HARDY ASSOCIATES (1978) LTD.

RESULTS OF GROUND CHECKING OF VEGETATION MAPS IN THE AOSERP STUDY AREA

A PILOT STUDY

by

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1. INTRODUCTION

Vegetation maps at a scale of 1:50 000 have been prepared for the AOSERP study area by Intera Environmental Consultants Ltd. (Thompson et al. 1978). The purpose of these maps is to provide baseline vegetation information which can be used in the planning and design of other resource studies in the AOSERP area.

The maps prepared by Intera display a considerable volume of useful information on the distribution of major vegetation types in the AOSERP area. However, the detail offered by the maps has often not been sufficient to meet the needs of other resource studies. This stems from at least three aspects of the maps: first, the mapping scale (1:50 000) is relatively small and thus individual map units often include several vegetation types which may not be described by the annotation; secondly, the vegetation types outlined on the maps are broad, largely physiognomic units and convey little information on vegetation composition. In forested areas, the map units are defined only by the tree layer. Finally, the maps have not been ground checked and thus include errors of interpretation.

The vegetation units outlined by Intera are based in large part on the vegetation classification developed for the AOSERP area by P.W. Stringer (1976). Although Stringer's classification is the most comprehensive and detailed classification available for the AOSERP study area, it is preliminary and the types are very broad. A detailed vegetation classification based on total vegetation composition is not available for the whole of the AOSERP area.

In order to make the current vegetation maps more useful as a basis for other resource studies, the vegetation units outlined on the maps need to be described in greater detail. A means for describing the complex vegetation of heterogeneous map units and a means for displaying more detailed information on vegetation composition needs to be developed.

The purpose of this report is to provide background information for discussions relating to methodologies for enhancing the vegetation detail on Intera's maps. This report is based on the results of a brief

field survey and ground checking of the maps in the Fort MacKay area (T94R10W4 and T94R11W4). A very preliminary vegetation classification which is more detailed than that described by Stringer (1976) is described as an example of how vegetation community information could be documented for inclusion on map units.

2. OBJECTIVES

The specific objectives of this report are to:

1) describe a preliminary vegetation community classification based on a brief survey of vegetation types in the Fort MacKay area,
2) describe the results of a ground check of Intera's vegetation maps in the Fort MacKay area,
3) provide recommendations based on the field survey and ground checking, for developing methodologies to enhance the detail on Intera's vegetation maps.

3. METHODS

Field studies were conducted from 30 August to 5 September 1979 in areas near the lower reaches of the Muskeg and MacKay rivers (T94R10W4 and T94R11W4). This area was selected for the pilot study since it includes a diversity of vegetation types, is near areas under development or slated for development and is reasonably accessible. Several cutlines are present in these two townships and facilitate ground surveys.

3.1 FIELD METHODS

3.1.1 Ground Checking of Maps

Ground checking of Intera's maps was accomplished primarily on foot from cutlines. Cutlines chosen for travel were those which crossed a relatively large number of vegetation types as indicated on Intera's maps and on air photos. Most of the larger map units within the study area were visited at least briefly. Each map unit was travelled for a sufficient distance from the cutline to indicate variability. Large,

very heterogeneous map units were surveyed by low level helicopter reconnaissance.

In each map unit visited, the annotation on the map was compared with the existing vegetation. Based on the dominant species and the vegetation physiognomy, the vegetation was classified according to Intera's mapping legend and changes were applied to the annotation if necessary. In those map units where the vegetation physiognomy did not correspond to any of Intera's or Stringer's units, the characteristics of the vegetation were noted and a sample plot was selected to describe the vegetation.

In addition, attention was given to the lesser vegetation to determine if it was relatively homogeneous within each physiognomic type, and thus adequately described by Stringer's report, or if classifiable variability existed with the physiognomic types. Where major differences were noted, study plots were selected to document this variability and to form a basis for more detailed vegetation classification. A preliminary community classification was developed in the field in order that lesser vegetation types could be noted on the maps.

3.1.2 Community Classification

In order to display more detailed information on the maps regarding community composition, a more detailed classification than that presented by Stringer was developed.

3.1.2.1 Study Plot Selection . Study plots were selected to document, to the extent which the short time allowed, each major vegetation community type encountered during ground checking of the maps. At least one study plot was located within each major physiognomic type described by Stringer (1976). In types where significant variability of lesser vegetation was noted, two or more plots were selected to document this variability. The principal exception is fens where time did not allow a sufficient number of study plots to document variability. Data were recorded from a total of 39 plots in six days of survey.

Each study plot was required to be representative of a principal vegetation community type in the area and to display visual

homogeneity of vegetation, site characteristics, and soils. Study plots were 20 m X 20 m in most vegetation but reduced to 10 m X 10 m in dense shrub thickets and dense black spruce bog forests. All plots were free of human disturbance such as tree cutting or seismic activity.

3.1.2.2 Data Collection. In each study plot, the percent cover of all species noted within each vegetation stratum was visually estimated. For purposes of this study, vegetation strata were defined as

tree: > 8m

tall shrub: 2 - 8m

low shrub: upright woody plants < 2m

dwarf shrub/herbaceous: prostrate shrubs and all vascular herbaceous plants

moss: Mosses and lichens

No attempt was made to make a comprehensive and exhaustive list of species at each plot but rather to make a list which would adequately describe the vegetation and distinguish it from other vegetation types.

In addition, the percent cover of principal corticolous lichen species on tree boles between 1 and 2m above ground were visually estimated. Although a more precise methodolgy would have been developed if time had allowed, this visual estimate is sufficient to indicate principal species and their relative abundance.

In forested plots, the heights, diameters (dbh), and ages of two or three trees of the predominant species in the upper canopy (dominant/codominant) were recorded.

A shallow (approximately 40 to 50 cm) soil pit was dug near the center of each plot to note surface substrate characteristics and soil type. Texture and depth of principal surface horizons were described and the soil provisionally classified according to Canada Soil Survey Committee (1978).

Soil parent material, stoniness, drainage, slope, solar aspect, and topography were recorded at each site. The approximate location of each plot was noted on Intera's maps for future reference. A photograph was taken of each plot.

3.2 DATA ANALYSES

Since this is a pilot study based on reconnaissance and a relatively small amount of data, no detailed or quantitative analyses of the data were carried out. The plot data were grouped according to Stringer's (1976) classification in order that the more detailed community classification would represent hierarchial subdivisions of Stringer's types. Thus, the validity of Intera's mapping classification would not be affected. Data which could not be fitted within any of Stringer's types were compared with classifications presented by other authors in order to maintain some consistency of terminology.

Various techniques of presenting more detailed information on Intera's maps have been explored. These include expanding the annotations within the map units and footnoting the map units, as described in the Recommendations Section.

4. RESULTS

4.1 VEGETATION COMMUNITY CLASSIFICATION

This section briefly describes 24 provisional community types noted during vegetation surveys in the Fort MacKay area. These types are presented as an example of how vegetation detail could be catalogued for presentation on the maps.

The community types are grouped according to Stringer's (1976) classification which corresponds closely to that used for mapping purposes by Intera (Thompson et al. 1978). Since these communities are based on very limited data, they are strictly provisional and described only for purposes of discussion relating to methodology for enhancing detail on the maps.

4.1.1 Fen

Fen vegetation occurs on very wet sites and is characterized by a dominant herb stratum comprised primarily of sedges and grasses. Semi-aquatic forbs are typically present but are a minor component. A mat of mosses typically covers the ground and in contrast to bogs, is dominated by Drepanocladus spp. Sphagnum mosses are rare. Shrub cover

ranges from nearly absent to continuous and very scattered trees may be present. In comparison to bogs, the surface water in fens has a higher pH and cation content. They are richer in nutrients.

