



*Guidelines for
Reclamation/
Revegetation
in the Yukon*
Volume II

Yukon
Renewable Resources

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Revegetation*

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Renewable Resources

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PREFACE

"Volume Two - Guidelines for Reclamation/Revegetation in the Yukon" provides a northern extension to the first volume of guidelines published 1992, which addressed the southern Yukon in Regions 1 to 4 (South-Central Yukon, South-East Yukon, South-West Yukon, Pelly/Cassiar Mountains).

In this volume, the guidelines for regional seed specifications are expanded in the central Yukon from Mayo west to Dawson City in Region 5, the Klondike Highway Corridor. The guidelines are extended into the northern Yukon in Region 6, the Dempster Highway Corridor.

General background information regarding site considerations, surface preparation, timing, method and rate of seeding, fertilization and northern seed varieties, is included in the introductory section of the first volume.

The original data from which the revegetation prescriptions have been formulated was obtained through research conducted from 1976 to 1981 by Herman and Manivalde Vaartnou, in the course of environmental studies for the construction of the proposed Foothills Pipeline, designed for the transport of natural gas from the Beaufort Sea to southern Canada.

This extensive and comprehensive demonstration program involved the collection of seeds of native species of grasses and legumes from widely geographically dispersed locations throughout the Yukon. Seed stocks were increased in nurseries; these propagated native seeds, as well as seeds of agronomic varieties of grasses and legumes, were

then planted in test plots at numerous locations within the proposed pipeline corridors. Test sites were situated along the Alaska Highway from Watson Lake to Beaver Creek, along the Klondike Highway from Whitehorse to Dawson, along the Dempster Highway from km 0 to Inuvik, and north of Tuktoyaktuk.

The test plots received various surface preparation, treatments, mulches, and fertilizer applications. Seed trials, using both native and agronomic seeds, were conducted in replicate; plots were monitored continuously for a minimum of five years and again in 1985. In addition to grasses and forbs, the use of groundcover shrubs for revegetation was also investigated. Several test sites planted in the 1970's are still in existence. One site which may be observed is situated east of the Dempster Highway in the Richardson Mountains.

Seed testing programs were conducted by Manivalde Vaartnou in the southern Yukon during 1991 to 1995, in a monitoring program supported by Arctic Alpine Seed Company and the Department of Communities and Transportation Services, Government of the Yukon.

It is hoped that more seed testing and monitoring programs can be established elsewhere in the Yukon, to fill in data gaps and enhance our knowledge of reclamation and revegetation specifically suited to the Yukon.

Since the publication of Volume I in 1992, both the private and the public sector have demonstrated their commitment to the environment, through their enthusiastic support of the manual and a willingness to implement the guidelines provided. Numerous individuals from the mining industry, highway construction and land use assessment agencies have used and

promoted the recommendations in Volume One.

Users of the guide should be aware that some of the varieties recommended may not be available due to limited production as well as the development of new varieties since the guidelines were formulated. For current information regarding availability, please contact the Agriculture Branch, Government of the Yukon, or seed suppliers prior to ordering seeds.

Comments from users of both volumes are encouraged, to assist with improvements in future editions.

Tony Hill
Catherine E. Kennedy
David Murray

Whitehorse, Yukon
March, 1996

ACKNOWLEDGEMENTS

The regional seed specifications in this volume (as with the preceding companion volume) have been designed by Manivalde Vaartnou. Editorial review was provided by Tony Hill, Agrologist, Agriculture Branch, Government of Yukon.

The regional descriptions are a joint contribution of Manivalde Vaartnou and David Murray, Agriculture Technician, Agriculture Branch, Government of Yukon. The schematic cross-sections of soil and vegetation relationships were prepared by David Murray and Catherine Kennedy, Vegetation Specialist, Fish & Wildlife Branch, Government of Yukon.

The site characteristics tables for vegetation communities and the fertilizer requirements were based on studies

conducted by the Vaartnous as well as extensive soil surveys and agricultural research conducted throughout the Yukon by David Murray and other investigators at the Agriculture Branch.

Vegetation community descriptions were a joint contribution of Manivalde Vaartnou and Catherine Kennedy.

Funding for this project and its publication was provided by the Department of Renewable Resources, Government of Yukon and the Agri-Food Component of the Canada-Yukon Green Plan Agreement.

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1.0 REGION 5 - KLONDIKE HIGHWAY CORRIDOR

Revegetation Region 5, the Klondike Highway corridor and adjacent areas, is immediately north of Revegetation Regions 1 and 3. It extends north to Keno Hill from the convergence of the boundaries of Regions 1 and 4. From Keno Hill the northern boundary is in a northwesterly direction, crossing the Dempster Highway just south of North Fork Pass, and extending to the Alaska border. Region 5 encompasses the McArthur Game Sanctuary, the towns of Dawson and Elsa, and the villages of Stewart Crossing, Pelly Crossing, Keno Hill and Mayo. Revegetation Region 5 is depicted in Figure 18.

1.1 Climate

This region receives more precipitation than Region 1, directly to the south. Mean annual precipitation ranges from 250 to 325mm at lower elevations, but increases to over 450mm at upper elevation sites. The major population centre of the region, Dawson, receives annual precipitation of 325mm. Of this, 140mm occurs from June to August (70). In most years, insufficient precipitation during the growing season is not a reason for unsuccessful revegetation.

Mean annual temperatures are typical for Yukon, ranging from -4°C to -7°C . However, there are temperature extremes, particularly in the northeastern part of region, where January mean temperatures are around -30°C , and July mean temperatures are in the vicinity of 16°C . At Dawson, the mean temperature from May to September is 11°C (70), more than sufficient for revegetation purposes.

1.2 Landforms and Soils

The terrain in Revegetation Region 5 typically consists of smooth rolling topography, with low relief plateaus dissected by moderate to deep narrow valleys. Elevation generally ranges from 1000 to 1500m, but some peaks exceed 2100m, and some valleys decrease to below 300m. Permafrost is common, especially in valley bottoms.

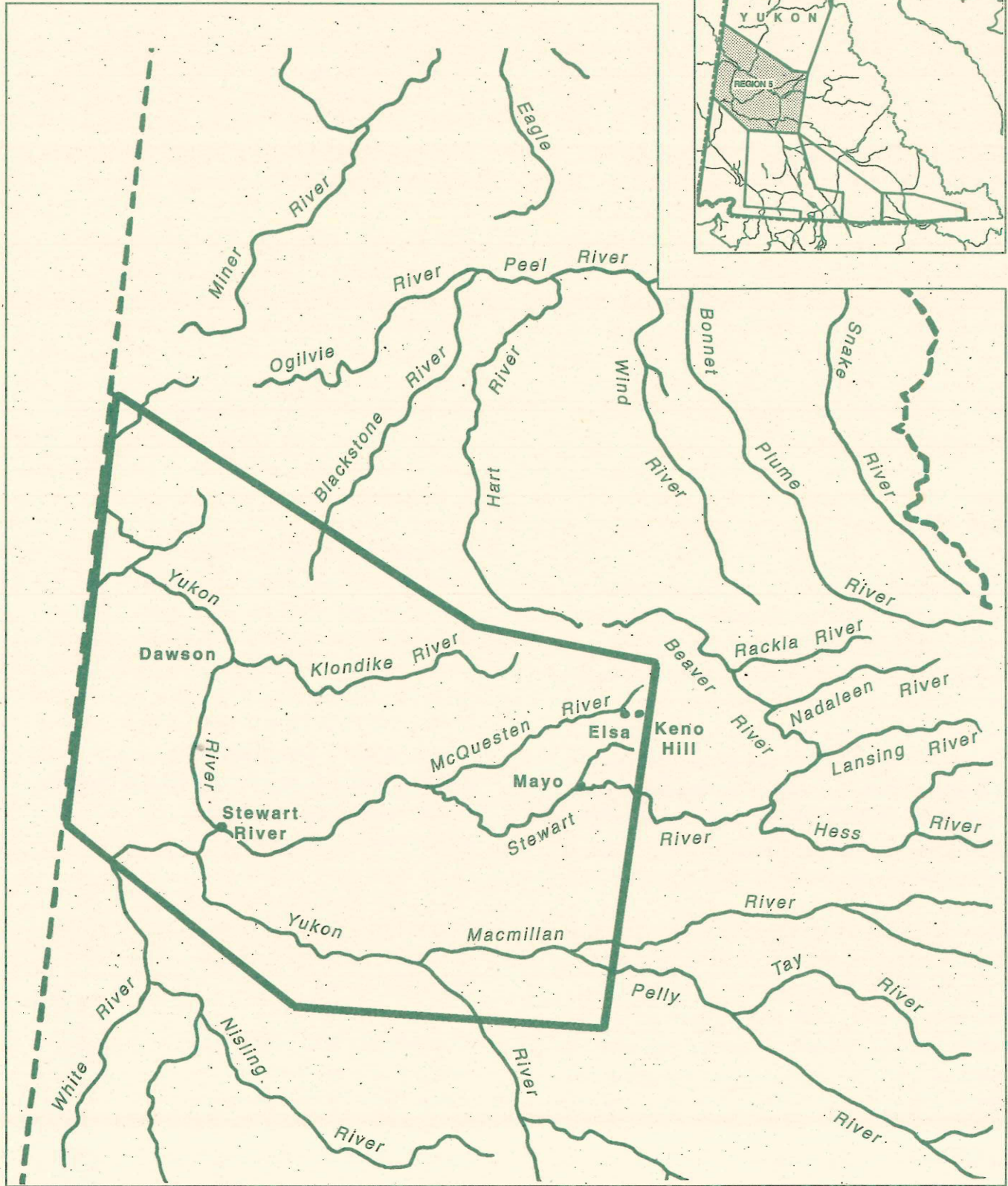
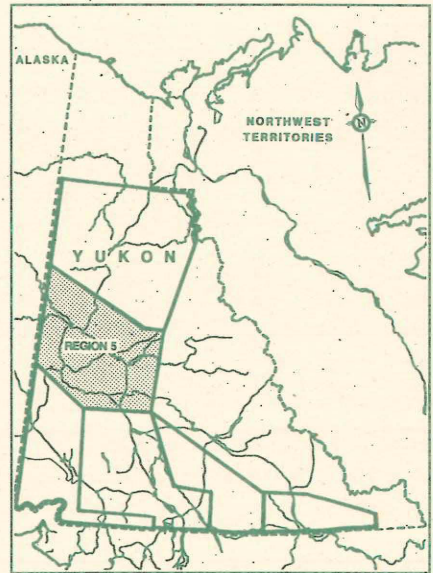
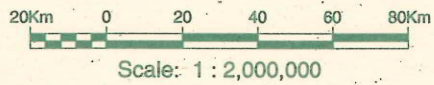
Soil texture in Region 5 is comparable to that of Regions 1 and 3, in that there is a wide range of variability in texture of soils. Organic soils are prominent, occurring under black spruce, shrub birch and sedge communities. Soils not classified as organic are primarily loam and sandy loam, but silty and clay soils are not uncommon. Soil characteristics relevant for revegetation are summarized below.

The majority of soils in this region have near-neutral pH values between 6.1 and 7.3. However, soil pH can vary from 5.3 to 8.4 as soils of the more southerly grassland and white spruce communities are alkaline, with pH values near 8.0, while soils under lodgepole pine stands are generally fairly acidic. CaCO_3 levels are low, except under some grassland and white spruce communities, while organic matter varies tremendously, ranging from trace amounts to over 50%. Electrical conductivity and salinity levels are low except in isolated pockets throughout the region.

Phosphorus and nitrogen levels are consistently low. Thus, these nutrients should be added in all revegetation programs unless thorough soil sampling has shown them to be unnecessary on any given



DETAIL REGION 5



site. In contrast, potassium and sulphur levels vary from moderate to high. Only in some isolated cases will supplemental potassium or sulphur be beneficial for successful revegetation.

1.3 Vegetation

The vast majority of Revegetation Region 5 is in the Dawson section of the boreal forest region of Canada, while the eastern edges are in the Central and Eastern Yukon sections of the boreal forest region (26, 77). Region 5 primarily encompasses the Klondike River Ecoregion, but includes the western part of the Pelly River and Mayo Lake-Ross River Ecoregions, and the north-west corner of the Dawson Range Ecoregion (70).

White (*Picea glauca*) and black (*P. mariana*) spruce are the most common trees in Revegetation Region 5. White spruce is usually dominant on drier, better drained sites while black spruce occurs on poorly drained sites. Aspen (*Populus tremuloides*) and balsam poplar (*P. balsamifera*) are invaders which often establish on permafrost-free slopes or after the occurrence of fires. Paper birch (*Betula papyrifera*) occurs sporadically in Revegetation Region 5 while lodgepole pine (*Pinus contorta*), another post-fire invader species, is common only in the Pelly River Ecoregion of Region 5. Alpine fir (*Abies lasiocarpa*) stands, which occur at treeline (1350-1500m), are sparse (70).

In the understory, willows (*Salix* spp.), rose (*Rosa acicularis*), soapberry (*Shepherdia canadensis*) and bog blueberry (*Vaccinium uliginosum*) are the most common shrubs. Other shrubs which have a wide-spread distribution include shrubby cinquefoil (*Potentilla fruticosa*), Labrador tea (*Ledum*

groenlandicum and *L. palustre*), alder (*Alnus crispa* and *A. incana*) and shrub birch (*Betula glandulosa*). Less common are highbush cranberry (*Viburnum edule*), raspberry (*Rubus idaeus*), gooseberry (*Ribes oxycanthoides*), northern red currant (*R. triste*) and Alaska spiraea (*Spiraea Beauverdiana*) (115).

The most prominent species in the dwarf/ground shrub layer is kinnikinnick (*Arctostaphylos uva-ursi*), but lowbush cranberry (*Vaccinium vitis-idaea*) and twinflower (*Linnaea borealis*) are also abundant. Less common dwarf shrubs include mossberry (*Empetrum nigrum*) and northern bearberry (*Arctostaphylos rubra*). At higher elevations, dwarf birch (*Betula nana*), alpine azalea (*Loiseleuria procumbens*), white heather (*Cassiope tetragona*) and dryas (*Dryas octopetala* and *D. integrifolia*) constitute the dwarf shrub layer.

The grass flora is diverse, with few homogeneous stands. Common species in mesic areas are bluejoint reedgrass (*Calamagrostis canadensis*), tufted hairgrass (*Deschampsia caespitosa*), a northern bluegrass (*Poa alpigena*), and on some sites, bearded wheatgrass (*Agropyron subsecundum*) or alтай fescue (*Festuca altaica*).

On drier sites, purple reedgrass (*Calamagrostis purpurascens*) is usually the dominant graminoid. Slender and violet wheatgrass (*Agropyron pauciflorum* and *A. violaceum*), glaucous bluegrass (*Poa glauca*), hairy wild ryegrass (*Elymus innovatus*) and northern brome grass (*Bromus*



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Pumpellianus) are common but scattered. Alpine bluegrass (Poa alpina), mountain timothy (Phleum commutatum) and spike trisetum (Trisetum spicatum) are the grass species which are most prevalent at higher elevations (115).

On disturbed sites, ticklegrass (Agrostis scabra), several species of alkaligrass (Puccinellia spp.), and the introduced species, foxtail barley (Hordeum jubatum), are common invaders. Also, many of the other grasses discussed above invade disturbed sites.

Legumes do not provide substantial amounts of ground cover, but are found throughout Revegetation Region 5. The most common legumes in forested communities are arctic lupine (Lupinus arcticus) and bear root (Hedysarum alpinum). Mackenzie's hedysarum (H. Mackenzii) is common on highway roadsides, while showy and late yellow locoweed (Oxytropis splendens and O. campestris); and alpine milk vetch (Astragalus alpinus), are locally abundant on gravelly sites. Several other species of milk vetch (Astragalus spp.) also occur throughout the region, but none provides substantial ground cover except on isolated disturbed sites (115).

2.0 PLANT COMMUNITY BASED SEED MIXTURES

In most instances, undisturbed native plant communities provide a good indication of the underlying soil properties. The correlative relationship between soil characteristics such as pH, texture, moisture retention, salinity, etc. and the composition of the native plant community can be used as a guide for revegetation of adjacent disturbed areas if detailed soil analyses are unavailable.

In the following guidelines, the major plant communities which characterize the region have been used to indicate, in a general nature, the type of soil properties which may be encountered. Due to previous revegetation studies (94,115) conducted in the region in the course of pipeline proposals, soil-plant community data have been developed from which appropriate seed mixtures for disturbed sites within these plant communities have been formulated. However, if at all possible, information from analyses of soil samples taken from the actual site requiring revegetation should be utilized in the formulation of appropriate seed mixtures.

Tables 94-113 are paired tables of complementary information prepared for each of ten major plant communities found at moderate elevations in this region. The first table in each pair lists pertinent site characteristics associated with each community, while the second table lists current and future seed mixtures for revegetation. Fertilizer recommendations are given.

Figures 16.1 & 16.2 illustrate in cross section the plant community and land form relationships common to the Klondike and Stewart Valley portions of the Klondike River Corridor.

