pallida	
APABOR	Apargidium boreale	
AQUFOR	Aquilegia formosa	Western columbine
ARAHIR	Arabis hirsuta	Hairy rockcress
ARALYR	Arabis lyrata	Kamchatka rockcress
ARNLES	Arnica Lessingii	Arnica
ARNAMP	Arnica amplexicaulis amplexicaulis	Clasping arnica
ARNLAT	Arnica latifolia	Mountain arnica
ARNLON	Arnica lonchophylla	
ARTARC	Artemisia arctica arctica	Sage
ARTTIL	Artemisia tilesii	Aleutian mugwort
ARUSYL	Aruncus sylvester	Goatsbeard
ASTSIB	Aster sibiricus	
ASTSUB	Aster subspicatus	Douglas' aster
ASTROB	Astragalus Robbinsii	Robbins milk-vetch
ASTALP	Astragalus alpinus	Alpine milk-vetch
BARORT	Barbarea orthoceras	Wintercress
BOSROS	Boschniakia rossica	Ground-cone
CAKEDE	Cakile edentula	Searocket
CALVER	Callitriche verna	Spring water-starwort
CALPAL	Caltha palustris asarifolia	Marsh marigold
CAMLAS	Campanula lasiocarpa	Mountain harebell
CAMROT	Campanula rotundifolia	Bluebells of Scotland
CARPRA	Cardamine pratensis	Cuckoo flower
CARUMB	Cardamine umbellata	Bittercress
CASMIN	Castilleja miniata	Great red paintbrush
CASUNA	Castilleja unalaschensis	Yellow paintbrush
CERBEE	Cerastium Beeringianum	Bering chickweed
CERFIS	Cerastium fisherianum	Fischer chickweed
CERFON	Cerastium fontanum	Chickweed
CHRARC	Chrysanthemum arcticum	Arctic daisy
CICDOU	Cicuta douglasii	Water hemlock
CIRALP	Circaea alpina	Enchanter's nightshade
CLASIB	Claytonia sibirica	Siberian spring-beauty
COEVIRB	Coeloglossum viride bracteatum	Frog orchis
CONCHI	Conioselinum chinense	Western hemlock-parsley
COPASP	Coptis asplenifolia	Fern-leaf goldthread
COPTRI	Coptis trifolia	Trifoliate goldthread
CORTRI	Corallorrhiza trifida	Early coral-root
CORCAN	Cornus canadensis	Bunchberry
CORSUE	Cornus suecica	Lapland cornel
DODJEF	Dodecatheon jeffreyi	Jeffrey shooting-star
DODPUL	Dodecatheon pulchellum	Pretty shooting-star
DRABA	Draba spp.	Whitlow-grass
DROANG	Drosera anglica	Long-leaf sundew
DROROT	Drosera rotundifolia	Round-leaf sundew
EPIADE	Epilobium adenocaulon	Northern willow-herb
EPIALP	Epilobium alpinum	Alpine willow-herb
EPIANG	Epilobium angustifolium	Fireweed
EPIBEH	Epilobium behringianum	Willowherb
EPIGLA	Epilobium glandulosum	Glandular willow-herb

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME	COMMON NAME
FORBS (continued)		
EPIHOR	Epilobium hornemannii	Willowherb
EPILAT	Epilobium latifolium	Dwarf fireweed
EPILEP	Epilobium leptocarpum	Willowherb
EPILUT	Epilobium luteum	Yellow willow-herb
EPIPAL	Epilobium palustre	Swamp willow-herb
EQUARV	Equisetum arvense	Meadow horsetail
EQUFLU	Equisetum fluviatile	Swamp horsetail
EQUPAL	Equisetum palustre	Marsh horsetail
EQUPRA	Equisetum pratense	Meadow horsetail
EQUVAR	Equisetum variegatum	Northern horsetail
ERIHUM	Erigeron humilis	Arctic-alpine daisy
ERIPER	Erigeron peregrinus	Subalpine daisy
EUPMOL	Euphrasia mollis	Arctic eyebright
FAUCRI	Fauria crista-galli	Deer cabbage
FRACHI	Fragaria chiloensis	Beach strawberry
FRICAM	Fritillaria camschatcensis	Chocolate lily
GALTRI	Galium trifidum	Small bedstraw