Stringer (1976) lumps all fens into one type but other authors such as Jeglum (1973) describe several types. Due to the short time available in this study, data were collected from only two fen types with one plot in each type. These types are termed open fen and low shrub fen and correspond to Jeglum's (1973) categories of the same name. Tall shrub fen was also noted in the study area but due to lack of time was not sampled.

4.1.1.1 Open Fen. Open fen is characterized by a sparse or absent shrub layer (Photo 1). The vegetation is dominated primarily by sedges and mosses with principal species being Carex diandra, C. lasiocarpa, C. aquatilis and Drepanocladus spp. Other species in the plot studied are listed on Table 1.

Soils of this type are organic and very poorly drained. This type is common around the perimeters of small lakes and ponds and in low areas where drainage waters collect and move slowly through the stand.

Considerable compositional variability is present within this type and it would probably be subdivided by additional survey.

4.1.1.2 Low Shrub Fen. Low shrub fen is characterized by a prominent shrub stratum, 1 to 1.5 m tall (Photo 2). Dominant shrubs are primarily Betula pumila with lesser Salix macalliana, S. pedicellaris, S. candida, and Larix laricina. Beneath the shrubs is a herbaceous layer dominated by sedges and a moss carpet of various fen species (Table 1).

Shallow standing water is commonly present on the surface throughout the growing season.

4.1.1.3 Tall Shrub Fen. Tall shrub fen with a discontinuous tall shrub stratum dominated by Salix bebbiana was noted in the area but no data were collected. Sedges and grasses (primarily Calamagrostis) dominate the herbaceous layer but the vegetation is very heterogeneous and patchy. This type occurs in broad low areas traversed by minor

Table 1. Percent Cover of Species in Fen Community Types

	TYPE		
	Open Fen	Low Shrub Fen	
Species	(22)*	(8)	(19)
Low Shrubs			
Betula pumila	6	40	50
B. glandulosa		2	
Salix maccalliana	4	20	2
Salix pedicellaris	2		8
Picea glauca		5	
Larix laricina	2	2	15
Salix myrtillifolia		1	
Dwarf Shrubs/Herbaceous			
Arctostaphylos rubra		2	
Carex diandra	80		25
Carex aquatilis	5	25	40
Smilacina trifolia	10	1	5
Triglochin maritima	6		
Calamagrostis canadensis	4	2	
Galium trifidum	4		2
Potentilla palustris	2	1	3
Menyanthes trifoliata			2
Caltha palustris			2
Petasites sagitattus		2	
Mosses			
Drepanocladus spp.	65		5
Campylium stellatum	10		5
Aulacomnium palustre		14	
Tomenthypnum nitens		10	25
Hylocomium splendens		4	
Hypnum lindbergii			15

* (22) Stand number.

drainageways. As the site becomes somewhat better drained, this type appears to grade into Tall Willow-River Alder Scrub.

4.1.2 Tall Willow-River Alder Scrub

According to Stringer (1976), the tall willow-river alder type includes vegetation dominated by a closed canopy of willows and river alder approximately 5 to 6 m tall. It occurs along rivers and water-courses and in wet, but freely drained depressions throughout the AOSERP area. The lesser vegetation is sparse but variable.

Two principal communities of this physiognomic type were noted in the area surveyed. The first occurs in wet depressions on the uplands, often in association with fens while the second forms a band along principal water courses.

4.1.2.1 Tall Willow - Alder/Reed Grass Community. This community type is common on the uplands in the area surveyed where it occurs as small stands in close association with fens and occassionally as more extensive stands in areas of numerous, minor channels. The small stands associated with fens are generally too small to map at a scale of 1: 50 000.

The vegetation is dominated by a nearly closed canopy of willows (especially Salix bebbiana) and alder (Alnus tenuifolia) (Photo 3) although scattered white birch (Betula papyrifera), trembling aspen (Populus tremuloides), and white spruce (Picea glauca) are typically present. The low shrub layer is sparse and typically comprised of red osier dogwood (Cornus stolonifera), other willow species, low bush cranberry (Viburnum edule) and seedlings of the above tree species. The herbaceous layer is sparse to moderately dense but nearly always includes a moderate cover of reedgrass (Calamagrostis canadensis). Other herbaceous species and mosses in the one plot studies are listed in Table 2.

A few corticolous lichens occur on the stems of the alders but cover is small. Tufted Usnea spp., Parmelia sulcata, Evernia mesomorpha, Cetraria pinastre, and Alectoria glabra were noted.

Table 2. Percent Cover of Species in Tall Willow - Alder Community Types.

	TYPE	
	Tall Willow - Alder/ Reedgrass	Tall Willow - River Alder/Red Osier Dogwood
Species	(5)	(18)
Trees and Tall Shrubs		
Alnus tenuifolia	60	30
Salix bebbiana	3	60
Betula papyrifera	8	
Populus balsamifera		3
Populus tremuloides		1
Low Shrubs		
Picea glauca	1	10
Betula papyrifera	1	1
Cornus stolonifera	2	5
Viburnum	1	8
Salix maccalliana	8	
Ribes hirtellum		4
R. lacustre		1
Lonicera dioica		1
Rosa acicularis		1
Dwarf Shrubs/Herbacious		
Calamagrostis canadensis	20	
Impatiens capensis	15	
Sium suave	4	
Galium trifidum	5	1
Mitella nuda	2	10
Carex disperma	5	
Agrostis alba	2	
Carex aquatilis	4	
Aster foliaceus	5	1
Rubus acaulis	1	
Smilacina trifolia	1	
Rubus pubescens	1	5
Cornus canadensis		3
Linnaea borealis		10
Fragaria vesca		2
Equisetum scirpoides		3
Elymus innovatus		2
Equisetum palustre		2
Mertensia paniculata		2

Table 2. Continued.

	TYPE	
	Tall Willow - Alder/ Reedgrass	Tall Willow - River Alder/Red Osier Dogwood
Mosses		
Plagiomnium spp.	8	3
Mnium spinulosum	10	
Aulacomnium palustre	20	
Hylocomium splendens		8
Tomenthypnum nitens		2

This community apparently corresponds to the willow - reed grass type described by Peterson and Levinsohn (1977) except that they identify the principal alder as being Alnus crispa.

4.1.2.2 Tall Willow - River Alder/Red Osier Dogwood Community. This community occurs on alluvial plains and terraces along rivers and major streams. These sites are apparently flooded periodically.

Similar to the previous community, the vegetation is dominated by tall willows (especially Salix bebbiana) and river alder (Photo 4). Some principal differences compared to the previous community are that balsam poplar (Populus balsamifera) and red osier dogwood (Cornus stolonifera) are more abundant, the low shrub layer is generally better developed and includes a greater number of species and reedgrass is less abundant. Table 2 indicates compositional differences between two plots representing these two types.

4.1.3 Bottomland Balsam Poplar Forest

Bottomland balsam poplar forests occupy alluvial flats and terraces along rivers and major streams. According to Stringer (1976), the forest canopy is dominated by tall (> 29 m) balsam poplar with occassional white spruce and trembling aspen.

Two stands of this type along the Athabasca River were visited. The vegetation of these stands did not differ substantially from one another or from the descriptions provided for the type by Stringer (1976). Consequently, only one community type is identified.

4.1.3.1 Balsam Poplar - White Spruce/Red Osier Dogwood Community. Composition of this community is adequately described by Stringer's (1976) description of bottomland balsam poplar forests. Based on our data from two stands, characteristic features of this community include a tall (26 m in one stand, and 41 m in the other) tree layer dominated by balsam poplar with scattered white spruce and occassional balsam fir (Abies balsamea). Red osier dogwood (Cornus stolonifera) appears to be consistently present and dominates a characteristic tall shrub stratum often 3 to 4 m tall (Photo 5). River alder is also present but less

dense in this stratum. A medium dense low shrub stratum includes low bush cranberry, rose (Rosa acicularis), chokecherry (Prunus virginiana), raspberry (Rubus strigosus), and gooseberry (Ribes spp.). The herbaceous layer typically covers 25 to 50% of the soil surface and the moss layer is sparse. Composition of the two stands studied is indicated on Table 3.

