Rare and Endangered Plant Communities of the Southeastern Skeena Region

final report

prepared for:

B.C. Environment, Skeena Region
and the
Habitat Conservation Trust Fund
B.C. Ministry of Environment, Lands and Parks

by

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May 1998

Executive Summary

A two year project, funded by the Habitat Conservation Trust Fund of B.C. (HCTF) and administered by the Skeena Region, Wildlife Branch, B.C. Ministry of Environment, Lands and Parks (MELP), was carried out in the southeastern Skeena Region (Bulkley, Kispiox, Morice, and Lakes Forest Districts) to inventory and assess rare and endangered plant communities. The inventory focused on red-listed grassland, scrub-steppe and floodplain communities in the Bulkley Basin (BUB) ecosection and dry cool Sub-Boreal Spruce (SBSdk) biogeoclimatic subzone with the objective of mapping all red-listed occurrences in the Bulkley SBSdk at 1:20,000 scale. Other objectives for the project were to provide an overview assessment of rare and endangered plant communities throughout the four Districts, including plant communities not currently listed, and to raise awareness among MELP and Ministry of Forests staff in the four Districts of rare and endangered plant communities and their management.

A total of 56 days were spent in the field between May 1, 1996 and October 28, 1997. Site visits were made to 131 rare plant community element occurrences and 177 field records of various types were collected. Each ground-truthed element occurrence was marked on an aerial photograph and 745 photographic slides were taken. Permanent photo-tiepoints were established at 57 locations to allow changes in the plant communities to be monitored. An additional 107 field records of element occurrences were obtained from other sources. Collections of plant voucher specimens (359 vascular plants, 84 cryptogams) and rock samples (38) were made.

Twenty six 1:20,000 TRIM mapsheets were either partially or completely mapped with a total of 871 plant community polygons delineated (total area 6795 ha). These mapsheets encompass the Bulkley Valley SBSdk corridor, with a few partial mapsheets scattered in other drainages and in other Forest Districts. The project maps have a

computerized database that is compatible with TEM standards and allows each element occurrence or polygon to be entered into the B.C. Conservation Data Centre (CDC) tracking records in Victoria. The 1:20,000 maps were digitized by the CDC using ARC-INF0 format.

Table 1 summarizes located and mapped occurrences of the red-listed and other rare and endangered plant communities by Element Occurrence (EO) Rank, an indication of quality or condition.

The Saskatoon - slender wheatgrass scrub-steppe (SW) is an exceptionally diverse plant community found on dry southwest facing slopes. A total of 226 occurrences totaling 1074 hectares were recorded in the Bulkley, with an additional 74 located in other Districts (many more unmapped) (Table 1). Although not particularly rare, the SW is threatened by changes to its disturbance regime, including climatic change, fire suppression, urbanization, heavy grazing or browsing, and invasion by non-native plants. There is excellent representation of SW within newly approved Goal 1 and 2 protected areas in both the Lakes and Bulkley Forest Districts; however, even in protected areas, active management of fire, herbivores and some control of invasive species will be needed to maintain their diversity over time. Occurrences of the SW with well developed stands of Rocky Mountain juniper (JS) or on steep river scarps (SWd) are rare, highly threatened and occur mostly on private land. I recommend that the SW be down-listed to blue status provided that the JS receives separate status as a red-listed plant community.

Bluegrass slender - wheatgrass grasslands (BW) in good to excellent condition are essentially absent from the Bulkley District. Five occurrences totaling 58 ha were mapped in the Bulkley (Table 1) but these occurrences only marginally fit the description of BW. The largest and best occurrence, located in the upper SBSmc2 on Grouse

Table 1. Summary of Rare and Endangered Plant Communities and Ecosystem Complexes

a. Occurrences located and mapped in the former Bulkley Forest District

Plant Community/Ecosystem Complex	Site Series	TEM Code		Occurrences by EO Rank				Total	% Good or Excellent
				Excellent	Good	Marginal	Poor		
Saskatoon - slender w heatgrass scrub/steppe	SBSdk,SBSmc2,ICHmc2/81	SW	number:	1	76	114	35	226	34%
			area (ha):	85	338	387	263	1073	39%
Bluegrass - slender w heatgrass grassland	SBSdk,SBSmc/82	BW	number:	1	3	0	1	5	80%
(occurrences in poor condition generally not mapped)			area (ha):	38	4	0	16	58	73%
Cow parsnip - avens/aster - meadow-rue meadow s	SBS, ESSF, ICH, CWH/00	CA/AM	number:	0	107	120	11	238	45%
(occurrences in poor condition mostly not mapped)			area (ha):	0	411	662	52	1125	37%
Black cottonw ood - red osier dogw ood - prickly rose	SBSdk/08	CD	number:	0	96	83	48	227	42%
			area (ha):	0	486	513	364	1363	36%
White spruce - horsetail	SBSdk/07	SH	number:	0	23	13	0	36	64%
(occurrences in poor condition not mapped)			area (ha):	0	55	53	0	108	51%
Hybrid Sitka spruce - salmonberry floodplain forest	CWHw s2/07	SS	number:	0	103	11	0	114	90%
			area (ha):	0	244	14	0	258	95%
Miscellaneous exceptional populations & ecosystems									
Arctic poppy alpine ridge	AT/00	00	number:	0	1	1	0	2	50%
			area (ha):	0	4	0.4	0	4	89%
Basalt outcroppings w ith blue-listed pine-kinnickinnick - lichen	SBSdk/02, ICHmc2/02	LJ, LK	number:	0	3	0	0	3	100%
			area (ha):	0	63	0	0	63	100%
Fluvial meadow - open pine forest complex	SBSmc2/00	AM/SHc?	number:	0	2	0	0	2	100%
			area (ha):	0	16	0	0	16	100%
Mature spruce forest (Crow n land & giant spruce tree)	SBSdk/06	ST	number:	0	2	0	0	2	100%
			area (ha):	0	18	0	0	18	100%
Mountain lady slipper population	SBSdk/06	ST	number:	0	1	1	0	2	50%
			area (ha):	0	1	0.1	0	1	90%
Old grow th lodgepole pine - black tw inberry	SBSdk/06	ST	number:	0	1	0	0	1	100%
			area (ha):	0	14	0	0	14	100%
Paper birch - black tw inberry - horsetail high bench floodplain	SBSdk/$58(new)	CDbt or SHbt	number:	0	2	0	0	2	100%
			area (ha):	0	6	0	0	6	100%
Skunk cabbage - horsetail sw amp on glaciolacustrine	ICHmc2/07	RC	number:	0	2	0	0	2	100%
			area (ha):	0	41	0	0	41	100%
Slender rock brake - large-aw ned sedge spray zone	SBSmc2/00	00	number:	1	0	0	0	1	100%
			area (ha):	1	0	0	0	1	100%
Western redcedar stand-range limit	ICHmc2/03	HO	number:	0	1	0	0	1	100%
			area (ha):	0	17	0	0	17	100%

b. Summary of recorded occurrences - other Forest Districts[a]

Plant Community/Ecosystem Complex	Site Series	TEM Code	Morice	Lakes	Kispiox
primarily Saskatoon - slender w heatgrass scrub/steppe	SBSdk,SBSmc2,ICHmc2/81	SW	18	45	11
primarily Bluegrass - slender w heatgrass grassland	SBSdk,SBSmc/82	BW	4	10	--
primarily Black cottonw ood - red osier dogw ood - prickly rose	SBSdk/08	CD	36	4	--
primarily White spruce - horsetail floodplain forest	SBSdk/07	SH	8	11	--
primarily hybrid Sitka spruce - salmonberry floodplain forest	CWHw s2/07	SS	0	0	0
fluvial meadow & w etland complex	ESSF, SBS, ICH, CWH/00	CA/AM	10	0	3
primarily Douglas-fir - soopolallie - feathermoss	SBSdk/04	DS	?	15	--

[a] TEM mapping is showing that these occurrences represent only a small fraction of the total occurrences.

Mountain straddles the Bulkley:Morice District boundary. It is dominated by introduced agronomic grasses, but retains many native species and is an outstanding example of the type of herb meadow/grassland community that may once have been common at low elevations in the Bulkley Valley. Most herb-dominated plant communities in the Bulkley are not true grasslands but are better classified as cow parsnip - avens (CA) or aster - meadow rue (AM) herb meadows (238 occurrences, 1124 ha mapped, Table 1). These communities, found on southwest-facing slopes and on inactive fluvial terraces, were not previously described or classified. I recommend red-listing the AM and blue-listing the CA, pending more detailed classification work.

True grasslands (BW) are more extensive in the Lakes District along the north shorelines of southern lakes from Francois to Netalkuz, but are not well represented in the new protected areas recommended for that District. All known occurrences are substantially modified by a century of domestic grazing and introduced plant species.

Fire suppression has greatly reduced the original extent of the BW, CA and AM communities, and prescribed burning should be reintroduced, where possible, with careful monitoring to avoid increasing the dominance of non-native species. Controlled grazing is another option for reducing tree encroachment onto these plant communities, but should not be considered in areas that currently have few non-native species. A system of large and small benchmark ecosystems is proposed for the SW, BW, AM, CA and associated aspen communities to develop and monitor prescriptions for prescribed burning and controlled grazing. In intensely settled areas such as the Bulkley Valley where most occurrences are on private land, a public awareness and stewardship program, similar to the Garry oak and Antelope-brush conservation strategies in southern B.C., is recommended to encourage private landowners to conserve and restore these ecosystems.

The red-listed Black cottonwood - red osier dogwood - prickly rose plant community (CD) is extensive along the Bulkley and Morice Rivers but small and scattered elsewhere in the SBS zone. The Morice River occurrences (mostly unmapped) are in good to excellent condition. In the Bulkley District most of the 227 mapped occurrences (1363 ha) are in marginal to poor condition (58% of all polygons; 64% by area, Table 1) because of disturbances associated with settlement and agricultural activity. Flood control measures and bank erosion also threaten the long term viability of these ecosystems. Heavy ungulate browsing and introduced species are a concern in some areas.

Closely associated with the CD on SBSdk floodplains are a variety of other forested and non-forested riparian plant communities. The White spruce - horsetail (SH) plant community was identified as rare and highly threatened on floodplains and other settled areas within the SBSdk. Only 36 polygons, totaling 108 ha (median size 1.9 ha) could be found in the Bulkley SBSdk (Table 1). Several additional riparian plant communities were described and proposed for red- or blue-listing.

There are few occurrences of large river floodplains in newly approved protected areas. The Morice R. corridor is the best remaining opportunity in the southeastern Skeena Region to maintain the CD and associated plant communities in a near natural condition with unrestricted flooding regimes. This must be a primary objective in future planning for the river corridor. Mapping and preparing management strategies for scattered occurrences of the CD on lakeshores and smaller streams in the Lakes and Morice Districts and in the Bulkley SBSmc2 should be also done promptly.

Along the Bulkley River and its tributaries, opportunities for restoration of natural communities and hydrological processes are greatly restricted. Further alienation and disturbance to the remaining Crown land occurrences must be prevented. Efforts to

restore connectivity should begin by working with municipalities, the Regional District, private landowners and Fisheries Canada to develop a greenway system with the goal of preventing further clearing, stabilizing banks, restoring riparian vegetation, and allowing natural flooding of backchannels and lower benches to occur wherever possible.

Preliminary mapping of the red-listed Sitka spruce - salmonberry plant community (SS) identified 114 small, poorly-developed occurrences (90% in good condition) and few imminent threats on the upper Zymoetz R. Careful planning of road and bridge locations, attention to riparian management guidelines, and greater awareness among recreational users of the river should ensure that minimal damage occurs to this ecosystem.

This pilot study has provided an excellent opportunity to increase awareness of, and interest in, rare and endangered ecosystem management within the southeastern Skeena Region. Descriptive operational reports, oral and poster presentations and field trips were used present the information to resource management professionals and the public, and stimulated much discussion and information exchange. Preliminary information from the project has already proven useful in protected areas assessment (Lakes District LRMP), landscape unit planning (Kispiox and Bulkley Districts), environmental impact assessments (Telkwa Coal, Huckleberry Mine Powerline Corridor) and was the impetus for the first-ever purchase of private land in the Bulkley Valley by HCTF. The digitized maps and database from the project (completed May 1998) will be a further asset to planning.

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1. Introduction

Conservation of biological diversity, at all levels of biological organization, has become an overriding management imperative for natural resource agencies worldwide. In British Columbia, the Conservation Data Centre (CDC), a joint program of the B.C. Ministry of Environment, Lands and Parks (MELP), the Nature Trust of B.C. and The Nature Conservancy (Canada, U.S.), has the responsibility of tracking species and plant communities that are considered threatened or endangered at the provincial, national, or global level. Management programs to conserve threatened and endangered plant communities are administered by MELP, at the regional level by the Rare and Endangered Species specialist, and at the Forest District level by the Forest Ecosystem Specialist.

The CDC is a partner of the National Heritage Network, an international body that uses standardized methods and terminology to gather and exchange information on threatened elements of global biodiversity. By international convention, the CDC uses the term "plant community" for the ecosystem component of its conservation program. This definition implicitly recognizes that a plant community consists not only of a relatively stable and homogeneous collection of plant species, but also includes the soils, rocks, air and water, animals and microorganisms, and the energy, nutrient and water cycles that bind them together. In British Columbia, plant communities are equivalent to the "plant association" level of the Biogeoclimatic Ecosystem Classification (BEC) (Pojar et al. 1987). The site associations and site series described through BEC are used as a basis for defining and naming plant communities.

For each Forest District in British Columbia, the CDC maintains a tracking list of **red-** and **blue-listed** plant communities known or believed to occur within the District. The most recent version of the list is available at the website: **www.env.gov.bc.ca** (see Appendix Ia for Forest Districts in the Southeastern Skeena Region). To establish the red and blue lists, each plant community is assigned a provincial ranking (S1 through S5; Table 2) The CDC has developed a preliminary procedure for inventorying and mapping occurrences of red-listed plant communities. Draft prescriptions for managing red-listed

Table 2. Provincial rank and provincial list definitions used by the B.C. Conservation Data Centre (CDC) for plant communities
(refer to Appendix Ib for the criteria used to derive provincial ranks)

Prov. Rank	Definition
S1	**Critically imperiled** because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation or extinction
S2	**Imperiled** because of rarity or because of some factor(s) making it vulnerable to extirpation or extinction
S3	**Rare or uncommon;** may be susceptible to large-scale disturbances; may have lost extensive range
S4	**Frequent to common;** apparently secure but may have a restricted distribution or there may be perceived future threats
S5	**Common to very common;** demonstrably secure and essentially ineradicable under present conditions

Prov. List	Corresponding Provincial Rank
red	S1, S1?, S1S2, S2, S2?
blue	S2S3, S3, S3?

"?" indicates uncertainty, double ranks indicate a possible range

plant communities are also being prepared as part of the Identified Wildlife Management Strategy Guidebook of the Forest Practises Code of British Columbia Act (B.C. Conservation Data Centre 1997), currently in review.

In 1996, Skeena Forestry Consultants was contracted by Anne Hetherington, (Rare and Endangered Species specialist, B.C. Environment, Skeena Region) to conduct an inventory and assessment of rare and endangered plant communities in the southeastern portion of the Skeena Region, defined as comprising the Kispiox, former Bulkley (now a portion of the Bulkley-Cassiar), Morice, and Lakes Forest Districts. This report summarizes the work completed between June 1996 and May 1998.

1.1. Objectives

Five objectives were defined for the project:

1. To complete an inventory (1:20,000 TRIM mapping) and assessment of currently red-listed plant communities in the dry cool subzone of the Sub-Boreal Spruce Biogeoclimatic Zone (SBSdk) within the Bulkley Forest District.
2. To assist MELP and Ministry of Forests (MOF) staff in the Lakes, Morice, Bulkley-Cassiar, and Kispiox Forest Districts in the identification, assessment and management of red- and blue-listed plant communities.
3. To prepare a description and preliminary assessment of other rare and possibly endangered plant communities within the SBSdk of the southeastern Skeena Region and make recommendations for additions/changes to the red- and blue-lists and further inventory needs.
4. To prepare an overview inventory and assessment of red-listed plant communities in the SBSdk of the Lakes and Morice Forest Districts.
5. To prepare an overview inventory and assessment of red-listed plant communities outside the SBSdk in the southeastern Skeena Region.

1.2. Scope

The objectives recognize that the CDC red- and blue-lists are preliminary because some of the rarest plant communities, particularly non-forested types, have not been described or classified. Inventorying and mapping were focused on the SBSdk subzone along the Highway 16 corridor because this is the most intensely settled portion of the southeastern Skeena Region. An overview assessment, without detailed fieldwork or mapping, was made in the adjacent SBSmc2, ICHmc, CWHws2 and forested ESSF subzones. Alpine and subalpine parkland areas were excluded because their plant communities are poorly understood, and, in general, less threatened than low or mid elevation communities. Wetlands and aquatic communities were excluded from the inventory because a provincial wetland ecosystem classification is currently underway (Mackenzie and Banner 1995).

1.3. Acknowledgements

Many people helped out with this project and contributed to two fascinating field seasons. I thank A. Hetherington (MELP, Skeena Region) for securing funding and overseeing the project, and L. Vanderstar (MELP, Skeena Region) for initiating the project and encouraging me to take it on. J. Smith, L. Coates, C. Houwers. and T. Jenne assisted in the field and office. I thank W. Mackenzie and J. Pojar (MOF, Prince Rupert Region), H. Williams, D. MacLennan, and I. Ronalds (Oikos Ecological Services Ltd.), R. Pojar (Viewmount Ecological Services), and D. Yole for sharing knowledge and data and allowing me to join them in the field. J. Cuell, D. Fillier, C. Samis, J. Stadt, R. Stewart, A. Witt (MELP Forest Ecosystem Specialists, Smithers, Hazelton, Houston and Burns Lake), M. Budgens, B. Fowler, L. Palmer and J. Woods (District Range staff, MOF), P. Bartemucci, A. Coates, D. Coates, J. Hooge, G. M., K. von Muehldorfer, C. Nelin, D. Stoffels, J. Wier, and K. Yates accompanied me in the field and shared their expertise. E. Coulson, the Dykens, the Dielemans, D. Gillespie, D. Hanson, C. Harivel, the Knoerrs, M. Lautenbacher, and C. Quanstrom provided local knowledge and access to private property. A. Banner, B. Drinkwater and D. Russell (MOF, Prince Rupert Region),

C. Jones, A. Macadam and R. Trowbridge (Boreal Research and Development), P. and C. Burton (Symbios Research and Restoration) provided helpful tips or review comments. J. Hutter identified the rock samples. Staff at the Bulkley-Cassiar Forest District, particularly J. Lloyd-Smith, T. Sheng, B. Copley and M. Goodchild, were extremely cooperative. C. Cadrin (B.C. Environment, Victoria) C. vanTyghem, S. Flynn (B.C. Conservation Data Centre), and T. Glover (B.C. Environment, Smithers) were also helpful. Special thanks to Canadian Helicopters for donating flight time to the Arctic Poppy Ridge.

2. Study Area

The area referred to as the southeastern Skeena Region comprises the Lakes Forest District (1,123,667 ha), Morice Forest District (1,498,697 ha), Kispiox Forest District (1,222,624 ha) and the former Bulkley Forest District (now the southern portion of the Bulkley-Cassiar Forest District) (758,000 ha). It does not include portions of the southeastern Skeena Region that lie outside the Prince Rupert Forest Region. The total study area is 4,582,988 ha. It encompasses the communities of Hazelton, Smithers, Houston and Burns Lake and surrounding villages, rural and forested areas (Figure 1). The study area is not restricted by land ownership, tenure or zoning. It includes provincial parks and other protected areas, Crown forest, other Crown land, federal land, Indian Reserve and private land (Crown grant).

The southeastern Skeena Region includes portions of 3 Ecoprovinces, 5 Ecoregions, and 8 Ecosections (Demarchi et al. 1990; Pojar et al. 1988; Table 3). The focus of the project was the Bulkley Basin (BUB) which encompasses most of the settled, southeastern portion of the Skeena Region, but fieldwork or data collection extended into all Ecosections except the Eastern Skeena Mountains (ESM).

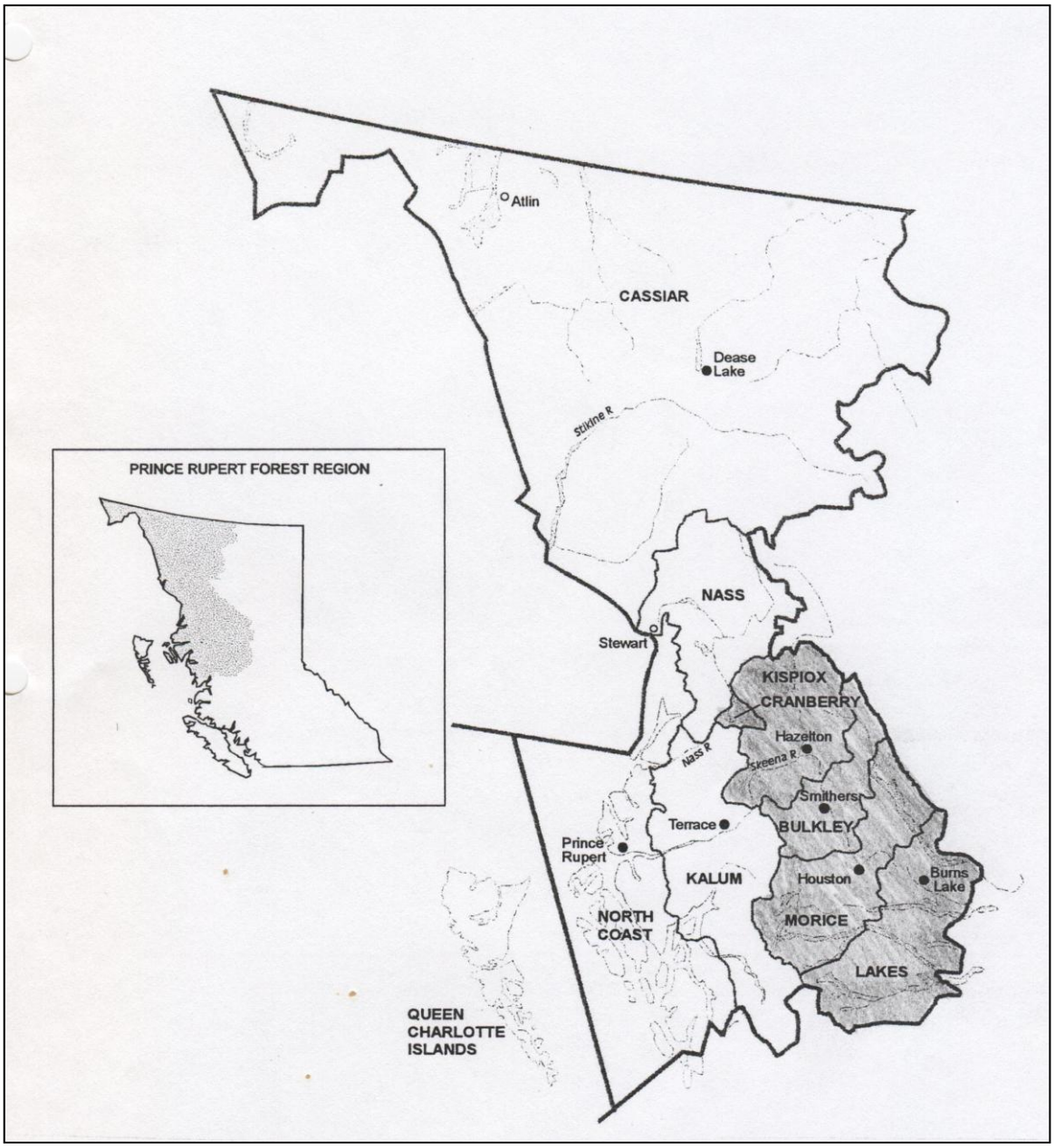

Figure 1. Map of the study area. The southeastern Skeena Region is shaded grey (on large map) and includes the former Bulkley Forest District, the Kispiox Forest District (comprising the Kispiox and Cranberry timber supply areas), the Morice Forest District and the Lakes Forest District of the Prince Rupert Forest Region.