GALTRIC	Galium trifidum columbianum	Small bedstraw
GALTRIT	Galium trifidum trifidum	Small bedstraw
GALTRIL	Galium triflorum	Sweet-scented bedstraw
GENAMA	Gentiana amarella	Gentian
GENDOU	Gentiana douglasiana	Swamp gentian
GENPLA	Gentiana platypetala	
GENPRO	Gentiana propinqua	Four-parted gentian
GERERI	Geranium erianthum	Northern geranium
GEUCAL	Geum calthifolium	Caltha-leaf avens
GEUMAC	Geum macrophyllum	Large-leaf avens
GLAMAR	Glaux maritima	Sea milkwort
GLELIT	Glehnia littoralis	Glehnia
GOOOBL	Goodyera oblongifolia	Menzies' rattlesnake
HEDALP	Hedysarum alpinum	Alpine sweet-vetch
HERLAN	Heracleum lanatum	Cow parsnip
HEUGLA	Heuchera glabra	Alpine heuchera
HIPVUL	Hippuris vulgaris	Common marestail
HIPTET	Hippuris tetraphylla	Four-leaf marestail
HONPEP	Honckenya peploides major	Seabeach sandwort
IRISET	Iris setosa	Wild iris
LATMAR	Lathyrus maritimus	Beach pea
LATPAL	Lathyrus palustris	Wild-pea
LEPPYR	Leptarrhena pyrolifolia	Leatherleaf saxifrage
LIGSCO	Ligusticum scoticum	Hulten sea-lovage
LISCAU	Listera caurina	Western twayblade
LISCOR	Listera cordata	Heart-leaved twayblade
LOMROT	Lomatogonium rotatum	Marsh felwort
LUPKUS	Lupinus Kuschei	Lupine
LUPNOO	Lupinus nootkatensis	Nootka lupine
LYSAME	Lysichitum americanum	Yellow skunk-cabbage
LYSTHY	Lysimachia thyrsiflora	Tufted loosestrife
MAIDIL	Maianthemum dilatatum	Deerberry
MALMON	Malaxis monophylla	White adder's-tongue
MENARV	Mentha arvensis	Field mint
MENTRI	Menyanthes trifoliata	Buckbean
MERMAR	Mertensia maritima maritima	Oysterplant
MIMGUT	Mimulus guttatus	Monkey flower
MOELAT	Moehringia lateriflora	Grove sandwort
MONUNI	Moneses uniflora	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	Coltsfoot
PINVUL	Pinguicula vulgaris	Common butterwort
PLAMAC	Plantago macrocarpa	Plaintain
PLAMAJ	Plantago major var. major	Common plantain
PLAMAR	Plantago maritima	Plaintain
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	Rumex fenestratus	Dock
SAGCRA	Sagina crassiceulis	
SAGOCC	Sagina occidentalis	
SANMEN	Sanguisorba menziesii	Burnet
SANSTI	Sanguisorba stipulata	Burnet
SAUAME	Saussurea americana	
SAXLYA	Saxifrage Lyallii	Saxifrage
SAXMER	Saxifrage Mertensiana	Saxifrage
SAXRIV	Saxifrage rivularis	Saxifrage
SCHPAL	Scheuchzeria palustris	
SEDROS	Sedum rosea	Sneezeweed
SENPAU	Senecio pauciflorus	Sneezeweed
SENPSE	Senecio pseudo-Arnica	Sneezeweed
SENTRI	Senecio triangularis	Arrowleaf Groundsel
SENVUL	Senecio vulgaris	
SIBPRO	Sibbaldia procumbens	
SILACA	Silene acaulis	
SISLIT	Sisyrinchium litorale	
SOLCAN	Solidago canadensis	Goldenrod
SOLLEP	Solidago lepida	Goldenrod
SOLMUL	Solidago multiradiata	Goldenrod
SPAANG	Sparganium angustifolium	Bur-reed
SPAHYP	Sparganium hyperboreum	Bur-reed
SPECAN	Spergularia canadensis	
SPIROM	Spiranthes romanzoffiana	
STEBOR	Stellaria borealis	Chickweed
STECAL	Stellaria calycantha	Chickweed
STECRA	Stellaria crassifolia	Chickweed
STECRI	Stellaria crispa	Chickweed
STEHUM	Stellaria humifusa	Chickweed