The largest trees of the AOSERP study area probably occur within this community. Balsam poplar trees 26 m tall and 98 cm in diameter (dbh) and white spruce trees 42 m tall and 88 cm in diameter (dbh) were recorded in stands adjacent to the Athabasca River.

4.1.4 Bottomland White Spruce Forest

This physiognomic type is not included in Stringer's (1976) classification scheme but is found locally on alluvial flats along the Athabasca, Muskeg, and MacKay rivers. Most sites which potentially support this type, are currently vegetated by an earlier successional stage represented by Bottomland Balsam Poplar forests.

One community type was noted in the Fort MacKay area.

4.1.4.1 White Spruce/River Alder - Horsetail Community. This community is characterized by an intermittent tall shrub layer dominated by alder (Alnus tenuifolia), a sparse or nonexistent low shrub layer, and a herb layer with prominent horsetail (Equisetum pratense, E. palustre, and E. scirpoides) (Photo 6). Other herbaceous species are less dense but a discontinuous layer of feathermosses (especially Hylocomium splendens) covers much of the surface. The composition of the one stand studied is shown on Table 3.

This community appears to be rich in arboreal lichens with principal species being pendulose and tufted Usnea spp., Evervnia mesomorpha, and Parmelia sulcata.

Soils of this community are moderately well to imperfectly drained and sandy.

A second community type of Bottomland White Spruce Forests is anticipated based on observations of earlier successional stages represented by Bottomland Balsam Poplar Forests. The undergrowth is

Table 3. Percent Cover of Species in Bottomland and Riparian Forest Communities.

	TYPE		
	Balsam Poplar - White Spruce/Red Osier Dogwood.		White Spruce/ River Alder - Horsetail
Species	(11)	(28)	(17)
Trees			
Populus balsamifera	50	75	
Picea glauca	15		30
Abies balsamea	2		
Tall Shrubs			
Cornus stolonifera	10	80	
Prunus virginiana	10	1	
Viburnum trilobum	4	P	
Alnus tenuifolia		3	35
Salix bebbiana		5	
Low Shrubs			
Viburnum edule	5	8	1
Rosa acicularis	8	2	7
Prunus virginiana	15		
Rubus strigosus	3	3	
Ribes hirtellum		1	1
Cornus stolonifera		1	
Amelanchier alnifolia			2
Ribes lacustre		1	
Dwarf Shrub/Herbaceous			
Aralia nudicaulus	10		
Rubus pubescens	10	20	8
Matteuccia struthiopteris	10		
Equisetum palustre	8	2	2
Mertensia paniculata	8	5	2
Mitella nuda	15		8
Calamagrostis canadensis	5	2	
Urtica gracilis		5	
Fragaria vesca	2		
Athyrium Filix-Femina	1		
Galium trifidum	1		
Galium triflorum	1		1
Maianthemum canadense	1		
Galium boreale	1		1

Table 3. Continued.

	TYPE	
	Balsam Poplar - White Spruce/Red Osier Dogwood	White Spruce/ River Alder - Horsetail
Smilacina stellata	3	
Equisetum pratense	1	15
Cornus canadensis		4
Equisetum scirpoides		18
Linnaea borealis		8
Petasites palmatus		1
Mosses		
Plagiomnium spp.	2	5
Brachythecium sp.	2	
Hylocomium splendens		35
Pleurozium schreberi		20
Ptilium crista-castrensis		3

probably characterized by a greater cover of shrubs, especially red osier dogwood, and herbs. It would be expected on well drained sites, somewhat drier than those of the above community.

4.1.5 Upland White Spruce - Aspen Forest

Stringer (1976) includes all upland forests of trembling aspen, white spruce, or aspen - white spruce mixtures in this one type. For mapping purposes, Intera (Thompson et al. 1978) subdivides this type into deciduous, mixed, and coniferous but no undergrowth information is included. As well, some aspen - jack pine mixed forests are included in their map classification but are not described by Stringer (1976).

Based on our preliminary field survey, the Upland White Spruce - Aspen type is subdivided into seven community types. However, other vegetation literature from northern Alberta suggests that more extensive surveys would probably describe additional community types.

The seven communities are grouped into three physiognomic types - aspen dominated forests, white spruce - aspen mixed forests and white spruce forests. These correspond to Intera's mapping units 2aA, 2aM, and 2aC.

Aspen Dominated Forests

4.1.5.1 Aspen - Jack Pine/Buffalo-Berry Community. This community type is common on well drained sandy soils which are probably the driest sites of Stringer's (1976) White Spruce - Aspen type. The tree layer is dominated by trembling aspen but nearly always includes scattered jack pine. Trees are generally 13 to 20 m tall and of relatively uniform size within a given stand. A tall shrub layer is absent but a low shrub layer dominated by buffalo-berry (Shepherdia canadensis) is prominent (Photo 7). This low shrub layer together with other dry site species characterizes the community. Other common low shrubs include rose (Rosa acicularis), Saskatoon berry (Amelanchier alnifolia) and blueberry (Vaccinium myrtilloides). The dwarf shrub/herbaceous layer is moderately dense and characterized by the dwarf shrubs, bearberry (Arctostaphylos uva-ursi) and bog cranberry (Vaccinium vitis-idaea), and

by ryegrass (Elymus innovatus). In contrast to other communities of this type, ground dwelling lichens are common. The composition of two stands of this community is described in Table 4.

Although few arboreal lichens occur on aspen in this community, the scattered pine trees support several species, especially Evernia mesomorpha, Hypogymnea physodes, and Cetraria spp.

4.1.5.2 Aspen/Low Bush Cranberry Community. This is probably the most common community of aspen forests in the AOSERP study area. It forms extensive stands on well to moderately well drained glacial tills and aeolian sand deposits. The tree layer is often pure aspen but may include widely scattered white spruce indicating succession towards a white spruce dominated community. Scattered alder (Alnus crispa) and willow (Salix spp.) form only a very sparse tall shrub layer but low shrub species are moderately dense (20 to 50% cover) (Photo 8). Principal species of this layer are low bush cranberry (Viburnum edule) and rose (Rosa acicularis). A rich and relatively luxuriant assemblage of herbaceous species (Table 4) forms a moderately dense layer. Dwarf shrubs, mosses, and lichens are poorly represented.

Arboreal lichens are poorly represented.

4.1.5.3 Aspen/Green Alder Community. Much less common than the previous aspen community, the aspen/green alder community occurs on more moist topographic positions such as lower slopes. It typically forms a band between the previous community and either the Tall Willow - Alder type, fens, or bogs.

The distinguishing feature of this community is a moderately dense tall shrub layer dominated by green alder (Alnus crispa) (Photo 9) beneath the aspen canopy. In addition, low shrub cover and especially herbaceous plant cover is considerably reduced, probably due to decreased sunlight reaching the forest floor.

Arboreal lichens are poorly represented.

Table 4. Percent Cover of Species in Aspen Dominated Upland Forest stands.