Table 3. Ecoregion classification of the southeastern Skeena Region (after Pojar et al. 1988 and Demarchi et al. 1990)

Ecoprovince	Ecoregion	Ecosection	Map Symbol
Coastal Mountains	Nass Ranges		NAR
	Nass Basin		NAB
Central Interior	Fraser Plateau	Bulkley Basin	BUB
		Bulkley Ranges	BUR
		Nazko Upland	NAU
		Nechako Plateau	NEP
Sub-Boreal Interior	Fraser Basin	Babine Upland	BAU
	Skeena and Omineca Mountains	Eastern Skeena Mtns	ESM
		Omineca Mountains	OMM
		Western Skeena Mtns	WSM

There are 7 biogeoclimatic zones, 10 biogeoclimatic subzones, and 6 biogeoclimatic variants in the southeastern Skeena Region (Banner et al. 1993, Table 4). The focus of the project was the SBSdk subzone which encompasses most of the BUB ecosection in the settled southeastern portion of the Skeena Region. However, fieldwork and data collection included all biogeoclimatic units except the moist cold Sub-Boreal Pine - Spruce (SBPSmc) subzone, the leeward moist maritime Mountain Hemlock (MHmm2) variant, and the Omineca moist very cold Engelmann Spruce - Subalpine Fir (ESSFmv3) variant which occur only on the fringes of the study area.

Within the southeastern Skeena Region, the CDC has currently red-listed 6 plant communities and blue-listed 15 communities (Table 5). The current tracking list for the Kispiox District includes 4 red- and 12 blue-listed communities, the Bulkley tracking list has 4 red- and 13 blue-listed communities, the Morice tracking list has 4 red- and 9 blue-listed communities, and the Lakes tracking list has 3 red-listed and 5 blue-listed plant communities (Appendix Ia).

Table 4. Biogeoclimatic units of the southeastern Skeena Region (after Pojar et al. 1988 and Banner et al. 1993)

Zone	Subzone	Variant	Symbol
Alpine Tundra			AT
Coastal Western Hemlock	wet submaritime	montane	CWHws2
Engelmann Spruce-Subalpine Fir	moist cold		ESSFmc
	moist cool		ESSFmk
	moist very cold	Omineca	ESSFmv3
	wet very cold		ESSFwv
Interior Cedar-Hemlock	moist cold	Nass	ICHmc1
		Hazelton	ICHmc2
Mountain Hemlock	moist maritime	leeward	Mhmm2
Sub-Boreal Pine - Spruce	moist cold		SBPSmc
Sub-Boreal Spruce	dry cool		SBSdk
	moist cold	Babine	SBSmc2

Table 5. Red- and blue-listed plant communities of the southeastern Skeena Region

(Source: B.C. Conservation Data Centre (CDC) tracking lists updated June 10, 1996)

	Scientific Name	Common Name	Habitat Requirement[1]	Prov. Rank
Current Red-List				
1	*Amelanchier alnifolia - Elymus trachycaulus*	Saskatoon - slender wheatgrass	SBSdk/81	S2
2	*Poa secunda - Elymus trachycaulus*	Bluegrass - slender wheatgrass	SBSdk/82	S1
3	*Populus balsamifera ssp. trichocarpa -Cornus sericea - Rosa acicularis*	Cottonwood - dogwood - prickly rose	SBSdk/08	S2
4	*Picea sitchensis - Rubus spectabilis* (Wet Submaritime)	Hybrid Sitka spruce - salmonberry	CWHws2/07	S2
5	*Luzula piperi*[2]	Piper's wood-rush	AT/00	S2
6	*Poa rupicola = P. glauca ssp. rupicola*[2]	Alpine glaucous bluegrass	AT/00	S2
Current Blue List				
1	*Abies amabilis - Thuja plicata - Gymnocarpium dryopteris*	Amabilis fir - western redcedar - oak fern	CWHws2/04	S3
2	*Abies amabilis - Thuja plicata - Oplopanax horridus* (Wet Submaritime)	Amabilis fir - western redcedar - devil's-club	CWHws2/06	S3
3	*Abies lasiocarpa - Juniperus communis - Cladonia*	Subalpine fir - lodgepole pine - common juniper - lichen	ESSFmc/02	S3
4	*Abies lasiocarpa - Pinus contorta - Cladonia*	Subalpine fir - lodgepole pine - lichen	ESSFwv/02	S3
5	*Abies lasiocarpa - Vaccinium membranaceum - Empetrum nigrum*	Subalpine fir - huckleberry - crowberry	ESSFmc/03	S3
6	*Picea mariana - Pinus contorta - Pleurozium schreberi*	Black spruce - lodgepole pine - feathermoss	SBPSmc/03 SBSmc2/03	S3
7	*Pinus albicaulis - Cladonia - Dicranum fuscescens*	Subalpine fir - whitebark pine - lichen	ESSFmk/02 ESSFmk/03	S3
8	*Pinus contorta - Arctostaphylos uva-ursi*	Lodgepole pine - kinnickinnick	CWHws2/02	S3
9	*Pinus contorta - Juniperus communis - Oryzopsis asperifolia*	Lodgepole pine - common juniper - ricegrass	SBSdk/02	
10	*Pinus contorta - Sphagnum girgensohnii (*Wet Submaritime)	Lodgepole pine - sphagnum	CWHws2/10	S3
11	*Populus balsamifera ssp. trichocarpa - Cornus sericea*	Cottonwood - red-osier dogwood	CWHws2/08	S3
12	*Pseudotsuga menziesii - Shepherdia canadensis - Pleurozium schreberi*	Douglas-fir - soopolallie - stepmoss	SBSdk/04	S3
13	*Thuja plicata - Equisetum arvense - Lysichiton americanum*	Western redcedar - hybrid spruce - horsetail - skunk cabbage	ICHmc2/07	S3
14	*Tsuga heterophylla - Pinus contorta - Arctostaphylos uva-ursi - Cladonia*	Western hemlock - lodgepole pine - kinnikinnick - lichen	ICHmc1/02 ICHmc2/02	S3
15	*Tsuga heterophylla - Menziesia ferruginea - Lysichiton americanum*	Western hemlock - false azalea - skunk cabbage	ICHmc1/06	S3

[1]BEC site series as defined by Banner et al. (1993)

[2]These alpine plant communities were not considered in the current inventory

3. Summary of Existing Information

The CDC red- and blue-lists are based on the MOF guide to site identification and interpretation for the Prince Rupert Forest Region (Banner et al. 1993), which briefly describes each of the biogeoclimatic units and site series, with vegetation and environmental tables. More detailed descriptions of many of the plant communities can be found in earlier MOF publications such as Pojar et al. (1984) (Appendix Id) for the SBS and SBPS, Haeussler et al. (1984) for the CWHws, Lewis et al. (1989) for the ESSFmc, mv and wv, MacKinnon et al. (1990) for the ESSFmv, and Haeussler et al. (1985) for the ICHmc. Unfortunately most of the names used to describe biogeoclimatic and site units in these earlier publications have changed. Some rare non-forested plant communities not included in the BEC series are described by Pojar (1983) and Haeussler (1980). Black cottonwood floodplain and other deciduous-dominated plant communities of the SBSdk and ICHmc2 have recently been described and classified by Oikos Ecological Services Ltd. (1998a,b). Regional geology is described by Clague (1984) and Gottesfeld (1985), soils by Farstad and Laird (1954), Runka (1972) and Cotic et al. (1974).

Previous field data on plant communities of southeastern Skeena Region came from three sources on file at the MOF Prince Rupert Regional office in Smithers: (1) data collected by J. Pojar and V.J. Krajina for the Ecological Reserves Program 1974-76; (2) the BEC classification program 1976-1983; (3) ecosystem mapping projects (now called TEM projects) for smaller study areas within the region including: the Tweedsmuir-Entiako cariboo study (Cichowski and Banner 1993), Date Ck. research area (Clements and Banner 1992), Smithers Community Forest (Banner and Mackenzie 199?), Kispiox, Suskwa and Kitsguecla River floodplain mapping (Oikos Ecological Services Ltd. 1995, 1996). Several TEM projects were underway in 1996-1997 (Babine East and Taltapin, Gosnell, Nilkitkwa River) and provided field data used in this study.

4. Methods

This was a pilot project with time allowed to develop and refine a methodology for rare and endangered plant community inventory and assessment. In 1996 I placed the primary emphasis on field work, in order to better define and describe the rare and endangered plant communities of the southeastern Skeena Region and to improve my photo-typing skills. In 1997 more time was spent completing mapsheets and the accompanying database, organizing field data and voucher specimens and preparing reports. Throughout the project I made it a priority to contact interested individuals (MELP and MOF ecosystem specialists and range officers, contract plant ecologists and biologists, amateur naturalists, local landowners, etc) and encouraged joint field trips to build awareness and exchange information. As a result, many of the field plots were completed by inexperienced personnel, as "hands-on" training in ecosystem description. In both years the inventory was concentrated in the former Bulkley Forest District, with 2 - 5 field days each year in the Lakes, Morice and Kispiox Forest Districts.

4.1. Field Procedures

Areas of interest were initially identified from local knowledge and inspection of overview maps and satellite imagery. In 1997, many of the field sites were chosen to ground truth and fill in gaps from the previous years' air photo interpretation and mapping. Field work was concentrated in the low elevation Bulkley Valley corridor (BUB ecosection, SBSdk subzone), but beyond that, I distributed the fieldwork across a range of ecosections, biogeoclimatic units, and elevations. Within the range of identified plant communities, priority was given to visiting the largest and best of the known sites, but damaged sites were also sampled to gauge the impact of severe disturbance. Field work on southwest-facing slopes began in early May to catch spring ephemerals and was spread throughout the growing season to observe phenological changes (e.g. maturation of grasses). Sampling of floodplains and higher elevation sites was delayed until later in the season.

Aerial photographs were borrowed from MOF district offices and preliminary typing was carried out to locate plant communities and decide on efficient travel routes, transects and photo tiepoint locations.

Field visits ranged from quick drive-bys to visually check photo-typing and take photographs, to complete days spent sampling a topographic gradient of plant communities within a single polygon. Within each element occurrence (polygon), I subjectively sampled either the dominant plant community, or the rare plant community of interest, and either sampled or made field notes on the full range of plant communities present. This usually involved walking a transect across a moisture gradient caused by variation in soil depth, soil texture, or bench height. Proper soil pits were dug for most FS882 plots, with quick soil pits to check for changes in soil characteristics along the transect.

Data collection procedures and terminology followed a combination of Luttmerding et al. (1990), MOF/BCE (1996), CDC instructions for ground-truthing forms and TEM standards (RIC 1995, Cadrin et al. 1996). Field notes ranged from unstructured notes to CDC ground-truthing forms, TEM Ground Inspections Forms (GIF - 1997 only) to FS882 forms. We took landscape and closeup photographs at all sites and established permanent photo tiepoints wherever possible. We attempted to make a complete list of all vascular plants encountered in a polygon, and recorded information on physical characteristics, disturbance factors and ecosystem condition. As time permitted we also recorded vegetation percent cover, bryophytes and lichens, wildlife sightings and sign, soil characteristics, and collected bedrock samples and voucher specimens of unknown or unusual plant species. We did not record wildlife tree or mensuration data, nor did we fill out the new wildlife data forms (FS882A). Portions of some CDC ground-truthing forms or FS882 forms were completed in the office from field notes, photographs and map information.

Extensive driving of backroads and several opportunistic overflights of the Bulkley Valley provided a visual check of most polygons within the BUB ecosection between Smithers and Houston. The Bulkley R. from Smithers to Trout Ck., and the Morice R. below the Aspen recreation site were checked by floating down the river. The Bulkley R. from Smithers to the Bulkley/Morice District boundary near Walcott was checked from the CN railway line. A helicopter flight into the upper Nilkitkwa, returning via Topley Landing, as well as several short flights into the Sutherland R. provided an excellent overview of the BAU ecoregion. Field trips to the Poplar, Francois and Ootsa Lake country, and the Kispiox, Cranberry and upper Skeena Rivers were done by road.

4.2. Mapping

Plot and photo locations were recorded on aerial photos and TRIM maps in the field or in the office. In the office, phototyping was refined and extended to nearby polygons and the information manually transferred to TRIM maps. After each field season was over, additional photo-interpretation was done at the Bulkley-Cassiar Forest District office to extend the mapping to areas within the District that were not field checked. No ortho-stereoplotting of polygons was done to correct for distortions in the photograph, and as a result, a few of the polygons, particularly the larger ones on relatively featureless mountainsides, will be distorted. The vast majority of polygons were very well defined by topographic features, roads, fencelines and property lines, forest/meadow boundaries and other features shown on the TRIM base map.

A colour-themed forest cover map of the entire former Bulkley District, and 1:20,000 surficial geology mapping of the Zymoetz R. corridor (Meynard 1994) aided the photo interpretation. In the Kispiox, Lakes and Morice Forest Districts, only aerial photos used on the field days were borrowed, and no additional photo-interpretation or mapping was completed.

Each map polygon was assigned a unique number, and information describing the polygon was entered into an Excel 5.0 spreadsheet. We followed the Ecosystem Inventory Database Standards of RIC (Cadrin et al. 1996), but did not enter any terrain data (Bioterrain component) because no qualified geomorphologist was involved in the project. For each polygon, we also entered project-specific information not required for TEM projects such as: location description, elevation, Element Occurrence Ranking, aerial photo numbers, plot locations, ground photo and photo tiepoint numbers and land ownership. Land ownership and tenure within the former Bulkley District was determined from a 1:50,000 scale map dated February 1995 and updated with new zoning information from the Bulkley LRMP. Land ownership information outside the Bulkley was determined from existing (NTS) maps and personal communications.

Original mapsheets were digitized by the CDC in Victoria for entry into GIS (ARC-INFO format). The map database was then merged with the ARC-INFO database to determine the area of each polygon.

4.3. Data processing

We did not enter any field data into "ProvBase" the provincial ecosystem database (formerly ECOBASE) (Britton et al. 1996). However, MOF staff and consultants have entered approximately one third of our FS882 forms into ProvBase using the computer program VENUS for the wetland and riparian (Mackenzie and Banner 1995) and seral deciduous classification projects (Oikos Ecological Services Ltd. 1998a, b). No computer analysis was done to sort and classify the ecosystem data. Recommendations for changes and additions to the plant community (site series) classification are preliminary and based on subjective interpretations of the field data and observations.

Data analysis consisted of tallying polygon areas and summarizing them by plant community and element occurrence rank, and land tenure (area analysis for Bulkley District polygons only). To determine the area of each rare plant community I multiplied the polygon area by the Decile value(s) for the plant community of interest. I used hand-tabulated information (prior to digitizing) and my knowledge of the study area to reassess the provincial ranks (S1 to S5) and the red- and blue- status assigned by the CDC to each listed plant community in southeastern Skeena Region. The CDC recommended procedure for assigning provincial ranks is in Appendix Ib.

4.4. Inventory Personnel

Many different people participated in data collection (see acknowledgments) but in all cases they were supervised on site by Claudia Houwers (2 days only) or Sybille Haeussler. Key personnel were:

Name	Education/Affil.	Experience	Role
Sybille Haeussler	BSF-Forest Biology MSc-Forest Ecology RPF	20 yrs ecosystem data collection & analysis	supervised & carried out all phases of the inventory.
Joanna Smith	BSc - Biology Msc – Ecology	10 years experience as a biologist	photography, wildlife obs., voucher specimens, some ecosys-tem description,
Claudia Houwers	BSc-Biology RPBio	5 yrs TEM & other ecology projects incl. project coordination	photo interp., site selection, ecosystem description
Laraine Coates	student -Univ. of Alberta	no previous field work	photography, voucher specimens, data recording data entry

Forest Ecosystem Specialists from each of the four Forest Districts participated in the inventory. All are trained biologists with a minimum of a BSc degree and a wealth of field experience. Several lacked experience describing soils or vegetation but were experienced in wildlife inventory. The joint field days were used as training exercise in ecosystem description and assessment, as well as for exchanging information on rare ecosystems and their management.

5. Results

5.1. Field Data (Appendix II)

Thirty days were spent in the field between May 9 and October 22, 1996, and 26 days between May 8 and October 28, 1997. Site visits were made to approximately

131 discrete community occurrences or polygons, with many more inspected visually from a distance. Table 6 summarizes all sources of field data (records of occurrences and plant community descriptions) used in the study. A total of 76 CDC ground-truthing forms, 74 ecosystem field forms (FS882) and 13 ground inspection forms (GIF, Cadrin et al. 1996) were completed. An additional 14 FS882s, 24 DEIF long forms (Luttmerding 1990) and 52 GIFs were obtained from other sources. The original field data are located in Appendix II (2 binders) organized by:

Forest District Bulkley (Volume 1); Morice, Lakes, Kispiox (Volume 2);

ecosystem complex within the District (tabs colour-coded to correspond to colours on the handdrawn maps)

- Southwest-facing slope complexes: saskatoon - slender wheatgrass (yellow) bluegrass - slender wheatgrass grasslands and herb meadows (green) and related plant communities
- Floodplain complexes: Black cottonwood - red-osier dogwood (blue), spruce - horsetail or spruce - salmonberry floodplains (violet) and related plant communities
- Fluvial meadow and wetland complexes (pink): unclassified dry grasslands and herb meadows on inactive fluvial deposits
- Douglas-fir ecosystems (red): SBSdk/04 and related plant communities

- Miscellaneous (orange)

geographically within the District, running roughly SE to NW, and downstream through the Morice-Bulkley watershed.

Table 6. Field records of element occurrences by type and source. Includes only sites that have been field inspected; does not include aerial photo typing or air calls. Some occurrences may have more than one type of record.

	This Project		Other Sources					
Type of Record	1996	1997	MOF 1978-1997	Oikos 1996-1997	ERP 1974-1976	Wildland 1997	Other	Total
CDC ground truthing form	56	20						76
FS882	42	32	4	8		2		88
DEIF long form			22				2	24
TEM ground inspection form		13		52				65
IBP form					4			4
Informal field notes (only)	4	10	5					19
Annotated map with notes			2				2	4
Range-habitat monit. transect			4					4
Total	102	75	37	60	4	2	4	284

MOF = B.C. Ministry of Forests
Oikos = Oikos Ecological Services, Smithers, B.C.
ERP = Ecological Reserves Program, B.C. Ministry of Environment, Lands and Parks
Wildland = Wildland Resources, Smithers, B.C.
DEIF = Describing Ecosystems in the Field (Luttmerding et al. 1990)

5.1.1. Preliminary Polygon ID or Element Occurrence Numbers

Each element occurrence or map polygon (either a single plant community or a complex of several different plant communities) that was ground-truthed was identified by a Preliminary Polygon ID number: A1, B1, ... Z12; AA1, AA2 . . .DF1. In 1996 a single letter, connotative code was used: A for **A**ldermere/ Telkw**a,** ....Z for **Z**ymoetz. In 1997, we used a double letter code with the first letter indicating the Forest District (A= Bulkley, B= Lakes, C = Kispiox, D = Morice) and the second letter assigned consecutively. Numbers following the letter code were assigned consecutively to polygons encountered in a given vicinity. Preliminary Polygon ID numbers were not assigned to occurrences identified only by aerial photo interpretation.

The Table of Contents for Appendix II has a complete list of Preliminary ID numbers. Within Appendix II, information relating to each Element Occurrence (i.e. a discrete map polygon) was organized as follows:

1. **colour aerial photograph.** Element Occurrences were outlined on the photo. Plot locations and photo tiepoints were pinpricked and plot numbers and photo tiepoint number were marked on the rear, along with the roll and frame number of ground photographs.
2. **CDC ground truthing form:** an overview description of each Element Occurrence or a cluster of closely related Element Occurrence.
3. **FS882 or DEIF long form(s):** detailed site and vegetation information for one plant community
4. **GIF(s):** a quick summary of the major ecological characteristics of the entire polygon using TEM standards and abbreviations.
5. **Miscellaneous** field notes, transect information, personal communications, background information on the sites, etc.
6. **Annotated field maps**.