STELON	Stellaria longipes	Chickweed
STESIT	Stellaria sitchana	Chickweed
STELLA	Stellaria species	Chickweed
STRAMP	Streptopus amplexifolius	Clasping twisted stalk
STRROS	Streptopus roseus	Rosy bells
SWEPER	Swertia perennis	Swertia
TARAXA	Taraxacum spp.	Dandelion
TELGRA	Tellima grandiflora	
THAALP	Thalictrum alpinum	Alpine meadow rue
THASPA	Thalictrum sparsiflorum	Meadow rue
TIATRI	Tiarella trifoliata	Foam flower
TIAUNI	Tiarella unifoliata	Foam flower
TOFGLU	Tofieldia glutinosa	Sticky asphodel
TRIEUR	Trientalis europea	Star flower
TRIMAR	Triglochin maritimum	Arrowgrass
TRIPAL	Triglochin palustre	Arrowgrass
URTLYA	Urtica Lyallii	Nettle
UTRINT	Utricularia intermedia	Bladderwort
VALSIT	Valeriana sitchensis	Valerian
VERVIR	Veratrum viride	False hellebore
VERSER	Veronica serpyllifolia	Veronica
VIOEPI	Viola epipsila	Violet
VIOGLA	Viola glabella	Violet
VIOLAN	Viola langsdorfii	Violet

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME -	COMMON NAME
	GRAMINOIDS	
AGRAEQ	Agrostis aequivalvis	
AGRALA	Agrostis alaskana	
AGRBOR	Agrostis borealis	
AGREXA	Agrostis exarata	
AGRSCA	Agrostis scabra	
BROCIL	Bromus ciliatus	
CALCAN	Calamagrostis canadensis	
CALINE	Calamagrostis inexpansa	
CALNEG	Calamagrostis neglecta	
CALNUT	Calamagrostis nutkaensis	
CARBIG	Carex Bigelowii	
CARMER	Carex Mertensii	
CARANT	Carex anthoxanthea	
CARAQU	Carex aquatilis	
CARATR	Carex atrata	
CARCAN	Carex canescens	
CARCAP	Carex capillaris	
CARDIA	Carex diandra	
CARDIO	Carex dioica	
CARDIS	Carex disperma	
CARELE	Carex eleusinoides	
CARFLA	Carex flava	
CARGME	Carex gmelini	
CARINT	Carex interior	
CARLAC	Carex lachenalii (bipartita)	
CARLEP	Carex leptalea	
CARLIM	Carex limosa	
CARLIV	Carex livida	
CARLYN	Carex lyngbyei	
CARMACL	Carex macloviana	
CARMACE	Carex macrocephala	
CARMACH	Carex macrochaeta	
CARMAR	Carex maritima	
CARMICG	Carex microglochin	
CARMUR	Carex muricata	
CAROED	Carex oederi	
CARPAC	Carex pachystachya	
CARPAU	Carex pauciflora	
CARPHY	Carex phyllomanica	
CARPLU	Carex pluriflora	
CARPRE	Carex preslii	
CARPYR	Carex pyrenaica	
CARROS	Carex rostrata	
CARSAX	Carex saxatilis	
CARSIT	Carex sitchensis	
CARSTE	Carex stenophylla	
CARSTY	Carex stylosa	
CINLAT	Cinna latifolia	
DESBER	Deschampsia beringensis	
DESCAE	Deschampsia caespitosa	
DESELO	Deschampsia elongata	
ELEKAM	Eleocharis kamtschatica	
ELENIT	Eleocharis nitida	
ELEPAL	Eleocharis palustris	
ELEQUI	Eleocharis quinqueflora	
ELYARE	Elymus arenarius mollis	

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME	COMMON NAME
	GRAMINOIDS (continued)	
ELYGLA	Elymus glaucus	
ELYHIR	Elymus hirsutus	
ELYSUB	Elymus subsecundus	
ERIANG	Eriophorum angustifolium	
ERIRUS	Eriophorum russeolum	
FESBRA	Festuca brachyphylla	
FESRUB	Festuca rubra	
GLYBOR	Glyceria borealis	
GLYPAU	Glyceria pauciflora	
HIEODO	Hierochloe odorata	
HORBRA	Hordeum brachyantherum	
HORJUB	Hordeum jubatum	
JUNALP	Juncus alpinus	
JUNARCS	Juncus arcticus spp. sitchensis	
JUNBUF	Juncus bufonius	
JUNCAS	Juncus castaneus	