	TYPE					
	Aspen-Jack Pine/ Buffalo Berry		Aspen/Low Bush Cranberry		Aspen/ Green Alder	
Species	(12)	(24)	(2)	(27)	(9)	(10)
Trees						
Populus tremuloides	65	50	85	80	90	90
Pinus banksiana	3	30				
Picea glauca		1				
Betula papyrifera		1		8		
Tall Shrubs						
Picea glauca	2	1	3			
Populus tremuloides	4	1	1	1		
Salix bebbiana				3		
Salix spp.			10			
Alnus crispa		1	P	4	55	35
Amelanchier alnifolia				1		
Viburnum edule					1	
Low Shrubs						
Rosa acicularis	5	15	10	10	2	4
Shepherdia canadensis	15	20	3			
Amelanchier alnifolia	4		2			
Symphoricarpos albus	3	2		2	1	2
Vaccinium myrtilloides	8	10	5			
Lonicera dioica	1	P	1			2
Viburnum edule		5	15	12	15	7
Ledum groenlandicum		8	3			
Betula papyrifera	P	P		2	1	
Picea glauca	3			1	2	P
Rubus strigosus				5	5	3
Vaccinium myrtilloides				P		
Salix spp.		3				2
Ribes lacustre					2	
Dwarf Shrubs/Herbaceous						
Arctostaphylos uva-ursi	10	2				
Vaccinium vitis-idaea	3	15				
Elymus innovatus	10		2	4	1	1
Linnaea borealis	20		1	4	1	2
Cornus canadensis	10		8	3	4	3
Calamagrostis canadensis			20	2	1	
Petasites palmatus			3	2	1	1

Table 4. Continued.

	TYPE			
	Aspen-Jack Pine/ Buffalo Berry	Aspen/Low Bush Cranberry		Aspen/ Green Alder	
Epilobium angustifolium	1	8	1	1	1
Equisetum pratense		5	1	2	
Aralia nudicaulis	3	2	12	12	4
Mertensia paniculata		1	2	8	
Rubus pubescens	4	3	1	3	3
Apocynum androsaemifolium	4	P			
Pyrola secunda	1	1	1		
Carex lasiocarpa					P
Maianthemum canadensis	2	2	P	1	P
Galium boreale	1	2	2		1
Pyrola asarifolia	1	2	3	1	2
Lycopodium complanatum			1		
Smilacina trifolia	1		1	1	
Lathyrus ochroleucus		1			
Equisetum scirpoides					
Aster ciliolatus		1	P		
Equisetum sylvaticum					
Aster conspicuus	1	1			
Lycopodium obscurum				1	
Mosses - Lichens					
Hylocomium splendens				1	
Pleurozium schreberi		2	1	1	
Dicranum polysetum	1	1	1		
Polytrichum juniperinum	2	P		1	
Tomenthypnum nitens		1			
Brachythecium sp.		1			
Aulacomnium palustre			P		
Ptilium crista-castrensis		P	P		
Peltigera apthosa					
Cladonia spp.	8				
Stereocaulon paschale	1				

White Spruce - Aspen Mixed Forests

4.1.5.4 Aspen - White Spruce/Buffalo-Berry Community. This community occurs on relatively dry upper slopes with silty loam or loam soils. Due to the finer textured soils, these sites are somewhat more moist than those of the similar aspen - jack pine/buffalo berry community.

Aspen and white spruce in various proportions dominate the tree layer. Tall shrubs are virtually absent but a low shrub layer dominated by buffalo-berry is conspicuous (Photo 18). A variety of other shrub and herbaceous species are present (Table 5) and mosses are more abundant than in the aspen - jack pine/buffalo-berry community. Arboreal lichens are well represented on the white spruce but not the aspen.

4.1.5.5 White Spruce - Aspen/Low Bush Cranberry Community. This community apparently represents a successional stage developed from the aspen/low bush cranberry community. The undergrowth is similar to that of the earlier stage but reflects the influence of increased white spruce in the canopy. In particular, the cover and luxuriance of the low shrub and herbaceous layers is reduced while the cover of feather-mosses is somewhat increased (Table 5). However, low shrubs and herbaceous plants still dominate the undergrowth with a cover much greater than that of mosses (Photo 11).

4.1.5.6 White Spruce - Aspen/Low Bush Cranberry - Feathermoss. This community represents a still later successional stage developed from the aspen/low bush cranberry community. White spruce dominates the canopy although remnant aspen are also well represented. Low shrubs and herbaceous species dominate the aspect of the undergrowth (Photo 12) but the cover of feathermosses (especially Pleurozium schreberi and Hylocomium splendens) is substantially increased compared to earlier stages (Table 5).

Upland White Spruce Forests

4.1.5.7 White Spruce/Feathermoss Community. This community appears to be the climax forest on well to moderately well drained soils in the

Table 5. Percent Cover of Species in Upland White Spruce - Aspen Mixed Forest stands.

	Aspen - White Spruce/Buffalo Berry	White Spruce - Aspen/Low Bush Cranberry		White Spruce Aspen/Low Bush Cranberry-Feathermoss	
Species	(20)	(26)	(3)	(34)	(35)
Trees					
Populus tremuloides	30	65	5	10	20
Picea glauca	15	25	35	55	40
Pinus banksiana				5	
Betula papyrifera				3	
Tall Shrubs					
Picea glauca		2	2	5	5
Salix bebbiana		1		4	
Alnus crispa			3	15	10
Populus tremuloides	1		10	1	1
Populus balsamifera			P		
Low Shrubs					
Shepherdia canadensis	40		3		5
Rosa acicularis	15	8	20	5	3
Symphoricarpos albus	8		1	1	
Viburnum edule	3	5	10	3	10
Cornus stolonifera			8		
Ledum groenlandicum		1		12	
Potentilla fruticosa	1				
Vaccinium myrtilloides		4		2	2
Ribes lacustre			1		
Ribes hirtellum			2	1	
Ribes spp.					
Rubus strigosus				1	
Amelanchier alnifolia					2
Dwarf Shrub/Herbaceous					
Arctostaphylos uva-ursi	20				
Vaccinium vitis-idaea				4	3
Linnaea borealis	12	10	3	8	12
Rubus pubescens		2	15	4	3
Calamagrostis canadensis			12		3
Mitella nuda			12		
Cornus canadensis		8	8	4	5
Elymus innovatus	3	5	8	8	

Table 5. Continued.

	TYPE			
	Aspen - White Spruce/Buffalo Berry	White Spruce - Aspen/Low Bush Cranberry		White Spruce Aspen/Low bush Cranberry-Feathermoss
Petasites palmatus		2	5	1	2
Epilobium angustifolium			8	8	4
Equisetum pratense		P	5		
Mertensia paniculata			5		
Aralia nudicaulis		2	1	7	5
Lycopodium annotinum				5	
Fragaria vesca	3		2	1	
Galium boreale	2	1	2	1	1
Pyrola minor	2				
Smilacina stellata	3				
Anemone multifida	3				
Aster conspicuus	1		2		1
Pyrola secunda	1	1		1	
Equisetum sylvaticum		1			
Smilacina trifolia		1		1	
Carex lasiocarpa		3			
Maianthemum canadense		1	1	1	1
Trientalis borealis	1	1		1	
Achillea millefolium			1		
Galium trifolium			2		
Lathyrus ochroleucus			2		
Aster ciliolatus			2		
Equisetum scirpoides			2		
Lycopodium complanatum				3	
Pyrola asarifolia		P		1	1
Mosses - Lichens					
Hylocomium splendens	4	1	8	15	40
Pleurozium schreberi	1	3	15	40	8
Tomenthypnum nitens	2				
Ptilium crista-castrensis		2	5	2	
Plagiomnium spp.			2		
Drepanocladus sp.			1		
Brachythecium sp.			P		
Dicranum polysetum				3	
Peltigera aphthosa	1				
Cladina spp.	1				

study area. Distinguishing features are the white spruce dominated tree layer with only scattered aspen, birch, or black spruce (Picea mariana) and the nearly continuous feathermoss layer (Photo 13) dominated by Pleurozium schreberi and Hylocomium splendens. Tall shrubs are virtually absent but a relatively sparse low shrub layer of Labrador tea (Ledum groenlandicum), low bush cranberry, red osier dogwood, and rose is characteristic. A variety of low herbaceous plants is rooted in the moss layer (Table 5).

Arboreal corticolous lichens are well represented on spruce boles in this community.