5.2. Photographic Slides (Appendix III)

The photographic slide collection and accompanying Excel 5.0 database (SLIDES.xls) are in Appendix III. Photo locations were cross-referenced on plot forms, aerial photographs, and 1:20,000 maps. Each photo was identified by roll number and photo number:

e.g. J1: 16 J. Smith, roll # 1, photo 16
S4: 20 - 22 S. Haeussler, roll # 4, photos 20 to 22
L6: 6, 9-11 L. Coates, roll #6, photos 6, 9, 10, 11

The slides are organized mainly by date, roll & photo number, and grouped by geographic area. Each slide is labelled with the Preliminary Polygon ID, location, tiepoint (if any) and roll and photo number. Refer to the handwritten photo number rather than the manufacturer's frame number.

Permanent photo tiepoints were identified by the letter T followed by the Polygon letter and a number (e.g. TZ1, for the first Tiepoint along the Zymoetz R. valley). Tiepoint numbers do not necessarily correspond to polygon numbers because some polygons had several tiepoints while others had none, and tiepoints were often located at good vantage points where several polygons could be seen. All tiepoints were pinpointed on aerial photos and TRIM maps, and digitized in ARC-INFO. Locations are described in the slide database. Additional tiepoint details appear on Ground truthing or Plot forms and in photocopied field notes (Appendix II).

5.3. Maps (Appendix IV)

5.3.1. 1:250,000 Mapsheets

Each of the ground-truthed element occurrences was marked on the 1:250,000 NTS map (Appendix IV) with a coloured dot (as per Section 5.1) and a polygon or plot number label (A1, B2, etc = sites visited in 1996; M = Ministry of Forests data, S = Haeussler thesis data, O = Oikos data). A few additional known element occurrences (with personal communications but no field data or 1:20,000 mapping available) were also marked on the 1:250,000 map and identified by the site series or tree species (e.g. SBSdk/81, Pa = whitebark pine).

The 1:250,000 maps provide a quick reference to the available field data and to the best known occurrences. They are *not* a complete overview of all occurrences for two reasons: (1) Polygons mapped at 1:20,000 with no supplemental ground-truthing data are not shown on the 1:250,000 maps because they would have become too crowded, and (2) there are many occurrences of the red-listed SBS ecosystems in the Lakes and Morice District that have not been mapped.

5.3.2. 1:20,000 TRIM Mapsheets

Twenty-six TRIM mapsheets were either partially or fully mapped with 871 polygons (Table 7) totalling 6795 ha . The original maps (Appendix IV) were hand

Table 7. 1:20,000 TRIM map coverage and number of polygons mapped

Mapsheet	Total Polygons	District	Biogeoclimatic Unit	Coverage
93L.010	1	Lakes	SBSdk	partial
93L.036	27	Morice	SBSdk	partial
93L.037	16	Morice	SBSdk	partial
93L.046	1	Morice	SBSdk	partial
93L.047	11	Morice	SBSdk	partial
93L.048	2	Morice	SBSdk	partial
93L.056	34	Morice	SBSdk	partial
		Bulkley	SBSdk	complete
93L.057	51	Morice	SBSdk	partial
			SBSmc2	partial
		Bulkley	SBSdk	complete
			SBSmc2	partial
93L.064	24	Bulkley	SBSdk	complete
93L.065	104	Bulkley	SBSdk	complete
93L.066	78.5	Bulkley	all	complete
93L.071	51.5	Bulkley	CWHws2	complete
93L.072	57	Bulkley	CWHws2	complete
			SBSmc2	partial
93L.073	14.5	Bulkley	SBSmc2	complete
93L.074	4	Bulkley	SBSmc2	complete
93L.075	116.5	Bulkley	all	complete
93L.076	49.5	Bulkley	SBSdk	complete
			SBSmc2	complete
93L.081	31.5	Bulkley	CWHws2	complete
93L.084	2	Bulkley	SBSdk	complete
			other	partial
93L.085	90	Bulkley	SBSdk	complete
			SBSmc2	complete
93L.093	19	Bulkley	ICHmc2	partial
93L.094	36.5	Bulkley	SBSdk	complete
			ICHmc2	partial
93L.095	22.5	Bulkley	SBSdk	complete
			SBSmc2	complete
93M.004	9	Bulkley	ICHmc2	partial
93M.025	6	Bulkley	SBSmc2	complete
			ICHmc1	partial
l03l.090	12	Bulkley	CWHws2	partial
Total: 26 sheets	871	polygons		

drawn and colour-coded based on the dominant plant community. The digitized maps maps are being digitized by the CDC. Each polygon was assigned a unique number (e.g. 93L.094 1 ... 93L.094 30), independent of the Preliminary Polygon ID. Map polygons that overlap onto more than one mapsheet are digitized as a single polygon in ARC-INFO database and take the lowest mapsheet/polygon number as their unique number (e.g if Polygon 93L.085 1 and 93L.086 30 overlap, the unique number for the single polygon in ARC-INFO is 93L_085 1). Preliminary Polygon IDs were marked as red circles on the original maps, but were not digitized. Plot locations, photo tiepoints and ground photo locations, indicated as red rectangles on the original maps, were digitized in ARC-INFO.

The maps are compatible with TEM mapping standards but do not meet minimum TEM requirements because (a) there is no Bioterrain underlay (although mapsheets 93L071, 072, 081 and 103I090s have 1994 surficial geology mapping), and (b) polygons are smaller than the TEM minimum (0.5 cm^2 or 2 ha at 1:20,000 scale) and average (10 cm^2 or 40 ha at 1:20,000 scale). The ecosystem survey intensity level (ESIL) was was not consistent from mapsheet to mapsheet, nor among different plant communities. SBSdk/81 and SBSdk/82 and fluvial meadow complexes generally had high ESILs, while floodplain communities, particularly the CWHws2/07, had low survey intensity (< 10%) because of access constraints.

Ecoregion/ecosection and Biogeoclimatic unit boundaries were transferred from a 1:500,000 scale map onto the 1:20,000 scale maps using local knowledge and casual field observations to make adjustments as required. They are not very accurate.

5.3.3. Map Database (Appendix V)

Each 1:20,000 TRIM mapsheet has a corresponding worksheet within the Excel 5.0 database (MAPS1.xls to MAPS4.xls; hardcopy in Appendix V) with two pages of information. The first page is the TEM Ecosystem Database (Cadrin et al. 1997). The second page contains the following project-specific information:

Preliminary Polygon ID number: A1...DF1. (refer to Appendix II for full details) applies to ground-truthed polygons only.

Plot number(s): FS882 and DEIF long form numbers

Location: general geographic description

Aerial photo number(s): see Appendix II for marked copy

Ground photo number(s): J3:15-20 etc. see Appendix III for slides

Photo Tiepoint: TA1, TX2, TAA1, etc.-see Appendix III for details

Latitude & Longitude: not entered except for old MOF DEIF plots, could be added after digitizing (or replaced with UTM grid).

Lower elevation: determined from TRIM map

Upper elevation: from TRIM map, not given for level polygons

Forest District: B = Bulkley, M = Morice, L = Lakes, K = Kispiox

Land Tenure: private, crown (non-forest), prov. forest, grazing lease/license, protected area, indian reserve, etc.

Element Occurrence Rank: see below. 2 columns; first column dominant.

Explanation: explains EO Rank and provides miscellaneous information

5.3.4. Element Occurrence (EO) Rankings

An element occurrence (EO) ranking was assigned to each mapped polygon, either in the field or from aerial photo interpretation. The EO ranking is subjective and considers the quality, condition, viability and defensibility of the occurrence, taking into account factors such as plant community composition and diversity, the degree to which it displays the characteristics of the red-listed community, successional status, degree of disturbance (anthropogenic or otherwise), adjacent threats, and size (see Appendix Ic for more details). Except in the case of EOR = A, size was judged to be less important than other characteristics because it is immediately apparent from the map and area calculations. Where intermediate ranks (e.g. AB) were assigned, the first letter is dominant and was used to colour the polygon (e.g. CD (hatched) is in better condition than DC (dotted) and for area calculations (Tables 1a and 8).

A = Excellent (solid map colour) the very best occurrences, in pristine or near-pristine condition with few or no non-native species. Large, well-developed occurrences with a full range of the red-listed and closely associated plant communities present, or outstanding smaller communities with exceptional species diversity or many rare or unusual plants. In most cases, these occurrences should receive protected area status (either Goal 1 or Goal 2). In the Bulkley I assigned EO rank A to N2: Netalzul Waterfall (one-of-a-kind calciphytic spray community - unlisted). X4: “Mount Inteference” near Kitseguecla Lake: a large and diverse

ICHmc2/81 complex, with Rocky Mountain juniper, lots of rock outcrop, ICHmc2/02, dry aspen woodland and scattered mesic meadows was ranked Excellent-to-Good (AB), because the lower slope component is grazed by cattle, but I found no introduced species higher up. Examples from other Districts include: Tetzalto Mountain, the Gullwing area, and Sutherland River.

B = Good (also solid map colour) Typical of the best examples found in the District or Region. They contain all the characteristic features of the rare plant community, and are usually in a mature successional stage, but are generally highly fragmented or slightly to substantially altered by human disturbance - roads bissecting the polygon, non-native species present, a history of domestic grazing, lots of adjacent land development. Exceptional sites (e.g. T2 and T6 above Tyhee Lake, W1 at Hubert Rd.) were ranked Good even if they have been badly damaged, whereas smaller, less diverse sites would have been downgraded to C with the same level of disturbance. The pristine CWHws2/07 sites on the Zymoetz (Z12) were ranked B rather than A because they are small, lack diversity, and have no outstanding features (e.g. no huge trees).

C = Marginal (striped map colour) These sites are either in a natural state but in an early seral stage (e.g. young cottonwood and willow floodplain island) or severely disturbed but capable of restoration (e.g. cottonwood with grazed understory). Or they may only marginally express the characteristics of the red-listed ecosystem because the landform/parent material is not quite right or the climate is marginal (eg. G5: near Gramophone Ck., an undisturbed pocket of SBSdk/81 on dioritic parent material -with poor development of grasses)..

D = Poor (dotted map colour) The native plant community is more-or-less eliminated, typically as a result of cultivation or residential development. No real opportunity for restoration exists. I rated most of the Call Lake Ridge (V1 and V2) as DC even though it is large, diverse and still has quite a lot of native vegetation, because it is almost completely subdivided into 5 acre lots, badly scarred by road construction, and has recreational and cattle trails throughout. I was able to map SBSdk/08 and SBSdk/81 ecosystems in poor condition, because they can be readily identified by their landform. I did not attempt to map most poor condition SBSdk/82 and herb meadow communities because they are indistinguishable from cleared or cultivated aspen or mixed forest. Similarly, SBSdk/07 can not readily be identified after the trees are cut. This discrepancy biases the ranking summaries (Tables 1a and 8).

Polygons with less than 50% of the listed element (black hatching) Polygons dominated by a more typical ecosystem with <50% of the desired element were usually considered marginal if the element occurrence was in good to marginal condition, and poor if the plant community was in marginal or poor condition. Such polygons could be

rated Good if they were very diverse or if the dominant and rare ecosystems were in very good condition (e.g. many of the SBSmc2/81 polygons on Grouse Mtn and above Newitt Ck. have an intimate mix of species-rich rock outcrops, blue-listed /02 pine - lichen forest, aspen-snowberry woodland and scrub steppe in very good condition).

5.4. Voucher Specimens (Appendix VI)

5.4.1. Vascular Plants

Three hundred and ninety five vascular plant voucher specimens were collected, and catalogued on a Excel 5.0 spreadsheet. The spreadsheet was sorted taxonomically (PVOUCH.xls) and by voucher specimen number (PVOUCH2.xls) (hardcopies in Appendix VIa). Each voucher specimen was assigned a unique number based on the Preliminary Polygon ID for the element occurrence in which it was found, and subsequently by specimen number (e.g. AA1001, AA1002, etc.). Voucher specimen numbers were recorded on the CDC ground truthing forms and/or FS882s where they were collected.

I identified all but a few specimens to the level of genus, and most (except for difficult grasses, sedges and Brassicaceae) to the species level; however, they should be verified by a plant taxonomist. Most specimens are of relatively common, secure species, although several are rare in the study area (e.g. *Cryptogramma stelleri*, N2001) or disjunct (e.g. *Agrimonia striata* K2001, K5001), and most are restricted to the specialized habitats sampled in the study. There are no red listed vascular plants in the collection and only one blue-listed plant, Rocky Mtn. Sedge (*Carex saximontana = C. backii),* collected within an aspen thicket at Colleymount (BB1012) and in a spruce - horsetail swamp on the Telkwa High Road (AE1003). Jim Pojar also collected this species at Tetzalto Mountain (see field notes G1-3). Specimen DB1001 from Morice R. may be the blue-listed *C. leptophyllum* but is more likely a form of *Chenopodium album.*

5.4.2. Cryptogams

Eighty-four moss, lichen and liverwort specimens were packaged and labelled with specimen numbers, but not catalogued. Most cryptogammic specimens come from bedrock outcrops on xeric sites.

5.4.3. Rock Samples

Thirty eight samples of exposed bedrock or coarse fragments derived directly from the bedrock (saprolite) were labelled according to the Preliminary Polygon ID, packaged and identified by Jim Hutter, P.Geo. (Appendix VIb). Most of the specimens were collected from Saskatoon - slender wheatgrass plant communities with exposed bedrock or from bedrock outcrops directly above herbaceous meadow or grassland communities. They include a wide range of intrusive, extrusive and sedimentary rock types from diorites to basalts, and sandstones to limestone, with wide variability in the amount of base-rich minerals and calcite present.

5.5. Extension Activities

Descriptive reports describing the rare plant communities and red- and blue-listed vascular plants were prepared for operational staff in each of the four Forest Districts. These reports are in Appendix Ie.

Informal extension was carried out during both field seasons by encouraging joint field trips with interested persons from a variety of backgrounds (see Sec. 1.3). These field trips also provided a good opportunity to discuss management issues.

A variety of other extension activities related to this project were done under separate contract or as volunteer activities. A 1-day rare ecosystem workshop (funded by MELP, Skeena Region, Wildlife Branch) was held at the Bulkley-Cassiar District Office in April 1997 and was attended by approximately 25 MELP/MOF staff. I made slide

presentations to the Bulkley Valley Naturalists, Smithers (Feb. 1997), the Northwest Research and Resource Management Consultants group, Smithers (Jan. 1998) and at the University of Northern B.C., Prince George (Feb. 1998), addressing a total of approximately 150 people. An unfunded poster presentation was made at an FRBC-sponsored Ecosystem Management Symposium, Terrace, B.C. (June 1997); an interview was done with local print media (2-page article, Connections Magazine, Vol 2(1) Summer 1997); and three field trips to the Hubert Rd. juniper site were made with the Bulkley Valley Naturalists (June 1997, Oct. 1997, April 1998). The Habitat Conservation Trust Fund and MELP, Skeena Region, Wildlife Branch were acknowledged on all occasions.

6. Results and Discussion - Ecosystem Complexes and Plant Communities

The problem of pattern and scale is central to ecology (Levin 1992) and finding an appropriate scale within which to study ecosystems or plant communities can be difficult. I had difficulty restricting the scope of this investigation to a narrow list of plant communities. Once a decision was made to organize the report and maps around a series of ecosystem complexes, the project became more manageable, for several reasons:

1. rare plant communities are generally too small to map at 1:20,000. Most map polygons consist of a complex of ecosystems.

2. plant communities are rarely discrete entities. More often there is a gradation of species assemblages along a topographic or moisture gradient, and it is difficult to decide that a portion of the gradient is rare and endangered while an adjacent portion is not.

3. plant communities are not managed as discrete, static entities. They must be managed within the context of surrounding ecosystems, often as a dynamic or shifting mosaic of short- or long-lived seral stages.

4. Without a well-developed classification system for non-forest communities, some rare communities could slip between the cracks. For example, it does not make sense to rank a shrub-dominated (low bench) floodplain community lower than a tree-dominated mid or high bench floodplain community, simply because the MOF did not describe it.

6.1. Southwest-facing Slope Complexes (yellow and green)

Steep to moderately steep slopes or ridges oriented in a southwesterly to southerly direction within the SBSdk, SBSmc2 and ICHmc2 were the primary focus of field sampling because they include two red-listed plant communities identified as highest priority: (1) Saskatoon - slender wheatgrass scrub/steppe (hereafter abbreviated as ***SW***), and (2) Bluegrass - slender wheatgrass grasslands (hereafter abbreviated as ***BW***). I also needed to look more closely at these ecosystem complexes to find other undescribed plant communities worth listing. Southwest-facing slope complexes are often local landmarks

and are readily delineated on 1:20,000 topographic maps or by stereo-viewing aerial photographs.

Figure 2. illustrates a topographic sequence of ecosystems on a such a slope. Aspect is between 180^{o} and 270^{o}, most often southwest, and rarely extends to the southeast. The terrain unit is typically a knoll or ridge of bedrock overlain by shallow to deep colluvial, morainal or fluvial deposits. A condensed topographic sequence can be found on steeply eroded fluvial or lacustrine escarpments ("river breaks") or canyon walls. Most large occurrences overlook a major lake or river (Babine Lake, Francois Lake, Owen Lake, Tyhee Lake, Bulkley R,, Sutherland R., Skeena River, etc.). At their best, southwest-facing slope complexes consist of a linked series of ridges and toeslopes, dissected by erosion channels, beginning in the ESSF zone and terminating with a fluvial or lacustrine escarpment at the valley floor.

Southwest-facing ecosystems experience the greatest range of climatic extremes of any ecosystem within the Skeena Region. Mean annual soil temperature monitoring at an SW site in the Bulkley Valley showed that it was the coldest in winter and hottest in summer of all ecosystems studied (R. Trowbridge, pers. comm.). They are the first to leaf out in spring; the first to turn colour in fall. They accumulate the greatest number of heat units in summer and are snow-free for much of the winter. They are often windy and have high evapotranspirative demand because of afternoon sunshine. Climatic extremes may be moderated by proximity to large bodies of water.

Fire has had a profound influence on the mosaic of plant communities on southwest-facing slopes. They can become tinder-dry in spring before leaf-flush and

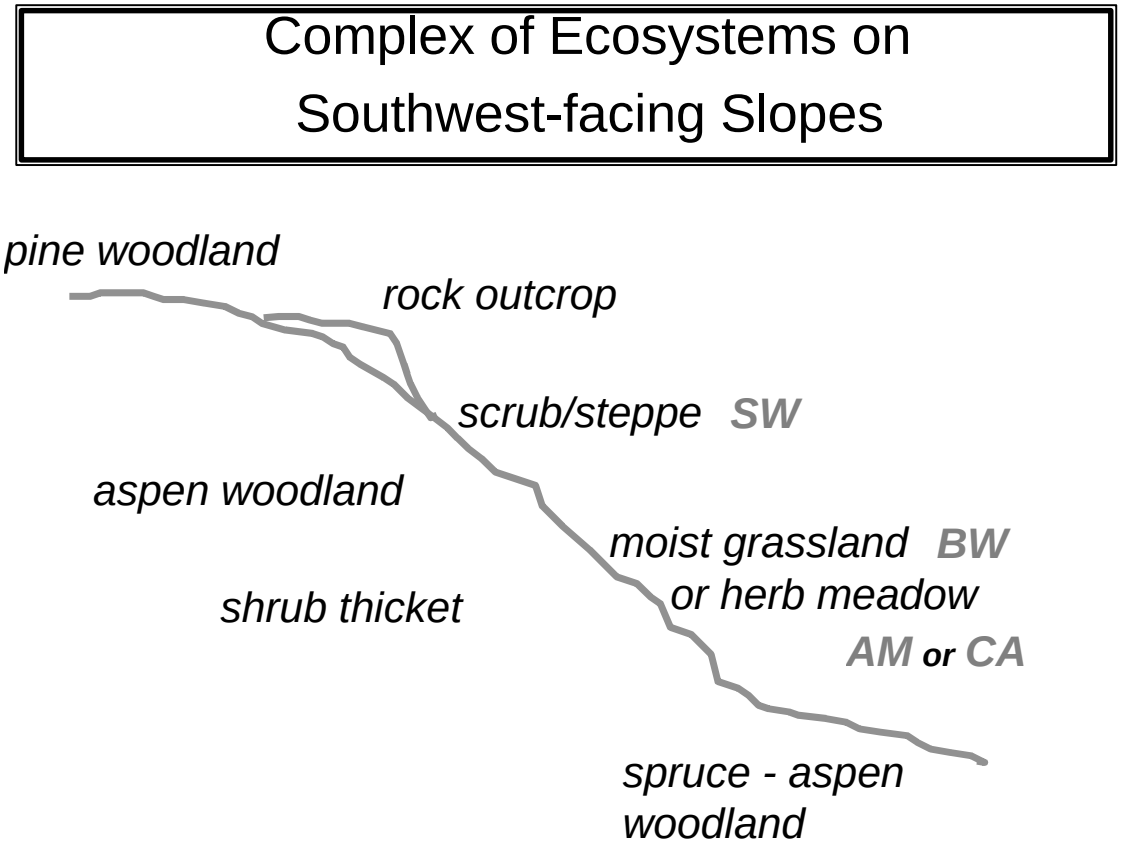

Figure 2. Southwest-facing slope complex. A typical slope sequence in the SBSdk and SBSmc2 containing red-listed Saskatoon - slender wheatgrass (SW), Bluegrass - slender wheatgrass (BW) or unlisted Aster - meadow rue (AM) and Cow parsnip - avens (CA) herb meadows intimately complexed with woodland and shrub thickets. SW-dominated polygons were coloured yellow, while CA-, AM- (and rarely BW-) dominated polygons were coloured green on 1:20,000 TRIM maps.

again in mid- to late summer as grasses and shrubs senesce, and, as a result, are subject to more frequent fires than the surrounding landscape. It is also possible that bedrock knolls or ridges act as lightning rods, attracting more than their fair share of lightning strikes (D. Russell, pers. comm.). Anthropogenic fires, both deliberate and accidental, are important. The sunny microclimate and proximity to water makes these sites particularly attractive for human settlement. Southwest-facing slopes are currently the preferred locations for spring burning in both aboriginal and non-aboriginal communities, and there is historical evidence that burning was widely used by aboriginals and later by European settlers for land clearing and habitat manipulation (Poudrier 1892; Gottesfeld 1993).