VEGETATION COMMUNITY

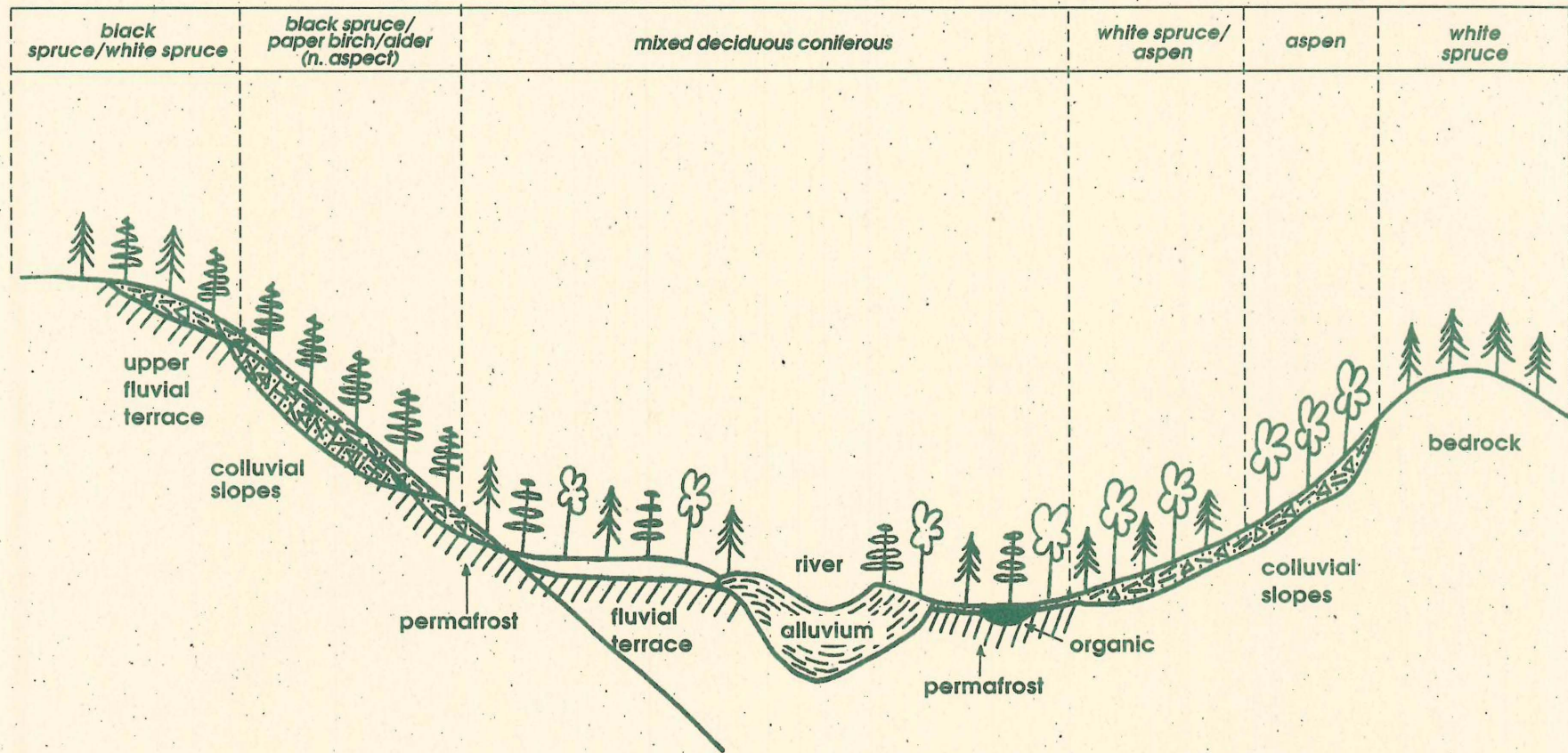


Figure 16.1 : Vegetation and Landform Relationships
 REGION 5 - Klondike Highway Corridor - Klondike Valley

VEGETATION COMMUNITY

<i>white spruce/shrub/ willow</i>	<i>black and white spruce</i>	<i>white spruce / pine</i>	<i>mixed coniferous deciduous</i>	<i>black and white spruce</i>	<i>aspen/ white spruce</i>	<i>black spruce/ willow/ sedge</i>	<i>mixed decid- uous/ conif- erous</i>
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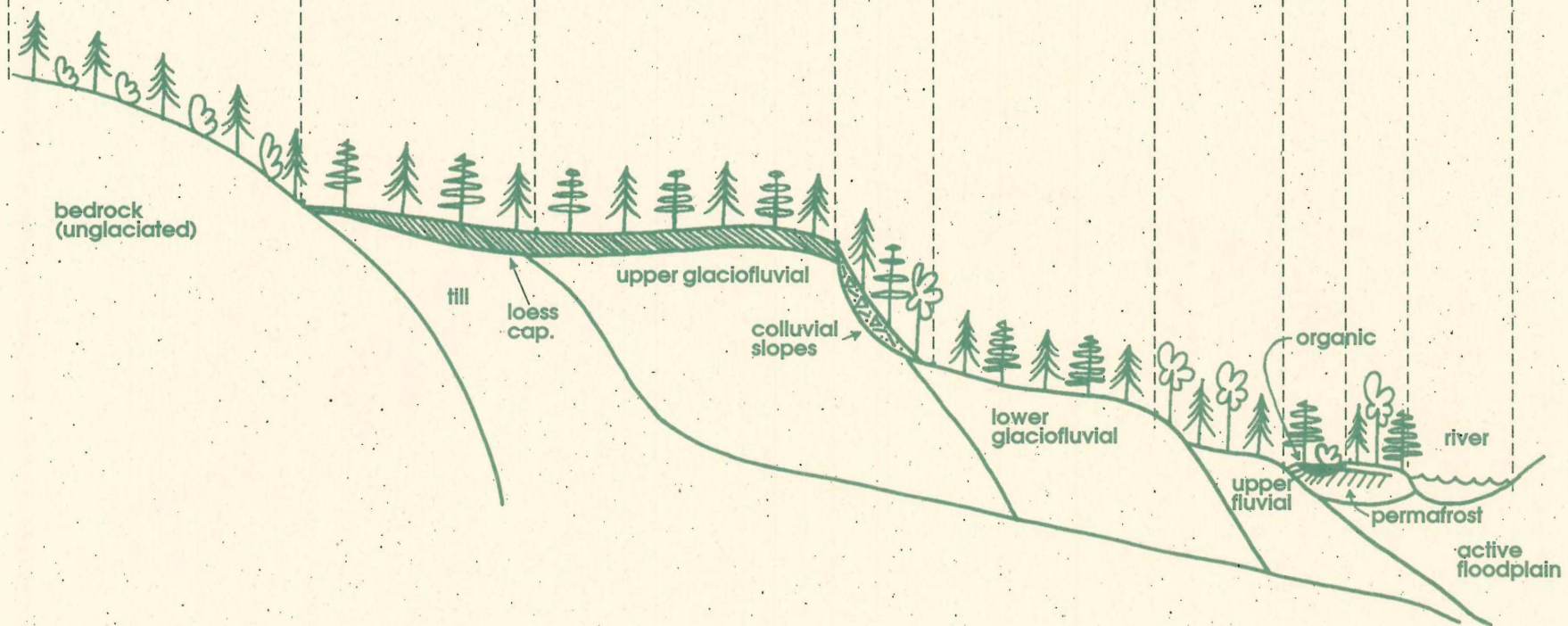


Figure 16.2 : Vegetation and Landform Relationships
 REGION 5 - Klondike Highway Corridor - Stewart Valley

Table 94: Site characteristics of southern aspect grassland (Poaceae) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	glaciofluvial, colluvial
Modifier(s):	very steeply sloping
Drainage:	well to rapid
Soil Texture: (top 30cm): (>30cm)	organic to loam sand and gravel
Other Soil Properties (top 30cm):	
pH:	slightly alkaline (pH: 7.3 - 8.0)
Organic matter:	moderate to high
CaCO ₃ :	low to high
Available nutrients:	N - moderate to high P - moderate to high K - moderate to high S - moderate to high

The revegetation potential of such soils is high. No major problems should be encountered in the reestablishment of a thriving ground cover unless there is a shortage of precipitation in the year of establishment. Seed of selections adapted to alkaline soils should be included in the basic seed mixture.

Vegetation Community Description: The community overstory is dominated by graminoids and forbs; community edges may contain some aspen seedlings, an occasional bearberry or rose plant; very xeric sites are dominated by sage, Gorman's beard tongue or prickly saxifrage; slightly moister sites contain purple reedgrass, Yukon wheatgrass, glaucous bluegrass and sedges; communities develop on weathered shale or glacial till; volcanic ash in upper layer common.

Characteristic Species: Yukon wheatgrass (Agropyron yukonense), purple reedgrass (Calamagrostis purpurascens), sage (Artemisia frigida), glaucous bluegrass (Poa glauca), Gorman's beard tongue (Penstemon Gormanii)

Associated Species: prickly saxifrage (Saxifraga tricuspidata), flax (Linum perenne), androsace (Androsace septentrionalis), crocus (Pulsatilla patens), pussytoes (Antennaria rosea), sedge (Carex spp.)



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Table 95: Seed mixture and fertilizer specifications for southern aspect grassland (Poaceae) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	8	Yukon wheatgrass <i>Agropyron yukonense</i>	3
			Northern fescue <i>Festuca saximontana</i>	4
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	10	Violet wheatgrass <i>Agropyron violaceum</i>	4
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	3
Alfalfa <i>Medicago sativa</i>	DRYLANDER or RANGELANDER	4	Late yellow locoweed <i>Oxytropis campestris</i>	2
Canada bluegrass <i>Poa compressa</i>	REUBENS	4	Canada bluegrass <i>Poa compressa</i>	2
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	4	Glaucous bluegrass <i>Poa glauca</i>	4
Total		36		22

FERTILIZER:

Nutrient requirement: Nitrogen (80kg N/ha) + Phosphate (80kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha 16-20-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 96: Site characteristics of aspen (*Populus tremuloides*) tree communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	fluvial, glaciofluvial
Modifier(s):	undulating to moderately rolling
Drainage:	moderate to well
Soil Texture: (top 30cm): (>30cm)	silty clay loam sand to gravelly sand
Other Soil Properties (top 30cm): pH: Organic matter: CaCO ₃ : Available nutrients:	neutral to alkaline (pH: 6.3 - 7.7) low moderate N - low P - moderate K - high S - moderate

In general, sites comparable to these are viable candidates for successful revegetation. The growth medium is favourable for the establishment of grasses, although nitrogen levels must be enhanced considerably. If a lack of soil moisture is a concern in the spring, then fall seeding may provide a superior alternative.

Vegetation Community Description: Aspen dominates an open tree canopy which may include occasional white spruce and balsam poplar; shrubs include soapberry, rose, willow and Labrador tea; kinnikinnick and twinflower are common groundshrubs; grasses, forbs and lichens are common. This vegetation often occurs as a stable community adjacent to grasslands on south-facing slopes, or as an early successional community following fire.

Characteristic Species: aspen (*Populus tremuloides*), kinnikinnick (*Arctostaphylos uva-ursi*), rose (*Rosa acicularis*), purple reedgrass (*Calamagrostis purpurascens*), soapberry (*Shepherdia canadensis*)

Associated Species: white spruce (*Picea glauca*), willow (*Salix* spp.), altai fescue (*Festuca altaica*), arctic lupine (*Lupinus arcticus*), Labrador tea (*Ledum groenlandicum*), bunchberry (*Cornus canadensis*), twinflower (*Linnaea borealis*), northern bromegrass (*Bromus Pumpellianus*)



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Table 97: Seed mixture and fertilizer specifications for aspen (*Populus tremuloides*) tree community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	10	Violet wheatgrass <i>Agropyron voilaceum</i>	5
			Northern fescue <i>Festuca saximontana</i>	3
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	10	Slender wheatgrass <i>Agropyron pauciflorum</i>	5
Sheep fescue <i>Festuca ovina</i>	COMMON	4	Sheep fescue <i>Festuca ovina</i>	2
Creeping red fescue <i>Festuca rubra</i>	BOREAL	6	Glaucous bluegrass <i>Poa glauca</i>	3
Alfalfa <i>Medicago sativa</i>	DRYLANDER or RANGELANDER	4	Arctic lupine <i>Lupinus arcticus</i>	2
			Late yellow locoweed <i>Oxytropis campestris</i>	1
Kentucky bluegrass <i>Poa pratensis</i>	COMMON	4	Kentucky bluegrass <i>Poa pratensis</i>	2
Total		38		23

FERTILIZER:

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (100kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 450kg/ha 23-23-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 98: Site characteristics of lodgepole pine (*Pinus contorta*) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	glaciofluvial, morainal
Modifier(s):	level terraces
Drainage:	well to rapid
Soil Texture: (top 30cm): (>30cm)	sandy loam to loamy sand sandy loam to gravelly sand
Other Soil Properties (top 30cm):	
pH:	acid to slightly acid (pH: 5.3 - 6.3)
Organic matter:	low
CaCO ₃ :	low
Available nutrients:	N - very low P - very low K - very low S - very low

Such soils are deficient in nutrients and have little water-holding capacity. Thus, a complete fertilization program will be necessary for revegetation to succeed. However, such soils can only support a sparse ground cover at best of times and may require reseeding if precipitation is minimal in the seeding year.

Vegetation Community Description: Lodgepole pine dominates an open tree canopy which can include white spruce and aspen; a tall shrub understory is sparse or absent; low shrubs include soapberry and rose; kinnikinnick is a diagnostic and dominant groundshrub; grasses, forbs and lichens are common but sparse; community develops on well-drained sites.

Characteristic Species: lodgepole pine (*Pinus contorta*), kinnikinnick (*Arctostaphylos uva-ursi*), lowbush cranberry (*Vaccinium vitis-idaea*), purple reedgrass (*Calamagrostis purpurascens*)

Associated Species: white spruce (*Picea glauca*), aspen (*Populus tremuloides*), soapberry (*Shepherdia canadensis*), willow (*Salix* spp.), rose (*Rosa acicularis*), altai fescue (*Festuca altaica*), arctic lupine (*Lupinus arcticus*), fireweed (*Epilobium angustifolium*)



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Table 99: Seed mixture and fertilizer specifications for lodgepole pine (*Pinus contorta*) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	6	Violet wheatgrass <i>Agropyron violaceum</i>	6
Creeping red fescue <i>Festuca rubra</i>	BOREAL	4		
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	6	Slender wheatgrass <i>Agropyron pauciflorum</i>	3
Sheep fescue <i>Festuca ovina</i>	COMMON	8	Northern fescue <i>Festuca saximontana</i>	5
Alfalfa <i>Medicago sativa</i>	DRYLANDER or RANGELANDER	4	Arctic lupine <i>Lupinus arcticus</i>	1
			Late yellow locoweed <i>Oxytropis campestris</i>	1
Canada bluegrass <i>Poa compressa</i>	REUBENS	6	Glaucous bluegrass <i>Poa glauca</i>	4
Total		34		20

FERTILIZER:

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (120kg P₂O₅/ha) + Potash (80kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha 28-28-0 + 150kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 100: Site characteristics of white spruce (*Picea glauca*) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	glaciofluvial, morainal, fluvial
Modifier(s):	gently rolling
Drainage:	moderate to well
Soil Texture: (top 30cm): (>30cm)	loam to clay loam sandy loam to gravelly sand
Other Soil Properties (top 30cm): pH: Organic matter: CaCO ₃ : Available nutrients:	alkaline to highly alkaline pH: 7.5 - 8.4 moderate low to high N - low to high P - very low K - high S - low to high

Excessive alkalinity, where present, combined with a lack of moisture in the seeding year may cause revegetation problems on such sites. The basic seed mixture must contain alkali tolerant species and fertilization rates must be sufficient to compensate for the very low levels of phosphate in these soils. In very dry years fall seeding may be optimal for rapid germination and plant development.

Vegetation Community Description: White spruce is the dominant tree in the canopy; pure stands are rare; the canopy may include aspen, lodgepole pine, black spruce; shrubs include soapberry, rose and willows; groundshrubs such as kinnikinnick and lowbush cranberry are common; arctic lupine, purple reedgrass and violet wheatgrass are the most abundant herbs; community occurs on mesic to dry sites.

Characteristic Species: white spruce (*Picea glauca*), soapberry (*Shepherdia canadensis*), kinnikinnick (*Arctostaphylos uva-ursi*), willows (*Salix* spp.), purple reedgrass (*Calamagrostis purpurascens*)

Associated Species: rose (*Rosa acicularis*), Labrador tea (*Ledum groenlandicum*), lowbush cranberry (*Vaccinium vitis-idaea*), twinflower (*Linnaea borealis*), arctic lupine (*Lupinus arcticus*), violet wheatgrass (*Agropyron violaceum*)



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Table 101: Seed mixture and fertilizer specifications for white spruce (*Picea glauca*) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	8	Violet wheatgrass <i>Agropyron violaceum</i>	6
Creeping red fescue <i>Festuca rubra</i>	BOREAL	4		
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	6	Slender wheatgrass <i>Agropyron pauciflorum</i>	5
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	2
			Northern fescue <i>Festuca saximontana</i>	2
Alfalfa <i>Medicago sativa</i>	DRYLANDER or RANGELANDER	2	Late yellow locoweed <i>Oxytropis campestris</i>	1
Timothy <i>Phleum pratense</i>	CLIMAX	4	Fowl bluegrass <i>Poa palustris</i>	2
Kentucky bluegrass <i>Poa pratensis</i>	COMMON	4	Glaucous bluegrass <i>Poa glauca</i>	2
Alsike clover <i>Trifolium hybridum</i>	AURORA	4	Arctic lupine <i>Lupinus arcticus</i>	2
Total		38		22

FERTILIZER:

Nutrient requirement: Nitrogen (50-100kg N/ha) + Phosphate (100kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 500kg/ha
16-20-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 102: Site characteristics of mixed deciduous/white spruce (*Populus/Picea glauca*) tree communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	fluvial, morainal
Modifier(s):	gently rolling
Drainage:	moderate to well
Soil Texture: (top 30cm): (>30cm)	loam to clay sandy loam to gravel
Other Soil Properties (top 30cm):	
pH:	neutral to slightly alkaline (pH: 6.5 - 7.4)
Organic matter:	low to moderate
CaCO ₃ :	low
Available nutrients:	N - low P - moderate K - moderate S - low

Such soils are well suited for revegetation with a grass-legume mixture. However, high levels of nitrogen should be applied at the time of seeding. If this nitrogen deficiency is addressed, there should be few problems in revegetation of comparable soils.