4.1.6 Upland Jack Pine Forest

According to Stringer (1976), this physiognomic type includes jack pine forests on dry, well drained aeolian sand deposits. He concludes that the undergrowth composition is very distinctive and uniform.

Based on our survey, we have identified two provisional community types within jack pine forests. The first corresponds closely to Stringer's description.

4.1.6.1 Jack Pine/Lichen Community. The jack pine/lichen community occurs on sites that are apparently the driest and most nutrient poor of the AOSERP area. It is typically found on upper slopes and knolls of aeolian sand deposits which are rapidly drained. The aeolian deposits are often thin and bedrock may be contacted within 60 cm.

The trees are relatively open grown and almost entirely jack pine although widely scattered white spruce may be present. No tall shrubs are present. The prominent low shrub layer is predominantly blueberry (Vaccinium myrtilloides) less than 50 cm tall (Photo 14). The dwarf shrub/herbaceous layer beneath these shrubs is very sparse but terrestrial lichens (especially Cladina mitis) form a conspicuous and often nearly continuous ground cover (Photo 15).

4.1.6.2 Jack Pine/Buffalo-Berry Community. Most jack pine forests on medium and fine textured soils are included within this community

Table 6. Percent Cover of Species in an Upland White Spruce/ Feathermoss stand.

	TYPE
	White Spruce/ Feathermoss
Species	(32)
Trees	
Picea glauca	45
Picea mariana	3
Tall Shrubs	
Picea glauca	2
Picea mariana	1
Populus tremuloides	2
Betula papyrifera	1
Low Shrubs	
Viburnum edule	3
Rosa acicularis	2
Amelanchier alnifolia	1
Shepherdia canadensis	1
Cornus stolonifera	2
Ledum groenlandicum	4
Dwarf Shrub/Herbaceous	
Vaccinium vitis-idaea	5
Linnaea borealis	10
Cornus canadensis	8
Rubus pubescens	5
Geocaulon lividum	4
Elymus innovatus	2
Calamagrostis canadensis	2
Epilobium angustifolium	2
Mitella nuda	1
Lathyrus ochroleucus	2
Petasites palmatus	1
Smilacina trifolia	1
Lathyrus	1
Equisetum scirpoides	1
Pyrola secunda	1
Maianthemum canadense	1
Aralia nudicaulis	1

Table 6. Continued.

	TYPE
	White Spruce/ Feathermoss
Mosses - Lichens	
Pleurozium schreberi	50
Hylocomium splendens	40
Ptilium crista-castrensis	4
Dicranum polysetum	4
Peltigera aphthosa	3
Peltigera canina	1

type. Surface soil textures in the two plots studied are silt loam and silty clay loam, although one plot has a thin (10 cm) aeolian sand veneer over the finer textured soils.

This community differs considerably from the previous (Table 7). The tree layer, which is predominantly jack pine but may include scattered aspen and white spruce, is typically closed. In addition, a prominent low shrub layer is dominated by buffalo-berry (Shepherdia canadensis) and a much richer and more dense dwarf shrub/herbaceous layer is present (Photo 16). Although terrestrial lichens are commonly present, they cover only a small percentage of the ground surface (Table 7).

A rich arboreal lichen flora is present on the pine trees of the community .

4.1.7 Upland Mixedwood and Coniferous Forest

Stringer (1976) states that this type includes " a heterogeneous group of mixedwood and coniferous forest stands on upland, sandy sites." Jack pine, black spruce, and white birch are principal tree species.

In the Fort MacKay area, this physiognomic type is represented primarily by jack pine - black spruce forests. Only one community type was noted.

4.1.7.1 Jack Pine - Black Spruce/Labrador Tea Community. The composition of this community is adequately documented by Stringer's (1976) description of this physiognomic type. Characteristic features are a jack pine - black spruce dominated tree layer which frequently consists of widely spaced trees, a prominent low shrub layer consisting almost entirely of Labrador tea (Ledum groenlandicum) and blueberry (Vaccinium myrtilloides), and an extensive cover of lichens (especially Cladina mitis) (Photo 17). Feathermosses are locally important. The composition of two plots is presented in Table 8.

Soils of this community are moderately well to imperfectly drained sands and loamy sands which are more moist and probably colder than those of the somewhat similar pine/lichen community.

Table 7. Percent Cover of Species in Upland Jack Pine stands.

	TYPE		
	Jack Pine/ Lichen	Jack Pine/ Buffalo-Berry	
Species	(16)	(14)	(36)
Trees			
Pinus banksiana	25	65	70
Picea glauca			1
Populus tremuloides		2	P
Tall Shrubs			
Pinus banksiana		1	
Populus tremuloides		1	
Larix laricina		1	
Picea glauca			5
Low Shrubs			
Picea glauca	1	5	1
Populus tremuloides			1
Vaccinium myrtilloides	40	4	
Shepherdia canadensis		15	15
Rosa acicularis		8	5
Symphoricarpus albas		1	5
Viburnum edule		3	2
Ledum groenlandicum		4	
Potentilla fruticosa		1	3
Lonicera dioica		P	2
Cornus stolonifera		P	1
Dwarf Shrub/Herbaceous			
Arctostaphylos uva-ursi		40	70
Vaccinium vitis-idaea	10	15	3
Cornus canadensis	3	20	5
Oryzopsis pungens	1	8	5
Linnaea borealis		8	8
Epilobium angustifolium		3	
Elymus innovatus		5	3
Galium boreale		1	2
Rubus pubescens		1	2
Campanula rotundifolia			1
Fragaria vesca			1
Anemone multifida			1
Maianthemum canadensis			1
Lathyrus ochroleucus			1

Table 7. Continued.

	TYPE		
	Jack Pine/ Lichen	Jack Pine/ Buffalo - Berry	
Achillea millefolium			1
Aster ciliolatus			1
Viola rugulosa			1
Mosses - Lichens			
Cladina mitis	70	3	5
Cladonia uncialis	20		
Pleurozium schreberi		2	3
Dicranum polysetum			2
Cladina rangiferina		4	1
Peltigera apthosa		1	1
Peltigera malacea		1	
Hylocomium splendens		1	1
Polytrichum juniperinum		1	
Cladonia furcata			1
Cladonia gracilis			1

Table 8. Percent Cover of Species in Pine - Black Spruce Mixed Forest stands.

	TYPE	
	Jack Pine - Black Spruce/ Labrador Tea	
Species	(31)	(33)
Trees		
Pinus banksiana	25	15
Picea mariana	15	20
Larix laricina		1
Picea glauca	2	
Tall Shrubs		
Picea mariana	30	8
Betula papyrifera		1
Populus tremuloides	1	
Alnus crispa		
Low Shrubs		
Ledum groenlandicum	10	55
Vaccinium myrtilloides	3	15
Dwarf Shrub/Herbaceous		
Vaccinium vitis idaea	8	8
Cornus canadensis	5	2
Mosses - Lichen		
Cladina mitis	80	45
Pleurozium schreberi		40
Cladina alpestris	1	8
Cladina rangiferina		5
Dicranum polysetum		5
Polytrichum juniperinum		1
Peltigera aphthosa		1
Cladonia cornuta		1
Stereocaulon paschale	1	
Cladonia furcata	1	

4.1.8 Upland Black Spruce Forest

4.1.8.1 Black Spruce/Feathermoss Community. The placement of this community type within Stringer's (1976) classification is problematical since it does not appear to fit well within any of his physiognomic types. Based on his photograph of stand 18 (p.103), Stringer apparently included this community within his upland white spruce and aspen forest type but based on our survey it is quite distinct from other communities of this type. On Intera's maps, areas of this community are classified as upland white spruce - aspen forest, conifer type (2aC). Peterson and Levinsohn (1977) also identify a black spruce - feathermoss type and conclude that it corresponds to Stringer's black spruce bog forest. However, since it does not seem to fit well here either, we have elected, for purposes of this provisional classification, to maintain it as a distinctive type.