Southwest-facing slopes are critical habitat for many wildlife species in the Skeena Region. The mosaic of grassland, scrub, and herb meadow, interspersed with small patches of deciduous and coniferous woodland provides a diversity of niches. During our field work we observed greater numbers and varieties of insects, including ants, butterflies, grasshoppers, cicadas, bees, gall wasps (see Appendix II) in southwest-facing scrub/steppe, grassland and meadow communities than in the surrounding forest landscape. We also noticed many songbirds, raptors, and small mammals (including many packrat dens) and observed coyote, fox and wolf sign. Most sites were heavily used by deer and moose (browse, droppings and soil disturbance). Bear sign (droppings, ant digging) was also frequent. We observed western garter snakes and their cast-off skins on several occasions, but found no snake hibernacula.

No strong relationship between rock type and the diversity or character of the plant community or the presence of certain species was apparent. Basalt outcrops such as those at Tetzalto Mtn (U12), Colleymount (BB1) and Cheslatta Lake (M4112-79, M4114-79) are often (but not always) associated with well developed BW or diverse rock outcrop communities. Well-developed SW occurrences in the Bulkley Valley were commonly found on feldspathic wacke (V1 Call Lake ridge) or greywacke (W1 Hubert Rd.).

6.1.1. Saskatoon - Slender Wheatgrass (SBSdk/81 TEM code SW, CDC code AaEt) *Amelanchier alnifolia - Elymus trachycaulus*

6.1.1.1. Ecology (adapted from IWMS:Plant Communities)

This scrub-steppe community is a mosaic of shrub and grassland patches. Common shrubs are *Amelanchier alnifolia* (saskatoon), *Symphoricarpos albus* (common snowberry), *Rosa acicularis* (prickly rose) and *Prunus virginiana* (choke cherry). *Juniperus scopulorum* (Rocky mountain juniper) may also occur and can be a dominant and characteristic indicator of this community. The steppe or grassland layer is diverse and well-developed. Common species are *Elymus trachycaulus* (slender wheatgrass), *Poa interior* (interior bluegrass), *Stipa occidentalis* (stiff needlegrass), *S. richardsonii* (spreading needlegrass), *Lathyrus nevadensis* (purple peavine) and *Galium boreale* (northern bedstraw). Many other forb species, too numerous to mention here, also occur in this community. The moss and lichen layer generally consists of *Tortula ruralis, Cladonia* and *Peltigera* spp.

The community is restricted to south or southwest-facing slopes (moderate to very steep). It commonly occurs on dry rock outcrops or ridges, on morainal or colluvial veneers over similar bedrock below such outcrops, and less often on deep unconsolidated materials on erosional (terrace) scarps. Bedrock type varies but is frequently base-rich and slightly calcareous. Soils are loamy to sandy, often with a high content of angular coarse fragments, xeric to subxeric (occasionally submesic), Brunisols and (rarely) Luvisols, with medium to very rich nutrient regimes.

6.1.1.2. Distribution and Abundance

The SW is found not only in the SBSdk subzone, where it is red-listed, but also in the SBSmc2 (Banner et al. 1993), and occasionally in the ESSFmc (Oikos Ecological Services Ltd. 1997) and ICHmc (Haeussler 1980). A few occurrences exist in transitional CWHws2 along the Zymoetz River. It may also be present in the SBPS but no work was done in that zone.

We located and mapped 226 occurrences of the SW (total area 1074 ha, Table 8) in the former Bulkley Forest District, and either located or acquired data on an additional 45, 18 and 11 occurrences, respectively, in the Lakes, Morice and Kispiox Forest Districts (Table 1). Mapping in the Bulkley was largely confined to the Bulkley River Valley and tributaries (BUB Ecoregion). The mapping is complete for the SBSdk subzone, and takes in all significant occurrences in the SBSmc2 and ICHmc2 immediately above and adjacent to the SBSdk, but is not complete for the SBSmc2 and ICHmc outside of the Bulkley Valley/Hwy 16 corridor nor for the ESSF zone. For example, there are probably additional occurences along the south shore of Babine Lake and on the lower slopes of 'the Nipples' in the Kitseguecla River valley (ICHmc2).

The 11 SW occurrences in the Kispiox Forest District are incomplete, but probably include most of the largest, best developed occurrences in that District, where the ecosystem is known to be rare and at the limits of its range. A reported occurrence towards the north end of the suspected range (at the mouth of the Babine River) was reclassified as ICHmc2/02 rather than /81.

The 45 SW occurrences recorded in the Lakes District are just the "tip of the iceberg", although they probably include many of the largest and best. During TEM mapping of the Babine East and Taltapin landscape units (Oikos Ecological Services Ltd. 1997), many SW polygons were located in addition to the ground-truthed polygons (copies in Appendix II). Casual inspection of aerial photographs along the north shores of Ootsa, Francois Lake and Tchesinkut Lakes reveals a dozen or more SW polygons on a single aerial photograph (see e.g. BD2, photo 30BCC96143 #53 in Appendix II).

Table 8. Summary of rare and endangered plant community occurrences mapped at 1:20,000 scale, former Bulkley Forest District

Plant Community	Biogeoclimatic Site Series	TEM Code	Map Colour	Number of Occurrences or Area by EO Rank	Excellent A	Good B	Marginal C	Poor D	Total	% Good to Exc. (A+B)
Saskatoon - slender wheatgrass scrub-steppe	SBSdk/81	SW	yellow	Number of occurrences:	1	76	114	35	226	34%
	SBSmc2/81			protected area	0	34	8	0	43	81%
	ESSFmc/81			provincial forest	85	91	31	1	208	85%
	ICHmc/81			grazing tenure	0	28	76	0	104	27%
				other crown	0	16	30	0	46	35%
				municipal	0	0	0	2	2	0%
				private	0	169	240	260	669	25%
				indian reserve	0	0	2	0	2	0%
				Total area (ha):	85	338	387	263	1074	39%
Rocky Mtn Juniper savanna	SBSdk/81	JS	yellow	Number of occurrences:	0	10	3	0	13	77%
				Total area (ha):	0	73	11	0	84	87%
				(all private-incl. HCTF land)						
"deep soil phase" on fluvial or lacustrine scarp	SBSdk/81	SWd	yellow	Number of occurrences:	0	7	27	0	34	21%
				Total area (ha):	0	28	100	0	128	22%
Grassland or Herb Meadow										
Bluegrass-slender wheatgrass grassland	SBSdk/82	BW	green	Number of occurrences:	1	3	0	1	5	80%
	SBSmc2/82			provincial forest	0	4	0	0	4	100%
				grazing lease	38	0	0	0	38	100%
				other crown	0	0.4	0	0	0.4	100%
				private[a]	0	0	0	16	16	0%
				Total area (ha):	38	4.4	0	16	58.4	73%
Cow parsnip - large-leaved avens moist herb meadow	SBSdk/00	CA	green or	Number of occurrences:	0	53	74	11	138	38%
	SBSmc2/00		pink	protected area	0	34	29	0	63	55%
	ESSFmc/00			provincial forest	0	119	66	0	185	64%
	ICHmc/00			grazing tenure	0	20	118	12	149	13%
	CWHws2/00			other crown	0	20	66	0	87	23%
				private[a]	0	17	163	27	207	8%
				indian reserve	0	0	4	2	6	0%
				Total area (ha):	0	263	519	52	834	32%
on coarse-textured fluvial terrace	as above	CAtc	pink	Number of occurrences:	0	14	2	0	16	88%
				Total area (ha):	0	39	14	0	53	74%
Aster - peavine - meadow-rue mesic herb meadow	SBSdk/00	AM	green or	Number of occurrences:	0	54	46	0	100	54%
	SBSmc2/00		pink	protected area	0	16	4	0	20	82%
	ESSFmc/00			provincial forest	0	95	27	0	121	78%
	ICHmc/00			grazing tenure	0	20	48	0	67	29%
	CWHws2/00			other crown	0	10	5	0	15	65%
				private[a]	0	7	59	0	66	10%
				Total area (ha):	0	148	143	0	290	51%
on coarse-textured fluvial terrace	as above	AMtc	pink	Number of occurrences:	0	27	2	0	29	93%
				Total area (ha):	0	39	7	0	47	84%

Table 8. continued.

Plant Community	Biogeoclimatic Site Series	TEM Code	Map Colour	Number of Occurrences or Area by EO Rank	Excellent A	Good B	Marginal C	Poor D	Total	% Good to Exc. (A+B)
Floodplain Forests										
Black cottonwood - red-osier dogwood - prickly rose	SBSdk/08	CD	blue	Number of occurrences:	0	96	83	48	227	42%
				provincial forest	0	18	2	0	20	91%
				other crown	0	208	28	12	248	84%
				utility corridor[b]	0	38	0	0	38	100%
				municipal	0	45	10	14	69	65%
				private	0	177	473	339	988	18%
				Total area (ha):	0	486	513	364	1363	36%
White spruce - horsetail	SBSdk/07	SH	violet	Number of occurrences:	0	23	13	0	36	64%
				provincial forest	0	0	1	0	1	0%
				other crown	0	21	2	0	23	93%
				utility corridor[a]	0	2	0	0	2	100%
				municipal	0	0	0	0	0	--
				private	0	31	51	0	82	38%
				Total area (ha):	0	55	53	0	108	51%
Sitka spruce - salmonberry	CWHws2/07	SS	violet	Number of occurrences:	0	103	11	0	114	90%
				Total area (ha): *(all prov. forest)*	0	244	14	0	258	95%
Black cottonwood - red-osier dogwood - prickly rose	CWHws2/08	CD	blue	Number of occurrences	0	11	6	0	17	65%
				Total area (ha): *(all prov. forest)*	0	17	8	0	25	69%

[a] most private land occurrences (poor to marginal EO Rank) are unmapped -indistinguishable from cleared aspen forest

[b] cleared right-of-way (poor EO Rank) is only a small portion of the mapped polygon

Similar densities are expected on the north shores of other large E-W- trending SBSdk lakes such as Cheslatta, Netalkuz and Tetachuck, with fewer occurrences expected above smaller lakes and in the SBSmc2.

The Morice District has more SW than the Bulkley District, but probably fewer than the Lakes District. They are scattered along the Hwy 16 corridor, along the banks of the Morice River, and on the north shore of many of the lakes, at least as far north as Tahlo Lake. There are large occurrences on the north shore of Babine Lake, particularly near Old Fort.

6.1.1.3. Rocky Mountain juniper

The Bulkley Valley between Round Lake and Reiseter Creek is the epicentre of a localized population of Rocky Mountain juniper (*Juniperus scopulorum* Sarg.). This conifer is scattered through the Kitseguecla Valley and another population node occurs on the north side of the Skeena Valley at Kitwanga. It appears to be absent in the Hazelton area although likely ICHmc2/81 locations such as Tenas Hill, the base of 4-Mile Mtn/Bulkley Canyon, and the lower Suskwa River have not been checked closely. It also appears to be absent from the Morice Forest District. Possible locations in the Morice include the north bank of the Bulkley River near the Morice/Bulkley District boundary, the north shore of Babine Lake and the northwest end of Francois Lake. Rocky Mountain juniper is scattered through the Lakes District, but is nowhere as abundant as in the Bulkley Valley. Scattered trees and a few stands occur on the north side of Francois, Ootsa and Cheslatta Lakes, and at Tetzalto Mountain and the Gullwing area at the east end of Babine Lake. In the Lakes District, it may be hybridizing with *Juniperus horizontalis* (creeping juniper*)* which is absent from the Bulkley, and it occasionally occurs on the blue-listed SBSdk/04 site series together with Douglas-fir. Climate appears to be a strong controlling factor because the species is found in only warm, dry areas at low elevations or adjacent to large lakes. Abundance decreases quickly with elevation and it is generally absent from the SBSmc2, although it does occur above Newitt Ck.

(elev. 940 m). Birds are the primary dispersal agent, so the species can be expected to occur along bird migration corridors.

6.1.1.4. Classification Issues

There appears to be sufficient variation in environmental and vegetation features to consider subdividing the site series into two site phases based on soil and landform characteristics and two site variations based on vegetation characteristics:

The typical "shallow soil" phase (81a) has strong bedrock control with morainal and colluvial veneers and frequent bedrock outcrops. The moisture regime for this phase is normally xeric to subxeric. The proposed "deep soil" phase (81b, TEM code ***SWd***) is less common and more threatened than the 81a. It occurs on steep south- to west- facing erosional scarps developed in unconsolidated lacustrine, fluvial or morainal sediments created when rivers and streams incised Pleistocene valley fills during postglacial time (Clague 1984). The SWd has a subxeric to submesic moisture regime. It usually has lower species diversity than the typic phase and experiences more rapid aspen encroachment. Thirty-four SWd occurrences (128 ha, Table 8) were mapped in the Bulkley. We also sampled it in the Lakes District on the north side of the Sutherland River (U9, 96-1257). SWd is also present along the upper Bulkley R. in the Morice District.

I propose a new site variation (perhaps a new site series?) to recognize the rare Rocky Mountain juniper plant communities. The typical SBSdk/81.1 is a shrub-steppe community with scattered tall shrubs -normally willow or cherry and occasional Rocky Mtn. Juniper (<5% cover). The proposed SBSdk/81.2 (TEM code ***JS***) is a savanna-steppe community with a well developed, but open-grown stand of 2 - 8 m tall open-grown Rocky Mountain juniper with 5 - 20% cover. Thirteen JS occurrences totalling approximately 84 ha were located in the Bulkley Valley (Table 8). All were within the SBSdk zone. Two occurrences are recorded in the ICHmc2 at Kitwanga. The JS seems

to be restricted to rocky sites with shallow soils (81a phase) in the SBSdk and ICHmc2 biogeoclimatic units, where it occupies only a small portion of a larger SW-dominated mosaic.

6.1.1.5. Status

Table 8 summarizes the SW occurrences in the Bulkley by EO Rank. One occurrence (85+ ha) in the ICHmc2 near Kitseguecla Lake was rated Excellent-to-Good (AB), 76 were Good (B), 114 were Marginal (C) and 35 were Poor (D). The percentage of occurrences rated A or B was 34%. Verified occurrences are found within the following newly approved or proposed protected areas:

BUB Ecosection: Uncha Mtn/Red Hills (Goal 1) -good representation; Babine Mtns Park (Goal 1) good representation (34 ha, EOR = B); Call Lake (Goal 2) minor representation (8 ha, EOR = C).

BAU Ecosection: Sutherland River (Goal 1) -good representation.

NAR Ecoregion: Andimaul Lookout (Goal 2) -good representation.

Of the 34 SWd occurrences in the Bulkley, 7 were Good (B), 27 Marginal (C), and 0 Poor (21% A or B by area). 57% are on private land and none are in protected areas. There are several verified occurrences of this phase in good condition within the proposed Sutherland River protected area. Occurrences along the upper Bulkley River (Morice District) are thought to be in marginal to poor condition.

Of the 13 JS occurrences in the Bulkley, 11 were Good (B), and 3 were Marginal (C) (87% A or B by area). The EO ratings are strongly biased because abundance of juniper increased the rating. In fact, many JS occurrences are fragmented and disturbed with a high cover of non-native species. It appears that all of these occurrences are on private land except the Hubert Rd property (W1), purchased in 1997 by HCTF. However, ownership of the Can Brook juniper site (AA1) and the Driftwood/Bulkley Canyon site (B3) should be verified with B.C. Lands. There are scattered junipers (1 - 3% cover)

within the new Babine Mtns park (AA3) and the new Call Lake protected area (V2), as well as on Crown Land at Reiseter Ck (R2, R4), on the Bulkley R just north and south of B3, above Bigelow Lake (S2), and in the Kitseguecla River valley (X4); however, none of these occurrences qualify as JS. A verified occurrence of ICHmc2 JS in good condition exists within the proposed Andimaul Lookout Goal 2 protected area. Rocky mountain juniper is common in the Gullwing portion of the Sutherland River protected area, and it is likely that this area includes some well developed JS.

6.1.1.6. Threats

Threats to the SW and JS communities include habitat fragmentation, construction of homesites, roads and rock quarries, intensive recreational use, overgrazing and soil erosion caused by domestic livestock -especially on fenced small holdings, overbrowsing and soil disturbance by high deer and moose populations, harrassment of wildlife by humans and their pets, fire suppression causing aspen and shrub encroachment, excessive burning (in a few cases), and invasive non-native species. *Poa pratensis* (Kentucky bluegrass), *Taraxacum officinale* (dandelion) and *Phleum pratense* (timothy) are very abundant --often dominant-- on all occurrences near human settlement, and scattered even in remote areas. Other non-native species are currently restricted to severely disturbed ground, but *Tragopogon dubius* (goat's beard) is beginning to show up on a few sites and *Centaurea* spp. (knapweeds) although not yet present are expected to be highly competitive on these ecosystems (B. Drinkwater, pers. comm. Feb. 1998). In settled areas, removing livestock will not necessarily reduce invasive species because deer, ants and other wildlife play an important role in their dispersal and maintainance. In remote areas with few non-native species, the best way to limit introduction is to avoid access construction and soil disturbance and to rigorously control introductions with handpulling or herbicides (Northwest Weed Control Committee 1997). Having domestic animals like packhorses graze in transitional "cleanout" areas before being permitted into these communities may help to reduce introductions.

6.1.2. Bluegrass - Slender Wheatgrass (SBSdk/82 TEM code BW, CDC code PsEt) *Poa secunda -Elymus trachycaulus*

6.1.2.1. Ecology (modified from Pojar et al. (1984) to fit IFMS:Plant Communities format)

These grasslands have a well developed and diverse herb layer with very few shrubs. Dominant native grasses are *Poa secunda* (Sandberg bluegrass), *Poa interior* (interior bluegrass), *Elymus trachycaulus* (slender wheatgrass), *Stipa richardsonii* (spreading needlegrass) and *Stipa occidentalis* (stiff needlegrass), but agronomic grasses like *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), and *Festuca rubra* (creeping red fescue) are often more abundant. *Koeleria macrantha* (junegrass), *Elymus glaucus* (blue wild-rye), *Schizachne purpurascens* (false melic), *Bromus* spp. (brome) and *Danthonia intermedia* (timber oatgrass) are also common. *Carex macloviana* (Falkland Island sedge) is frequent. Typical forbs include *Lathyrus nevadensis* (purple peavine), *Epilobium angustifolium* (fireweed), *Achillea millefolium* (yarrow), *Thalictrum occidentale* (western meadow-rue) and *Galium boreale* (northern bedstraw). The moss layer is sparse or lacking.

The community occurs on to gentle to steep south or southwest-facing slopes or on level ground. It develops on deep morainal blankets or on inactive fluvial and lacustrine terraces or scarps, sometimes below basalt bedrock outcrops (buttes), and often adjacent to water. Soils are usually fine textured at the surface, sometimes becoming coarser textured below. Ah development is the dominant feature of the soil profile. Soils are melanized Brunisols and Luvisols and marginal Chernozems. The moisture status is subxeric to mesic; nutrient regimes are rich to very rich.

6.1.2.2. Distribution and Abundance

The BW is found in the SBSdk and in some adjacent SBSmc2. It is absent from the ICHmc and CWHws and appears to be absent from the ESSF. Although there are mesic grasslands in the ESSF, they have a different species composition, generally

lacking slender wheatgrass and needlegrasses, and having greater abundance of alpine/subalpine *Poas* and other grasses like *Danthonia intermedia, Trisetum spicatum* (spike trisetum) and *Phleum alpinum* (alpine timothy). The BW may be present in the SBPSmc but we no records from this zone.

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Within the SBS of the southeastern Skeena Region, the BW is very rare towards the north and west (BAU and Skeena watershed portion of the BUB) and increases in frequency towards the southeast (NEP, NAU and Fraser watershed portion of the BUB). It is most common along the north shores of large lakes such as Francois, Ootsa, Cheslatta and Natalkuz.

We mapped 5 marginal BW occurrences in the Bulkley and either located or acquired data on an additional 4 occurrences in the Morice, and 10 in the Lakes District (Table 1). The Morice and Lakes District records would probably translate into many more occurrences if individual polygons at each location were mapped. There are no occurrences of this plant community in the Kispiox District.

Because of uncertainties in the classification of grasslands, and the degree of modification the herbaceous communities have experienced (see Section 5.2.3), it was difficult to decide which polygons to include as BW. If the community is broadly defined to include all herbaceous-dominated communities with a submesic (rarely subxeric) to mesic moisture regime in the SBSdk, SBSmc2 and lower ESSFmc, the total number of recorded occurrences would increase greatly. Mapping in the Bulkley does not include a large number of semi-natural hay meadows on private land. In the Morice and Lakes District the records are very incomplete on both public and private land.

6.1.2.3. Classification Issues

The term "grassland" is used broadly to describe any herb-dominated vegetation (Daubenmire 1968) or more narrowly to describe a community dominated by graminoids (grasses and grass-like plants) with combined tree and shrub cover less than some specified amount (often 15%) (Nicholson 1982). Banner et al. (1993) define a single herb-dominated site unit for the entire southeastern Skeena Region: the (82) bluegrass - slender wheatgrass grasslands (pg. 5.189). This, combined with the disturbed nature of most herbaceous communities has lead to all semi-permanent open range that is not shrub-dominated, being, by default, classified as the red-listed BW. This situation existed until 1997 when a new sites series, the Cow parsnip - large leaved avens (TEM code ***CA***), was defined to descibe lush forb-dominated meadows with subhygric to hygric moisture regimes (Oikos Ecological Services Ltd. 1997).

In searching for the BW we attempted to locate all occurrences of permanent or semi-permanent herbaceous communities minimally disturbed by humans or domestic livestock within the Bulkley Valley SBSdk, SBSmc2 and lowermost ESSFmc and to sample as many as possible across a topographic and moisture gradient. In total, we mapped 183 herb-dominated community occurrences in the Bulkley (total area 1182 ha). Of these, only 5 marginally fit the description of BW while the remainder were overwhelmingly forb-dominated with a minor cover of native grasses, mostly bromes, blue wild-rye, and *Melica subulata* (onion grass). Within most occurrences, a cow parsnip-dominated plant community closely matching the CA of Oikos Ecological Services Ltd. (1997) was dominant. However, 100 occurrences had at least a minor component of mesic to submesic forb meadow that fit neither the CA or BW two community descriptions (new TEM code ***AM,*** total area: 290 ha).