Vegetation Community Description: The canopy is usually dominated by white spruce, aspen and balsam poplar; may also include black spruce, paper birch or lodgepole pine; diverse shrub layer includes willows alder and rose; kinnikinnick and lowbush cranberry are very common groundshrubs; most prevalent grasses are slender wheatgrass, purple reedgrass and glaucous bluegrass; American hedysarum and arctic lupine are prominent legumes, various milk vetches are less common.

Characteristic Species: white spruce (*Picea glauca*), aspen (*Populus tremuloides*), balsam poplar (*P. balsamifera*), willows (*Salix* spp.), rose (*Rosa acicularis*), kinnikinnick (*Arctostaphylos uva-ursi*)

Associated Species: bog blueberry (*Vaccinium uliginosum*), lowbush cranberry (*Vaccinium vitis-idaea*), mossberry (*Empetrum nigrum*), slender wheatgrass (*Agropyron pauciflorum*), glaucous bluegrass (*Poa glauca*), purple reedgrass (*Calamagrostis purpurascens*), arctic lupine (*Lupinus arcticus*), bear root (*Hedysarum alpinum*)



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**Table 103: Seed mixture and fertilizer specifications for mixed deciduous/white spruce
(*Populus/Picea glauca*) tree community soils**

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	6	Violet wheatgrass <i>Agropyron violaceum</i>	6
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	6	Slender wheatgrass <i>Agropyron pauciflorum</i>	3
Smooth brome <i>Bromus inermis</i>	CARLTON	4	Bearded wheatgrass <i>Agropyron subsecundum</i>	2
Creeping red fescue <i>Festuca rubra</i>	BOREAL	6	Northern fescue <i>Festuca saximontana</i>	3
Sheep fescue <i>Festuca ovina</i>	COMMON	4	Sheep fescue <i>Festuca ovina</i>	2
Fowl bluegrass <i>Poa palustris</i>	COMMON	4	Fowl bluegrass <i>Poa palustris</i>	2
Kentucky bluegrass <i>Poa pratensis</i>	COMMON	4	Glaucous bluegrass <i>Poa glauca</i>	3
Alsike clover <i>Trifolium hybridum</i>	AURORA	4	Arctic lupine <i>Lupinus arcticus</i>	2
Total		38		23

FERTILIZER:

Nutrient requirement: Nitrogen (90kg N/ha) + Phosphate (50kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha
23-23-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 104: Site characteristics of black spruce (*Picea mariana*) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	morainal, colluvial, lacustrine
Modifier(s):	depressional to level
Drainage:	very poor to poor
Soil Texture: (top 30cm): (>30cm)	organic organic (permafrost)
Other Soil Properties (top 30cm):	
pH:	slightly acid to neutral (pH: 6.0 - 6.7)
Organic matter:	very high
CaCO ₃ :	very low
Available nutrients:	N - low P - very low K - low S - low

Such organic soils will require the inclusion of selections in the basic seed mixture which are adapted to organic soils. High levels of nitrogen and phosphorus will need to be added, and potassium may be required at some locations. However, if these criteria are met, only high levels of precipitation during the seeding window will cause revegetation problems on such sites.

Vegetation Community Description: Black spruce dominates the tree canopy; black spruce dominates the tree canopy, which may also include white spruce and paper birch; a wide range of shrubs and dwarf shrubs includes Labrador tea, willows, blueberry, shrubby cinquefoil, lowbush cranberry, mossberry and northern bearberry; forbs and graminoids are limited - the most common are sedges and bluejoint reedgrass.

Characteristic Species: black spruce (*Picea mariana*), willows (*Salix* spp.), Labrador tea (*Ledum palustre*), sedges (*Carex* spp.), bluejoint reedgrass (*Calamagrostis canadensis*)

Associated Species: white spruce (*Picea glauca*), blueberry (*Vaccinium uliginosum*), lowbush cranberry (*Vaccinium vitis-idaea*), mossberry (*Empetrum nigrum*), northern bearberry (*Arctostaphylos rubra*), tufted hairgrass (*Deschampsia caespitosa*), altai fescue (*Festuca altaica*)



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Table 105: Seed mixture and fertilizer specifications for black spruce (*Picea mariana*) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Red top <i>Agrostis gigantea</i>	COMMON	2	Red top <i>Agrostis gigantea</i>	2
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	2	Meadow foxtail <i>Alopecurus pratensis</i>	4
Tufted hairgrass <i>Deschampsia caespitosa</i>	NORTRAN	6	Tufted hairgrass <i>Deschampsia caespitosa</i>	4
Reed canarygrass <i>Phalaris arundinacea</i>	PALATON or VANTAGE	4	Bearded wheatgrass <i>Agropyron subsecundum</i>	4
Timothy <i>Phleum pratense</i>	CLIMAX	8	Altai fescue <i>Festuca altaica</i>	5
Fowl bluegrass <i>Poa palustris</i>	COMMON	4	Fowl bluegrass <i>Poa palustris</i>	4
Total		38		23

FERTILIZER:

Nutrient requirement: Nitrogen (80kg N/ha) + Phosphate (100kg P₂O₅/ha)
+ Potash (60kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient
requirement: 500kg/ha 16-20-0 + 100kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 106: Site characteristics of white spruce/black spruce (*Picea glauca*/*Picea mariana*) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	morainal, glaciofluvial, fluvial
Modifier(s):	nearly level, upland
Drainage:	imperfect to moderate
Soil Texture: (top 30cm): (>30cm)	organic sandy gravel
Other Soil Properties (top 30cm):	
pH:	slightly acid to neutral (pH: 6.2 - 7.1)
Organic matter:	high
CaCO₃:	low
Available nutrients:	N - moderate to high P - low K - low S - low

Ground cover establishment can be difficult during periods of high precipitation. Species which are tolerant of organic soils and high moisture levels should be utilized in the revegetation seed mixture.

Nitrogen levels are generally adequate, but supplementary phosphate and potash are needed at the time of seeding.

Vegetation Community Description: White and black spruce dominate the tree canopy; white spruce is more prominent on higher, drier sites, and black spruce more prominent at moister, lower elevations; the diverse shrub layer includes Labrador tea, willow, kinnikinnick, rose, shrubby cinquefoil, lowbush cranberry, blueberry and mossberry; an equally diverse herb stratum includes species such as bearberry, numerous sedges, and numerous grasses.

Characteristic Species: white spruce (*Picea glauca*), black spruce (*P. mariana*), willows (*Salix* spp.), Labrador tea (*Ledum palustre*), sedges (*Carex* spp.), bluejoint reedgrass (*Calamagrostis canadensis*)

Associated Species: blueberry (*Vaccinium uliginosum*), kinnikinnick (*Arctostaphylos uva-ursi*), lowbush cranberry (*Vaccinium vitis-idaea*), mossberry (*Empetrum nigrum*), altai fescue (*Festuca altaica*), bear root (*Hedysarum alpinum*)



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Table 107: Seed mixture and fertilizer specifications for white spruce/black spruce (*Picea glauca*/*Picea mariana*) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	4	Slender wheatgrass <i>Agropyron pauciflorum</i>	2
Red top <i>Agrostis gigantea</i>	COMMON	4	Ticklegrass <i>Agrostis scabra</i>	1
			Bearded wheatgrass <i>Agropyron subsecundum</i>	2
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	7	Meadow foxtail <i>Alopecurus pratensis</i>	4
Reed canarygrass <i>Phalaris arundinacea</i>	PALATON or VANTAGE	5	Altai fescue <i>Festuca altaica</i>	3
Timothy <i>Phleum pratense</i>	CLIMAX	8	Violet wheatgrass <i>Agropyron violaceum</i>	4
Fowl bluegrass <i>Poa palustris</i>	COMMON	6	Fowl bluegrass <i>Poa palustris</i>	4
Alsike clover <i>Trifolium hybridum</i>	AURORA	5	Bear root <i>Hedysarum alpinum</i>	3
Total		39		23

FERTILIZER:

Nutrient requirement: Nitrogen (50kg N/ha) + Phosphate (100kg P₂O₅/ha) + Potash (50kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha 16-20-0 + 90kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 108: Site characteristics of willow/shrub birch (Salix/Betula glandulosa) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	lacustrine, fluvial
Modifier(s):	depressional to level
Drainage:	poor to imperfect
Soil Texture: (top 30cm): (>30cm)	organic to loam sandy loam to gravelly sand
Other Soil Properties (top 30cm): pH: Organic matter: CaCO ₃ : Available nutrients:	acid to neutral (pH: 5.6 - 6.3) moderate to high moderate N - low P - low K - moderate S - moderate

Comparable soils are deficient in nitrogen and phosphorus. If these nutrients are added in sufficient quantities, revegetation of these soils should not be a problem. The relatively high levels of organic matter indicate that selections which are adapted to organic soils should be included in the basic seed mixture.

Vegetation Community Description: Canopy is comprised of medium to tall shrubs, with a scattered occurrence of white or black spruce; dominant shrubs are shrub birch and several willows; other shrubs include blueberry, Labrador tea and shrubby cinquefoil; mossberry and lowbush cranberry are common dwarf shrubs; herb layer is limited in diversity, dominated by grasses such as bluejoint reedgrass and sedges.

Characteristic Species: shrub birch (Betula glandulosa), willows (Salix spp.), Labrador tea (Ledum groenlandicum, L. palustre), bluejoint reedgrass (Calamagrostis canadensis), sedges (Carex spp.)

Associated Species: shrubby cinquefoil (Potentilla fruticosa), lowbush cranberry (Vaccinium vitis-idaea), mossberry (Empetrum nigrum), northern bearberry (Arctostaphylos rubra), tufted hairgrass (Deschampsia caespitosa), ticklegrass (Agrostis scabra), cottongrass (Eriophorum spp.)



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Table 109: Seed mixture and fertilizer specifications for willow/shrub birch (*Salix/Betula glandulosa*) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	6	Violet wheatgrass <i>Agropyron violaceum</i>	4
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	8	Meadow foxtail <i>Alopecurus pratensis</i>	6
Tufted hairgrass <i>Deschampsia caespitosa</i>	NORTRAN	6	Tufted hairgrass <i>Deschampsia caespitosa</i>	3
Reed canarygrass <i>Phalaris arundinacea</i>	PALATON or VANTAGE	8	Fowl bluegrass <i>Poa palustris</i>	4
Timothy <i>Phleum pratense</i>	CLIMAX	8	Kentucky bluegrass <i>Poa pratensis</i>	5
Total		36		22

FERTILIZER:

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (100kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement:
500kg/ha 16-20-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 110: Site characteristics of tall willow/sedge (Salix/Carex) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	fluvial
Modifier(s):	very gently sloping
Drainage:	poor to imperfect
Soil Texture: (top 30cm): (>30cm)	organic organic
Other Soil Properties (top 30cm): pH: Organic matter: CaCO ₃ : Available nutrients:	neutral to alkaline (pH: 6.4 - 7.6) high very low N - moderate P - moderate K - moderate S - high

Soils underlying these communities will support vigorous growth of grass swards with only minimal nitrogen and phosphate application. The basic seed mixture must contain species adapted to organic soils and high moisture levels. Major problems are unlikely to occur in revegetation of these soils.

Vegetation Community Description: The tree overstory is usually restricted to various species of tall willows, but may include scattered balsam poplar; the shrub layer includes shorter willows, shrub birch, Labrador tea, shrubby cinquefoil and mossberry; northern bearberry is a prominent ground shrub; forbs are uncommon but graminoids include sedges, bluejoint reedgrass and tufted hairgrass.

Characteristic Species: willows (Salix alaxensis, S. arbusculoides, S. bebbiana, S. scouleriana), sedges (Carex spp.)

Associated Species: shrub birch (Betula glandulosa), Labrador tea (Ledum palustre), bluejoint reedgrass (Calamagrostis canadensis) shrubby cinquefoil (Potentilla fruticosa), lowbush cranberry (Vaccinium vitis-idaea), mossberry (Empetrum nigrum), northern bearberry (Arctostaphylos rubra), tufted hairgrass (Deschampsia caespitosa), bear root (Hedysarum alpinum)



*Guidelines for
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Table 111: Seed mixture and fertilizer specifications for tall willow/sedge (*Salix/Carex*) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	10	Meadow foxtail <i>Alopecurus pratensis</i>	5
Tufted hairgrass <i>Deschampsia caespitosa</i>	NORTRAN	8	Tufted hairgrass <i>Deschampsia caespitosa</i>	5
Reed canarygrass <i>Phalaris arundinacea</i>	PALATON or VANTAGE	10	Violet wheatgrass <i>Agropyron violaceum</i>	3
			Bearded wheatgrass <i>Agropyron subsecundum</i>	3
Timothy <i>Phleum pratense</i>	CLIMAX	8	Fowl bluegrass <i>Poa palustris</i>	6
Total		36		22

FERTILIZER:

Nutrient requirement: Nitrogen (75kg N/ha) + Phosphate (75kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 300kg/ha 23-23-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 112: Site characteristics of white spruce/balsam poplar (Picea glauca/Populus balsamifera) floodplain communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	lacustrine, fluvial
Modifier(s):	nearly level
Drainage:	imperfect to well
Soil Texture: (top 30cm): (>30cm)	silty clay silty sand; gravel
Other Soil Properties (top 30cm): pH: Organic matter: CaCO ₃ : Available nutrients:	neutral to slightly alkaline (pH: 6.6 - 7.4) low moderate N - low P - moderate K - high S - moderate

Sites having the above characteristics pose no major revegetation problems. If sufficient nitrogen is added at the time of seeding ground cover should be quickly reestablished. Seeding should be avoided during periods of potential flooding.

Vegetation Community Description: The open tree canopy is largely comprised of white spruce and balsam poplar; common shrubs include alder, willow, rose, shrubby cinquefoil and highbush cranberry; lowbush cranberry and kinnikinnick provide ground cover; legumes are not common but may include bear root and alpine milk vetch; graminoids such as sedges, rushes and numerous grasses are diverse but sparse.

Characteristic Species: white spruce (Picea glauca), balsam poplar (Populus balsamifera), alder (Alnus incana), willows (Salix spp.), bluejoint reedgrass (Calamagrostis canadensis), sedges (Carex spp.)

Associated Species: highbush cranberry (Viburnum edule), shrubby cinquefoil (Potentilla fruticosa), rose (Rosa acicularis), lowbush cranberry (Vaccinium vitis-idaea), tufted hairgrass (Deschampsia caespitosa), bear root (Hedysarum alpinum), alpine milk vetch (Astragalus alpinus), ticklegrass (Agrostis scabra)



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Table 113: Seed mixture and fertilizer specifications for white spruce/balsam poplar (*Picea glauca*/*Populus balsamifera*) floodplain community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Red top <i>Agrostis gigantea</i>	COMMON	4	Red top <i>Agrostis gigantea</i>	2
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	8	Tufted hairgrass <i>Deschampsia caespitosa</i>	3
Creeping red fescue <i>Festuca rubra</i>	BOREAL	6	Glaucous bluegrass <i>Poa glauca</i>	3
Reed canarygrass <i>Phalaris arundinacea</i>	PALATON or VANTAGE	5	Bearded wheatgrass <i>Agropyron subsecundum</i>	2
Timothy <i>Phleum pratense</i>	CLIMAX	8	Violet wheatgrass <i>Agropyron violaceum</i>	6
Fowl bluegrass <i>Poa palustris</i>	COMMON	3	Fowl bluegrass <i>Poa palustris</i>	3
Alsike clover <i>Trifolium hybridum</i>	AURORA	4	Bear root <i>Hedysarum alpinum</i>	1
			Mackenzie's hedysarum <i>Hedysarum Mackenzii</i>	1
Total		38		21

FERTILIZER:

Nutrient requirement: Nitrogen (90kg N/ha) + Phosphate (50kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha 23-23-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

3.0 TOPOGRAPHY BASED SEED MIXTURES

Results from revegetation trials throughout North America indicate that grass and legume selections developed for use in moderate climates have minimal long-term success and often decrease in vigour or die within three years on alpine sites (13,85). Consequently, successful revegetation of alpine and subalpine sites requires the use of seed mixtures containing selections adapted to the severe climate of the alpine and subalpine (13). Soil conditions can vary extensively, but severe climatic conditions constitute the major barrier to successful revegetation. Climatic factors which cause revegetation problems are high radiation, low summer temperatures, high winds, a short growing season and often, a precipitation shortage during the growing season (11,12).

Revegetation Region 5 contains substantial amounts of alpine and subalpine terrain within the area roughly bordered by McCabe Creek, Elsa and Dawson, while the area from Dawson to the Alaska border is nearly exclusively in the alpine or subalpine. Therefore, agronomic seed mixtures listed in Tables 114-115 include northern cultivars (34,59,60,64) developed for use in Alaska. These cultivars are expensive, but are more likely to survive than cultivars developed for use in less severe environments. The native Yukon selections listed in the native seed mixtures also indicated in these tables are in the process of development. Some are already available and others will soon be on the market.