JUNFAL	Juncus falcatus	
JUNFIL	Juncus filiformis	
JUNTRI	Juncus triglumis	
LUZMUL	Luzula multiflora	
LUZPAR	Luzula parviflora	
LUZRUF	Luzula rufescens	
LUZSPI	Luzula spicata	
PHAARU	Phalaris arundinacea	
PHLCOM	Phleum commutatum americanum	
POAALP	Poa alpina	
POAARC	Poa arctica	
POAEMI	Poa eminens	
POAGLA	Poa glauca	
POALAX	Poa laxiflora	
POAPAL	Poa palustris	
POAPRA	Poa pratensis	
PUCMAR	Puccinellia maritima	
PUCNUT	Puccinellia nutkaensis	
PUCPUM	Puccinellia pumila	
SCIMIC	Scirpus microcarpus	
TRICAE	Trichophorum caespitosum	
TRICER	Trisetum cernuum	
TRISPI	Trisetum spicatum	
VAHATR	Vahlodea atropurpurea latifolia	
	FERNS AND ALLIES	
ADIPED	Adiantum pedatum	
ATHFIL	Athyrium filix-femina	
BLESPI	Blechnum spicant	
BOTLUN	Botrychium lunaria	
BOTMUL	Botrychium multifidum	
CRYCRI	Cryptogramma crispa	
CYSFRA	Cystopteris fragilis	
DRYDIL	Dryopteris dilatata	
GYMDRY	Gymnocarpium dryopteris	
ISOTRU	Isoetes truncata	
LYCANN	Lycopodium annotinum	
LYCSEL	Lycopodium selago	
POLGLY	Polypodium glycyrrhiza	
POLBRA	Polystichum Braunii	
THEPHE	Thelypteris phegopteris	

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME -	COMMON NAME
MOSSES		
ANTCUR	Antitrichia curtipendula	
AULPAL	Aulacomium palustre	
BRAHYL	Brachythecium hylotepetum	
BRAPLU	Brachythecium plumosum	
CALGIG	Calligeron giganteum	
CAMSTE	Campylium stellatum	
CERPUR	Ceratodon purpureus	
CLIDEN	Climacium dendroides	
DICACU	Dicranium acutifolium	
DICHOW	Dicranium howellii	
DICMAJ	Dicranium majus	
DREADU	Drepanocladus aduncus	
DREREV	Drepanocladus revolvens	
DREUNC	Drepanocladus unciniatus	
EURPRA	Eurhynchium praelongum	
FISADI	Fissidens adianthoides	
FISOSM	Fissidens osmundoides	
HELBLA	Helodium blandowii	
HOMFUL	Homolotriecium Fulgens	
HYGOCH	Hygrohypnum ochraceum	
HYLSPL	Hylocomium splendens	
HYPCAL	Hypnum callichroum	
HYPCUP	Hypnum cupressiforme	
HYPREV	Hypnum revolutum	
ISOSEL	Isopterygium seligeri	
ISOSTO	Isothecium stoloniferum	
MEETRI	Meesia triquetra	
MNIUM	Mnium spp.	
ONCWAH	Oncophorus wahlenbergii	
ORTCON	Orthotrichum consimile	
ORTHOT	Orthotrichum spp.	
PALSQU	Paludella squarrosa	
PHIFON	Philonotis fontena	
PLAINS	Plagiomnium insigne	
PLAMED	Plagiomnium medium	
PLARUG	Plagiomnium rugicum	
PLAGIO	Plagiomnium spp.	
PLAPIL	Plagiothecium piliferum	
PLAUND	Plagiothecium undulatum	
PLESCH	Pleurozium schreberi	
POGALP	Pogonatum alpinus	
POGCON	Pogonatum contortum	
POHDRU	Pohlia drummondii	
POLCOM	Polytrichum commune	
POLSTR	Polytrichum strictum	
PTICRI	Ptilium crista-castrensis	
RACCAN	Racomitrium canescens	
RACHET	Racomitrium heterostichum	
RACLAN	Racomitrium lanuginosum	
RHIGLA	Rhizomnium glabrescens	
RHINUD	Rhizomnium nudum	
RHIPSE	Rhizomnium pseudopunctatum	
RHYLOR	Rhytidiadelphus loreus	
RHYSQU	Rhytidiadelphus squarrosus	
RHYTRI	Rhytidiadelphus triquetrus	
SCLCES	Scleropodium cespitans var. sublaeve	
SCOSCO	Scorpidium scorpoides	

Appendix 5. (continued)

SPECIES CODE	SCIENTIFIC NAME	COMMON NAME
	MOSSES (continued)	
SPHAGN	Sphagnum spp.	