In the Lakes and Morice Districts, range and FES staff members helped us to locate and sample some of the best known, accessible BW occurrences. Here we were more successful, but again, many of the communities were forb-dominated meadows similar to those found in the Bulkley.

6.1.2.4. Status

Table 8 summarizes the BW occurrences in the Bulkley by EO Rank. Of the 5 occurrences, 2 were very small (0.15 - 0.3 ha in size), one is a cultivated hay meadow, and none closely matched the BW description. The large occurrence (P1), 85+ ha in size and rated Excellent to Good (AB), is located on the Bulkley-Morice District boundary within the Dykens grazing lease on Grouse Mountain. Although technically within the Bulkley District (see mapsheet 93L.057) this grazing lease is administered by the Morice Forest District. It is an exceptionally large and diverse grassland/meadow complex at 930 - 1200 m elevation in the SBSmc2/ESSFmc transition and has had moderate livestock grazing for many decades. It is dominated by timothy and Kentucky bluegrass (30-50% cover in 1996) with little or no slender wheatgrass, needlegrass or caespitose bluegrasses. Higher elevation ESSFmc occurrences on Grouse Mountain that receive little cattle use and have few non-native species are forb-dominated, so it is unknown whether or not the "natural" community at slightly lower elevations is BW.

There are no verified occurrences of BW in existing protected areas, but there appears to be minor BW in the Red Hills protected area on Francois Lake. There is some herbaceous meadow and xeric grassland in the Sutherland River protected area but no BW. Most of the significant remaining grasslands in the Lakes District appear to be on crown grazing land, whereas occurrences on private land are small, greatly modified or both. Grasslands in the Poplar Lakes area of the Morice District appear to be dominated by introduced grasses, blue wild-rye and bromes and forb species.

6.1.2.5.Threats

Native grassland in good condition with few introduced species is critically imperiled in the SBS of the southeastern Skeena Region because most occurrences are either cultivated or have been sufficiently disturbed that they are now overtaken by highly competitive agronomic and weed species, principally Kentucky bluegrass, timothy and dandelion, but also *Dactylis glomerata* (orchard grass), red fescue, *Trifolium spp*.

(clovers) and a variety of weeds (Northwest Weed Committee 1997). Without either fire or grazing, they succeed rather quickly to shrubland, aspen woodland, (or perhaps become forb meadows??), with a resultant decline in species diversity and the loss many of "southern" species of grassland specialists (Schwarz and Wein 1997). Forage quality may also decline (B. Fowler, pers. comm. June 1997).

The exceptions appear to be a few, very steep, exposed sites (e.g. below the basalt buttes at Colleymount (DD1) and Cheslatta Lake (M4112-79) with deep rich, very well drained soils on which the native grasses have remained dominant. Although these areas have long ranching history, the slopes are too steep to be heavily utilized by domestic livestock and they have never been artificially seeded, yet at the same time, they are too exposed for rapid encroachment of woody species. It appears that the desiccating microclimate in combination with a deep, nutrient-rich, constantly ravelling soil, and moderate wildlife and livestock disturbance allows the native *Elymus* and *Poa* bunchgrasses, the needlegrasses, *Artemisia frigida* and a variety of grassland annuals to root very deeply, remain vigorous and competitive and thus resist encroachment by shrubs, aspen and forbs. These grasslands fit the *Artemisia frigida - Agropyron trachycaulum* association of Pojar (1983) and are reminiscent of the steep grasslands of the Peace River breaks (Raup 1934), but are here included under the umbrella classification BW.

6.1.3. Newly Described Rare and Endangered Plant Communities of Southwest-facing Slopes

6.1.3.1. Cow parsnip - large leaved avens (TEM code CA) *Heracleum lanatum - Geum macrophyllum*

Subhygric to hygric cow parsnip-dominated meadows (CA) described and proposed for red-listing by Oikos Ecological Services Ltd (1997) are found on deep, rich, moist soils (often underlain by gravels) throughout much of British Columbia and have a fairly similar species composition wherever they occur. Typical species are *Heracleum*

lanatum (cow parsnip), *Epilobium angustifolium* (fireweed), *Urtica dioica* (stinging nettle*), Thalictrum occidentale* (western meadow-rue), *Geum macrophyllum* (large-leaved avens), *Elymus glaucus* (blue wild-rye), *Bromus* spp. (bromes), and *Calamagrostis canadensis* (bluejoint). Their abundance in the landscape varies with climate, landforms and disturbance history and they are most common in avalanche terrain or moist areas with a history of repeated fire. They are uncommon and threatened at low elevations, and become more frequent and less threatened with increasing elevation. In the ESSF zone, *Senecio triangularis* (arrow-leaved ragwort) and *Vertrum viride* (false hellebore) become prominent. A rare variation in the southeastern Skeena Region ICHmc2 (more common towards the Nass and Terrace areas) is dominated by *Pteridium aquilinum* (bracken). In low elevation, developed areas the CA is threatened by suburban development, agriculture, domestic grazing and introduced plant species (notably Canada thistle (*Cirsium arvense)*). In less developed areas it is threatened by long term fire suppression, possible expansion of grazing tenures, and logging road or highway development, for example road locations and gravel pits across toe slopes and in riparian corridors.

6.1.3.2. Aster - meadow-rue - peavine - fireweed (TEM code AM) *Aster spp. - Thalictrum occidentale - Lathyrus nevadensis - Epilobium angustifolium*

Mesic to submesic forb meadows (TEM code ***AM*)** are scattered throughout the SBSdk and mc2, rare in the ICHmc and most common in the ESSF. They occur on gentle to steep southwest-facing slopes with well to rapidly drained but reasonably deep soil and on level inactive fluvial deposits with a fine-textured surface capping over gravels. Species composition varies greatly from one site to another and there are no obvious dominants. Characteristic species include: *Ranunculus* spp. buttercups *(*dominant on the Nilkitkwa River), monkshood (*Aconitum delphinifolium* dominant in the Zymoetz), asters (*Aster modestus, A. ciliatus, A. conspicuus*), peavine, western meadow-rue, northern bedstraw, meadow valerian (*Valeriana dioica*), fireweed, yarrow *(Achillea millefolium),* goldenrod (*Solidago canadensis*) indian paintbrush (*Castilleja miniata* -orange and yellow), cinquefoils (*Potentilla* spp.*),* native thistles (*Cirsium foliosum, C. edule),* grapeferns and moschatel (*Adoxa moschatellina*). A variety of

grasses (*Elymus glaucus, Poa spp., Bromus spp., Melica subulata, Schizachne purpurascens*) and sedges (esp. *Carex macloviana*) are present but never dominant.

These plant communities can be distinguished from CA plant communities (often present within the same meadow) by their lower stature, higher species diversity and absence or scarcity of cow parsnip, stinging nettle, large-leaved avens, arrow-leaved ragwort, and bluejoint. They are less common, and are more susceptible to tree encroachment. Other threats include road and gravel pit construction, heavy recreational use (ATVs, hunting campsites) expanded use by domestic livestock, and seeding of agronomic species either on site or nearby.

6.1.3.3. Timber oatgrass dry grassland (TEM code BWx or BWtc)

Danthonia intermedia - Stipa spp - Galium boreale (SBSdk)

Danthonia intermedia - Trisetum spicatum - Galium boreale (ESSFmc)

A xeric to submesic grassland community characterized by *Danthonia intermedia (*timber oatgrass) occurs on inactive level gravelly fluvial deposits (TEM code ***BWtc)*** and south-facing ridge crests (TEM code ***BWx***) from valley bottom to subalpine elevations. It is scattered and highly threatened in the SBSdk and SBSmc2, but more common and less threatened in the ESSFmc. It is absent from the Kispiox District, very rare in the Bulkley, and increases in frequency to the southeast. This plant community was found on the Telkwa River near Goathorn Ck. (SBSdk) growing with needlegrasses (*Stipa richardsonii, S. occidentalis)* and may have been fairly common on fluvial terraces of the Bulkley River before these were cleared for agriculture. In the SBSmc2 it has been found in the driest portions of the fluvial (montane) meadow and wetland complexes in the Zymoetz River valley, but was absent from similar complexes at Netalzul meadows and Nilkitkwa Rivers. In the ESSF it occurs in gravelly frost pocket areas mingled with wetlands and begins to resemble dry alpine grassland, with spike trisetum *(Trisetum spicatum)* and alpine timothy (*Phleum alpinum)* as common associates. Other associated species include: northern bedstraw (*Galium boreale)*, yarrow (*Achillea millefolium*), dwarf blueberry (*Vaccinium caespitosum*), sweetgrass (*Hierochloe odorata*), tall blue

penstemon (*Penstemon procerus*), northern gentian (*Gentianella amarella*), orange agoseris (*Agoseris aurantiaca*), stonecrop (*Sedum lanceolatum*), strawberry (*Fragaria virginiana*), grape ferns (*Botrychium* spp,) and pussy toes (*Antennaria* spp). There is a moderately developed cryptogammic crust with *Cladina* and *Peltigera* lichens, *Polytrichum juniperinum* and *Thuidium abietinum* mosses. These ecosystems are at risk from tree and shrub encroachment (aspen, lodgepole pine, prickly rose), invasive alien species (timothy, dandelion and creeping red fescue), gravel pit and road construction, and possible expansion of domestic grazing tenures.

6.2. Fluvial Meadow and Wetland Complexes (pink)

6.2.1. Ecology

Grassland and herb meadow communities are found not only on southwest-facing slopes, but also within what I have termed "fluvial meadow and wetland complexes". These ecosystem complexes are found on large, inactive fluvial deposits, mostly of postglacial origin. Most are on level ground, often with a small stream meandering through an oversized valley floor (e.g. Netalzul Meadow, Foxy Ck. Meadows, Sutherland R. valley) but they can also be found on gently sloping alluvial fans or deltas (e.g. Passby Ck. Meadow) and adjacent to swiftly flowing rivers (e.g., along the Cranberry, Kispiox and Nilkitkwa Rivers). A subsurface layer of gravels overlain by horizontally bedded sand and silt deposts is a characteristic feature of such sites. Old erosion channels and small kettles are also common.

Figure 3. illustrates a typical complex of plant communities on such sites. The meadows have scattered large open-grown trees (aspen, lodgepole pine, spruce or subalpine fir), a sure sign that these are not typical wetlands, but have rich, well-drained mineral soils (although they may be highly frost-prone). The stream bank is bordered by a willow - mountain alder - black twinberry shrub carr (the WT site series of Oikos 1997) in the SBSmc2 or by hardhack (*Spirea douglasii)* scrub in the ICHmc. Areas underlain by clays contain minerotrophic sedge wetlands. The meadow itself is well drained and

ranges from subhygric to subxeric in moisture status, depending on the depth of fine sandy or silty material overlying gravel. Plant communities present within the meadow are closely analgous to those found on southwest-facing slopes. Areas of deep moist soil, are dominated by the CA plant community (Section 6.1.3.1), mesic areas are exceptionally diverse AM communities (Section 6.1.3.2) and gravelly subxeric ridges are BWtc (Section 6.1.3.3). Shrub cover is low (5-10%) and usually associated with tip-up mounds from windblown trees. These sites support a great variety of insects and small mammals and have high floristic diversity. They are also well-used by large mammals, and are favoured by hunters. Environmental factors inhibiting tree establishment on these sites appear to be a combination of cold air ponding and seasonal drought, conditions in which herbs are highly competitive. Subalpine or alpine plant species are typically found below their usual elevational range.

Fluvial Meadow and Wetland Complexes

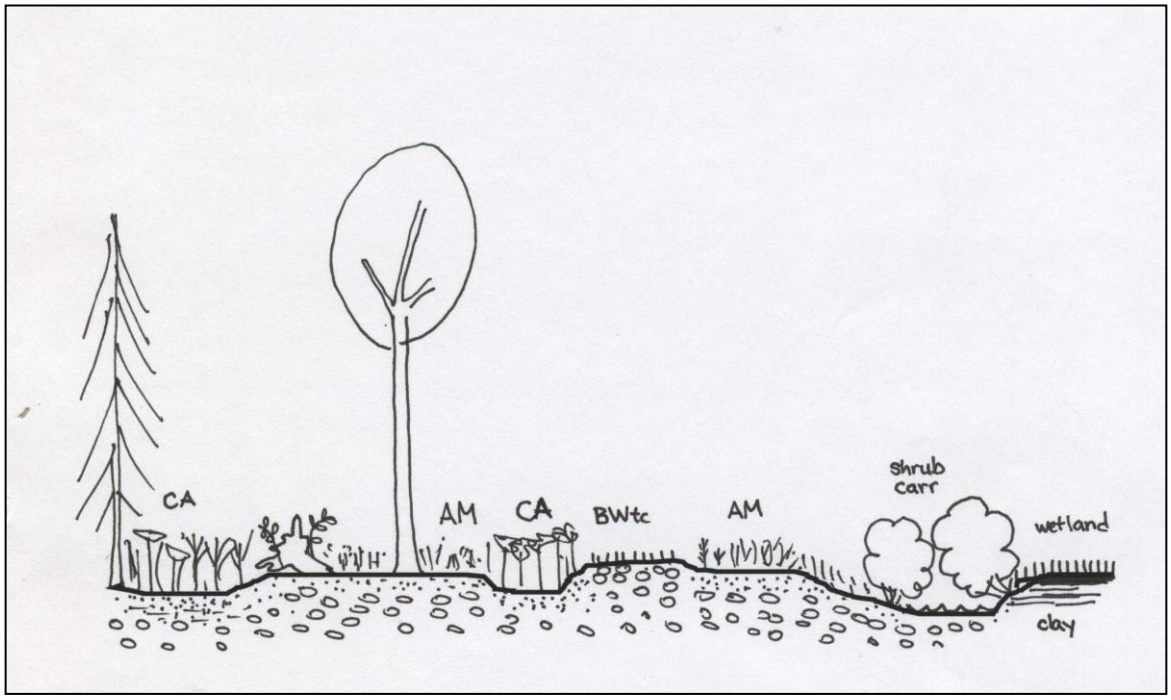

Figure 3. Fluvial meadow and wetland complexes on inactive fluvial terraces with fine sediments overlying gravel. A typical meadow contains a mosaic of subhygric cow parsnip - avens plant community (CA), the mesic aster -meadow rue plant community (AM) and dry timber oatgrass grassland (Bwtc) interspersed with shrub carr and sedge wetland with the occurrence of each determined by moisture availability and the depth of fine sand, silt and clay deposits over a gravelly substratum.

Distribution and Status

Fluvial meadow and wetland complexes are scattered throughout the southeastern Skeena Region at all elevations in the SBSdk, SBSmc2, ICHmc and ESSF, but are rare in most landscapes. They are mapped as pink polygons, and are amalgamated with other AM and CA occurrences on Table 1, but shown separately with a "tc" site modifier (AMtc, CAtc) on Table 8. A total of 16 CAtc occurrences (53 ha, 74% in good condition) and 29 AMtc occurrences (47 ha, 84% in good condition) were mapped in the Bulkley District. Most SBSmc2 occurrences near the Bulkley Valley were mapped at 1:20,000, but occurrences in pristine condition in the upper Nilkitkwa R./Barbeau Ck. area (I1-2), were not mapped. A total of 13 occurrences were recorded in other Districts, including the large Foxy Ck (ESSFmc) and Klo Ck.(SBSmc2) meadow complexes near Houston (Q1-2). There are verified occurrences in the Netalzul Meadow Goal 2 protected area (N1, 13 ha) and the Sutherland River protected area (Oikos 1997).

In the SBSdk these ecosystems have been extensively disturbed by human activity, making them difficult to locate. In fact, the Town of Smithers sits on a former fluvial meadow/wetland complex where alluvial fans from Hudson Bay Mtn (e.g. Dahlie Ck.) spill out onto the valley floor. The lowest elevation SBSdk occurrences have a high grass component and may have included BW plant communities -but are now usually cultivated. At mid-elevations these montane meadows are commonly used by guide-outfitters to graze packhorses, and they probably served as campsites for many generations of aboriginals and early European settlers.

6.2.2. Threats

Threats to these ecosystems are similar to those faced by CA, AM, and BW communities on southwest-facing slopes. Introduced non-native species, excessive livestock grazing and recreational use are major causes of site degradation. These meadows often serve as road beds or gravel pits because of their substrate, and once accessed, can be further disturbed by 4x4s and ATVs. Fire suppression is also an

important threat; significant tree encroachment was observed on some sites. Rates of tree encroachment appear to be slowest at higher elevations, or at low elevations where herbaceous vegetation is extremely vigorous or where moose or cattle use is heavy.

6.3. Sub-Boreal Spruce Floodplain Complexes (blue and violet)

Figure 4. illustrates a typical large floodplain in the SBSdk subzone. The red-listed black cottonwood - dogwood - prickly rose plant community (***CD***) is the dominant plant community on the floodplain, but a huge variety of other site series, seral associations and undescribed non-forested plant communities can be found as well. In BEC, floodplains are now generally subdivided into three bench levels (low, medium, and high) to account for different flooding regimes, with different site series defined at each level. This was not done by Banner et al. (1993) for the SBSdk due to lack of sample data, but a preliminary classification of floodplain communities is beginning to emerge as a result of recent work in the SBSdk (Oikos 1997, 1998a,b, and this project).

Even the 3-tiered classification adopted by BEC greatly oversimplifies the diversity of plant communities present within the area encompassed by a large active floodplain. At any one bench level different plant communities develop in aggrading areas adjacent to main channel where soils are typically coarse textured, well drained Regosols, than in back channels areas where soils tend to be finer textured, poorly drained Gleysols. Also present are a variety of aquatic and semiaquatic communities in ponds and channels, shrub and sedge-dominated wetlands in abandoned back channels, and herb meadows and upland forest communities on inactive raised terraces. With ongoing erosion and sedimentation, each plant community may be present in a range of structural or successional stages. Active floodplains of major (S1 and larger S2) rivers

SBSdk Floodplain Complex

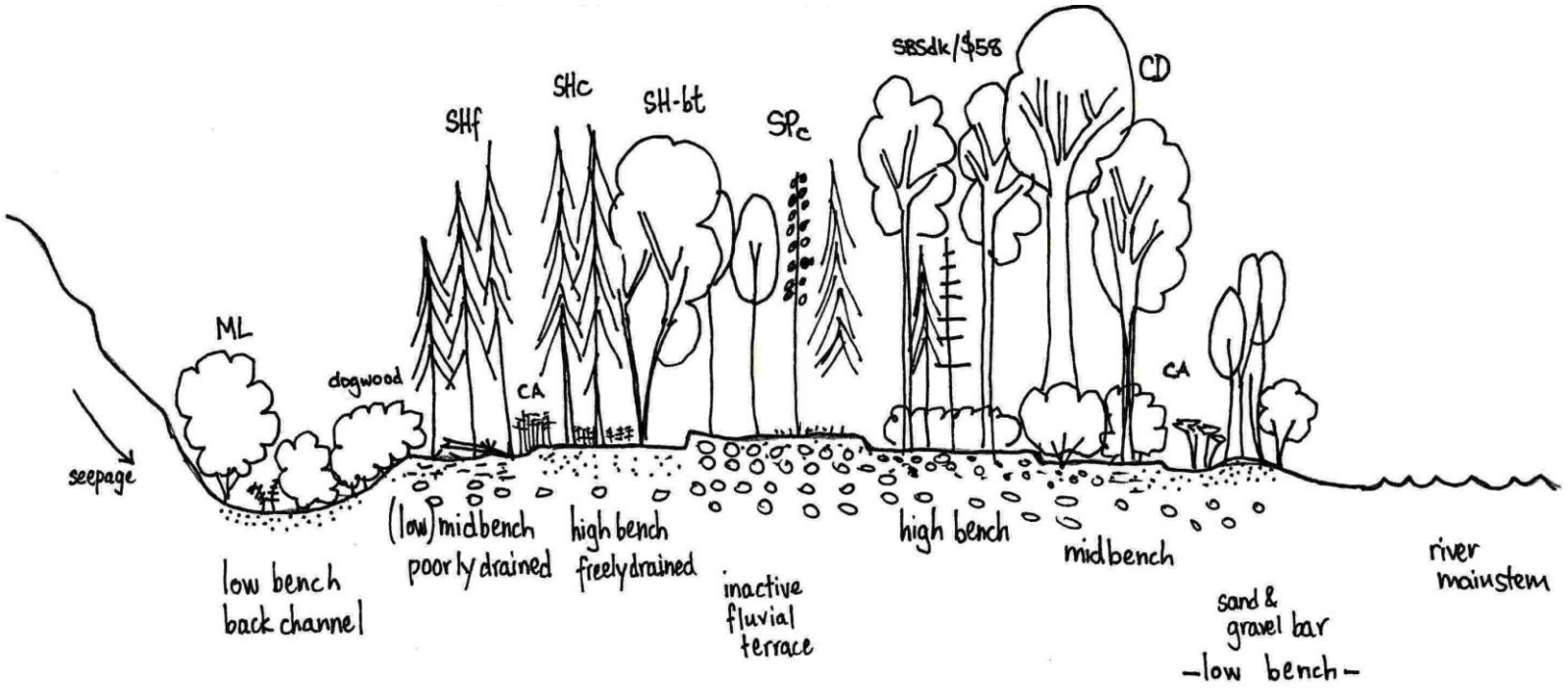

Figure 4. SBSdk floodplain complex showing how bench level, soil texture and disturbance history interact to create a diverse range of plant communities, including the red-listed Black cottonwood - dogwood - prickly rose (CD) and unlisted Hybrid spruce - horsetail (SH), Paper birch - black twinberry - horsetail (SHbt), Pacific willow - mountain alder - lady fern (ML), cow parsnip - large-leaved avens (CA), pioneering sand and gravel bar communities, as well as typical upland Hybrid spruce - spirea - purple peavine (SP).

are thus among the most diverse ecosystems in British Columbia, containing species and communities not found elsewhere in the landscape.