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Table 114: Seed mixture and fertilizer specifications for subalpine environments

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	6	Bearded wheatgrass <i>Agropyron subsecundum</i>	2
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	4	Violet wheatgrass <i>Agropyron violaceum</i>	1
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	4		
Tufted hairgrass <i>Deschampsia caespitosa</i>	NORTRAN	4	Tufted hairgrass <i>Deschampsia caespitosa</i>	2
Sheep fescue <i>Festuca ovina</i>	COMMON	4	Sheep fescue <i>Festuca ovina</i>	2
			Red top <i>Agrostis gigantea</i>	1
Yellow lucerne <i>Medicago falcata</i>	ANIK	4	Arctic lupine <i>Lupinus arcticus</i>	1
Alpine bluegrass <i>Poa alpina</i>	COMMON or GRUENING	4	Alpine bluegrass <i>Poa alpina</i>	4
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	6	Glaucous bluegrass <i>Poa glauca</i>	4
Total		36		

FERTILIZER:**

Nutrient requirement: Nitrogen (80kg N/ha) + Phosphate (80kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement:
300kg/ha 28-28-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

**On sandy soil, Potassium sulphate, at the rate of 50kg K₂O/ha, may be required.

Table 115: Seed mixture and fertilizer specifications for alpine environments

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	6	Mountain timothy <i>Phleum commutatum</i>	3
Polargrass <i>Arctagrostis latifolia</i>	ALYESKA	2	Polargrass <i>Arctagrostis latifolia</i>	1
Tufted hairgrass <i>Deschampsia caespitosa</i>	NORTRAN	4	Tufted hairgrass <i>Deschampsia caespitosa</i>	2
			Ticklegrass <i>Agrostis scabra</i>	1
Sheep fescue <i>Festuca ovina</i>	COMMON	4	Sheep fescue <i>Festuca ovina</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	4	Alpine bluegrass <i>Poa alpina</i>	6
Alpine bluegrass <i>Poa alpina</i>	COMMON or GRUENING	6		
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	8	Glaucous bluegrass <i>Poa glauca</i>	4
Total		34		20

FERTILIZER:**

Nutrient requirement: Nitrogen (80kg N/ha) + Phosphate (80kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 350kg/ha 23-23-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

**On sandy soil, Potassium sulphate, at the rate of 50kg K₂O/ha, may be required.



4.0 MULTI-MICRO ENVIRONMENT SEED MIXTURES

The seed mixtures in Tables 116-118 are designed for use on projects which encompass a long but narrow stretch of land which needs revegetation. At the present time this primarily refers to the reseeding of roadsides, but if subsequent pipeline or powerline development were to occur, the mixtures would also be applicable.

Seed mixtures for lengthy linear projects must be of a more comprehensive nature than those formulated for projects which are confined to one or two relatively homogeneous microenvironments. Soils and climate will vary to some degree on such projects. Precise locations of changes in either soil or climate will not be demarcated

even if the general soil types and ecoregion climatic conditions are known. It is improbable that sufficient soil sampling will be done for definitive knowledge of the soils underlying each plant community and every part of the disturbed site. Also, it is not feasible, from a logistics point of view, to constantly change seed mixtures every few kilometers to account for minor shifts in growing conditions.

Seed mixtures must contain sufficient diversity in species to allow for all major microenvironments which may be encountered in the revegetation process. The mixtures in Tables 116-118 include a greater number of species than the mixtures for precisely defined disturbed sites, and total weight of seed per hectare is higher. Although every seed selection is not required at all locations en route, a complete range of species is necessary for overall success.

Table 116: Seed mixture and fertilizer specifications for linear project seeding from McCabe Creek to Stewart Crossing

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	4	Violet wheatgrass <i>Agropyron violaceum</i>	6
Smooth brome <i>Bromus inermis</i>	CARLTON	6		
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	8	Slender wheatgrass <i>Agropyron pauciflorum</i>	4
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	3
Creeping red fescue <i>Festuca rubra</i>	BOREAL	8	Northern fescue <i>Festuca saximontana</i>	2
			Glaucous bluegrass <i>Poa glauca</i>	5
Alfalfa <i>Medicago sativa</i>	DRYLANDER or RANGELANDER	2	Late yellow locoweed <i>Oxytropis campestris</i>	1
Fowl bluegrass <i>Poa palustris</i>	COMMON	2	Fowl bluegrass <i>Poa palustris</i>	2
Alsike clover <i>Trifolium hybridum</i>	AURORA	4	Arctic lupine <i>Lupinus arcticus</i>	2
Total		40		25

FERTILIZER:

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (120kg P₂O₅/ha) + Potash (60kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 500kg/ha 16-20-0 + 100kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.



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Table 117: Seed mixture and fertilizer specifications for linear project seeding from Stewart Crossing to Dawson or Elsa

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	6	Slender wheatgrass <i>Agropyron pauciflorum</i>	3
Smooth brome <i>Bromus inermis</i>	CARLTON	4	Violet wheatgrass <i>Agropyron violaceum</i>	8
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	5		
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	3
Creeping red fescue <i>Festuca rubra</i>	BOREAL	4	Northern fescue <i>Festuca saximontana</i>	2
Alfalfa <i>Medicago sp.</i>	ANIK or RANGELANDER	2	Late yellow locoweed <i>Oxytropis campestris</i>	1
Timothy <i>Phleum pratense</i>	CLIMAX	4	Bearded wheatgrass <i>Agropyron subsecundum</i>	2
			Fowl bluegrass <i>Poa palustris</i>	2
Kentucky bluegras <i>Poa pratensis</i>	NUGGET	5	Glaucous bluegrass <i>Poa glauca</i>	3
Alsike clover <i>Trifolium hybridum</i>	AURORA	4	Mackenzie's hedysarum <i>Hedysarum Mackenzii</i>	2
Total		40		26

FERTILIZER:

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (120kg P2O5/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 500kg/ha 16-20-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 118: Seed mixture and fertilizer specifications for linear project seeding from Dawson to the Alaska border

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Red top <i>Agrostis gigantea</i>	COMMON	2	Red top <i>Agrostis gigantea</i>	2
Polargrass <i>Arctagrostis latifolia</i>	ALYESKA	2	Meadow foxtail <i>Alopecurus pratensis</i>	2
Bering hairgrass <i>Deschampsia beringensis</i>	NORCOAST	4	Fowl bluegrass <i>Poa palustris</i>	2
Tufted hairgrass <i>Deschampsia caespitosa</i>	NORTRAN	4	Tufted hairgrass <i>Deschampsia caespitosa</i>	2
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	10	Sheep fescue <i>Festuca ovina</i>	5
Timothy <i>Phleum pratense</i>	ENGMO or KORPA	4	Macrourum wheatgrass <i>Agropyron macrourum</i>	2
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA or COMMON	4	Glaucous bluegrass <i>Poa glauca</i>	4
Alpine bluegrass <i>Poa alpina</i>	GRUENING or COMMON	6	Alpine bluegrass <i>Poa alpina</i>	3
Alsike clover <i>Trifolium hybridum</i>	TETRA or COMMON	4	Bear root <i>Hedysarum alpinum</i>	1
			Mackenzie's hedysarum <i>Hedysarum Mackenzii</i>	1
Total		40		24

FERTILIZER:

Nutrient Requirement: Nitrogen (100kg N/ha) + Phosphate (120kg P₂O₅/ha) + Potash (60kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 500kg/ha 16-20-0 + 100kg/ha 0-0-60

*Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.



5.0 SPECIFIC PROBLEM SEED MIXTURES

5.1 Highway Cut Slope Seed Mixtures

Highway cut slopes present one of the more difficult problems in northern reclamation. Initial instability must be corrected through physical techniques prior to the application of seed, fertilizer and mulch (89). The seed then applied is expected to germinate and produce vegetative cover on subsoil which can vary tremendously in physical and chemical properties, even on a small slope. For optimal results, site-specific soil sampling of the growth medium is essential, but, if not possible, then the mixtures indicated in Tables 119-120 can be used as guidelines for revegetation of sand or gravel and silty-clay cut slopes, respectively.

5.2 Saline Soil Seed Mixture

Saline soils are not common in the west-central part of Yukon. If revegetation of these areas is deemed critical, the mixtures in Table 121 can be used as guidelines. However, it must be remembered that until northern selections of alkaligrass (*Puccinellia* spp.) are developed there is not a truly satisfactory saline soil seed mixture available.

5.3 High Gravel Content Soil Seed Mixtures

The mixtures in Table 122 are designed for revegetation of sites which have a very high gravel content. If the addition of finer material to the growth medium is not possible, these sites will be difficult to revegetate successfully. However, within Region 5, there is likely to be a need for restoration of such sites. One possible application is the revegetation of disturbance caused by placer mining.

5.4 Sandy Soil Seed Mixtures

The mixtures in Table 123 are designed for revegetation of sites which have soil texture similar to that of the sand dunes found near Carcross. Comparable growth media are extremely difficult to revegetate, but the probability of encountering such sites in the proximity of the Klondike highway or Klondike River valley is minimal. However, the mixtures are included to indicate the optimal seed choices if pure sandy soils need revegetation.

Table 119: Seed mixture and fertilizer specifications for sand or gravel cut slopes

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Crested wheatgrass <i>Agropyron cristatum</i>	FAIRWAY	4	Yukon wheatgrass <i>Agropyron yukonense</i>	2
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	4	Bearded wheatgrass <i>Agropyron subsecundum</i>	2
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	6	Violet wheatgrass <i>Agropyron violaceum</i>	6
Smooth brome <i>Bromus inermis</i>	CARLTON	4		
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	4
Creeping red fescue <i>Festuca rubra</i>	BOREAL	6	Northern fescue <i>Festuca saximontana</i>	3
Alfalfa <i>Medicago sativa</i>	DRYLANDER or RANGELANDER	4	Late yellow locoweed <i>Oxytropis campestris</i>	1
			Mackenzie's hedysarum <i>Hedysarum Mackenzii</i>	1
Canada bluegrass <i>Poa compressa</i>	COMMON	3	Glaucous bluegrass <i>Poa glauca</i>	3
Total		37		22

FERTILIZER:

Nutrient requirement: Nitrogen (120kg N/ha) + Phosphate (120kg P₂O₅/ha) + Potash (100kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 500kg/ha 23-23-0 + 160kg/ha 0-0-60



* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

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Table 120: Seed mixture and fertilizer specifications for silty-clay cut slopes

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	8	Yukon wheatgrass <i>Agropyron yukonense</i>	2
			Bearded wheatgrass <i>Agropyron subsecundum</i>	4
Smooth brome <i>Bromus inermis</i>	CARLTON	8	Violet wheatgrass <i>Agropyron violaceum</i>	6
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	4	Sheep fescue <i>Festuca ovina</i>	4
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Glaucous bluegrass <i>Poa glauca</i>	4
Creeping red fescue <i>Festuca rubra</i>	BOREAL	6	Late yellow locoweed <i>Oxytropis campestris</i>	1
Alsike clover <i>Trifolium hybridum</i>	TETRA or COMMON	4	Showy locoweed <i>Oxytropis splendens</i>	1
Total		36		22

FERTILIZER:

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (80kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 450kg/ha 16-20-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 121: Seed mixture and fertilizer specifications for saline soils*

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Tall wheatgrass <i>Agropyron elongatum</i>	ORBIT	10	Violet wheatgrass <i>Agropyron violaceum</i>	4
Slender wheatgrass <i>Agropyron trachycaulum</i>	REVENUE	5	Bearded wheatgrass <i>Agropyron subsecundum</i>	2
Sheep fescue <i>Festuca ovina</i>	COMMON	5	Northern fescue <i>Festuca saximontana</i>	4
Alfalfa <i>Medicago sativa</i>	DRYLANDER or RANGELANDER	5	Late yellow locoweed <i>Oxytropis campestris</i>	1
			Showy locoweed <i>Oxytropis splendens</i>	1
Big bluegrass <i>Poa ampla</i>	SHERMAN	5	Big bluegrass <i>Poa ampla</i>	3
			Northern bluegrass <i>Poa alpigena</i>	2
Alkaligrass <i>Puccinellia sp.</i>	COMMON	5	Alkaligrass <i>Puccinellia sp.</i>	4
Total		35		21

FERTILIZER:

Nutrient requirement: Nitrogen (150kg N/ha) + Phosphate (100kg P2O5/ha)

Example of a commercial fertilizer which approximates the nutrient requirement; 500kg/ha 28-28-0

*There is not a truly satisfactory saline soil mixture available at present. The mixture indicated has some chance of success.

** Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.



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Table 122: Seed mixture and fertilizer specifications for high gravel content soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Smooth brome <i>Bromus inermis</i>	CARLTON	10	Violet wheatgrass <i>Agropyron. violaceum</i>	6
			Bearded wheatgrass <i>Agropyron. subsecundum</i>	2
Sheep fescue <i>Festuca ovina</i>	COMMON	8	Sheep fescue <i>Festuca ovina</i>	4
			Northern fescue <i>Festuca saximontana</i>	2
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	5	Glaucous bluegrass <i>Poa glauca</i>	5
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA or COMMON	5		
Alfalfa <i>Medicago sp.</i>	ANIK or RANGELANDER	3	Late yellow locoweed <i>Oxytropis campestris</i>	2
Canada bluegrass <i>Poa compressa</i>	COMMON	4	Canada bluegrass <i>Poa compressa</i>	2
Alsike clover <i>Trifolium hybridum</i>	TETRA or COMMON	3	Mackenzie's hedysarum <i>Hedysarum Mackenzii</i>	1
Total		38		24

FERTILIZER:

Nutrient requirement: Nitrogen (120kg N/ha) + Phosphate (120kg P₂O₅/ha) + Potash (100kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 480kg/ha 23-23-0 + 160kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 123: Seed mixture and fertilizer specifications for sandy soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Crested wheatgrass <i>Agropyron cristatum</i>	FAIRWAY	8	Crested wheatgrass <i>Agropyron cristatum</i>	4
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	4	Violet wheatgrass <i>Agropyron violaceum</i>	4
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Northern fescue <i>Festuca saximontana</i>	3
Alfalfa <i>Medicago sativa</i>	DRYLANDER or RANGELANDER	4	Late yellow locoweed <i>Oxytropis campestris</i>	2
			Arctic lupine <i>Lupinus arcticus</i>	2
Canada bluegrass <i>Poa compressa</i>	COMMON	5	Northern brome <i>Bromus Pumpellianus</i>	2
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA or COMMON	5	Glaucous bluegrass <i>Poa glauca</i>	3
Alkaligrass <i>Puccinellia sp.</i>	COMMON	4	Alkaligrass <i>Puccinellia sp.</i>	2
Total		36		22

FERTILIZER:

Nutrient requirment: Nitrogen (100kg N/ha) + Phosphate (120kg P2O5/ha) + Potash (100kg K2O)

Example of a commercial fertilizer which approximates the nutrient requirement: 500kg/ha 16-20-0 + 160kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.



1.0 REGION 6 - DEMPSTER HIGHWAY CORRIDOR

Revegetation Region 6, the Dempster Highway corridor and adjacent areas, is immediately north of Revegetation Region 5. The northern boundary of Revegetation Region 5 is also the southern boundary of Revegetation Region 6. The western boundary of Region 6 is the Yukon-Alaska border while the eastern boundary extends north-east from approximately Elsa to the Yukon-Northwest Territories border. The northern boundary extends from west to east across the 67th parallel. There are no significant population centres in Region 6, as it is located north of Dawson and Elsa, but is south of Old Crow. The largest centre of human activity in the region is the Eagle Plains Lodge. Revegetation Region 6 is depicted in Figure 20.

1.1 Climate

This region receives more precipitation than Region 5, directly to the south. In general, annual precipitation ranges from 263mm to 453mm, depending upon the location and year, but values as high as 496mm have been recorded at the Eagle Plain Lodge. Of this, from 209mm to 321mm occurs as rain (Environment Canada, unpublished data). Thus, precipitation during the growing season is adequate for successful revegetation.

Precipitation may be considerably higher in mountainous areas (70), but most of this occurs as snow in the winter, and thus has minimal impact upon successful revegetation.

Mean annual temperatures are typical for northern Yukon, ranging from -6.7°C to -9.6°C . However, there are temperature

extremes throughout the year, as January mean temperatures may fall below -35°C , and July mean temperatures can exceed 12°C . At the Eagle Plain Lodge, the mean temperature from May to September is 10°C ; adequate for revegetation purposes (Environment Canada, unpublished data).