The black spruce/feathermoss community is characterized by a dense tree layer dominated by black spruce (typically 18 to 25 m tall and 10 to 30 cm dbh) and scattered white spruce with an undergrowth formed by a continuous cover of feathermosses (Pleurozium schreberi and Hylocomium splendens) (Photo 18). Relatively little other vegetation is present with the exception of scattered low shrubs, horsetails (Equisetum spp.), and graminoids (Table 9).

The soil of the plot studied is a silty clay, peaty Rego Gleysol developed apparently in lacustrine deposits with a watertable 35 cm below the surface (in late August).

4.1.9 Black Spruce Bog Forest

Stringer's (1976) black spruce bog forest includes black spruce stands on organic soils composed of sphagnum peat usually in excess of 1 m deep. The tree layer which varies from "sparse to medium dense" is formed of trees which are of small diameter (seldom over 10 cm dbh) and short (mostly less than 10 m).

Two provisional community types were distinguished during our brief survey. The first corresponds most closely to Stringer's (1976) description.

Table 9. Percent Cover of Species in an Upland Black Spruce Forest stand.

	TYPE
	Black Spruce/ Feathermoss
Species	(4)
Trees	
Picea mariana	60
Picea glauca	15
Tall Shrubs	
Picea mariana	5
Salix bebbiana	1
Low Shrubs	
Rosa acicularis	5
Ledum groenlandicum	3
Salix myrtillifolia	4
Ribes lacustre	1
Viburnum edule	1
Ribes hirtellum	1
Symphoricarpos albus	2
Dwarf Shrub/Herbaceous	
Vaccinium vitis-idaea	3
Arctostaphylos rubra	2
Carex capillaris	15
Calamagrostis canadensis	5
Equisetum scirpoides	8
Equisetum sylvaticum	5
Linnaea borealis	5
Mitella nuda	2
Equisetum pratense	3
Cornus canadensis	3
Petasites palmatus	2
Geocaulon lividum	3
Moneses uniflora	2
Rubus pubescens	1
Aralia nudicaulis	1
Petasites sagittatus	1
Mertensia paniculata	1
Achillea millefolium	1
Rubus acaulis	1
Rubus chamaemorus	1
Epilobium angustifolium	1

Table 9. Continued.

	TYPE
	Black Spruce/ Feathermoss
Mosses - Lichens	
Pleurozium schreberi	65
Hylocomium splendens	35
Peltigera aphthosa	1

4.1.9.1 Black Spruce/Labrador Tea - Sphagnum Community. This community is extensive on deep organic deposits in very poorly drained depressions and flats. It is characterized by a relatively open and often multistoried tree layer composed mostly of stems less than 15 m tall and 20 cm dbh. A few scattered tamarack (Larix laricina) and occasionally white birch (Betula papyrifera) trees may be scattered among the dominant black spruce. The tall shrub layer is composed of black spruce saplings and seedlings. Other tall shrubs are absent or incidental. A moderately dense low shrub layer, dominated by Labrador tea (Ledum groenlandicum) is a distinguishing feature of the community (Photo 19). These shrubs cover 20 to 60 percent of the surface and are about 40 to 75 cm tall. They are rooted in a thick and nearly continuous mat of mosses and lichens. Principal mosses are Sphagnum spp. A sparse cover of dwarf shrubs and herbaceous plants include characteristic bog species (Table 10).

Soils are organic, or less often peaty Gleysols. Frozen peat was encountered in one plot at 37 cm below the surface.

Arboreal lichens are abundant on black spruce branches in this community.

4.1.9.2 Black Spruce/Willow - Moss Community. This community differs from the previous primarily in the composition of the shrub and moss layers. The low shrub layer is generally more sparse than in the previous type and is dominated by willows (especially Salix macalliana S. pedicellaris and S. myrtillifolia) and dwarf birch (Betula pumila and B. glandulosa). Labrador tea is consistently present but less dense. The moss layer is nearly continuous and dominated by Tomethypnum nitens with only scattered sphagnum mosses. In addition, herbaceous cover is generally greater (Table 10) and organic accumulations are thinner. The tree layer is similar (Photo 20). This community may represent a successional stage to the previous community following fire.

Table 10. Percent Cover of Species in Black Spruce Bog Forest stands.

	TYPE				
	Black Spruce/ Ledum-Sphagnum		Black Spruce/ Willow - Moss		
Species	(1)	(25)	(23)	(29)	(13)
Trees					
Picea mariana	25	35	2		
Larix laricina	1	2	2		
Tall Shrubs					
Picea mariana		15	40	85	65
Larix laricina		2	1		2
Low Shrubs					
Picea mariana	10		20		
Larix laricina	2				
Ledum groenlandicum	35	35	2	1	15
Betula papyrifera	3				
Salix maccalliana	2		10	4	4
Pinus banksiana	1				
Betula pumila			5		
Rosa acicularis				2	
Ribes hirtellum				1	1
Cornus stolonifera				2	
Potentilla fruticosa				1	
Salix myrtillifolia		8	20	8	10
Salix pedicellaris				1	
Dwarf Shrubs/Herbaceous					
Vaccinium vitis-idaea	25	15	4	P	5
Arctostaphylos rubra		4	2	3	8
Oxycoccus microcarpus	8	2	1		
Equisetum sylvaticum	8				
Carex aquatilis	2	2	8	2	5
Calamagrostis canadensis	3			5	
Rubus chamaemorus	4				
Equisetum scirpoides		1	2	3	
Equisetum pratense	1	3	2		25
Carex rostrata					8
Carex diandra			15	3	2
Smilacina trifolia	1	1	3	1	3
Petasites sagittatus		1	1	1	

Table 10. Continued.

	TYPE			
	Black Spruce/ Ledum-Sphagnum	Black Spruce/ Willow - Moss		
Agrostis alba		1		
Pyrola secunda			1	
Mitella nuda			1	1
Deschampsia caespitosa			2	2
Linnaea borealis			2	
Geocaulon lividum		1	2	
Achillea millefolium			P	1	1
Petasites palmatus			1	1
Epilobium angustifolium		P	1	
Carex capillaris			1	
Mertensia paniculata			1	
Parnassia palustris				1
Mosses - Lichens				
Sphagnum fuscum	35	10		2
Sphagnum nemoreum	15	8	2	1
Sphagnum warnstorfii		15	P	
Hylocomium splendens		40		
Cladina mitis	2	30	2	8	8
Tomenthypnum nitens			60	40	50
Aulacomnium palustre		5	3	45	35
Cladonia bellidiflora	2				1
Cladonia gracilis	2				3
Cladina rangiferina	1	1	1		2
Polytrichum juniperinum	1	1	1		1
Dicranum polysetum	P	10	1		
Cladina alpestris		2			
Pleurozium schreberi	2	3			2
Cladina arbuscula		1		1	
Cladonia amaurocraea	1	1			
Drepanocladus spp.			1		
Cladonia furcata				1	
Peltigera aphthosa		1			2

4.1.10 Semi-Open Black Spruce - Tamarack Bog Forest

Dense mature bog forest grades continuously into open bog vegetation as sites become wetter. Many intermediates between bog forest and open bog are present and included within this type. According to Stringer (1976), this type is very similar to black spruce bog forests but includes a higher proportion of open bog and more frequent tamarack.

Two provisional communities are included within this type and are similar to the two communities of the black spruce bog forest.

4.1.10.1 Black Spruce - Tamarack/Labrador Tea - Sphagnum Community. This muskeg community is similar to the black spruce/Labrador tea - sphagnum community with the exception of its less dense tree layer and greater proportion of tamarack.

4.1.10.2 Black Spruce - Tamarack/Willow - Moss Community. This community is similar to the black spruce/willow - moss community with the exception of a less dense tree layer and greater proportion of tamarack.