6.3.1. Black cottonwood - dogwood - prickly rose (SBSdk/08, TEM code = CD, CDC code PtCs) *Populus balsamifera* spp. *trichocarpa - Cornus stolonifera - Rosa acicularis*

6.3.1.1. Ecology (modified from MIWS: Plant Communities)

This deciduous riparian forest has an open canopy of *Populus balsamifera* ssp. *trichocarpa* (black cottonwood). *Picea glauca x engelmannii* (hybrid white spruce) may be present in the tree or shrub layer with very low cover. The shrub layer is dense, tall and vigorous with a high cover of *Cornus stolonifera* (red-osier dogwood), *Lonicera involucrata* (black twinberry), *Rosa acicularis* (prickly rose), *Viburnum edule* (highbush-cranberry). *Amelanchier alnifolia* (saskatoon), *Symphoricarpos albus* (common snowberry), *Ribes lacustre* (black gooseberry), and *Shepherdia canadensis* (soapberry) are frequently present. Willow and alder may also occur. The herb layer is diverse and often patchy with *Calamagrostis canadensis* (Canada bluejoint), *Petasites frigida* var. *palmatus* (palmate coltsfoot), *Lathyrus nevadensis* (purple peavine), *Vicia americana* (American vetch), *Equisetum arvense* (common horsetail), *Aster modestus* (great northern aster), *Elymus glaucus (*blue wild-rye), *Osmorhiza chilensis* (mountain sweet cicely), *Heracleum lanatum* (cow parsnip) and a variety of other herbs often present. A moss layer is generally absent.

This community is found on mid-bench floodplains of larger rivers. It develops over fluvial materials on level slope positions. Sites receive frequent overbank flooding (1-5 yr interval) and have seasonally high water tables. Moisture regime is subhygric to hygric (relative within subzone). Soils are rich to very rich and coarse textured (loamy to sandy) Regosols and Brunisols.

6.3.1.2. Distribution and Abundance

The CD is extensive along the Bulkley and Morice Rivers in the SBSdk subzone and rare elsewhere on smaller rivers and creeks, and along the shores of large lakes such as Babine and Francois Lake where small deltas have developed. Within the Bulkley SBSdk I located and mapped 227 CD polygons (1363 ha, Table 8) on the Bulkley River and its larger tributaries. There are also some minor unmapped occurrences in the SBSmc2 on the Telkwa River, the Babine River, lower Nilkitkwa, and on the shores of Babine Lake. The Morice District has extensive CD along both the Morice River and the Bulkley River as far upstream as Perow, mostly unmapped. This plant community is very rare in the Lakes District because there are no major rivers, and it is absent from the Kispiox District where an equivalent (but unlisted) ICHmc community occurs.

The best CD occurrences are found on braided (wandering) reaches of Riparian Class S1 and larger S2 rivers, while reaches with a stable single thread channel and smaller tributaries (S2, S3) tend to have small high benches and terraces with poorly developed floodplains. In the Bulkley District the largest floodplains occur between Telkwa and Canyon Ck. The lower Telkwa River and the Bulkley R. upstream of Telkwa (e.g. mouth of Thompson Ck.) also have moderately well developed floodplains. Small floodplains occur on the Bulkley River downstream of Canyon Ck. and on tributaries such as Deep Ck., Vanderven Ck., Goathorn Ck., Pine Ck., Canyon Ck. and Driftwood Ck. In the Morice District, the floodplains of the Bulkley are more extensive, and the meandering reach upstream of Houston is almost continuous CD floodplain. Several very large CD occurrences occur at the confluence of the Morice and Bulkley Rivers (unmapped).

The Morice River is described as having 3 reaches (Weiland and Schwab 1992). Reach I extends from Morice Lake to the Thautil River and lies within the SBSmc2 zone. On this reach, the river is a single thread channel with a relatively stable channel configuration and small CD plant communities. Reach III extends from Owen Ck. to the

river mouth within the SBSdk zone and is also a single thread channel. CD occurrences on the lower half of Reach III were examined and mapped for this study. The most extensive floodplain communities on the Morice R. occur within Reach II, from Thautil to Owen Ck. which is characterized as a wandering gravel bed river with multiple channels, frequent channel changes, river bars and islands with exceptional fisheries values. This area is transitional between the SBSdk and SBSmc2 and contains a diverse array of well-developed floodplain CD, spruce-horsetail (SHa) and other riparian communities including extensive mature forest. The extent of the active floodplain was mapped by Weiland and Schwab (1992) but their "alluvial forest" includes not only CD and SHa occurrences but also higher fluvial benches and upland ecosystems on raised terraces within the floodplain. Smaller CD occurrences are found along many of the Morice R tributaries.

6.3.1.3. Classification and Mapping Issues

Distinguishing among floodplain bench heights on aerial photographs is extremely difficult. My maps separate cottonwood-dominated CD polygons (blue) from spruce-dominated SH polygons (violet) and attempt to exclude or estimate the proportion of aspen, birch or lodgepole pine dominated ecocomponents which are generally ST or SP site series on inactive fluvial terraces. Where floodplains were cleared and cultivated (poor EO Rank) I did not assign any SH, calling it all CD or ST/SP. I visually checked most polygons from the river, road or railway to verify the phototyping. Polygons coloured in blue and identified as CD on the map are a combination of mid bench (true CD) and high bench floodplains. High bench floodplains have recently been reclassified as SBSdk/$58 (the black cottonwood - twinberry seral association) (Oikos 1988a, b). These high bench floodplains have better drained soils, and infrequent overbank flooding. There is less red-osier dogwood, and the shrubs are not as tall. Aspen and paper birch are also common. The SBSdk/$58 is more common in the landscape than the CD because it also occurs in the riparian areas of smaller streams and on alluvial fans.

The blue polygons also include non-forest riparian communities such as meadows, river bars and shrub-dominated low bench floodplains. Where these exceed 10% of the polygon they are typed out as separate ecocomponents. Because these varied plant communities contribute to the structural and species diversity of the floodplain, occurrences with diverse communities together with some mature CD were ranked just as high as occurrences of pure mature CD.

6.3.1.4. Status

Within the Bulkley Forest District, 42% of CD polygons are in good condition (36% by area, Table 8). Most CD occurrences (72%) are on private land and are either disturbed (EOR = marginal) or cleared and cultivated (EOR = poor). On crown or municipal land, the best occurrences are found opposite the regional dump (between CN's Tatlow and Huntington stations) and on the Telkwa River below Goathorn Ck. These occurences have abundant mature CD in mostly undisturbed condition and a wide variety of other floodplain plant communities with no obvious grazing history. Other occurences in good condition tend to be small and scattered. With the exception of the Telkwa River and Pine Ck., small CD occurrences on tributaries to the Bulkley are mostly in poor or marginal condition with cattle grazing and rural homesites adjacent to the streambank. Most CD occurrences in the Bulkley District have some introduced species (typically dandelion, but also Canada thistle and white clover) present. Heavy ungulate use has greatly reduced shrub abundance on some occurrences. Mature CD is fairly common, but old growth with large cottonwood snags is uncommon.

The floodplains on the Morice River are in good to excellent condition with minimal human disturbance, abundant old-growth or late mature forest and few non-native species. The Bulkley River from the Morice River downstream to the Bulkley District boundary also has many large occurrences in good condition. Upstream of the Morice River the almost continuous CD occurrences are mostly on private land with a mix of good, marginal and poor occurrences.

6.3.1.5. Threats

CD occurrences on the Bulkley River and its smaller tributaries are highly threatened by continued urbanization and land clearing, agriculture and cottonwood logging on private land, flood control measures that block back channels and reduce overbank flooding, bank erosion where streamside vegetation has been removed, coal mine and pipeline development and other disturbances related to the high settlement density. Non-native species are becoming established in most occurrences particularly where there is heavy recreational or ungulate use. There is little opportunity for the plant community to "cycle freely through successional stages in response to natural disturbances" such as flooding and beaver activity. In comparison, the outlook for the Morice River occurrences is good, because a 500 m no-harvest zone has been established on either side of the river and near-natural flow regimes can be expected to continue.

6.3.2. Other Rare Plant Communities of SBS floodplains

6.3.2.1. Paper birch - cottonwood - black twinberry - common horsetail (TEM code = SH bt seral assoc.) *Betula papyrifera - Populus balsamifera* ssp. *trichocarpa - Lonicera involucrata - Equisetum arvense*

Stands dominated by paper birch (*Betula papyrifera)* are rare in the SBSdk. This plant community, a pure stand of "cathedral-like" paper birch on a very productive subhygric high bench floodplain is a variation of the newly described SBSdk/$58 seral association (see above). It has an understory shrub layer dominated by black twinberry, moist forbs including false sarsaparilla (*Aralia nudicaulis),* common horsetail *(Equisetum arvense),* oak fern (*Gymnocarpium dryopteris*), and Solomon's seals (*Smilacina* spp.*).* Both known occurrences are small (6 ha total): (one on an island in the middle of the Bulkley near Canyon Ck; the second on the Telkwa River floodplain below Goathorn Ck). It may also occur in the large floodplain area near the regional dump and in the Morice District on the Bulkley or Morice River floodplain.

6.3.2.2.Hybrid spruce - horsetail high bench floodplains and back channels (SH)

Spruce - horsetail (SH) forests growing on moist depressional sites are a widespread feature of the subboreal and boreal landscape. However, in the SBSdk they are both naturally uncommon and imperiled by land clearing and logging. I located 36 occurrences (108 ha) of this site series in the SBSdk of the Bulkley District --far fewer and smaller than the red-listed CD. The largest occurrence is 16 ha in size, median size is 2 ha. Seventy six percent of occurrences are on private land. The freely-drained phase (SHc or SHa) is a highly productive spruce forest growing on sandy to silty Regosolic or Brunisolic floodplain soils. It is reasonably common on the Morice River floodplain - especially in the SBSdk/mc2 transition, but virtually absent elsewhere in the SBSdk where such sites are either dominated by black cottonwood or cleared. The poorly drained phase (SHf or SHp) is more common, often found in back channel areas on the floodplain or near the outlet of wetlands. On lacustrine or fluvial parent materials with water movement through the site, these forests often have a very diverse understory including such locally rare plant species as Rocky Mountain sedge (*Carex saximontana),* water avens (*Geum rivale),* jewelweed (*Impatiens noli-tangere),* northern twayblade *(Listera borealis)* and many atypical bryophytes. I did not attempt to map small patches of SH in depressional pockets on morainal landforms. These are scattered throughout the SBSdk but are typically less productive and have lower species diversity than the fluvial SH.

6.3.2.3.Pacific willow - mountain alder - lady fern (TEM code **=ML***)*

Salix lasiandra - Alnus incana *ssp*. tenuifolia - Athyrium filix-femina

This is a previously undescribed plant community occurring on regularly flooded backchannels (low benches) of SBSdk floodplains. It is extremely valuable as wildlife and fish habitat. In the Bulkley SBSdk these ecosystems are naturally uncommon, and threatened by insensitive construction practises, changes to natural drainage patterns and water pollution. These are highly diverse plant communities with multi-layered shrubs and a lush herb layer dominated by ferns and horsetails. Highly accessible examples of this community occur at Riverside Park in Smithers and in the Cottonwood flats area of Telkwa. They are also common on the Morice River floodplain.

Other non-forested plant communities containing highly specialized floodplain species were encountered during field work, but require further sampling. Some examples:

- Bluejoint (*Calamagrostis canadensis*) - fowl bluegrass (*Poa palustris*) wet riparian grassland
- Sandbar willow (*Salix exigua*) - wolf willow (*Elaeagnus commutata*) on sand and gravel bars (threatened by white clover (*Melilotus alba*) and other non-native spp.),
- Yellow mountain avens (*Dryas drummondii*) - alpine milk vetch (*Astragalus alpinus*) pioneer community on sand and gravel bars

6.4. Hybrid Sitka Spruce - Salmonberry High Fluvial Bench (CWHws2/07, TEM code SS, CDC code PsRs)

The SS plant community is red-listed throughout the CWH biogeoclimatic zone and occurs in southeastern Skeena Region at the eastern limits of its range in a strongly transitional form. Preliminary mapping of SS occurrences in the Bulkley District was completed in 1996, but I was advised that further work on this plant community was a low priority because the ecosystem is not highly threatened in the study area. The following description is taken from my 1996 progress report.

6.4.1.1. Description

The Coastal Western Hemlock zone (CWH) occurs in the westernmost portions of the Kispiox, Bulkley and Morice Forest Districts on the lee side of the Coast Mountain Range. It is represented by the most inland subzone and variant, the CWHws2 (wet submaritime subzone, montane variant), which has strong continental climatic influences.

Within the CWHws2, one plant community has been red-listed, the Sitka spruce - salmonberry high fluvial bench site series (CWHws/07). This plant community, in its archetypal form, represents the the most productive forest ecosystems of the inland CWH: towering “Carmanah valley” forests of old growth Sitka spruce, with a vigorous riparian

shrub understory, and deep, well drained, sandy to silty Regosolic or Brunsolic soils with seasonally fluctuating water tables and infrequent flooding. Such ecosystems are appropriately red-listed. Large floodplains make up only a small percentage of the CWHws landscape; they were disproportionately targeted for clearcut logging -the Kitimat and Kitsumkalum River valleys being prime examples- and the plant community, particularly the giant Sitka spruce, is very sensitive to hydrological changes. Remaining unlogged examples of this site series tend to be on the upper reaches of coastal rivers where the floodplains are not well developed and where continental climatic influences are strong (i.e. the CWHws2).

6.4.1.2. Status - Bulkley Forest District

One hundred and fourteen CWHws2/07 polygons (258 ha, Table 8) were mapped along the Zymoetz River and its largest tributaries, Red Canyon Ck. and Mullwain Ck (Mapsheets 93L.071, .072, .081 and 103I.090) in 1996 using the surficial geology mapping of D. Meynard (1994) as a base to identify floodplains and fluvial terraces, and 1:15.000 colour aerial photographs to locate the appropriate site series and structural stages. Because road access is lacking, only one field check was done (Z12, Plot 96-11978) opposite the western edge of the Coal Ck burn. No aerial checks were done in 1997. I am confident that Z12 is a good representative example of these ecosystems, because I have overflown the area at several times and make frequent trips into the upper Zymoetz on Kalum District side, within 1 km of the Bulkley District boundary. However, further fieldwork will be needed to bring the mapping up to TEM standards, to verify that I have properly distinguished the high fluvial benches from adjacent older fluvial terraces (CWHws2/01, /04 and /06), and to sample the full range of fluvial (riparian) plant communities present. A quick road check in the Telkwa Pass area (also CWHws2) indicated no occurrences in the main valley, but it is possible that there are a few small polygons near the headwaters of the Telkwa R. These occurrences will have stronger cold air and continental influences than the Zymoetz occurrences.

The CWHws/07 is common along the upper Zymoetz, but does not extend significantly into any of its tributaries. The fluvial benches are narrow, but more-or-less continuous, and essentially undisturbed by humans (minor sport fishing use). With the exception of the Coal Creek burn portion, all of the sites are in an old growth or late mature structural stage, because of infrequent large scale disturbance events. The shrubby polygons (mostly untyped -occasionally hatched) are typically low fluvial benches (CWHws2/09) or shrub thickets and herb meadows that are unlikely to succeed to conifer forest. Cottonwood-dominated floodplains (CWHws2/08) are small and infrequent and have been typed in blue (17 polygons, 25 ha, Table 8).

Although in excellent condition, the fluvial ecosystems along the mainstem of the Zymoetz River lack diversity (EO ranking Good (B)). By comparison, the lower reaches of Red Canyon Ck. and the mid-section of Mullwain Creek have well developed fluvial complexes with a rich variety of floodplain forests, fluvial meadows and wetlands and open SxBl - Devil's club forests (CWHws/06) on fluvial and colluvial fans. These sections probably also support higher faunal diversity.

The CWHws2/07 on the Zymoetz River does not fit the classic concept of a Sitka spruce - salmonberry plant community. It is transitional to floodplain forests of the SBSmc2 and ESSFwk, because of strong cold air drainage or ponding, severe winter conditions, and the rainshadow effect of the Coast Mountain Range. Rather than the towering Sitka spruce that should characterize this plant community, subalpine fir is the dominant tree species. The hybrid spruce is relatively small and appears to have a have a high "interior fraction" (sensu Grossnickle et al. 1996). Red alder is absent, western redcedar and amabilis fir are absent or extremely rare, and western hemlock is usually present only in the understory (the latter three species confined to nearby sideslopes). Characteristic "interior" shrubs such as black twinberry and highbush-cranberry are more abundant than salmonberry. Rainforest epiphytes such as *Antitrichia curtipendula* are lacking.

Floristically, there is nothing to distinguish this plant community from the CWHws2/06 (blue-listed), and our single sample plot turned up no unusual species (e.g. *Galium kamschaticum)* and no non-native plants. The soils, however, are typical of floodplains: well-drained sandy to silty Brunisols or Regosols with thin Moder humus forms over coarse river gravels; sub-irrigated rather than receiving seepage water. Bear sign and salmon carcasses are common along the riverbank. Ungulate browsing is much lighter than on floodplain ecosystems at lower elevations, presumably because moderate to high winter snowpacks and a dominantly coniferous forest landscape limit habitat capability.

6.4.1.3.Status - Morice, Lakes and Kispiox Forest Districts

Small occurrences of the CWHws2/07 may be present at the mouths of streams feeding into Atna, Morice, Tahtsa and Whitesail and Eutsuk Lakes. In the Kispiox District, there may be some CWHws2/07 in the upper reaches of Kitsuns, Sedan and Kitwancool Cks, and the Kitwanga and Cranberry Rivers, but they are unlikely to be as abundant as those along the Zymoetz.

6.5. Douglas fir - soopolallie - feathermoss *(SBSdk/04 TEM code DS) Pseudotsuga menziesii - Shepherdia canadensis - Pleurozium schreberi* and related ecosystems

There is no Douglas-fir in the Bulkley or Kispiox Forest Districts. In the Lakes District, two site visits to the blue-listed SBSdk/04 or related dry Douglas-fir ecosystems (TEM code ***DS***) were made and 15 ecosystem descriptions were acquired from other sources. These data indicate that DS and other Douglas-fir dominated communities (SBSdk/01 etc.) are common along the eastern shorelines of Babine Lake and Francois Lake, and should be well represented in Uncha Mtn/Red Hills and Sutherland River protected areas. Two outstanding examples from these new protected areas are a highly

unusual Douglas-fir - spruce - birch - devil's-club community on a fluvial fan on the south shore of Francois Lake opposite Alligator Pt.(M1003-80), and a very dry Douglas fir - juniper (*J. horizontalis, J. scopulorum, J. communis)* - pinegrass (*Calamagrostis rubescens)* community from Tetzalto Mtn.(G1) (TEM code DSxw). Occurrences along Babine Lake and southern Francois Lake appear to be in good condition while those closer to Highway 16 are often heavily disturbed. No information was gathered on forest health that appear to be causing decline of many old-growth Douglas-fir stands in the Prince George Region.

There are two unverified records of Douglas-fir in the Morice District. A possible DS occurrence on Morice Lake was spotted from a helicopter by V.J. Krajina and J. Pojar should be ground-truthed (see NTS mapsheet 93L). We attempted to verify a second reported occurrence (J. Pojar, pers. comm., Sept. 1997) in the Fulton Lake - Granisle area but were unable to locate it. This occurrence may have been extirpated by extensive logging north of Fulton Lake. (Refer to DG1 notes in Appendix II, Vol.2 for details).

6.6. Miscellaneous Noteworthy Plant Populations and Communities

A variety of blue- or unlisted plant communities and plant populations at or near their range limits in southeastern Skeena Region are included in this category. These occurrences were mapped as orange-coloured polygons and are listed in Table 1. Refer to the orange-tabbed sections in Appendix II for more details.

7. Critique of Inventory Protocols

In a pilot study, considerable time is spent refining and adjusting the inventory methods, so that by the time the project is complete, one has a fairly clear idea of how one

should have gone about conducting the project. However, I do not believe that the inventory and assessment of rare and endangered plant communities lends itself well to a precisely defined inventory protocol unless the study area is very small and can be completely surveyed, or the plant communities being inventoried are very narrowly defined and well understood. In a typical inventory it is most efficient to focus very closely on the object of the survey and block out extraneous information. In a project where the object of the inventory is largely unknown, one always needs to keep an open mind, allowing time for discovery and serendipity.

7.1. Inventory Procedures

A reasonable budget for helicopter time should be provided and a portion allocated to reconnaissance at the beginning, and for revisiting problem areas and knowledge gaps at the end. During reconnaissance one should resist the temptation to collect detailed information so that many sites can be examined. Specialists (with expertise in different fields and with intimate knowledge of the study area) should accompany the project leader during reconnaissance to provide differing perspectives on rare ecosystems. In my case, a geologist/geomorphologist and a wildlife ecologist would have been ideal.

In my second year I acquired a small helicopter budget but was reluctant to spend it because I wanted to use it to fine tune the mapping. Then the weather closed in before I got to the mapping. A pre-winter completion date (rather than March 31) would avoid the scenario where one crams field work into the summer months and does the all analysis and mapping over the winter. But realistically, no ecologist is likely to spend the summer months indoors finishing a project.

Not having a dedicated set of aerial photographs was a major limitation to this project and will be for any projects without a small, well-defined study area. Forest Districts are reluctant to lend out photos to out-of-town consultants, and staff do not have

time to acquire photos or refile them. Colour photocopies are acceptable for record-keeping but not for mapping. To save time and avoid making enemies in District offices, a rigorous filing system is needed to keep track of photos and photo numbers.

7.2. Data Collection

The CDC Ground-truthing form is useful for overview descriptions of element occurrences but would be greatly improved by being made compatible with TEM mapping standards (Cadrin et al. 1996) and the DEIF format (Luttmerding et al. 1990; Ministry of Forests/B.C. Environment 1996). It should become a expanded version of a TEM ground inspection form (GIF) with extra spaces for recording more detailed information on the polygon such as photonumbers and tiepoints, EO ranking and reasons for the ranking (condition, threats, non-native spp., surrounding land-use), a site diagram, a list of (new) ecosystems present in addition to the 3 ecocomponents, and wildlife observations. Detailed descriptions of ecosystems within the polygon should be done on FS882s to facilitate entry into VENUS. The system of stratifying vegetation layers and the method of recording % cover (relative in the CDC system; absolute in DEIF and TEM) must be changed to conform to DEIF.