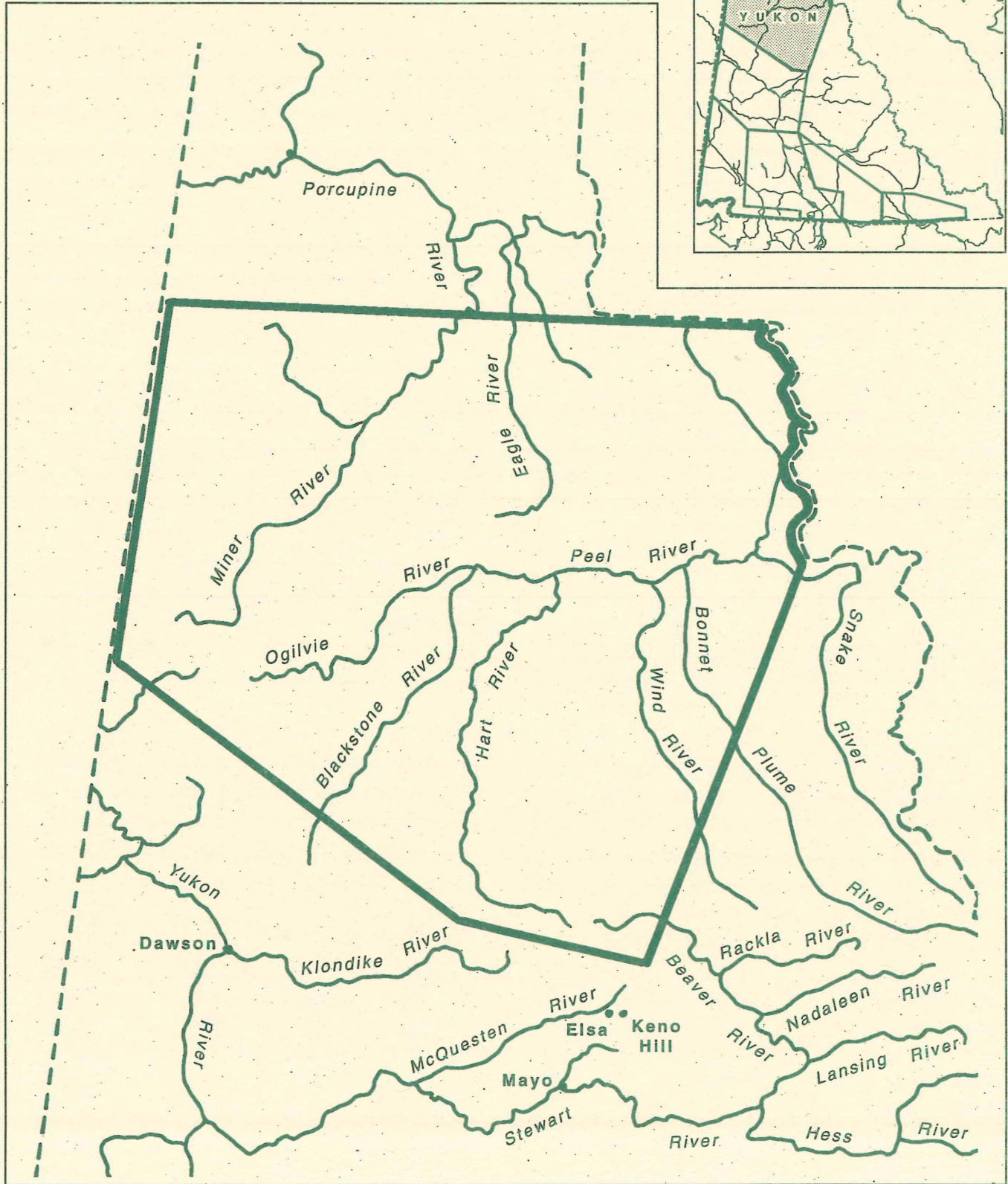
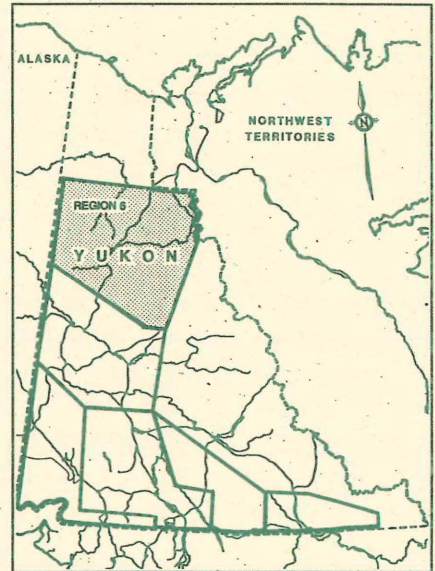
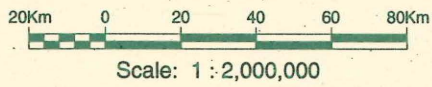
1.2 Landforms and Soils

Region 6 covers parts of four ecoregions and physiography is highly variable. As you travel north on the Dempster Highway you traverse the South Ogilvie Mountains, the most westerly extenuation of the Mackenzie Mountains Ecoregion. These rugged mountains often exceed 1500 m in elevation with deeply incised valleys. The Southern Ogilvies and the Richardson Mountains at the point where the Dempster Highway exits from the Yukon were subject to glaciation. The North Ogilvie Mountains Ecoregion, beyond Engineer Creek, as well as the Eagle Plains Ecoregion have never been glaciated. The limited areas of glaciation are a major terrain distinction of Region 6.

Flat topped peaks between 900 and 1350 m elevation are typical in the North Ogilvie Mountains along with deeply cut river valleys often descending to below 600 m. The Eagle Plains consist of undulating ridges between 300 to 600 m. in elevation. With no glacial activity to reorganize the landscape, typical landforms are colluvial, fluvial or organic in origin. There also exists a whole suite of periglacial phenomena such as stone stripes, stone circles and nets, frost oriented stones, mudboils and solifluction. High ice content features such as ice



DETAIL REGION 6



wedge polygons are of particular interest for highway construction. These preglacial phenomena are not confined to the unglaciated areas but are part of the South Ogilvie and Richardson Mountains as well. Soils in Region 6 are highly variable with permafrost as a common feature. Organic soils are common in lowland areas, while upland sites in the unglaciated portion commonly have a silty texture. Long ages of weathering 'in situ' of marine shales, siltstone and other sedimentary rocks have mantled the landscape with a fine textured soils. In mountainous regions fluvial and colluvial processes control deposition patterns with bedrock and scree typical landscape constituents.

Permafrost is less of a factor on well-drained south facing slopes, well-drained coarse fluvial deposits and soils adjacent to flowing water. Soils not classified as organic may vary from sand to silt, but clay soils are common beneath thick organic layers (70, 117).

Minimal soil chemical analysis has been undertaken in this region (100, 116, 117). However, this limited analysis suggests that soil characteristics relevant for revegetation are as follows. The majority of mineral soils in this region are generally slightly acid and have pH values between 4.8 and 6.0. Nonetheless, soil analysis has indicated that pH of mineral soils can vary from highly acid, with values as low as 3.15 (117), to alkaline, with values up to 7.6 (100). Organic soils are highly acid, with pH values at some locations decreasing to below 3.0 (117). CaCO_3 levels are variable, while organic matter varies tremendously, ranging from minimal amounts on some alpine sites, to high amounts on lower elevation sites which are predominantly organic. Electrical conductivity and salinity levels are low (100).

Plant nutrient levels are comparable to those which occur in more southerly regions of Yukon Territory. Phosphorus and nitrogen levels are consistently low. These nutrients must be added in all revegetation programs unless extensive soil sampling has shown them to be unnecessary on any given site. In contrast, potassium and sulphur levels vary from moderate to high. Only in some isolated cases will supplemental potassium or sulphur be beneficial for successful revegetation (100).

1.3 Vegetation

The majority of Revegetation Region 6 is in the Alpine Forest-Tundra section of the Boreal Forest Region of Canada. However, the most southerly parts are in the Dawson and Eastern Yukon sections of the Boreal Forest Region, while a small intrusion in the north-east is in the Lower Mackenzie section of the Boreal Forest Region (26, 77).

Region 6 primarily encompasses the North Klondike, Eagle Plain and Peel River Ecoregions, but also includes small sections of the Berry Creek, and Northern Mountains and Coastal Plain Ecoregions in the north. In the south-east it includes the western half of the Wernecke Mountains Ecoregion and a minute portion of the South Ogilvie Mountains Ecoregion (70).

Much of Revegetation Region 6 is within tundra. However, trees do occur at lower elevations. The treeline decreases in elevation from south to north and can occur at elevations from 450m to 1200m, depending upon the ecoregion. White spruce (*Picea glauca*) occurs in open stands



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and in well-drained valley bottoms. Black spruce (*P. mariana*), which is common on low elevation wetlands, is the most common tree in Revegetation Region 6. The black spruce may be associated with tamarack (*Larix laricina*) in wetlands or on permafrost slopes. Paper birch (*Betula papyrifera*) is sparse, but occurs as a minor component of either white or black spruce stands. Aspen (*Populus tremuloides*) and balsam poplar (*P. balsamifera*) are limited, but do occur on some warmer sites and active floodplains. Subalpine fir (*Abies lasiocarpa*), which occurs near treeline, is uncommon (70, 115).

In the understory, willows (*Salix* spp.), shrub birch (*Betula glandulosa*), alder (*Alnus crispa* and *A. incana*) and Labrador tea (*Ledum palustre*) are the most common shrubs. Other shrubs which have a wide-spread distribution include rose (*Rosa acicularis*), Alaska spiraea (*Spiraea Beauverdiana*) and bog blueberry (*Vaccinium uliginosum*). Less common are cassandra (*Chamaedaphne calyculata*), shrubby cinquefoil (*Potentilla fruticosa*), soapberry (*Shepherdia canadensis*), highbush cranberry (*Viburnum edule*), raspberry (*Rubus idaeus*), and two species of currant (*R. triste* and *R. hudsonianum*) (115, 117). The most prominent species in the dwarf/ground shrub layer are lowbush cranberry (*Vaccinium vitis-idaea*); and mossberry (*Empetrum nigrum*). Other common dwarf shrubs include northern and alpine bearberry (*Arctostaphylos rubra* and *A. alpina*), cloudberry (*Rubus chamaemorus*) and dwarf birch (*Betula nana*). Less common dwarf shrubs include lapland rosebay (*Rhododendron lapponicum*), bog rosemary (*Andromeda polifolia*) and bog cranberry (*Oxycoccus microcarpus*). At higher elevations, various

species of prostrate willow (*Salix* spp.), alpine azalea (*Loiseleuria procumbens*), white heather (*Cassiope tetragona*) and mountain avens (*Dryas octopetala* and *D. integrifolia*) are common (115, 117).

The grass flora is diverse in the southern parts of Revegetation Region 6, but this diversity decreases from south to north. Bluejoint reedgrass (*Calamagrostis canadensis*), tufted hairgrass (*Deschampsia caespitosa*), glaucous bluegrass (*Poa glauca*), northern bluegrass (*Poa alpigena*) and polargrass (*Arctagrostis latifolia*) are typical throughout Region 6. Altai fescue (*Festuca altaica*) and sweetgrass (*Hierochloa odorata*) are less common.

In the more southerly South and North Ogilvie Mountains Ecoregions various wheatgrasses such as *Agropyron pauciflorum*, *A. violaceum* and *A. macrourum* are common. Some sporadic plants of northern bromegrass (*Bromus Pumpellianus*) and hairy wild ryegrass (*Elymus innovatus*) also occur in these ecoregions.

Alpine bluegrass (*Poa alpina*) and arctic bluegrass (*P. arctica*) are the most common grasses in the alpine. Mountain timothy (*Phleum commutatum*), alpine sweetgrass (*Hierochloa odorata*) and spike trisetum (*Trisetum spicatum*) also occur at high elevation sites (115).

On disturbed sites, ticklegrass (*Agrostis scabra*) and several species of alkaligrass (*Puccinellia* spp.) are common invaders. Also, at some locations, weedy species such as foxtail barley (*Hordeum jubatum*) and little foxtail (*Alopecurus aequalis*) occur on disturbed sites (115).

Legumes provide minimal ground cover in Revegetation Region 6. On more stable sites, arctic lupine (Lupinus arcticus) and bear root (Hedysarum alpinum). On disturbed sites, three species of locoweed (Oxytropis splendens, O. campestris and O. nigrescens), and alpine milk vetch (Astragalus alpinus), are locally abundant. Another species of milk vetch, Astragalus umbellatus, occurs throughout the region, both on disturbed and undisturbed sites (115).

2.0 PLANT COMMUNITY BASED SEED MIXTURES

In most instances, undisturbed native plant communities provide a good indication of the underlying soil properties. The correlative relationship between soil characteristics such as pH, texture, moisture retention, salinity, etc. and the composition of the native plant community can be used as a guide for revegetation of adjacent disturbed areas if detailed soil analyses are unavailable.

In the following guidelines, the major plant communities which characterize the region have been used to indicate, in a general nature, the type of soil properties which may be encountered. Due to previous revegetation studies (94, 100) conducted in

the region in the course of pipeline proposals, soil-plant community data have been developed from which appropriate seed mixtures for disturbed sites in these plant communities have been formulated. However, if at all possible, information from analyses of soil samples taken from the actual site requiring revegetation should be utilized in the formulation of appropriate seed mixtures.

Tables 124-141 are paired tables of complementary information prepared for each of the nine major plant communities found at moderate elevations in this region. The first table in each pair lists pertinent site characteristics associated with each community, while the second table lists current and future seed mixtures for revegetation. The severe climate of Revegetation Region 6 limits the utility of many of the agronomic varieties proposed for use in more southerly parts of Yukon Territory. Thus, approximately 50% of the varieties recommended for use in Region 6 have been developed in Alaska for use in harsh environments. Fertilizer recommendations are given.

N.P. Figure 17 illustrates in cross section the plant communities and landform relationships common to the Eagle Plains portion of the Dempster Corridor.



VEGETATION COMMUNITY

<i>sedge willows</i>	<i>black / white spruce</i>	<i>black spruce bog</i>	<i>balsam poplar / willow</i>	<i>black spruce</i>	<i>sedge tussock tundra</i>	<i>shrub birch / willow</i>	<i>black spruce</i>	<i>shrub birch / willow / prostrate shrubs</i>
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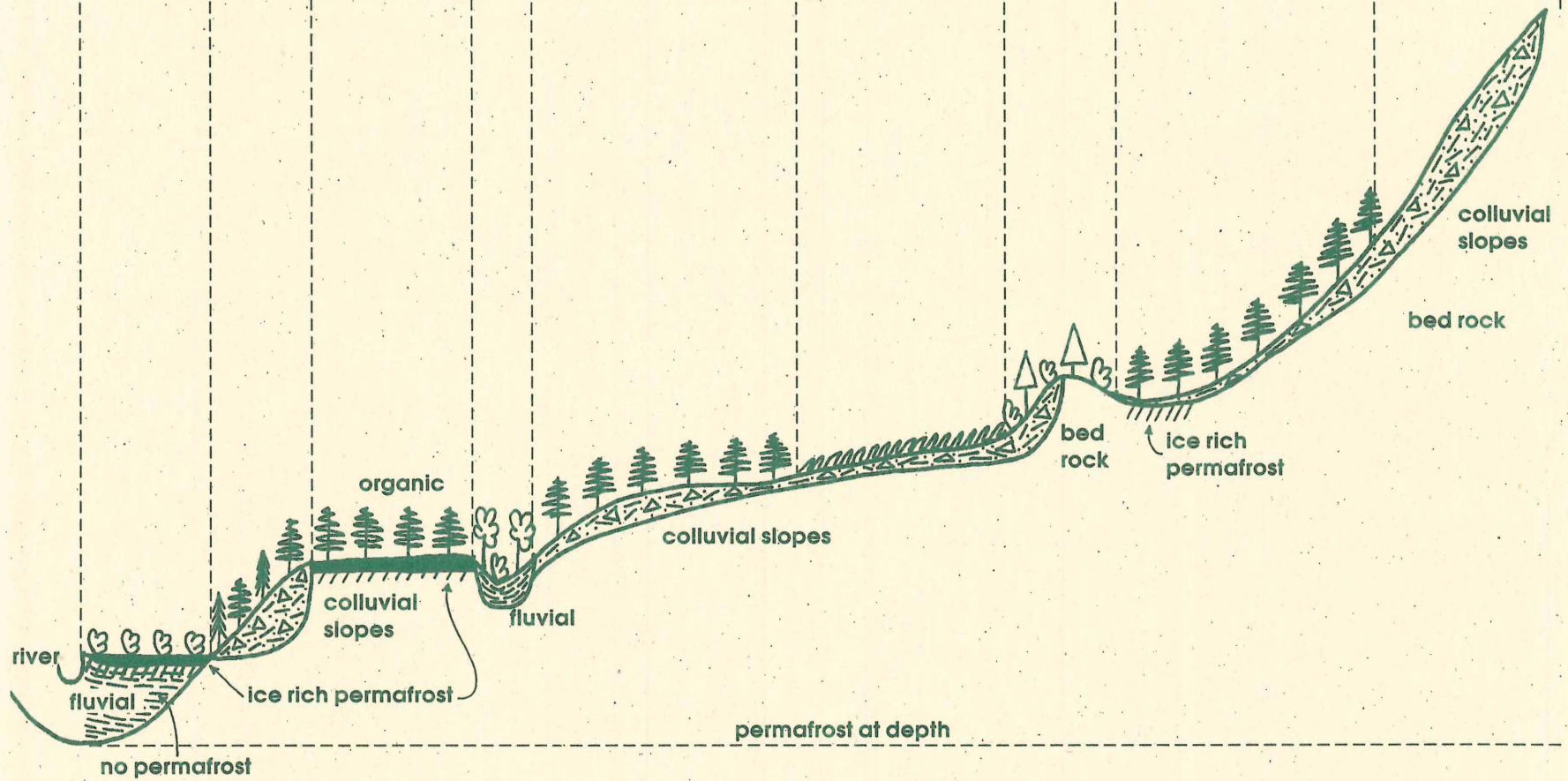


Figure 17 : Vegetation and Landform Relationship
 REGION 6 - Dempster Highway Corridor - Eagle Plains Section

Table 124: Site characteristics of black spruce (*Picea mariana*) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s)*:	fluvial, glaciofluvial, colluvial
Modifier(s):	depressional to level, some moderate slopes
Drainage:	very poor to poor
Soil Texture: (top 30cm): (>30cm)	organic (PT) clay, silt or sand (CL)
Other Soil Properties (top 30cm): pH: Organic matter: CaCO ₃ : Available nutrients:	extremely acid to strongly acid (pH: 3.2 - 5.5) very high very low N - low P - very low K - low to moderate S - low
<p>Note: Glacial landforms occur in the South Ogilvie's, the North Ogilvie's only to Engineer Creek and some parts of the Richardson Mountains.</p>	

Such organic soils will require the inclusion of selections in the basic seed mixture which are adapted to organic soils. High levels of nitrogen and phosphorus will need to be added, and potassium may be required at some locations.

Vegetation Community Description: Black spruce dominates the tree canopy which may also include limited amounts of tamarack or paper birch; a wide range of shrubs and ground shrubs includes Labrador tea, willow, bog blueberry, lowbush cranberry, cloudberry, mossberry and bog rosemary; forbs and graminoids are limited - the most common are sedges, horsetails, cottongrass and bluejoint reedgrass; mosses are common.