4.1.11 Shrub Bog

This type is not described by Stringer (1976) but includes relatively large bog areas which have been recently burned in the vicinity of the lower MacKay River. It is apparently a successional stage in the return of black spruce bog forest (black spruce/willow - moss community) following fire. Although it is dominated by a dense cover of shrubs, abundant black spruce reproduction indicates succession towards bog forest. It is superficially similar to low shrub fen but is distinguished from fen by the predominance of bog mosses (Tomethypnum nitens and Sphagnum spp.) rather than fen mosses (Drepanocladus spp.). However, due to the highly disturbed character of this type, some fen characteristics are expressed. For example, reed grass (Calamagrostis canadensis) and sedges (Carex spp.) and occassionally fen mosses (Drepanocladus spp.) are present. We have termed this a bog type based

on interpretations regarding successional trends but addition data on composition and successional trends are required to better define this type. We propose it only as a very provisional type. One community is distinguished.

4.1.11.1 Willow - Dwarf Birch - Bog Moss Community. This community is dominated by a moderately dense low shrub stratum approximately 1 to 3 m tall (Photo 21). Principal shrubs are willows (especially Salix maccalliana and S. pedicellaris) although dwarf birch (Betula pumila and lesser B. glandulosa) is commonly present. A variable and discontinuous herbaceous layer often includes reedgrass, sedges (Carex aquatilis, C. lasiocarpa, C. diandra), and coltsfoot (Petasites palmatus). Moss cover is relatively well developed and dominated by Tomenthypnum nitens with scattered Sphagnum spp. and Aulacomnium palustre (Table 11). Seedlings of black spruce, tamarack and occassional white spruce are numerous.

Soils are organic. However, peat depths appear to be thinner than in the bog forest, possibly due to the effects of recent fire. Additional data on soils of this community are needed.

4.1.12 Lightly - Forested Tamarack and Open Muskeg. Stringer (1976) states that stands in this type are generally open muskeg (i.e. non treed bog) but may have a few scattered tamarack trees present. A shrub stratum is prominent.

This type differs from the provisional shrub bog type described previously by its greater cover of sphagnum mosses and other characteristic bog species such as bog cranberry (Oxycoccus microcarpus), leather leaf (Chamaedaphne calyculata), and Carex chordorrhiza. One community is tentatively described.

4.1.12.1 Sphagnum Moss - Bog Birch Community. Ground cover in this community is dominated by Sphagnum mosses (Table 12). A prominent but open cover of low shrubs (Photo 22) includes bog birch (Betula glandulosa), willow (Salix pedicellaris and S. maccalliana), leather leaf and Labrador

Table 11. Percent Cover of Species in a Shrub Bog Stand

	TYPE
	Willow-Dwarf Birch/Bog Moss
Species	(6)
Tall Shrubs	
Picea mariana	4
Picea glauca	1
Low Shrubs	
Salix maccalliana	60
Salix pedicellaris	10
Salix myrtillifolia	2
Ledum groenlandicum	2
Alnus tenuifolia	1
Dwarf Shrub/Herbaceous	
Calamagrostis canadensis	35
Carex aquatilis	10
Petasites sagittatus	5
Carex diandra	2
Rubus acaulis	3
Smilacina trifolia	2
Aster ciliolatus	1
Equisetum pratense	1
Rubus pubescens	1
Pyrola asarifolia	2
Parnassia palustris	1
Mosses/Lichens	
Tomenthypnum nitens	60
Aulacomnium palustre	5
Sphagnum fuscum	1
Sphagnum warnstorfii	2
Sphagnum nemoreum	1
Polytrichum juniperinum	2
Drepanocladus spp.	4

Table 12. Percent Cover of Species in an Open Bog Stand

	TYPE
	Sphagnum Moss/Bog Birch
Species	(30)
Tall Shrubs	
Picea mariana	3
Low Shrubs	
Betula glandulosa	5
Salix maccalliana	10
Salix pedicellaris	2
Chamaedaphne calyculata	10
Ledum groenlandicum	2
Dwarf Shrub/Herbaceous	
Carex aquatilis	15
Carex diandra	10
Oxycoccus microcarpus	4
Carex chordorrhiza	4
Smilacina trifolia	2
Rubus acaulis	1
Potentilla palustris	1
Equisetum arvense	1
Mosses/Lichens	
Sphagnum warnstorfii	50
Sphagnum fuscum	20
Sphagnum nemoreum	20

tea. The dwarf shrub/herbaceous layer generally covers 10 to 50 percent of the surface and is predominantly sedges.

4.2 GROUND CHECKING OF VEGETATION MAP

The purpose of this section is to describe the results of our field checking of Intera's vegetation map in T94R10W4 and T94R11W4. Results are presented in terms of four types of problems we encountered in using the map to describe existing vegetation. Although the maps do display a considerable volume of useful information about the existing vegetation , we have concentrated our discussion on problems in order to provide background for designing programs to enhance the utility of the maps.

4.2.1 Editorial

This is a minor type of problem which can be relatively easily eliminated by careful office checking of the maps in conjunction with interpretation of air photos. For example, in T94R11W4, a map unit is annotated "3AM3B" but obviously should be 2AM3B. 3AM3B is not included on the legend. Other editorial errors which result in real units are more difficult to correct and would be included as errors of interpretation.

A second editorial problem relates to map boundaries. Different annotations are sometimes not separated by boundaries and in other cases the same annotation is given to adjacent map units.

4.2.2 Completeness of Mapping Classification

Some major physiognomic vegetation types are present within the AOSERP area but not recognized by Stringer (1976). For example, riperian white spruce forests are not included except as part of a much more generalized "Bottomland and Riperian Forest." Other physiognomic types which are not recognized include shrub fen, upland black spruce forest (black spruce - feathermoss forest) and shrub bog type may correspond, in part at least, to Intera's "Upland Undifferentiated" category.

4.2.3 Interpretation

Since the vegetation maps have not been ground checked, they include errors of interpretation. For example, extensive areas of shrub bog and bog forest in the Fort MacKay area are mapped as mixed coniferous forest (2b).

4.2.4 Scale

Mapping scale problems arise when the maps are used for detailed, site specific vegetation interpretations. Due to the relatively small scale (1:50 000) of the maps, approximately 30 % of the map units in the area surveyed encompass heterogeneous vegetation composed of small patches of several different types. These map units are primarily low wet areas where slight elevation changes result in pronounced vegetation differences. Fewer problems are apparent in upland areas. In some cases, the diverse types of these heterogeneous units have been lumped by Intera into a broader, more inclusive type such as Wetland Communities - Undifferentiated. However, since these broader units include a wide range of types, they leave much to be desired for many potential users.

In other cases, the diverse vegetation types within a map unit cannot be meaningfully combined. For example, fens, open bogs, black spruce bog forests, semi-open black spruce - tamarack bog forests, upland aspen forests and upland jack pine forests are all substantially present in some map units at a scale too small to map at 1:50 000. The map unit annotation commonly does not indicate all principal types present. For example a map unit with the above range of types in T94R11W4 is annotated 3/2c1B meaning wetlands undifferentiated and upland jack pine forests less than 10 m tall and of medium density. However, many of the pine forests are much taller and a substantial area of aspen forest is ignored. To indicate all principal types within the map unit would require a very long annotation.

Finally, some map units which are otherwise quite homogeneous contain small but significant inclusions of other types. In some units, these inclusions are numerous but individually too small to map

at 1:50 000. Less frequently, however, inclusions are sufficiently large to map at 1:50 000. A most obvious example of the latter is the pine forest of the AOSERP research camp site which is not shown on the map. Scale problems are generally much less significant when the maps are used for broad overview interpretations. Thus, the intended use of the maps is critical to an evaluation of scale problems.