The current CDC forms and procedures pay insufficient attention to soils and landforms. Although digging soil pits is time-consuming, it is never a waste of time. Plant communities can not be properly assessed and understood without closely examining physical site characteristics.

7.3. TEM Mapping Standards

While it is essential that rare ecosystem mapping be compatible with TEM, the inventory will have to be restructured considerably if it is expected that TEM standards are to be fully met. Bioterrain and TEM mapping are expensive, labour-intensive

operations requiring both a team of specialists (plant ecologist, geomorphologist, wildlife ecologist) and field crews that often do not have the expertise to evaluate rare element occurrences. Standard TEM mapping is a high production operation that does not lend itself well to searching out rare and endangered plant communities because the emphasis is on fitting ecosystems and landscapes into predetermined categories and patterns rather than seeking out the obscure and the unusual (e.g. 20% minimums for ecocomponents). The minimum and average polygon size and fixed survey intensity (ESIL) requirements are also are difficult to achieve when mapping tiny communities over a huge geographic area. Recent changes to reduce the cost of TEM, and the shift to PEM (predictive ecosystem mapping) make the data collection and mapping standards even less compatibile with the needs of rare plant community inventory and assessment.

Where TEM projects are being carried out, it does make sense to simultaneously carry out a rare and endangered ecosystem inventory. The Bioterrain underlay and initial stratification of ecosystem units can help to pinpoint where rare ecosystems may be found, and a higher ESIL can be used in those areas. However, additional funds and time must be allocated, and a rare and endangered ecosystem specialist may be needed to assist the project team.

7.4. Classification Issues

There are three important classification issues that the CDC must address and provide clear direction on if the red- and blue-listing of plant communities is to be successful. All are matters of scale.

The first problem is how to deal with plant communities that are rare or endangered within the administrative unit, or a portion of it, but common or secure elsewhere. This typically occurs when the dominant or characteristic plant species in the community approach the limits of their range, but can also occur when there is a shift in

the character of the landscape from, for example, dominantly mountainous to plateau-like. The plant association concept of BEC recognizes that a single plant community can occur across multiple biogeoclimatic units, but this level of the classification is poorly developed and does not currently provide much guidance. For the success of the program, I believe that the CDC should set firm, arbitrary limits on the geographic range within which a plant community should be assessed, and that these limits should be defined by natural rather than administrative units. Geographic limits should be set by ecoregions and biogeoclimatic units, rather than by Forest Districts, Regions, or for the province as a whole. For example, the CDC could decide that assessment of a plant community must occur within one biogeoclimatic zone, and one ecoprovince. It can cross subzone and variant boundaries but is considered a distinct plant community when it crosses zone boundaries, or when it extends into an adjacent ecoprovince. This may seem arbitrary, but we have an excellent classification system and we should use it to make management decisions.

The second issue is how narrowly or broadly to define a plant community at the site level. A particular plant association or site series can occur across a range of soils and landforms. Very often, one type of parent material (e.g. morainal veneers and blankets) is very common, while another (e.g. glaciolacustrine, sand dunes) is rare. The rare and endangered plant community, the one in need of protection, is very often the exceptional occurrence on an unusual landform. Alternatively, a plant association may have distinctive variations based on dominance by an atypical plant species (e.g. cedar-dominated, birch-dominated, Rocky Mtn. juniper-dominated, bracken-dominated). The site type, site phase, and site variation levels of BEC, which address these issues, are not particularly well developed. The CDC may choose not to further subdivide plant associations or site series based on physical characteristics or vegetation variations, but in this case the regional ecologist or rare and endangered species specialist need clear guidance on how to address exceptional occurrences of more common plant communities.

The third, less problematic issue involves deciding what constitutes a successional stage, and what is a distinct plant community. It is probably important that a consistent approach be taken. Often soil characteristics provide a good basis for distinguishing between transitory successional stages and more persistent communities. I consider long-lived, self-perpetuating seral associations (e.g. pure deciduous stands), "disclimax" communities (e.g. herb meadows with no stumps and well developed Ah horizons) and long-lived stages of primary succession (e.g. rock outcrops, sand and gravel bars) as distinct plant communities. Secondary successional stages, where the succession to a mature seral stage is apparent and will occur within, say 100 years without a major disturbance, are not. TEM mapping in the Prince Rupert Region has generally addressed this issue at the same level as I have, identifying longer-lived communities as new site series and seral associations, and treating short-lived ones as merely structural stages.

8. Management Recommendations

8.1. Changes and Additions to CDC Red and Blue Lists

Recommendations for changes and additions to the current CDC red and blue lists for plant communities in the southeastern Skeena Region (Appendix Ia) are summarized in Tables 9 (changes) and 10 (additions). More information on reasons for the recommendations is included in the operational reports prepared for each Forest District (Appendix Ie).

8.1.1. Currently Red-listed Plant Communities (Table 9a)

Remove the two alpine communities (*Luzula piperi* and *Poa rupicola)* from the red list as we do not have sufficient information on alpine communities to consider red-listing anything at this time.

Table 9. Recommended changes to current CDC red- and blue-lists of plant communities, southeastern Skeena Region
a) Red list

Scientific Name	Common name / possible subdivision	IWMS Code	Type of Community	Biogeo-climatic Units	Site Series	TEM Code	Abundance/Threat[1] by Forest District B	K	M	L	CDC Rank	Plant Community Ranking Criteria[2] No.	Area	Range	Trend	Prot.	Threats	Frag.	Recom-mended Rank	List	Explanation	Comment
1. Amelanchier alnifolia - Elymus trachycaulus	Saskatoon - slender wheatgrass	AaEt	scrub-steppe	SBSdk, SBSmc2, (ICHmc2 ESSFmc)	81	SW	U/T	R/T	F/R	C/R	S2	4	B	BC	B	CD	BC	B	S3	blue	uncommon but reasonably secure on rock outcrops	excludes juniper savanna (see Table 11 for new addition)
	"deep soil" phase			mainly SBSdk	"81b"	SWd	U/E	?	U/E?	U/T?		3	A	B	A	B	B	B	S2	?	this phase highly threatened	not worth listing separately?
2. Poa secunda - Elymus trachycaulus	Bluegrass - slender wheatgrass	PsEt	grassland	SBSdk, SBSmc2	82	BW	R/E	A	R/E	U/T	S1	3?	A?	B(C)?	BA	C	A	AB	S1S2	red	rare and imperiled-few good sites	
	xeric Oatgrass-dominated grassland					BWx	R/E	A	U/T?	U/T?		3	A	BC	B	C?	B	B			doesn't fit desc. of BW	include with BW for now
3. Populus balsamifera ssp. trichocarpa -Cornus sericea - Rosa acicularis	Cottonwood - dogwood - prickly rose	PbRa	mid-bench floodplain forest	SBSdk (SBSmc2)	08	CD	U/T	R/S mc2 only	F/T	R/T	S2	4	B	C	B	C but small	B	B	S2? or S2S3	red? or dow nlist to strong blue?	won't go extinct, but many sites already altered and remaining sites mostly threatened, expect continued decline	Morice R. sites excellent; Bulkley R. sites in decline; Lakes sites rare and small, scattered & small in SBSmc2
4. Picea sitchensis - Rubus spectabilis (Wet Submaritime)	Hybrid Sitka spruce - salmonberry	RsPs-WS	high-bench floodplain forest	CWHws2	07	SS	U/S	R/S	R/S	A	S2	4	A	B	C	C	C	C	S3	blue	frequent, but small and not well developed, protected in FENs, Kitlope,?Tweedsmuir	very transitional in study area, not the true Sitka spruce - salmonberry
5. Luzula piperi	Piper's wood-rush	n/a	alpine snowbed	AT	00		unknown				S2	unknown							unkno wn	delist for now	nothing known about this community	inappropriate to red-list communities in the AT when nothing is known about
6. Poa rupicola = P. glauca ssp. rupicola	Alpine glaucous bluegrass	n/a	alpine grassland	AT	00		unknown				S2	unknown							unkno wn	delist for now	no reason to believe this community is rare or threatened	and threats are perceived to be minimal

[1] Abundance: A = absent, R = rare, U = uncommon, F = fairly common, C = common; ? = unknown
Degree of Threat: E = endangered, T = threatened, M = may be threatened, S = secure

[2] Refer to Appendix Ib for definitions of CDC Plant Community Ranking Criteria
Note that except for protected area representation, these ranking criteria refer to occurrences in the study area only.

Table 9. Recommended changes to current CDC red- and blue-lists of plant communities, southeastern Skeena Region
b) Blue list

Scientific Name	Common Name (possible subdivision)	IWMS Code	Type of Community	Biogeo-climatic Units	Site Series	TEM Code	Abundance/Threat[1] by Forest District B	K	M	L	CDC Rank	Plant Community Ranking Criteria[2] No.	Area	Range	Trend	Prot.	Threats	Frag.	Recom-mended Rank	List	Explanation	Comment
1. Abies amabilis - Thuja plicata - Gymnocarpium dryopteris	Amabilis fir - western redcedar - oak fern	n/a	moist forest	CWHws2	04	AO	U/S	F/S	U/S	A	S3	5	B?	B	B for old-growth	D	C	CD	S4S5	delist	edge of range in study area. Very common in CWHws, but target of logging	large, well-developed old-growth sites with Cw are of concern; need protection
2. Abies amabilis - Thuja plicata - Oplopanax horridus (Wet Submaritime)	Amabilis fir - western redcedar - devil's-club	n/a	moist forest	CWHws2	06	AD	U/M	F/S	R?/S	A	S3	4-5	B?	B	B for old-growth	D	C	C	S4	delist	edge of range in study area. Common in CWHws, but most sites small, target of logging	large, well-developed old-growth sites, esp. with Cw need protection
3. Abies lasiocarpa - Juniperus communis - Cladonia	Subalpine fir - lodgepole pine - common juniper - lichen	n/a	dry subalpine forest	ESSFmc	02	LC	F/M	R/T	F/M	U/M	S3	4?	B?	B	B	CD	B	C	S4	blue	reasonably common but threatened by fire suppress. Common in Tweeds. Park	substrates other than bedrock are rare. Important caribou habitat. Pa sites rare
4. Abies lasiocarpa - Pinus contorta - Cladonia	Subalpine fir - lodgepole pine - lichen	n/a	dry subalpine forest	ESSFwv	02	LC	U/M	U?/M	A	A	S3	4	A?	B	B	C	B	C	S3S4	blue	uncommon and threatened by fire suppression	substrates other than bedrock are rare. Pa rare in Bulkley
5. Abies lasiocarpa - Vaccinium membranaceum - Empetrum nigrum	Subalpine fir - huckleberry - crowberry	n/a	dry subalpine forest	ESSFmc	03	FC	F/S	U/S	F/S	U/S	S3	5?	BC?	B	C	CD?	D	CD	S4S5	delist	widespread and reasonably common, no known threats	mostly in parkland subzone; important cariboo habitat
6. Picea mariana - Pinus contorta - Pleurozium schreberi	Black spruce - lodgepole pine - feathermoss	n/a	cold-nutrient-poor forest	SBSmc2, SBPS	03	BM	U/M?	R/M?	F/M?	F/M?	S3	4	BC?	C? if PG region included	BC?	C?	BC?	C	S3S4 S4?	blue or delist?	widespread but rarely abundant. Threatened by fire suppression & species conversion?	rare at edge of range in southern Bulkley & Kispiox, increasingly common in north e.g. Nilkitkwa
7. Pinus albicaulis - Cladonia - Dicranum fuscescens	Subalpine fir - Whitebark pine - lichen	n/a	dry subalpine forest	ESSFmk (ESSFmc and rarely ESSFwv)	02 03	WC MC	R/T	A?	U/T	A	S3	3 - 4	AB?	A	B	CD?	AB?	B	S3	blue	whitebark pine at northern limit; threatened by fire suppression, (?)rust	well represented in current & proposed parks, but threats exist there as well
8. Pinus contorta - Arctostaphylos uva-ursi	Lodgepole pine - kinnickinnick	n/a	dry forest	CWHws2	02	LK	U/M	F/M	R/M	A	S3	3?	A(B?)	B	B	B	B	C	S3	blue	threatened by fire suppression, mountain pine beetle	common along Skeena River - Kitwanga to Oliver Ck. Substrates other than bedrock are rare.
9. Pinus contorta - Juniperus communis - Oryzopsis asperifolia	Lodgepole pine - common juniper - ricegrass	n/a	dry forest	SBSdk	02	LJ	F/T	A	F/T	F/T	S3	4	B	B	B	CD	B	BC	S3	blue	widespread on bedrock but threatened by fire sup/beetles	substrates other than bedrock are rare and highly threatened
10. Pinus contorta - Sphagnum girgensohnii (Wet Submaritime)	Lodgepole pine - sphagnum	n/a	bog forest	CWHws2	10	LS	R/M?	R/M?	A	A	S3	2?	A	B	C?	A?	C	B	S3	blue	naturally rare, with no major threats if roads stay clear and cutblocks are buffered	transitional to SBS/ICH in study area, bogs with coastal elements should be protected
11. Populus balsamifera ssp. trichocarpa - Cornus sericea	Cottonwood - red-osier dogwood	n/a	mid-bench floodplain forest	CWHws2	08	CD	R/S	R/S	R/S	A	S3	3?	A	B	C?	U	C	C	S3	blue	rare in CWHws2 of study area and very valuable, but no obvious threats	occurrences very small; larger occurrences in CWHws2 but these more threatened
12. Pseudotsuga menziesii - Shepherdia canadensis - Pleurozium	Douglas-fir - Soopolallie - Stepmoss	n/a	dry open forest	SBSdk (SBSmc2?)	04	DS	A	A	A	U/T	S3	3	A	B	B	C	B	B	S3	blue	range limit in Lakes, threatened by fire sup, ingrowth, forest health, urbanization	unconfirmed occurrence in Morice
13. Thuja plicata - Equisetum arvense - Lysichiton americanum	Western redcedar - hybrid spruce - horsetail - skunk cabbage	n/a	swamp forest	ICHmc2	07	RC	R/T	U/M	A	A	S3	3-4?	A	A	B	A	B	B	S2?	red?	large sites rare, threatened by logging, hydrological change. Listing depends on how small pockets lacking Cw or skunk cabbage are classified	range limit for skunk cabbage and Cw, protect lg rich sites with these two species
14. Tsuga heterophylla - Pinus contorta - Arctostaphylos uva-ursi - Cladonia	Western hemlock - lodgepole pine - kinnikinnick - lichen	n/a	dry forest	ICHmc1 ICHmc2	02	LK	R/M	F/M	A	A	S3	4	B	B	B	CD?	BC	C	S3	blue	fairly common but threatened by fire suppression, beetles	substrates other than bedrock are rare & should be protected
15. Tsuga heterophylla - Menziesia ferruginea - Lysichton americanum	Western hemlock - false azalea - skunk cabbage	n/a	swamp forest	ICHmc1 (ICHmc2)	06 (07)	HC	R/M	F/M	A	A	S3	4 small	A (B?)	B	B(C)	C	C	B	S3	blue	large sites rare, threatened by logging, hydrological change	include ICHmc2/07 Hw sites with no Cw or skunk cabbage

[1] Abundance: A = absent, R = rare, U = uncommon, F = fairly common, C = common; ? = unknown
Degree of Threat: E = endangered, T = threatened, M = may be threatened, S = secure

[2] Refer to Appendix Ib for definitions of CDC Plant Community Ranking Criteria
Note that except for protected area representation, these ranking criteria refer to occurrences in the study area only.

Table 10. Recommended additions to CDC red- and blue-lists of plant communities, southeastern Skeena Region. Does not include poorly studied alpine, subalpine parkland, wetland and aquatic plant communities.

a) Red list

Scientific Name	Common Name	Type of Community	Biogeo-climatic Units	Site Series	TEM Code	Abundance/Threat[1] by Forest District				Plant Community Ranking Criteria[2]							Recom-mended		Explanation	Comment
						B	K	M	L	No.	Area	Range	Trend	Prot.	Threats	Frag.	Rank	List		
1. Aster spp. - Thalictrum occidentale - Lathyrus nevadensis - Epilobium angustifolium	Aster - meadow -rue - peavine - firew eed	mesic montane meadow	SBSdk, SBSmc2 ICHmc2	00	AM	R/E	R/E	R?/E	R?/E	3-4	A	C	AB	C	A	AB	S2	red	equivalent to SBSdk/82 but in moister, less continental climate; less grass; similar threats.	extremely diverse, variable spp. composition
2. Betula papyrifera - Populus balsamifera ssp. trichocarpa - Lonicera involucrata - Equisetum arvense	Paper birch - cottonw ood - black tw inberry - common horsetail	high bench floodplain	SBSdk	$58 new	bt	R/T	A	R/M	?	2-3	A	B	B	A	B	C	S2?	red	birch-dominated stands are very rare in the SBS, less rare cottonw ood-dominated stands already red-listed as SBSdk/08	recommended subdivision of SBSdk/08 (Oikos 1998a,b) w ould include both birch- and cottonw ood-dominated high bench floodplains
3. Juniperus scopulorum - Amelanchier alnifolia - Elymus trachycaulus	Rocky Mountain juniper - saskatoon - slender w heatgrass	savanna - steppe	SBSdk ICHmc2	81 "81.2"	JS	R/E	R/T	A?	R/T	2	A	B	AB	C	B	B	S1	red	rare juniper savannas separated from more common 81 scrub-steppe	if this is done, regular SBSdk/81 should be dow nlisted to blue
4. Picea glauca x engelmannii - Equisetum arvense	Hybrid w hite spruce - common horsetail	floodplain forest	SBSdk	7	SHa or SHc	R/E	A	U/M	R/T?	4	A	B	B	C	B	B	S2	red	rare and threatened in SBSdk, especially on floodplains, but similar community present in broader landscape	difficult classification question - see report
5. Picea mariana - Picea glauca x engelmannii x sitchensis -Betula glandulosa - Carex .	Black spruce - Hybrid w hite spruce - scrub birch - sedge	bog forest	ICHmc2	08	BB	A	R/T	A	A	2-3	A	A	B	A	B	A	S1?	red?	range limit for Sb, rare and highly threatened in ICHmc2 but similar community present in SBS/ICHmc transition	Seeley Lake park site is badly damaged
6. Picea sitchensis x glauca x engelmannii - Populus balsamifera ssp. trichocarpa - Matteucia struthiopteris	Roche spruce - cottonw ood - ostrich fern	high (to mid) bench floodplain	ICHmc2	06 05	CD SD	A?	R/T	A	A	3	A	A	B	? Sw an Lk. exten.	B	B	S2	red	a rare & diverse variation of the more common ICHmc2/06 or /05 -see blue list	reports by Oikos (1995, 1996) and McLennan & Mamias (1991) suggest it could be more common than my reconnaissance indicates
7. Populus tremuloides - Betula glandulosa	Aspen - scrub birch	w et deciduous scrub forest	SBSdk ?SBSmc2	03 or "$54		?	A	?	R/T	1-2	A	C?	B	U	B?	C?	S1S2	red	an extreme variation of the new ly described SBSdk/$54 on w et, nutrient poor soils	described by Oikos (1998 -one plot only)
8. Populus tremuloides - Prunus spp. - Corylus cornuta	(Aspen) - w ild cherry - beaked hazelnut	deciduous scrub or w oodland	ICHmc2	$55 new (52,53)	bt-old	R?/T	R/T	A	A								S1?	red	a variation of the new ly described ICHmc2/$55 or the former $52 or $53 that develops after repeated fire	restricted to Hazelton-Cedarvale area, mainly private land Distinctive enough to list?
9. Pseudotsuga menziesii - Juniperus communis, horizontalis, scopulorum - Calamagrostis canadensis	Douglas fir - juniper - pinegrass	open grassy forest	SBSdk	04	DSxw	A	A	A	R/T	1-2	A	B	B	B	C	C?	S1	red	a rare variation of the blue-listed SBSdk/04 -very similar to IDF, SBSdw forest	distinctive enough to list?
10. Pteridium aquilinum - Heracleum lanatum - Fritillaria camschatcensis	Bracken - cow parsnip - riceroot	fern meadow	ICHmc2	00	CA	R/T	R/T	A	A	2?	A	A?	B	A	B	C?	S1S2	red	variation of more common cow parsnip meadow w ith bracken fern at range limit	bracken fern is more abundant in CWHw s and ICHvc meadow s eg. avalanche tracks
11. Salix drummondii - Alnus incana	Drummond's w illow - mountain alder	low bench floodplain	SBSdk, SBSmc2	00	DM	?	A?	?	R/T	2-3?	A	C	B	B	B	B?	S2	red	a variation of ML (see suggested blue list) found on meandering streams	described and recommended for listing by Oikos (1997)

[1] Abundance: A = absent, R = rare, U = uncommon, F = fairly common, C = common; ? = unknow n
Degree of Threat: E = endangered, T = threatened, M = may be threatened, S = secure

[2] Refer to Appendix Ib for definitions of CDC Plant Community Ranking Criteria
Note that except for protected area representation, these ranking criteria refer to occurrences in the study area only.