Characteristic Species: black spruce (*Picea mariana*), willows (*Salix* spp.), Labrador tea (*Ledum palustre*), sedges (*Carex* spp.), bluejoint reedgrass (*Calamagrostis canadensis*)

Associated Species: tamarack (*Larix laricina*), paper birch, lowbush cranberry (*Vaccinium vitis-idaea*), cloudberry (*Rubus chamaemorus*), mossberry (*Empetrum nigrum*), bog blueberry (*Vaccinium uliginosum*), bog rosemary (*Andromeda polifolia*), cottongrass (*Eriophorum vaginatum*), sphagnum moss (*Sphagnum* spp.), feathermoss (*Hylocomium splendens*), wetland moss (*Aulacomnium palustre*)



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Table 125: Seed mixture and fertilizer specifications for black spruce (*Picea mariana*) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Red top <i>Agrostis gigantea</i>	COMMON	2	Red top <i>Agrostis gigantea</i>	2
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	8	Meadow foxtail <i>Alopecurus pratensis</i>	4
Polargrass <i>Arctagrostis latifolia</i>	ALYESKA	2	Macrourum wheatgrass <i>Agropyron macrourum</i>	3
Bluejoint reedgrass <i>Calamagrostis canadensis</i>	SOURDOUGH	2		
Reed canarygrass <i>Phalaris arundinacea</i>	PALATON or VANTAGE	2		
Bering hairgrass <i>Deschampsia beringensis</i>	NORCOAST	8	Tufted hairgrass <i>Deschampsia caespitosa</i>	4
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	4	Northern bluegrass <i>Poa alpigena</i>	2
Timothy <i>Phleum pratense</i>	ENGMO	8	Altai fescue <i>Festuca altaica</i>	4
Fowl bluegrass <i>Poa palustris</i>	COMMON	4	Fowl bluegrass <i>Poa palustris</i>	4
Total		40		23

FERTILIZER:

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (120kg P₂O₅/ha) + Potash (40kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 450kg/ha 23-23-0 + 75kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 126: Site characteristics of tamarack (*Larix laricina*) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	glaciofluvial, lacustrine, organic features
Modifier(s):	depressional to level
Drainage:	poor to imperfect
Soil Texture: (top 30cm): (>30cm)	organic (PT) clay and silt (OL)
Other Soil Properties (top 30cm): pH: Organic matter: CaCO ₃ : Available nutrients:	extremely acid to medium acid (pH:4.0 - 6.0) very high very low N - low P - very low K - low to moderate S - low to moderate

Such soils will require the inclusion of selections in the basic seed mixture which are adapted to highly acidic organic soils. High levels of nitrogen and phosphorus will need to be added; potassium may be required at some locations. However, if these criteria are met, only excessive precipitation during the seeding window will cause major revegetation problems on such sites.

Vegetation Community Description: Tamarack dominates a sparse tree canopy, which usually includes scattered black spruce; shrubs are limited in diversity, and include Labrador tea, willows, bog blueberry, shrub birch; the ground shrub layer is dense and includes lowbush cranberry, bog cranberry, mossberry, cloudberry and the occasional dwarf birch; forbs, which include coltsfoot and graminoids are low in frequency and occurrence.

Characteristic Species: tamarack (*Larix laricina*), willows (*Salix* spp.), Labrador tea (*Ledum palustre*), lowbush cranberry (*Vaccinium vitis-idaea*), shrub birch (*Betula glandulosa*)

Associated Species: black spruce (*Picea mariana*), bog blueberry (*Vaccinium uliginosum*), mossberry (*Empetrum nigrum*), bog cranberry (*Oxycoccus microcarpus*), cloudberry (*Rubus chamaemorus*), coltsfoot (*Petasites frigidus*), Sphagnum moss (*Sphagnum* spp.)



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Table 127: Seed mixture and fertilizer specifications for tamarack (*Larix laricina*) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Red top <i>Agrostis gigantea</i>	COMMON	2	Red top <i>Agrostis gigantea</i>	2
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	8	Meadow foxtail <i>Alopecurus pratensis</i>	4
Polargrass <i>Arctagrostis latifolia</i>	ALYESKA	3	Macrourum wheatgrass <i>Agropyron macrourum</i>	3
Bluejoint reedgrass <i>Calamagrostis canadensis</i>	SOURDOUGH	3		
Bering hairgrass <i>Deschampsia beringensis</i>	NORCOAST	8	Tufted hairgrass <i>Deschampsia caespitosa</i>	4
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	4	Northern bluegrass <i>Poa alpigena</i>	2
Timothy <i>Phleum pratense</i>	ENGMO	8	Altai fescue <i>Festuca altaica</i>	4
Fowl bluegrass <i>Poa palustris</i>	COMMON	4	Fowl bluegrass <i>Poa palustris</i>	4
Total		40		23

FERTILIZER:

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (120kg P₂O₅/ha) + Potash (40kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 500kg/ha 23-23-0 + 75kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 128: Site characteristics of white spruce (*Picea glauca*) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	glaciofluvial, morainal, fluvial, colluvial
Modifier(s):	gently rolling to steep
Drainage:	imperfect to well
Soil Texture: (top 30cm): (>30cm)	organic and sand or clay (OH) clay loam to coarse sand (SC)
Other Soil Properties (top 30cm): pH: Organic matter: CaCO ₃ : Available nutrients:	very strongly acid to neutral (pH: 4.6 - 7.1) moderate low to high N - very low P - very low K - moderate to high S - low to high

The variability in pH indicates that a wide range of species are required in the seed mixture. Fertilization rates must be sufficient to compensate for the very low levels of nutrients in these soils.

Vegetation Community Description: White spruce dominates the tree canopy, which frequently includes; paper birch or balsam poplar; shrubs include soapberry, rose, alder, shrubby cinquefoil and willows; ground shrubs include northern bearberry, lowbush cranberry and mossberry; arctic lupine, bluejoint reedgrass, fireweed, bear root and horsetails are common herbs. Feather mosses are characteristic on closed canopy sites.

Characteristic Species: white spruce (*Picea glauca*), arctic lupine (*Lupinus arcticus*), soapberry (*Shepherdia canadensis*), northern bearberry (*Arctostaphylos rubra*), willows (*Salix* spp.), bluejoint reedgrass (*Calamagrostis canadensis*)

Associated Species: paper birch (*Betula papyrifera*), rose (*Rosa acicularis*), Labrador tea (*Ledum palustre*), lowbush cranberry (*Vaccinium vitis-idaea*), alder (*Alnus incana*), horsetails (*Equisetum* spp.), bear root (*Hedysarum alpinum*), shrubby cinquefoil (*Potentilla fruticosa*), feathermoss (*Hylocomium splendens*)



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Table 129: Seed mixture and fertilizer specifications for white spruce (*Picea glauca*) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	3	Slender wheatgrass <i>Agropyron pauciflorum</i>	2
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	5	Macrourum wheatgrass <i>Agropyron macrourum</i>	5
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	7	Tufted hairgrass <i>Deschampsia caespitosa</i>	3
Alfalfa <i>Medicago sativa</i>	RANGELANDER	4	Bear root <i>Hedysarum alpinum</i>	2
Timothy <i>Phleum pratense</i>	ENGMO	4	Fowl bluegrass <i>Poa palustris</i>	2
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	4	Glaucous bluegrass <i>Poa glauca</i>	4
Kentucky bluegrass <i>Poa pratensis</i>	NUGGET	4	Northern bluegrass <i>Poa alpigena</i>	2
Alsike clover <i>Trifolium hybridum</i>	TETRA	4	Arctic lupine <i>Lupinus arcticus</i>	2
Total		41		25

FERTILIZER:

Nutrient requirement: Nitrogen (130g N/ha) + Phosphate (130kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 500kg/ha 28-28-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 130: Site characteristics of white spruce/black spruce/paper birch (*Picea glauca*/*P. mariana*/*Betula papyrifera*) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	morainal, glaciofluvial, colluvial
Modifier(s):	nearly level to steep
Drainage:	imperfect to moderately well
Soil Texture: (top 30cm): (>30cm)	organic and clay (OH) clay to sandy gravel (SC)
Other Soil Properties (top 30cm):	
pH:	extremely acid to neutral (pH: 3.6 - 6.5)
Organic matter:	moderate to high
CaCO₃:	low
Available nutrients:	N - low to moderate P - low K - moderate S - low

Undisturbed organic, acidic sites would be difficult to revegetate. However, most disturbed sites will have the relatively shallow organic layer mixed with more favourable mineral soil; thus, there are no major difficulties foreseen in revegetation if the initial fertilization is adequate.

Vegetation Community Description: White spruce dominates the tree canopy but black spruce and/or paper birch are commonly present; a diverse shrub layer includes Labrador tea, willow, alder, Alaska spiraea, rose, black currant, lowbush cranberry, cloudberry, mossberry and twinflower; the herb stratum is limited in diversity; bluejoint reedgrass and polargrass are common. Moss and lichen cover is low.

Characteristic Species: white spruce (*Picea glauca*), black spruce (*P. mariana*), paper birch (*Betula papyrifera*), willows (*Salix* spp.), Labrador tea (*Ledum palustre*), lowbush cranberry (*Vaccinium vitis-idaea*), bluejoint reedgrass (*Calamagrostis canadensis*)

Associated Species: Alaska spiraea (*Spiraea Beauverdiana*), mossberry (*Empetrum nigrum*), alder (*Alnus incana*), rose (*Rosa acicularis*), twinflower (*Linnaea borealis*), cloudberry (*Rubus chamaemorus*), black currant (*Ribes hudsonianum*), polargrass (*Arctagrostis latifolia*)



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Table 131: Seed mixture and fertilizer specifications for white spruce/black spruce/paper birch (*Picea glauca*/*P. mariana*/*Betula papyrifera*) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	4	Slender wheatgrass <i>Agropyron pauciflorum</i>	2
Red top <i>Agrostis gigantea</i>	COMMON	2	Red top <i>Agrostis gigantea</i>	2
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	4	Glaucous bluegrass <i>Poa glauca</i>	4
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	6	Meadow foxtail <i>Alopecurus pratensis</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	8	Tufted hairgrass <i>Deschampsia caespitosa</i>	3
Timothy <i>Phleum pratense</i>	ENGMO	6	Macrourum wheatgrass <i>Agropyron macrourum</i>	5
Fowl bluegrass <i>Poa palustris</i>	COMMON	3	Fowl bluegrass <i>Poa palustris</i>	2
Alsike clover <i>Trifolium hybridum</i>	TETRA	6	Bear root <i>Hedysarum alpinum</i>	3
Total		39		24

FERTILIZER:

Nutrient requirement: Nitrogen (80kg N/ha) + Phosphate (100kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 500kg/ha 16-20-0

: 60kg/ha 0-0-60 to be added only if a shortage of K has been indicated in the soil analysis

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 132: Site characteristics of balsam poplar (*Populus balsamifera*) floodplain communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	fluvial
Modifier(s):	nearly level
Drainage:	well to rapid
Soil Texture: (top 30cm): (>30cm)	sand (SM) sand to gravel (GM)
Other Soil Properties (top 30cm): pH: Organic matter: CaCO ₃ : Available nutrients:	neutral to slightly alkaline (pH: 6.3 - 7.4) low moderate N - low P - moderate K - high S - moderate

Sites having the above characteristics pose no major revegetation problems. If sufficient nitrogen is added at the time of seeding ground cover should be quickly reestablished. Seeding should be avoided during periods of potential flooding.

Vegetation Community Description: The open tree canopy is comprised mainly of balsam poplar, with occasional occurrence of white spruce and aspen; common shrubs include alder, willows, rose, soapberry and highbush cranberry; lowbush cranberry and northern bearberry provide ground cover; common forbs are horsetail, larkspur, bear root and arctic lupine; graminoids include tufted hairgrass, bluejoint reedgrass, violet wheatgrass, slender wheatgrass, sedges, and rushes.

Characteristic Species: balsam poplar (*Populus balsamifera*), alder (*Alnus incana*), willows (*Salix pulchra* & *S. alaxensis*), bluejoint reedgrass (*Calamagrostis canadensis*), horsetail (*Equisetum arvense*), sedges (*Carex* spp.).

Associated Species: white spruce (*Picea glauca*), highbush cranberry (*Viburnum edule*), soapberry (*Shepherdia canadensis*), rose (*Rosa acicularis*), lowbush cranberry (*Vaccinium vitis-idaea*), tufted hairgrass (*Deschampsia caespitosa*), bear root (*Hedysarum alpinum*), arctic lupine (*Lupinus arcticus*), larkspur (*Delphinium glaucum*)



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Table 133: Seed mixture and fertilizer specifications for balsam poplar (*Populus balsamifera*) floodplain community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Red top <i>Agrostis gigantea</i>	COMMON	3	Red top <i>Agrostis gigantea</i>	3
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	6	Macrourum wheatgrass <i>Agropyron macrourum</i>	3
Bering hairgrass <i>Deschampsia beringensis</i>	NORCOAST	6	Tufted hairgrass <i>Deschampsia caespitosa</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	8	Glaucous bluegrass <i>Poa glauca</i>	3
Timothy <i>Phleum pratense</i>	ENGMO	8	Slender wheatgrass <i>Agropyron pauciflorum</i>	4
Fowl bluegrass <i>Poa palustris</i>	COMMON	3	Fowl bluegrass <i>Poa palustris</i>	3
Alsike clover <i>Trifolium hybridum</i>	TETRA	4	Bear root <i>Hedysarum alpinum</i>	1
			Mackenzie's hedysarum <i>Hedysarum Mackenzii</i>	1
Total		38		21

FERTILIZER:

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (80kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha 23-23-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 134: Site characteristics of willow/shrub birch (*Salix/Betula glandulosa*) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	lacustrine, fluvial
Modifier(s):	depressional to level
Drainage:	poor to imperfect
Soil Texture: (top 30cm): (>30cm)	organic (some clay loam) (PT) clay loam (CL)
Other Soil Properties (top 30cm): pH: Organic matter: CaCO ₃ : Available nutrients:	extremely acid to slightly acid (pH: 3.3 - 5.8) moderate to high moderate N - low P - low K - moderate S - moderate

Comparable soils are deficient in nitrogen and phosphorus. If these nutrients are added in sufficient quantities, revegetation of these soils should not be a problem. The relatively high levels of organic matter indicate that selections which are adapted to organic soils should be included in the basic seed mixture.

Vegetation Community Description: The canopy is comprised of medium and tall shrubs; trees are limited to the occasional stunted white or black spruce; dominant shrubs are shrub birch and several willows; other shrubs include bog blueberry, Labrador tea and shrubby cinquefoil; cloudberry, mossberry and lowbush cranberry are common ground shrubs; herbs are low in diversity and frequency; to bluejoint reedgrass, cottongrass and tufted hairgrass.

Characteristic Species: shrub birch (*Betula glandulosa*), willows (*Salix* spp.), Labrador tea (*Ledum palustre*), bog blueberry (*Vaccinium uliginosum*), cottongrass (*Eriophorum* spp.), bluejoint reedgrass (*Calamagrostis canadensis*), cloudberry (*Rubus chamaemorus*)

Associated Species: shrubby cinquefoil (*Potentilla fruticosa*), lowbush cranberry (*Vaccinium vitis-idaea*), mossberry (*Empetrum nigrum*), northern bearberry (*Arctostaphylos rubra*), tufted hairgrass (*Deschampsia caespitosa*)



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Table 135: Seed mixture and fertilizer specifications for willow/shrub birch (*Salix/Betula glandulosa*) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	8	Meadow foxtail <i>Alopecurus pratensis</i>	5
Bering hairgrass <i>Deschampsia beringensis</i>	NORCOAST	6	Tufted hairgrass <i>Deschampsia caespitosa</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	8	Macrourum wheatgrass <i>Agropyron macrourum</i>	3
Reed canarygrass <i>Phalaris arundinacea</i>	PALATON or VANTAGE	4	Slender wheatgrass <i>Agropyron pauciflorum</i>	2
Timothy <i>Phleum pratense</i>	ENGMO	8	Northern bluegrass <i>Poa alpigena</i>	4
Fowl bluegrass <i>Poa palustris</i>	COMMON	4	Fowl bluegrass <i>Poa palustris</i>	4
Alsike clover <i>Trifolium hybridum</i>	TETRA	2	Bear root <i>Hedysarum alpinum</i>	1
Total		40		22

FERTILIZER:

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (100kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha 28-28-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 136: Site characteristics of riverine willow (*Salix* spp.) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	fluvial
Modifier(s):	depressional to level
Drainage:	poor to imperfect
Soil Texture: (top 30cm): (>30cm)	silt and sand (SM) sand to gravel (SW)
Other Soil Properties (top 30cm): pH: Organic matter: CaCO ₃ : Available nutrients:	 very strongly acid to neutral(pH: 4.8 - 7.2) low low N - low P - low K - moderate S - moderate

Soils underlying these communities will support vigorous growth of grass swards if sufficient nitrogen and phosphate are applied. The basic seed mixture must contain species adapted to acid soils and high moisture levels. Other revegetation problems are minimal.

Vegetation Community Description: The overstory is dominated by tall and medium willow, but may also include scattered shrub birch and alder; other shrubs include Labrador tea, shrubby cinquefoil and bog blueberry; mossberry, nagoonberry and northern bearberry are prominent ground shrubs; common herbs include horsetail and larkspur and graminoids such as sedges, bluejoint reedgrass and northern bluegrass.

Characteristic Species: willows (*Salix pulchra*), horsetail (*Equisetum arvense*), larkspur (*Delphinium glaucum*), sedges (*Carex* spp.)

Associated Species: shrub birch (*Betula glandulosa*), Labrador tea (*Ledum palustre*), bog blueberry (*Vaccinium uliginosum*), bluejoint reedgrass (*Calamagrostis canadensis*), shrubby cinquefoil (*Potentilla fruticosa*), northern bearberry (*Arctostaphylos rubra*), mossberry (*Empetrum nigrum*), nagoonberry (*Rubus arcticus*), northern bluegrass (*Poa alpigena*)



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Table 137: Seed mixture and fertilizer specifications for riverine willow (*Salix* spp.) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	6	Meadow foxtail <i>Alopecurus pratensis</i>	3
Bering hairgrass <i>Deschampsia caespitosa</i>	NORCOAST	8	Tufted hairgrass <i>Deschampsia caespitosa</i>	5
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	6	Glaucous bluegrass <i>Poa glauca</i>	3
Reed canarygrass <i>Phalaris arundinacea</i>	PALATON or VANTAGE	8	Macrourum wheatgrass <i>Agropyron macrourum</i>	2
			Bearded wheatgrass <i>Agropyron subsecundum</i>	2
Timothy <i>Phleum pratense</i>	ENGMO	8	Northern bluegrass <i>Poa alpigena</i>	4
Fowl bluegrass <i>Poa palustris</i>	COMMON	4	Fowl bluegrass <i>Poa palustris</i>	4
Total		40		23

FERTILIZER:

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (100kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha
23-23-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 138: Site characteristics of cottongrass/Labrador tea (*Eriophorum/Ledum palustre*) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	lacustrine, organic features
Modifier(s):	depressional to level
Drainage:	poor to imperfect
Soil Texture: (top 30cm): (>30cm)	peat (PT) sand to gravel (SP)
Other Soil Properties (top 30cm):	
pH:	extremely acid (pH: 3.4 - 3.9)
Organic matter:	high
CaCO₃:	low
Available nutrients:	N - low P - low K - low S - low

Revegetation of such soils will be difficult. A complete fertilizer must be applied, and species adapted to extremely acidic, organic soils must be included in the seed mixture. These species must also have some tolerance to the constantly wet soil.