SPHAND	Sphagnum andersonianum	
SPHANG	Sphagnum angustifolium	
SPHAUS	Sphagnum austinii	
SPHBAL	Sphagnum balticum	
SPHBAR	Sphagnum bartlettianum	
SPHCOM	Sphagnum compactum	
SPHFIM	Sphagnum fimbriatum	
SPHFUS	Sphagnum fuscum	
SPHGIR	Sphagnum girgensohnii	
SPHHEN	Sphagnum henryense	
SPHLIN	Sphagnum Lindbergii	
SPHMAG	Sphagnum magellanicum	
SPHMEN	Sphagnum mendocinum	
SPHPAC	Sphagnum pacificum	
SPHPAP	Sphagnum papillosum	
SPHPLA	Sphagnum platyphyllum	
SPHRIP	Sphagnum riparium	
SPHRUB	Sphagnum rubellum	
SPHRUS2	Sphagnum rubiginosum	
SPHRUS	Sphagnum russowii	
SPHSQU	Sphagnum squarrosum	
SPHSUB	Sphagnum subnitens	
SPHSUB3	Sphagnum subobesum	
SPHSUB2	Sphagnum subsecundum	
SPHTEN	Sphagnum tenellum	
SPHTER	Sphagnum teres	
SPHWAR	Sphagnum warnstorfii	
SPHWIL	Sphagnum wilfii	
SPHZIC	Sphagnum zickendrathii	
ULOCRI	Ulota crispa	
ULOPHY	Ulota phyllantra	
	LICHENS	
ALESAR	Alectoria sarmentosa	
BRYBIC	Bryoria bicolor	
BRYCAR	Bryoria carlottae	
BRYTRI	Bryoria trichocles	
CAVHUL	Cavernularia hultenii	
CAVLOP	Cavernularia lophyrea	
CETCHL	Cetraria chlorophyla	
CETISL	Cetraria islandica	
CLAARB	Cladina arbuscula	
CLARAN	Cladina rangiferina	
CLABEL	Cladonia bellidiflora	
CLAFIM	Cladonia fimbriata (group)	
CLAGRA	Cladonia gracilis	
CLAMAX	Cladonia maxima	
CLAUNC	Cladonia uncialis	
DENINT	Dendriscocaulon intracatulum	
HYPDUP	Hypogymnia duplicata	
HYPENT	Hypogymnia enteromorpha	
ICMERI	Icmadophila ericetrum	
LEPSAT	Leptogium saturnium	
LOBLAL	Lobaria lallii	
LOBLIN	Lobaria linita	

Appendix 5. (concluded)

SPECIES CODE	SCIENTIFIC NAME	COMMON NAME
	LICHENS (continued)	
LOBORE	Lobaria oregania	
LOBPUL	Lobaria pulmonaria	
LOBRET	Lobaria retigera	
LOBSCR	Lobaria scrobiculata	
LOXOSP	Loxospora spp.	
NEPBEL	Nephroma bellum	
NEPHEL	Nephroma helveticum	
NEPISI	Nephroma isidiosum	
NEPRES	Nephroma resupinatum	
PARSAX	Parmelia saxatilis	
PARSQU	Parmelia squarrosa	
PARSUL	Parmelia sulcata	
PELAPT	Peltigera apthosa	
PELCAN	Peltigera canina	
PELCOL	Peltigera collina	
PELMEM	Peltigera membranacea	
PELPOL	Peltigera polydactyla	
PELSCA	Peltigera scabrosa	
PLAGLA	Platismatia glauca	
PLAHER	Platismatia herrei	
PLALAC	Platismatia lacunosa	
PLANOR	Platismatia norvegica	
PSEANO	Pseudocyphellaria anomala	
PSEANT	Pseudocyphellaria anthapsis	
PSECRO	Pseudocyphellaria crocata	
RAUNAR	Raunaria spp.	
SIPCER	Siphula ceratites	
SPHGLO	Sphaerophorous globosus	
SPHMEL	Sphaerophorous melanocarpa	
STEREO	Stereocaulon spp.	
STIFUL	Sticta fuliginosa	
STIWEI	Sticta weigelii	
USNLON	Usnea longissima	
	ALGAE	
	Chara spp.	