4.2.5 Vegetation Composition Detail

Intera's maps present no detailed information on vegetation composition other than for trees in forested areas. For description of vegetation composition, Intera's maps rely heavily on descriptions by Stringer (1976). However, Stringer's types are very broad, lumping for example, all pine forests into one type and all upland white spruce and aspen forests into one type. One undergrowth description is applied to the entire range of variability within the type. Thus, the species composition of a given map unit cannot necessarily be inferred from Stringer's description. The result is that in forested areas at least, the maps do not display substantially more information than that which is available on forest cover maps prepared by the Alberta Forest Service.

Some of Intera's mapping types do not have a corresponding description in Stringer's (1976) report. For example, Intera's maps distinguished upland white spruce forest from upland mixed forest and upland aspen forest although Stringer provides one description for all three.

5. RECOMMENDATIONS

The following recommendations are proposed for purposes of discussion regarding means for enhancing vegetation detail on Intera's vegetation maps. These recommendations are organized as a response to the problems outlined in the preceeding section.

5.1 EDITORIAL

Careful office review of the maps in conjunction with air photo interpretation is recommended in order to correct editorial

problems. Attention should be given to map units with two or more different annotations, to adjacent map units with the same annotation and to map units without corresponding definition in the legend. Map units with editorial problems should also be examined by ground checking of the maps.

5.2 COMPLETENESS OF THE MAPPING CLASSIFICATION

Examples of physiognomic types which occur within the Fort MacKay area but are not described by Stringer (1976) are presented in the Results Section. Additional field survey may result in a modification of these types and the description of additional types. Consequently, a more extensive field survey program is recommended to more adequately document major physiognomic types of the AOSERP area. In general, new physiognomic types should be discernible on 1:60 000 false color infrared photography although some types such as shrub fen and shrub bog may require ground survey for final identification.

5.3 INTERPRETATION

Errors of interpretation can only be corrected with confidence by ground checking of the maps. Consequently, a ground checking program similar to that conducted in the Fort MacKay area is recommended. Areas of principal interest such as proposed development areas or areas likely to be affected by development should be given priority. As many map units as possible should be visited and a new annotation developed for those in which the existing annotation does not adequately describe the vegetation. An expanded classification of physiognomic types as recommended in Section 5.2 should be utilized.

5.4 SCALE

Three alternative approaches for more adequately documenting the complex vegetation of heterogeneous map units could be employed. The first would involve more detailed air photo interpretation and mapping within existing map units whenever mappable differences are apparent.

Except in areas of special interest, this approach is not recommended. More detailed mapping to outline vegetation types

sufficiently homogeneous for detailed user evaluation would require a larger mapping scale, such as 1:20 000. However, the current map boundaries were drawn for presentation at 1:50 000 and a larger presentation scale would require that some of the current boundaries be redrawn to conform to the greater detail. Not only the low lying wet areas where scale problems are most serious but also upland vegetation with many fewer scale problems would be mapped to the greater detail. Thus, a very large air photo interpretation and remapping project would be required if the entire area mapped by Intera were to be covered.

This approach may be appropriate for small areas of special interest such as proposed development sites.

A second approach would involve no alteration of map boundaries but an expansion of map unit annotations. A longer annotation could be developed to indicate the predominant types within the map unit as well as their relative proportions. As in the remapping approach, expansions of the annotations would be required primarily in low lying wet areas with slight topographic relief.

A possible example of an expanded annotation in a heterogeneous unit is 3c.3b(2aA2B.3a(2c2B). This would be interpretated to mean that the unit is predominantly semi-open black spruce - tamarack bog forest and black spruce bog forest with smaller areas of aspen forest and fen and minor areas of jack pine forest. A less heterogeneous unit might be annotated 2aA2B(2c2B). This system is employed in part on the existing maps since they often indicate two types separated by a slash.

Disadvantages of this approach are that in heterogeneous units, the map annotation becomes very long and cumbersome and also that the distribution of component types within the unit cannot be determined. The format of the annotation is also limited since parentheses are used by Intera for other purposes.

A third approach is to develop a footnoting system for the maps. Each unit on a given map would be given a number which would also appear in a tabular footnoting system. The principal, secondary and minor types within the unit would be listed together with any special notes on the vegetation. Map units with the same vegetation would be

given the same footnote number. The tabulated footnotes could be organized according to township in which the map unit occurs and their predominant vegetation type.

A possible example of the tabulated footnote system may read:

Footnote	Principal Type	Secondary Type	Tertiary Type	Minor Type	Notes
T94R10					
1	3C	3b	2aA2B	2c2B	
2	3C	3b			
3	3C	2b3A	2c1B		

Advantages of this system are that the annotations can be long without presenting cartographic difficulties and notes on the vegetation could be provided. Existing annotations on the maps would have to be deleted or altered to include only the predominant types. A disadvantage of this approach, as with the previous, is that the distribution of types within a unit cannot be determined. In addition, the maps may be more difficult to use since the user would have to refer to a table at the bottom on the side of the map for the complete annotation.

5.5 VEGETATION COMPOSITION DETAIL

By coding the vegetation community classification outlined in Section 4.1 of the Results Section, greater vegetation composition detail could be added to the maps. Each community type within a physiognomic mapping type could be given a distinct code as follows:

Bottomland and Riperian Forest (1a)

Balsam Poplar-White Spruce/Red Osier Dogwood Community: $\frac{1a}{1}$

White Spruce/River Alder - Horsetail Community: $\frac{1a}{2}$

Deciduous Shrub (1b)

Tall Willow - Alder/Reed Grass Community: $\frac{1b}{1}$

Tall Willow - River Alder/Red Osier Dogwood Community: 1b/2

Low Shrub Fen: 1b/3

Tall Shrub Fen: 1b/4

Willow Dwarf Birch - Bog Maps Community (Shrub Bog): 1b/5

Upland White Spruce - Aspen Forest (2a)

Aspen (2aA)

Aspen - Jack Pine/Buffalo Berry Community: 2aA/1

Aspen/Low Bush Cranberry Community: 2aA/2

Aspen/Green Alder Community: 2aA/3

Mixed (2aM)

Aspen - White Spruce/Buffalo Berry Community: 2aM/1

White Spruce - Aspen/Low Bush Cranberry Community: 2aM/2

White Spruce - Aspen/Low Bush Cranberry Feathermoss Community: 2aM/3

Coniferous (2aC)

White Spruce/Feathermoss Community: 2aC/1

Mixed Coniferous (2b)

Jack Pine - Black Spruce/Labrador Tea Community: 2b/1

Jack Pine (2c)

Jack Pine/Lichen Community: 2c/1

Jack Pine/Buffalo Berry Community: 2c/2

Upland Open (2d)

(A classification would be developed)

Fen Communities (3a)

Open Fen: 3a/1

(Low Shrub Fen and Tall Shrub Fen included in 1b)

Upland Black Spruce Forest (no current designation)

Black Spruce/Feathermoss Community: ?/1

Black Spruce Bog Forest (3b)

Black Spruce/Labrador Tea - Sphagnum Community: 3b/1

Black Spruce/Willow - Moss Community: 3b/2

Semi-Open Black Spruce - Tamarack Bog Forest (3c)

Black Spruce - Tamarack/Labrador Tea - Sphagnum Community: 3c/1

Black Spruce - Tamarack/Willow Moss Community: 3c/1

Lightly Forested Tamarack and Open Muskeg (3d)

Sphagnum Moss - Bog Birch Community: 3d/1

This code system could be expanded as additional types are domumented or these types are altered. Minor variants of the community types could be indicated by subscripting the community type designation ($\frac{2aA}{1a}$, $\frac{2aA}{1b}$ etc.).

The community type code could be added to the annotation on the maps or in the tabulated footnote system as outlined previously.

Compositional data on lichen communities would be part of the general community description. Special notes on lichens could be provided if the tabulated footnote system were utilized.

6. LITERATURE CITED

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