Vegetation Community Description: This community has no trees or tall shrubs, although the occasional stunted black spruce or shrub birch may occur; ground shrubs include Labrador tea, mossberry, lowbush cranberry, dwarf birch, cloudberry and northern bearberry; dominant herbs are cottongrass and sedges; bluejoint reedgrass, polargrass and coltsfoot also occur; sphagnum and peat moss are common.

Characteristic Species: cotton grass (*Eriophorum* spp.), sedges (*Carex* spp.), sphagnum moss (*Sphagnum* spp.), Labrador tea (*Ledum palustre*), dwarf birch (*Betula nana*), lowbush cranberry (*Vaccinium vitis-idaea*), cloudberry (*Rubus chamaemorus*)

Associated Species: bog blueberry (*Vaccinium uliginosum*), bluejoint reedgrass (*Calamagrostis canadensis*), mossberry (*Empetrum nigrum*), northern bearberry (*Arctostaphylos rubra*), coltsfoot (*Petasites frigidus*), polargrass (*Arctagrostis latifolia*), prostrate willows (*Salix* spp.), peat moss (*Drepanocladus* spp.)



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Table 139: Seed mixture and fertilizer specifications for cottongrass/Labrador tea (*Eriophorum/Ledum palustre*) community soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	6	Meadow foxtail <i>Alopecurus pratensis</i>	3
Polargrass <i>Arctagrostis latifolia</i>	ALYESKA	2	Polargrass <i>Arctagrostis latifolia</i>	2
Bluejoint reedgrass <i>Calamagrostis canadensis</i>	SOURDOUGH	2	Bluejoint reedgrass <i>Calamagrostis canadensis</i>	2
Bering hairgrass <i>Deschampsia beringensis</i>	NORCOAST	10	Tufted hairgrass <i>Deschampsia caespitosa</i>	5
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	8	Glaucous bluegrass <i>Poa glauca</i>	3
Timothy <i>Phleum pratense</i>	ENGMO	8	Northern bluegrass <i>Poa alpigena</i>	4
Fowl bluegrass <i>Poa palustris</i>	COMMON	4	Fowl bluegrass <i>Poa palustris</i>	4
Total		40		23

FERTILIZER:

Nutrient requirement: Nitrogen (120kg N/ha) + Phosphate (120kg P₂O₅/ha) + Potash (60kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha 28-28-0 + 100kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 140: Site characteristics of mountain avens (*Dryas* spp.) communities

SITE CHARACTERISTICS	
Landform/Genetic Material(s):	colluvial, morainal
Modifier(s):	rolling to level
Drainage:	well to rapid
Soil Texture: (top 30cm): (>30cm)	silty sand (SM) gravel and cobbles (GP)
Other Soil Properties (top 30cm):	
pH:	neutral (pH: 6.6 - 7.2)
Organic matter:	low
CaCO ₃ :	high
Available nutrients:	N - low P - low K - moderate S - low

Revegetation of such soils may prove difficult because most species tolerant of calcareous soils have limited winterhardiness. Other soil problems are minimal; although the addition of sufficient nitrogen and phosphorus is essential for success.

Vegetation Community Description: This community has no trees other than occasional stunted white spruce; common shrubs include mountain avens, lapland rosebay, white heather and alpine bearberry; less common are kinnikinnick, shrubby cinquefoil, bog blueberry, netted willow and Drummond's dryas; herbs include cottongrass, sedges, altai fescue, hairy wild ryegrass and bear root; lichens such as the reindeer mosses are common.

Characteristic Species: mountain avens (*Dryas integrifolia* and *D. octopetala*), lapland rosebay (*Rhododendron lapponicum*), white heather (*Cassiope tetragona*), alpine bearberry (*Arctostaphylos alpina*), sedges (*Carex* spp.)

Associated Species: cotton grass (*Eriophorum* spp.) bog blueberry (*Vaccinium uliginosum*), netted willow (*Salix reticulata*), altai fescue (*Festuca altaica*), hairy wild ryegrass (*Elymus innovatus*), Drummond's dryas (*Dryas Drummondii*), bear root (*Hedysarum alpinum*), lichens (*Cetraria* spp. and *Cladina rangiferina*)



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**Table 141: Seed mixture and fertilizer specifications for mountain aven (*Dryas* spp.)
community soils**

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Tufted hairgrass <i>Deschampsia caespitosa</i>	NORTRAN	6	Tufted hairgrass <i>Deschampsia caespitosa</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	8	Sheep fescue <i>Festuca ovina</i>	4
Timothy <i>Phleum pratense</i>	ENGMO	8	Northern bluegrass <i>Poa alpigena</i>	4
Canada bluegrass <i>Poa compressa</i>	REUBENS	6	Canada bluegrass <i>Poa compressa</i>	3
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	8	Glaucous bluegrass <i>Poa glauca</i>	5
Fowl bluegrass <i>Poa palustris</i>	COMMON	4	Fowl bluegrass <i>Poa palustris</i>	4
Total		40		23

FERTILIZER:

Nutrient requirement: Nitrogen (120kg N/ha) + Phosphate (120kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 500kg/ha
23-23-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

3.0 SEED MIXTURES FOR HIGH ELEVATIONS

Results from revegetation trials throughout North America indicate that grass and legume selections developed for use in moderate climates have minimal long-term success and often decrease in vigour or die within three years on alpine sites (13,85). Consequently, successful revegetation of alpine and subalpine sites requires the use of seed mixtures containing selections adapted to the severe climate of the alpine and subalpine (13). Soil conditions can vary extensively, but severe climatic conditions constitute the major barrier to successful revegetation. Climatic factors which cause revegetation problems are high radiation, low summer temperatures, high

winds, a short growing season and often, a precipitation shortage during the growing season (11,12).

Revegetation Region 6 contains extensive amounts of subalpine and alpine terrain in all Ecoregions except the Eagle Plain Ecoregion. The agronomic seed mixtures listed in Tables 142-143 are primarily composed of northern varieties (32,34,59,60,61,63,64) developed for use in Alaska. These varieties are more expensive than those used in more southerly regions, but are more likely to survive at high elevations than those developed for use in less severe environments. The native Yukon selections listed in the native seed mixtures also indicated in these tables are in the process of development. Some are already available and others will be on the market in the near future.



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Table 142: Seed mixture and fertilizer specifications for subalpine environments

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	2	Mountain timothy <i>Phleum commutatum</i>	1
Tufted hairgrass <i>Deschampsia caespitosa</i>	NORTRAN	6	Tufted hairgrass <i>Deschampsia caespitosa</i>	3
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	8	Red top <i>Agrostis gigantea</i>	3
Alpine bluegrass <i>Poa alpina</i>	COMMON or GRUENING	6	Alpine bluegrass <i>Poa alpina</i>	4
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	8	Glaucous bluegrass <i>Poa glauca</i>	6
Kentucky bluegrass <i>Poa pratensis</i>	NUGGET	4	Northern bluegrass <i>Poa pratensis</i>	2
		40		22

FERTILIZER:**

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (100kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 350kg/ha
28-28-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

**On sandy soil, Potassium sulphate, at the rate of 50kg K₂O/ha, may be required.

Table 143: Seed mixture and fertilizer specifications for alpine environments.

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	4	Mountain timothy <i>Phleum commutatum</i>	2
Polargrass <i>Arctagrostis latifolia</i>	ALYESKA	2	Arctic bluegrass <i>Poa arctica</i>	2
Tufted hairgrass <i>Deschampsia caespitosa</i>	NORTRAN	4	Tufted hairgrass <i>Deschampsia caespitosa</i>	2
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	8	Red top <i>Agrostis gigantea</i>	2
			Ticklegrass <i>Agrostis scabra</i>	1
Alpine bluegrass <i>Poa alpina</i>	COMMON or GRUENING	8	Alpine bluegrass <i>Poa alpina</i>	6
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	8	Glaucous bluegrass <i>Poa glauca</i>	4
Total		40		22

FERTILIZER:**

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (100kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha 23-23-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

**On sandy soil, Potassium sulphate, at the rate of 50kg K₂O/ha, may be required.



4.0 SEED MIXTURES FOR LINEAR DEVELOPMENTS

The seed mixtures in Tables 144-145 are designed for use on projects which encompass a long but narrow stretch of land which needs revegetation. At the present time this primarily refers to the reseeding of roadsides, but if subsequent pipeline or powerline development were to occur, the mixtures would also be applicable.

Seed mixtures for lengthy linear projects must be of a more comprehensive nature than those formulated for projects which are confined to one or two relatively homogeneous microenvironments. Soils and climate will vary on such projects. Precise locations of changes in either soil or climate will not be demarcated even if the general

soil types and ecoregion climatic conditions are known. It is unlikely that sufficient soil sampling will be done to obtain precise knowledge of the soils under each plant community and each part of a disturbed site. Also, it is not feasible, from a logistics point of view, to constantly change seed mixtures every few kilometers to account for minor shifts in growing conditions. Seed mixtures must contain sufficient diversity in species to allow for all major microenvironments which may be encountered in the revegetation process. The mixtures in Tables 144-145 include more species than the mixtures for precisely defined disturbed sites, and total weight of seed per hectare is higher. Although every seed selection is not required at all locations en route, a complete range of species is necessary for overall success.

Table 144: Seed mixture and fertilizer specifications for linear project seeding from North Fork Pass to the Eagle Plain

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Meadow foxtail <i>Agropyron macrourum</i>	COMMON	6	Macrourum wheatgrass <i>Agropyron macrourum</i>	4
Tufted hairgrass <i>Deschampsia caespitosa</i>	NORTRAN	6	Tufted hairgrass <i>Deschampsia caespitosa</i>	3
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	8	Northern bluegrass <i>Poa alpigena</i>	3
Timothy <i>Phleum pratense</i>	ENGMO	6	Mountain timothy <i>Phleum commutatum</i>	3
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	6	Glaucous bluegrass <i>Poa glauca</i>	5
Fowl bluegrass <i>Poa palustris</i>	COMMON	2	Fowl bluegrass <i>Poa palustris</i>	2
Alsike clover <i>Trifolium hybridum</i>	TETRA	4	Arctic lupine <i>Lupinus arcticus</i>	2
Total		44		25

FERTILIZER:

Nutrient requirement: Nitrogen (120kg N/ha) + Phosphate (120kg P₂O₅/ha) + Potash (60kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha 28-28-0 + 100kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.



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Table 145: Seed mixture and fertilizer specifications for linear project seeding from the Eagle Plain to the Richardson Mountains

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Meadow foxtail <i>Alopecurus pratensis</i>	COMMON	4	Macrourum wheatgrass <i>Agropyron macrourum</i>	3
Bering hairgrass <i>Deschampsia beringensis</i>	NORCOAST	6	Tufted hairgrass <i>Deschampsia caespitosa</i>	3
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	8	Northern bluegrass <i>Poa alpigena</i>	3
Reed canarygrass <i>Phalaris arundinacea</i>	PALATON or VANTAGE	2	Bluejoint reedgrass <i>Calamagrostis canadensis</i>	1
Timothy <i>Phleum pratense</i>	ENGMO	4	Red top <i>Agrostis gigantea</i>	2
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	6	Glaucous bluegrass <i>Poa glauca</i>	4
Fowl bluegrass <i>Poa palustris</i>	COMMON	4	Fowl bluegrass <i>Poa palustris</i>	4
Alsike clover <i>Trifolium hybridum</i>	TETRA	4	Bear root <i>Hedysarum alpinum</i>	2
Total		44		25

FERTILIZER:

Nutrient requirement: Nitrogen (120kg N/ha) + Phosphate (120kg P₂O₅/ha) + Potash (60kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha 28-28-0 + 100kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

5.0 SPECIFIC PROBLEM SEED MIXTURES

5.1 Highway Cut Slope Seed Mixtures

Highway cut slopes present one of the more difficult problems in northern reclamation (118). Initial instability must be corrected through physical techniques prior to the application of seed, fertilizer and mulch (89). The seed then applied is expected to germinate and produce vegetative cover on subsoil which can vary tremendously in physical and chemical properties, even on a small slope. For optimal results, site-specific soil sampling of the growth medium is essential, but, if not possible, then the mixtures indicated in Tables 146-147 can be used as revegetation guidelines for the reseeding of sand or gravel, and silty-clay cut slopes, respectively.

5.2 Saline Soil Seed Mixture

The presence of saline soils has not been reported for Revegetation Region 6. If some are encountered and revegetation of these areas is deemed necessary, the mixtures suggested in Table 148 can be used as guidelines. However, it must be remembered that until northern selections of alkaligrass (*Puccinellia* spp.) are developed there is not a truly satisfactory saline soil seed mixture available.

5.3 High Gravel Content Soil Seed Mixtures

The mixtures in Table 149 are designed for revegetation of sites which have a very high gravel content. If the addition of finer material to the growth medium is not possible, these sites will be difficult to revegetate successfully. High gravel content sites are always difficult to revegetate, even in more southerly regions. This problem is accentuated in Revegetation Region 6 since most agronomic cultivars which are reasonably well adapted to coarse growth media are not adapted to the harsh winters which occur in the proximity of the Dempster Highway. However, within Region 6, a requirement for revegetation of such media may occur. Thus, the mixtures in Table 149 are presented as the optimal choices available at present.

5.4 Sandy Soil Seed Mixtures

The mixtures in Table 150 are designed for revegetation of sites which have soil texture similar to that of the sand dunes found near Carcross. Comparable growth media are extremely difficult to revegetate, but the probability of encountering such sites in the proximity of the Dempster Highway or surrounding areas is minimal. However, the mixtures are included to indicate the optimal seed choices if pure sandy soils need revegetation.



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Table 146: Seed mixture and fertilizer specifications for sand or gravel cut slopes

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	4	Bearded wheatgrass <i>Agropyron subsecundum</i>	2
Polar brome <i>Bromus inermis</i> x <i>B. Pumpellianus</i>	POLAR	6	Macrourum wheatgrass <i>Agropyron macrourum</i>	5
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	8	Northern bluegrass <i>Poa alpigena</i>	3
Yellow lucerne <i>Medicago falcata</i>	ANIK	3	Late yellow locoweed <i>Oxytropis campestris</i>	2
Canada bluegrass <i>Poa compressa</i>	REUBENS	4	Canada bluegrass <i>Poa compressa</i>	3
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	6	Glaucous bluegrass <i>Poa glauca</i>	3
Alsike clove <i>Trifolium hybridum</i>	TETRA	3	Mackenzie's hedysarum <i>Hedysarum Mackenzii</i>	1
Total		40		22

FERTILIZER:

Nutrient requirement: Nitrogen (120kg N/ha) + Phosphate (120kg P₂O₅/ha) + Potash (100kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 400kg/ha 28-28-0 + 160kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 147: Seed mixture and fertilizer specifications for silty-clay cut slopes

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	8	Bearded wheatgrass <i>Agropyron subsecundum</i>	4
Smooth brome <i>Bromus inermis</i>	CARLTON	8	Macrourum wheatgrass <i>Agropyron macrourum</i>	5
Bering hairgrass <i>Deschampsia beringensis</i>	NORCOAST	4	Tufted hairgrass <i>Deschampsia caespitosa</i>	4
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	8	Northern bluegrass <i>Poa alpigena</i>	4
Fowl bluegrass <i>Poa palustris</i>	COMMON	2	Fowl bluegrass <i>Poa palustris</i>	2
Alsike clover <i>Trifolium hybridum</i>	TETRA	4	Late yellow locoweed <i>Oxytropis campestris</i>	1
			Showy locoweed <i>Oxytropis splendens</i>	1
Total		40		24

FERTILIZER:

Nutrient requirement: Nitrogen (100kg N/ha) + Phosphate (100kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 450kg/ha 23-23-0

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.



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Table 148: Seed mixture and fertilizer specifications for saline soils*

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Tall wheatgrass <i>Agropyron elongatum</i>	ORBIT	10	Macroum wheatgrass <i>Agropyron macroum</i>	4
Tufted hairgrass <i>Decshampsia caespitosa</i>	NORTRAN	5	Tufted hairgrass <i>Deschampsia caespitosa</i>	2
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	4
Alfalfa <i>Medicago sp.</i>	DRYLANDER or RANGELANDER	5	Late yellow locoweed <i>Oxytropis campestris</i>	1
			Showy locoweed <i>Oxytropis splendens</i>	1
Big bluegrass <i>Poa ampla</i>	SHERMAN	6	Big bluegrass <i>Poa ampla</i>	3
			Northern bluegrass <i>Poa alpigena</i>	2
Alkaligrass <i>Puccinellia sp.</i>	COMMON	6	Alkaligrass <i>Puccinellia sp.</i>	4
Total		38		21

FERTILIZER:

Nutrient requirement: Nitrogen (150kg N/ha) + Phosphate (150kg P₂O₅/ha)

Example of a commercial fertilizer which approximates the nutrient requirement:
500kg/ha 28-28-0

*There is not a truly satisfactory saline soil mixture available at present. The mixture indicated has some chance of success.

** Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

Table 149: Seed mixture and fertilizer specifications for high gravel content soils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	3	Bearded wheatgrass <i>Agropyron subsecundum</i>	2
Polar brome <i>Bromus inermis</i> x <i>B. Pumpellianus</i>	POLAR	6	Macroum wheatgrass <i>Agropyron macroum</i>	5
Sheep fescue <i>Festuca ovina</i>	COMMON	8	Sheep fescue <i>Festuca ovina</i>	4
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	8	Northern bluegrass <i>Poa alpigena</i>	3
Yellow lucerne <i>Medicago falcata</i>	ANIK	3	Late yellow locoweed <i>Oxytropis campestris</i>	2
Canada bluegrass <i>Poa compressa</i>	REUBENS	4	Canada bluegrass <i>Poa compressa</i>	2
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	5	Glaucous bluegrass <i>Poa glauca</i>	3
Alsike clover <i>Trifolium hybridum</i>	TETRA	3	Mackenzie's hedysarum <i>Hedysarum Mackenzii</i>	2
Total		40		23

FERTILIZER:

Nutrient requirement: Nitrogen (120kg N/ha) + Phosphate (120kg P₂O₅/ha) + Potash (100kg K₂O/ha)

Example of a commercial fertilizer which approximates the nutrient requirement: 500kg/ha 23-23-0 + 160kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.



**Guidelines for
Reclamation/ Revegetation in the Yukon**

Table 150: Seed mixture and fertilizer specifications for sandysoils

AGRONOMIC SELECTIONS			NATIVE SELECTIONS*	
Species	Variety	kg/ha	Species	kg/ha
Streambank wheatgrass <i>Agropyron riparium</i>	SODAR	7	Macroum wheatgrass <i>Agropyron macroum</i>	4
Sheep fescue <i>Festuca ovina</i>	COMMON	6	Sheep fescue <i>Festuca ovina</i>	3
Creeping red fescue <i>Festuca rubra</i>	ARCTARED	6	Northern brome <i>Bromus Pumpellianus</i>	2
Alfalfa <i>Medicago sp.</i>	DRYLANDER or RANGELANDER	4	Late yellow locoweed <i>Oxytropis campestris</i>	2
			Arctic lupine <i>Lupinus arcticus</i>	2
Canada bluegrass <i>Poa compressa</i>	REUBENS	5	Canada bluegrass <i>Poa compressa</i>	3
Glaucous bluegrass <i>Poa glauca</i>	TUNDRA	5	Glaucous bluegrass <i>Poa glauca</i>	3
Alkaligrass <i>Puccinellia sp.</i>	COMMON	5	Alkaligrass <i>Puccinellia sp.</i>	3
Total		38		22

FERTILIZER:

Nutrient requirement: Nitrogen (120kg N/ha) + Phosphate (120kg P2O5/ha) + Potash (100kg K2O)

Example of a commercial fertilizer which approximates the nutrient requirement:
400kg/ha 28-28-0 + 160kg/ha 0-0-60

* Native Seed Selections should be substituted, at the rates indicated, for the Agronomic Selections adjacent to them in the above table.

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APPENDIX I

Botanical and Common Names of Plant Species

BOTANICAL NAME*	COMMON NAME
<i>Abies lasiocarpa</i> (Hook.) Nutt.	Alpine fir
<i>Agropyron cristatum</i> (L.) Gaertn.	Crested wheatgrass
<i>Agropyron elongatum</i> (Host) Beauv.	Tall wheatgrass
<i>Agropyron pauciflorum</i> (Schwein.) Hitchc.	Slender wheatgrass
<i>Agropyron riparium</i> Scribn. & Smith	Streambank wheatgrass
<i>Agropyron subsecundum</i> (Link) Hitchc.	Bearded wheatgrass
<i>Agropyron trachycaulum</i> (Link) Malte	Slender wheatgrass
<i>Agropyron violaceum</i> (Hornem.) Lange	Violet wheatgrass
<i>Agropyron yukonense</i> Scribn. & Merr.	Yukon wheatgrass
<i>Agrostis gigantea</i> Roth	Red top
<i>Agrostis scabra</i> Willd.	Ticklegrass
<i>Alnus crispa</i> (Ait.) Pursh	Mountain alder
<i>Alnus incana</i> (L.) Moench	Hoary alder
<i>Alopecurus pratensis</i> L.	Meadow foxtail
<u><i>Androsace septentrionalis</i></u> L.**	Androsace
<u><i>Antennaria rosea</i></u> Greene**	Pussytoes
<i>Arctagrostis latifolia</i> (R.Br.) Griseb.	Polargrass
<i>Arctostaphylos rubra</i> (Rehd.& Wilson) Fern.	Northern bearberry
<i>Arctostaphylos uva-ursi</i> (L.) Spreng.	Kinnikinnick***
<i>Artemisia frigida</i> Willd.	Sage
<i>Astragalus agrestis</i> Dougl.	Field milk vetch
<i>Astragalus alpinus</i> L.	Alpine milk vetch
<i>Astragalus americanus</i> (Hook) M.E.Jones	American milk vetch
<i>Astragalus eucosmus</i> Robins.	Elegant milk vetch
<i>Astragalus umbellatus</i> Bunge	Tundra milk vetch
<i>Astragalus</i> sp. L.	Milk vetch
<i>Betula glandulosa</i> Michx.	Shrub birch
<u><i>Betula nana</i></u> L.**	Dwarf birch
<i>Betula papyrifera</i> Marsh.	Paper birch
<i>Bromus inermis</i> Leyss.	Smooth brome

BOTANICAL NAME*	COMMON NAME
Bromus Pumpellianus Scribn.	Northern brome
Calamagrostis canadensis (Michx.) Beauv.	Bluejoint reedgrass
Calamagrostis purpurascens R.Br.	Purple reedgrass
<u>Carex</u> sp. L.**	Sedge
<u>Cassiope tetragona</u> (L.) Don.**	White heather
Cornus canadensis L.	Bunchberry
Deschampsia caespitosa (L.) Beauv.	Tufted hairgrass
Dryas sp. L.	Dryas
Dryas Drummondii Richards.	Yellow dryas
Dryas octopetala L.	Mountain avens
Dryas integrifolia M.Vahl	Mountain avens
Elaeagnus commutata Bernh.	Silverberry
Elymus arenarius L.	Lymegrass
Elymus innovatus Beal	Hairy wild ryegrass
Elymus junceus Fisch.	Russian wild ryegrass
Empetrum nigrum L.	Mossberry
Epilobium angustifolium L.	Fireweed
Eriophorum sp. L.	Cottongrass
Festuca altaica Trin.	Altai fescue
Festuca ovina L.	Sheep fescue
Festuca rubra L.	Creeping red fescue
Festuca saximontana Rydb.	Northern fescue
Hedysarum alpinum L.	Bear root
Hedysarum Mackenzii Richards	Mackenzie's hedysarum
Hierochloe alpina (SW.) Roem. & Schult.	Alpine sweetgrass
Hierochloe odorata (L.) Wahlenb.	Sweetgrass
Hordeum jubatum L.	Foxtail barley
Juniperus communis L.	Ground juniper
Juniperus horizontalis Moench	Creeping juniper
Larix laricina (Du Roi) K.Koch	Larch/Tamarack

BOTANICAL NAME*	COMMON NAME
Ledum groenlandicum Oeder	Labrador tea
Ledum palustre L.	Labrador tea
Linnaea borealis L.	Twinflower
Linum perenne L.**	Wild flax
Loiseleuria procumbens (L.) Desv.**	Alpine azalea
Lupinus arcticus S.Wats.	Arctic lupine
Lupinus Kuschei Eastw.	Yukon lupine
Medicago falcata L.	Yellow lucerne
Medicago sativa L.	Alfalfa
Medicago sp. L.	Alfalfa
Oxytropis campestris (L.) DC.	Yellow locoweed
Oxytropis Maydelliana Trautv.	Maydell's locoweed
Oxytropis splendens Dougl.	Showy locoweed
Oxytropis sp. DC.	Locoweed
Phalaris arundinacea L.	Reed canarygrass
Penstemon Gormanii Greene**	Gorman's beardtongue
Phleum commutatum Gandoger	Mountain timothy
Phleum pratense L.	Timothy
Picea glauca (Moench) Voss	White spruce
Picea mariana (Mill.) Britt., Sterns & Pogg	Black spruce
Pinus contorta Dougl. ex Loud.	Lodgepole pine
Poa alpigena (E.Fries) Lindm.	Northern bluegrass
Poa alpina L.	Alpine bluegrass
Poa ampla Merr.	Big bluegrass.
Poa arctica R.Br.	Arctic bluegrass
Poa compressa L.	Canada bluegrass
Poa glauca M.Vahl	Glaucous bluegrass
Poa palustris L.	Fowl bluegrass
Poa pratensis L.	Kentucky bluegrass
Populus balsamifera L.	Balsam poplar

BOTANICAL NAME*	COMMON NAME
<i>Populus tremuloides</i> Michx.	Aspen
<i>Potentilla fruticosa</i> L.	Shrubby cinquefoil
<i>Puccinellia</i> sp. Parl.	Alkaligrass
<i>Pulsatilla patens</i> (L.) Mill.	Crocus
<i>Rhododendron lapponicum</i> (L.) Wahlenb.	Lapland rosebay
<i>Ribes oxycanthoides</i> L.	Canada gooseberry
<i>Ribes triste</i> Pall.	Northern red currant
<i>Rosa acicularis</i> Lindl.	Rose
<i>Rubus chamaemorus</i> L.	Cloudberry
<i>Rubus idaeus</i> L.	Raspberry
<u><i>Salix alaxensis</i></u> (Anderss.) Coville**	Alaska willow
<u><i>Salix arbusculoides</i></u> Anderss.**	Northern bush willow
<u><i>Salix bebbiana</i></u> Sarg.**	Bebb willow
<u><i>Salix Scouleriana</i></u> Barratt**	Scouler willow
<i>Salix</i> sp. L.	Willow
<i>Saxifraga tricuspidata</i> Rottb.	Prickly saxifrage
<i>Shepherdia canadensis</i> (L.) Nutt.	Soapberry
<i>Spiraea Beauverdiana</i> Schneid.	Alaska spiraea
<i>Trifolium hybridum</i> L.	Alsike clover
<i>Trisetum spicatum</i> (L.) Richter	Spike trisetum
<i>Vaccinium uliginosum</i> L.	Bog blueberry
<i>Vaccinium vitis-idaea</i> L.	Lowbush cranberry
<i>Viburnum edule</i> (Michx.) Raf.	Highbush cranberry
<p>* Botanical nomenclature follows; E. Hulten 1968. Flora of Alaska and Neighbouring Territories. Stanford University Press. 1008pp.</p>	
<p>** Not previously referred to in Regions 1-4, or listed in Appendix B of completed manual.</p>	

APPENDIX J

Botanical and Common Names of Plant Species

BOTANICAL NAME*	COMMON NAME
<i>Abies lasiocarpa</i> (Hook.) Nutt.	Alpine fir
<i>Agropyron elongatum</i> (Host) Beauv.	Tall wheatgrass
<u><i>Agropyron macrourum</i> (Turcz.) Drobov**</u>	Macrourum wheatgrass
<i>Agropyron pauciflorum</i> (Schwein.) Hitchc.	Slender wheatgrass
<i>Agropyron riparium</i> Scribn. & Smith	Streambank wheatgrass
<i>Agropyron subsecundum</i> (Link) Hitchc.	Bearded wheatgrass
<i>Agropyron violaceum</i> (Hornem.) Lange	Violet wheatgrass
<i>Agrostis gigantea</i> Roth	Red top
<i>Agrostis scabra</i> Willd.	Ticklegrass
<i>Alnus crispa</i> (Ait.) Pursh	Mountain alder
<i>Alnus incana</i> (L.) Moench	Hoary alder
<u><i>Alopecurus aequalis</i> Sobol.**</u>	Little foxtail
<i>Alopecurus pratensis</i> L.	Meadow foxtail
<u><i>Andromeda polifolia</i> L.**</u>	Bog rosemary
<i>Arctagrostis latifolia</i> (R.Br.) Griseb.	Polargrass
<u><i>Arctostaphylos alpina</i> (L.) Spreng.*</u>	Alpine bearberry
<i>Arctostaphylos rubra</i> (Rehd.& Wilson) Fern.	Northern bearberry
<i>Arctostaphylos uva-ursi</i> (L.) Spreng.	Kinnikinnick
<i>Astragalus alpinus</i> L.	Alpine milk vetch
<i>Astragalus umbellatus</i> Bunge	Tundra milk vetch
<i>Aulacomnium palustre</i> (Hedw.)Schwaegr.	Wetland moss
<i>Betula glandulosa</i> Michx.	Shrub birch
<i>Betula nana</i> L.	Dwarf birch
<i>Betula papyrifera</i> Marsh.	Paper birch
<i>Bromus inermis</i> Leyss.	Smooth brome
<i>Bromus Pumpellianus</i> Scribn.	Northern brome
<i>Calamagrostis canadensis</i> (Michx.) Beauv.	Bluejoint reedgrass
<i>Carex</i> sp. L.	Sedge
<i>Cassiope tetragona</i> (L.) Don.	White heather
<i>Cetraria</i> spp. L.	Reindeer moss

BOTANICAL NAME*	COMMON NAME
<u>Chamaedaphne calyculata (L.) Moench**</u>	Cassandra
<u>Cladina rangiferina (L.) Harm.**</u>	Reindeer moss
<u>Delphinium glaucum S.Wats.**</u>	Larkspur
<u>Deschampsia beringensis Hult.**</u>	Bering hairgrass
Deschampsia caespitosa (L.) Beauv.	Tufted hairgrass
<u>Drepanocladus spp. L.**</u>	Peat moss
Dryas Drummondii Richards.	Yellow dryas
Dryas octopetala L.	Mountain avens
Dryas integrifolia M.Vahl	Mountain avens
Elymus innovatus Beal	Hairy wild ryegrass
Empetrum nigrum L.	Mossberry
Epilobium angustifolium L.	Fireweed
<u>Equisetum arvense L.**</u>	Horsetail
Equisetum sp. L.	Horsetail
<u>Eriophorum vaginatum L.**</u>	Cottongrass
Eriophorum sp. L.	Cottongrass
Festuca altaica Trin.	Altai fescue
Festuca ovina L.	Sheep fescue
Festuca rubra L.	Creeping red fescue
Hedysarum alpinum L.	Bear root
Hedysarum Mackenzii Richards	Mackenzie's hedysarum
Hierochloe alpina (SW.) Roem. & Schult.	Alpine sweetgrass
Hierochloe odorata (L.) Wahlenb.	Sweetgrass
Hordeum jubatum L.	Foxtail barley
Hylocomium splendens (Hedw.) B.S.G.	Feathermoss
Larix laricina (Du Roi) K.Koch	Larch/Tamarack
Ledum palustre L.	Labrador tea
Linnaea borealis L.	Twinflower
Loiseleuria procumbens (L.) Desv.	Alpine azalea
Lupinus arcticus S.Wats.	Arctic lupine

BOTANICAL NAME*	COMMON NAME
Medicago falcata L.	Yellow lucerne
Medicago sativa L.	Alfalfa
Medicago sp. L.	Alfalfa
Oxycoccus microcarpus Turcz.	Bog cranberry
Oxytropis campestris (L.) DC.	Yellow locoweed
<u>Oxytropis nigrescens (Pall.) Fisch.**</u>	Black locoweed
Oxytropis splendens Dougl.	Showy locoweed
Petasites frigidus (L.) Franch.	Coltsfoot
Phalaris arundinacea L.	Reed canarygrass
Phleum commutatum Gandoger	Mountain timothy
Phleum pratense L.	Timothy
Picea glauca (Moench) Voss	White spruce
Picea mariana (Mill.) Britt., Sterns & Pogg	Black spruce
Poa alpigena (E.Fries) Lindm.	Northern bluegrass
Poa alpina L.	Alpine bluegrass
Poa ampla Merr.	Big bluegrass
Poa arctica R.Br.	Arctic bluegrass
Poa compressa L.	Canada bluegrass
Poa glauca M.Vahl	Glaucous bluegrass
Poa palustris L.	Fowl bluegrass
Poa pratensis L.	Kentucky bluegrass
Populus balsamifera L.	Balsam poplar
Populus tremuloides Michx.	Aspen
Potentilla fruticosa L.	Shrubby cinquefoil
Puccinellia sp. Parl.	Alkaligrass
Pulsatilla patens (L.) Mill.	Crocus
Rhododendron lapponicum (L.) Wahlenb.	Lapland rosebay
<u>Ribes hudsonianum Richards.**</u>	Black currant
Ribes triste Pall.	Northern red currant
Rosa acicularis Lindl.	Rose

BOTANICAL NAME*	COMMON NAME
<p><u>Rubus arcticus L.**</u> Rubus chamaemorus L. Rubus idaeus L. Salix alaxensis (Anderss.) Coville <u>Salix pulchra Cham.**</u> <u>Salix reticulata L.**</u> Salix sp. L. Shepherdia canadensis (L.) Nutt. Sphagnum spp. L. Spiraea Beauverdiana Schneid. Trifolium hybridum L. Trisetum spicatum (L.) Richter Vaccinium uliginosum L. Vaccinium vitis-idaea L. Viburnum edule (Michx.) Raf.</p>	<p>Nagoonberry Cloudberry Raspberry Alaska willow Willow Netted willow Willow Soapberry Sphagnum moss Alaska spiraea Alsike clover Spike trisetum Bog blueberry Lowbush cranberry Highbush cranberry</p>
<p>* Botanical nomenclature follows; E. Hulten 1968. Flora of Alaska and Neighbouring Territories. Stanford University Press. 1008pp.</p>	
<p>** Not previously referred to in Regions 1-5, or listed in Appendix B of the published manual.</p>	