Table 10 continued. Recommended additions to CDC red- and blue-lists of plant communities, southeastern Skeena Region. Does not include poorly studied alpine, subalpine parkland, wetland and aquatic plant communities.

b) Blue list

Scientific Name	Common Name	Type of Community	Biogeo-climatic Units	Site Series	TEM Code	Abundance/Threat[1] by Forest District				Plant Community Ranking Criteria[2]							Recom-mended		Explanation	Comment
						B	K	M	L	No.	Area	Range	Trend	Prot.	Threats	Frag.	Rank	List		
1. Betula papyrifera - Populus tremuloides - Corylus cornuta - Cornus sericea	Paper birch - aspen - beaked hazelnut - red osier dogwood: birch-leading stands only	upland deciduous	ICHmc2 (ICHmc1)	$53	ad	R/M	U/M	A	A	3	A	A	B	A	B	D	S3	blue	productive birch-dominated stands are at risk -no protected sites known	localized community, defining feature of ICHmc2; high percentage on private land
2. Danthonia intermedia - Trisetum spicatum - Galium boreale	Timber oatgrass - spike trisetum - northern bedstraw	montane to subalpine dry fluvial grassland	ESSFmc SBSmc2 SBPSmc	OO	BWtc	R/TE?	A	R/TM	R/TM	3?	A	C	DC	B	B	B	S3	blue	very small occurrences but ESSF sites not especially threatened, encroachment slow	similar community apparently common in Chilcotin in association with wetlands
3. Heracleum lanatum - Geum macrophyllum	Cow parsnip - large-leaved avens	moist meadow	SBSdk SBSmc2 ICHmc	OO	CA	U/T	U/T	U/T	U/T	4	B	D	B	C	B	C	S3	blue	widespread but never abundant, multiple threats	similar communities widely distributed but uncommon & threatened at low elev.
4. Picea glauca x engelmannii x sitchensis - Betula papyrifera - Oplopanax horridus - Athyrium filix-femina	Hybrid spruce - paper birch - devil's-club - lady fern	moist, valley bottom forest	ICHmc2 ICHmc1	O5 54	SD bd	R/M	U/M	A	A	4	AB	B	BC?	U Swan Lk. ext.	C	C	S3S4?	blue?	localized, highly productive ecosystem,heavily harvested	riparian management guidelines affect most occurrences
5. Populus balsamifera ssp. trichocarpa - Picea glauca x engelmannii x sitchensis - Cornus sericea	Cottonwood - hybrid spruce - red-osier dogwood	mid and high bench floodplains	ICHmc1 ICHmc2	05 06	CD	U/M	U/M	A	A	4	B	b	BC	B	BC	BC	S3S4	blue?	CD plant communities in adjacent CWH and SBS are listed	floodplain mapping in Kispiox should indicate whether this community needs to be listed as well
6. Salix lasiandra - Alnus incana - Athyrium filix-femina	Pacific willow - mountain alder - lady fern	low bench floodplain	SBSdk ICHmc? SBSmc2?	00 06.3 00	ML	U/T	U/M	U/T	R/T	3?	A	C	D	U	B	BC	S3	blue	restricted to large river floodplains at lower elev.	mainly threatened in populated areas
6. Woodsia spp. - Polypodium hesperium - Artemisia spp.	Woodsia - sagewort	canyon walls & rock faces	SBSdk ICHmc2	OO	WS	R/M	R/M	?	R/M	2?	A	C	CB	B	B	A	S2S3?	blue?	naturally rare, widespread but variable, accessible locations threatened	little studied, no classification exists, most diverse sites need protection

[1] Abundance: A = absent, R = rare, U = uncommon, F = fairly common, C = common; ? = unknown
Degree of Threat: E = endangered, T = threatened, M = may be threatened, S = secure

[2] Refer to Appendix Ib for definitions of CDC Plant Community Ranking Criteria
Note that except for protected area representation, these ranking criteria refer to occurrences in the study area only.

I assigned an S3 (blue) ranking to the SS community in the study area, but recognize that our version is poorly developed and atypical. The true wet submaritime SS on the west side of the Coast Range may need to retain its red-listed status.

Based on abundance alone, it is difficult to justify the S2 (red) ranking for the CD floodplain community in the SBSdk subzone. However, I believe that the degree of threat, and the extremely high habitat capability of this ecosystem justifies red-listing. I also recommend adding CD communities in the SBSmc2 to the red list because, although less threatened, they are extremely rare at mid-elevations. If the red-listing is retained, it should not be extended to marginal CD communities on alluvial fans (not mapped in this study). If the listing is changed to blue, then these communities should be included.

The typical SW community is more frequent and widespread than previously believed and many occurrences are still in good condition, although threatened by aspen encroachment and invasive species. I recommend red-listing the JS community separately and blue-listing the remaining SW, although special attention must be paid to highly threatened occurrences on steep erosional scarps (SWd). If splitting is deemed inappropriate, the entire SW community should remain on the red list with the understanding that low elevation SBSdk occurrences (especially JS and SWd) require the most attention.

The BW community should retain its S1 red-listing, as all low elevation grasslands in the study area are highly modified (occurrences with few or no non-native plants are practically non-existent) and the extent of the community is decreasing because of fire suppression. However, more classification work is needed to define the range of plant communities included in the BW designation (e.g. should high elevation SBSmc2 and lower ESSFmc grasslands be included?) and what the desired “natural” state of this community should be.

8.1.2. Currently Blue-listed Plant Communities (Table 9b)

Of the 15 plant communities currently on the blue list, I recommend that three, the AO, AD and FC, be delisted because they are not rare or uncommon within their respective subzones. Rather than blue-listing a common plant community, susceptible seral stages of these plant communities (e.g. old growth cedar for the AO and AD, and old-growth lichen habitat for the FC) should be addressed through coarse filter approaches to ecosystem management, or where appropriate, by defining specific sites with high habitat value as wildlife habitat areas (WHAs).

The BM community is a good example of the issue of geographic scale. It is rare in the southwest half of the study area, where black spruce reaches its range limits, and becomes common in the northeast. In this case, the BM community might be blue-listed in the SBS of the Central Interior ecoprovince, but not in the Sub-Boreal Interior ecoprovince.

The blue-listed RC community should perhaps be red-listed because classic, large, occurrences on (glacio)lacustrine and fine textured fluvial parent materials are rare and imperiled by development throughout the ICH zone in both the Coast Mountains and Sub-Boreal Interior ecoprovinces. Smaller, more numerous occurrences typically have lower species diversity than the large occurrences and often lack the two characteristic dominants, western redcedar and skunk cabbage, both of which reach their range limits in the study area.

8.1.3. Additions to the Red List (Table 10a)

Eleven plant communities in the study area were identified as possible new additions to the provincial red list (not including RC above). Four of these, the AM, JS, SBSdk/$58 (bt), and DSxw represent subdivisions of currently red- or blue-listed plant communities, the BW, SW, CD and DS, respectively. Four represent phases or variations of more common, unlisted plant communities: the SHa (or SHc) fluvial phase in the SBSdk, the ostrich fern variation of the CD in the ICHmc2, the wild cherry - hazelnut variation of the ICHmc2/$52 or $53, and the bracken variation of the newly described CA. The DM and SBSdk/$54 are newly described site series and seral associations, and the BB is a recognized site series that was apparently overlooked when the lists were originally developed.

8.1.4. Additions to the Blue List (Table 10b)

Six additions to the blue list are recommended. These include three ICHmc deciduous and riparian forest communities that are uncommon within the subzone and probably occur nowhere else in B.C.: the BWtc, an infrequent higher elevation timber oatgrass grassland that may be widespread in the Central Interior; the newly described ML low bench floodplain community, and the WS, a poorly studied, species-rich rock outcrop community.

8.2. General Recommendations

8.2.1. Stewardship Program(s)

A program to build public awareness and encourage stewardship of rare and endangered ecosystems on private and municipal land should be established in the Bulkley Valley (Smithers to Houston) and could be expanded to other communities in the study area if there is sufficient local interest. The program should be modelled on the Garry oak and Antelope-brush conservation strategies, and various stream stewardship programs in southern B.C. and guided by the Stewardship series of publications (Penn

1996). There is already some momentum underway to establish such a program. Cooperators could include MELP, Canadian Wildlife Service and Fisheries Canada and community environmental and wildlife groups such as the Bulkley Valley Naturalists, Northwest Wildlife for the Future, and the Driftwood Foundation. Funding to coordinate and implement the program should be sought from all levels of government, funds such as Wildlife Habitat Canada, HCTF, the Bulkley Valley Foundation, and private sources (see related comments in Section 8.5.2).

8.2.2. Acquisitions

The rare and endangered species specialist or a designate should monitor real estate listings within the Bulkley Valley and near Burns Lake for land parcels with significant occurrences of any of the red- or blue-listed plant communities, particularly floodplain or southwest-facing slope complexes, that could be purchased by HCTF or the Nature Trust. A fact sheet describing desirable properties could be distributed to local realtors. Owners of particularly valuable properties (e.g. the Malkow Lookout area near Smithers, Bulkley Valley floodplain near Houston) should be approached directly to let them know that there is an interest in acquiring their property for conservation purposes.

8.3. Recommendations for Southwest-facing Slope Complexes (SW, BW, CA, AM) and Related Plant Communities

8.3.1. Large Benchmarks

Establish large benchmarks in association with new protected areas and WHAs to encompass a full range of southwest-facing slope ecosystems including the red-listed SW and BW plant communities and other plant communities identified in this report (cf. Kamloops Land and Resource Management Team 1995). These benchmarks should be in areas with either no history of domestic grazing or no recent grazing use, in good to excellent condition with few introduced species. In these areas there will be no use by domestic livestock except as recommended by MELP, but adaptive management

principles could be used to develop prescriptions to maintain plant communities and wildlife habitat. For example, these may be good areas to test prescribed burning on a fairly large scale. The benchmarks should be in relatively remote areas with minimal land use conflicts such as the new Sutherland River, Uncha Mtn/Red Hills protected areas, the Cheslatta Lake special management area, or further north on Babine Lake.

8.3.2. Small Benchmarks

Establish smaller benchmarks or demonstration areas in conjunction with the range reference area program to compare the effects of different grazing regimes and and other management prescriptions on plant communities, browse and forage production. Prescribed burning, controlled grazing, herbicide use or other activities would be carried out on a small scale and closely monitored. These should be in accessible areas close to the ranching community. Some benchmarks should be areas that have no history of domestic range use, whereas others may be located in current range management tenures where use is low. At least one demonstration area should be located in each Forest District. Possible sites in the Bulkley include: Reiseter Ridge - Newitt Ck - mostly within the expanded Babine Mtns Protected area, but with range tenures lower down; Grouse Mtn (under range tenure with an excellent cross-section of ecosystems and a range of grazing impacts), Kitseguecla Valley (unique ICHmc area, not broadly representative), Zymoetz River valley near McDonell Lake.

8.3.3. Management Committee

Establish a multi-stakeholder committee to develop and implement a program for management and restoration of southwest-facing slope ecosystems. The committee could choose to have broad terms of reference -for example, establishing benchmark areas and developing comprehensive ecosystem management guidelines for southwest-facing slope complexes (cf. Kootenay/Boundary Land Use Plan 1997, White 1997). Alternatively, it could have a narrow focus, for example, developing and implementing a prescribed burning program within a specific geographic area which could serve as a pilot project for

other areas. To be successful the committee should have broad representation from agencies and the public, including MELP Wildlife and Parks Branches, MOF Range and Protection, First Nations, ranchers, guide-outfitters, wildlife advocates, landowners, environmentalists, and air quality advocates. Given current workloads, it will require a dedicated coordinator, working at least half-time, and new funding.

8.4. Management Recommendations - Saskatoon - Slender Wheatgrass (SW)

The following are suggested revisions to the draft MIWS: Plant Communities for the *Amelanchier alnifolia - Elymus trachycaulus* plant community (Aug.. 1997).

Planning Objective: Maintain 35%* of the current extent of this plant community in a natural state, with few non-native species, no significant mechanical soil disturbance, little or no domestic livestock use, and able to cycle freely through successional stages in response to fire or natural disturbances such as climatic injury, disease and insect attack or wildlife damage.

**original extent variable and unknown, so I raised it by 5%*

Revised WHA Description: 35% of the current extent of this plant community should be either located in protected areas or designated as WHAs, including all significant occurrences of JS and all ungrazed SWd on Crown land. Recruitment WHAs made up of less natural community occurrences should be designated in order to meet the 35% target and to obtain good representation of this plant community throughout its range, including the heavily settled Bulkley Valley.

Management Practises:

Access: No new motorized access on Crown land occurrences. Trails for non-mechanized access may be developed with MELP approval. Deactivate unused roads and trails.

Range: No new range tenures should be established within WHAs. On other crown land occurrences, salt licks, water supplies (?), access and other means should be used to avoid overgrazing in this plant community. Grazing prescriptions should be developed in cooperation with MELP. Increase public awareness to encourage private land owners to reduce grazing pressure within these plant communities particularly JS and SWd occurrences.

Recreation: Deactivate existing roads to prevent motorized access, for example, on former fire lookouts such as Andimaul. No new recreational trails or sites should be

developed without MELP approval. Use interpretetive signage, etc. at recreational sites to alert the public to the sensitivity of these ecosystems.

Silviculture: not generally applicable. Browse guards and artificial regeneration may be needed to regenerate Rocky Mtn. juniper on sites with heavy deer use. Cutting and girdling of trees and shrubs may be used to reduce encroachment or to improve wildlife browse.

Prescribed Fire: Reintroduce prescribed fire on an experimental basis in protected areas and WHAs with few non-native species. On actively grazed sites, burning prescriptions to improve forage and browse should be developed cooperatively by MOF and MELP and monitored to determine impacts on undesirable invasive species and forage production.

Non-native Plants: Avoid mineral soil disturbance to prevent or reduce invasion by non-native species. Use integrated methods of weed control -including herbicide use where deemed necessary- to suppress non-native species in protected areas and WHAs and to control identified weed species elsewhere.

Wildlife Management: On sensitive sites where ungulate use is consistently high, monitor impacts on soils and vegetation and develop methods to reduce damage. Brush cutting may be used on some sites to reinvigorate browse but avoid heavy equipment.

8.5. Management Recommendations - Bluegrass - Slender Wheatgrass (BW)

The following are suggested revisions to the draft MIWS:Plant Communities for the *Poa secunda - Elymus trachycaulus* plant community (Aug.. 1997).

Planning Objective: Restore 30% of the current extent of this plant community to a near-natural state, with few non-native species, no significant mechanical soil disturbance, little or no domestic livestock use, and able to cycle freely through successional stages in response to fire or natural disturbances such as winter injury, disease and insect attack or wildlife damage. Efforts should also be made to maintain or improve the condition of the remaining 70%.

WHA Description: Designate all significant community occurrences not currently on private land or within grazing tenures as protected areas or WHAs. Assess the condition of these areas, and if necessary, recruitment WHAs made up of less natural community occurrences should be designated in order to meet the 30% target. Follow MIWS guidelines for candidate area selection, but select for good representation of this plant community throughout its previous range, including the heavily settled Bulkley Valley.

Management Practises:

Access: No new motorized access on Crown land occurrences. Trails for non-mechanized access may be developed with MELP approval and should be designed to direct traffic through less sensitive areas. Deactivate unused roads and trails.

Range: No new range tenures should be established within WHAs. On other Crown land occurrences, use salt licks, water supplies (?), access and other means to prevent overgrazing. Grazing prescriptions should be developed in cooperation with MELP. Encourage private land owners to reduce grazing pressure in depleted, but uncultivated plant communities.

Recreation: Where feasible, deactivate former roads and trails to prevent motorized access. No new recreational trails should be developed without MELP approval. Locate recreational sites and facilities in less sensitive ecosystems. Use interpretetive signage and information at recreational areas to increase public awareness and encourage low impact recreation.

Silviculture: not applicable. Tree cutting and girdling may be used to reduce tree encroachment onto grasslands.

Prescribed Fire: Reintroduce prescribed fire on an experimental basis in protected areas and WHAs with few non-native species. On actively grazed sites, burning prescriptions to improve forage and browse should be developed cooperatively by MOF and MELP. Monitor burns to determine impacts on both desired and undesirable species, forage and browse production.

Non-native Plants: Avoid mineral soil disturbance to prevent or reduce invasion by non-native species. Use integrated methods of weed control -including herbicide use where deemed necessary- to suppress non-native species in protected areas and WHAs and to control identified weed species elsewhere. Increase public awareness of invasive weeds through appropriate signage and brochures at recreational sites and other logical locations (e.g. boat anchorages, parking lots).

Wildlife Management: On sensitive sites where ungulate use is consistently high, monitor impacts on soils and vegetation and develop methods to reduce damage.

8.6. Management Recommendations - Black Cottonwood - Dogwood - Prickly Rose (CD)

The following are suggested revisions to the draft MIWS: Plant Communities for the *Populus balsamifera* ssp. *trichocarpa* - *Cornus stolonifera* - *Rosa acicularis* (PbRa) plant community (Aug. 1997).

Planning Objective: Maintain 50%* of the original extent of this plant community in a natural state, with few or no non-native species, no significant human disturbance, little

or no domestic livestock use, and able to cycle freely through successional stages in response to natural disturbances such as flooding, fire or beaver activity.

** Assumes we currently have >50% good to excellent EO rank when Morice R. occurrences are included.*

WHA Description: All significant community occurrences in mature condition condition on Crown land should be designated as WHAs, with special attention paid to the oldest occurrences and those within large and diverse floodplain complexes. WHAs should include the complete range of floodplain successional stages and bench levels including young fire origin stands (e.g. Swiss Fire). Candidate areas should be selected to obtain good representation of this plant community throughout its previous range, including the heavily settled Bulkley Valley.

Landscape units or subunits where a substantial amount of this plant community occurs should receive the Higher Biodiversity Emphasis (*Biodiversity Guidebook*). The greater connectivity, larger proportion of natural ecosystems, and lower fragmentation at this Emphasis level will help to insulate this plant community from disturbance caused by human activity.

In heavily settled landscape units such as the Bulkley Valley where limited opportunity exists to apply Biodiversity Guidebook guidelines the emphasis should be on restoring natural connectivity and hydrological patterns, re-establishing riparian vegeation to stabilize streambanks, and increasing the proportion of mature community occurrences through cooperative arrangements with municipal and regional governments, federal agencies and private landowners. Funding should be sought together with Fisheries Canada for a voluntary stream stewardship program.

Management Practises:

Access: No new motorized access on Crown land occurrences. Trails for non-mechanized access may be developed with MELP approval and should be designed to direct traffic through less sensitive areas. Deactivate unused roads and trails, and restore to natural vegetation where feasible.

Range: No new range tenures should be established within significant occurrences of this plant community. On established range tenures, use salt licks, barriers, fencing and other means to prevent concentration of livestock use in sensitive riparian areas. Grazing prescriptions should be developed in cooperation with MELP. Use public awareness and a voluntary stewardship approach to encourage private land owners to reduce grazing pressure in depleted, but uncultivated plant communities, and to re-establish riparian vegetation adjacent to streambanks.

Recreation: Deactivate and revegetate unused roads and trails to prevent motorized access and assess existing recreational sites to determine how site disturbance can be minimized. No new recreational trails or facilities should be developed without MELP approval, and where possible sites and facilities such as boat launches should be located

in less sensitive upland ecosystems. Use interpretetive signage and information at recreational areas to increase public awareness and encourage low impact recreation.

Silviculture: Areas within WHAs should be removed from the timber-producing landbase and riparian management guidelines should be applied conservatively to maintain wide buffers around these ecosystems. In the few community occurrences already logged or still managed for timber production, apply mixed or deciduous stocking standards at reduced stocking levels to retain or restore natural stand structure and diversity. Partial cutting with large retention areas is preferred. Retain old growth cottonwoods as wildlife trees. Use selective brushing treatments only. Avoid heavy equipment.

Prescribed Fire: Prescribed fire may occasionally be necessary to maintain riparian meadow communities and improve wildlife browse within this community. Monitor prescribed burns to determine impacts on non-native species, forage and browse production, and soil erosion.

Non-native Plants: Non-native plants will establish on exposed soil of riverbanks and bars, especially downstream of settled areas. Avoid additional exposure of mineral soil, especially within mature communities. Integrated methods of weed control -including selective application of herbicides where necessary - should be considered to suppress non-native species in protected areas and WHAs and to control identified weed species elsewhere.

Wildlife Management: Retain old growth cottonwood trees and snags as wildlife trees and allow for recruitment of future wildlife trees. Where ungulate use is consistently high, monitor impacts on soils and vegetation and develop methods to reduce damage. Prescribed burning and manual cutting may be used to enhance wildlife habitat, but heavy equipment should be not be used.

8.7. Management Recommendations - Sitka spruce - Salmonberry Wet Submaritime (SS)

The following management recommendations were prepared for the 1996 progress report and have not been updated:

The outlook for the SS in the Bulkley Forest District is good, because it will be almost entirely confined to the Core Ecosystem/Class 1 Fishery zone established along the Zymoetz River corridor. These ecosystems should be left to themselves -with blowdown, insect attack and occasional severe flooding or beaver activity being the major disturbances. Fires rarely consumed these ecosystems, and even within the very intense Coal Ck. burn, it appears that some of the floodplains escaped burning while the surrounding landscape did not. Because the most easterly element occurrences were affected by the Coal Ck. burn, there is a currently a good distribution of age classes.

Damage by recreational users is the primary threat to these ecosystems (localized trampling, tree damage and introduction of non-native species). It is important to build awareness among guide outfitters and unguided recreationists of the need for minimal impact recreation in this more-or-less pristine area. The Class I river designation should be helpful in this regard. Road construction and mining exploration are also potential threats. There are some identified mineral occurrences close to the river.

The lower Red Canyon and middle Mullwain sections have excellent landscape diversity and deserve special management to avoid road construction and logging disturbance. They are currently zoned as landscape corridors within the FEN and management practises are constrained by riparian management guidelines. However, they should also be designated as Wildlife Habitat Areas. The proposed bridge crossing of Mullwain Ck. should be routed to avoid the CWHws2/06 and /07 (see 1:20,000 map) ecosystems. The southwest-facing slopes in this area may be candidates for prescribed burning at some future time, but there is no immediate need.

DNA analysis to determine the nature of spruce hybridization in this area is recommended.

8.8. Further inventory

1. Additional inventory and assessment of rare and endangered plant communities is needed for the Kispiox, Lakes and Morice Forest Districts. This should be tied into TEM and PEM projects where possible, and coordinated with landscape unit planning. In the Lakes and Morice Districts the highest priority is to assess CD and associated floodplain plant communities as these appear to be poorly represented in new protected areas. The full extent and condition of CD and SHa ecosystems on the Morice and upper Bulkley Rivers should be assessed as this is the largest concentration of these plant communities in the southeastern Skeena Region. In the Kispiox District, TEM mapping of floodplains has been largely completed. The priority in this District is to identify and assess unique plant communities that may not occur outside the coast-interior transition. Within the Bulkley, wetlands and aquatic plant communities, particularly within the SBSdk, are the highest priority for future assessments.

2. Several consultants doing fieldwork in remote areas of the Skeena Region (e.g. ecological descriptions of permanent vegetation inventory plots or TEM mapping)

have expressed interest in gathering data on rare and endangered plant community occurrences and passing this information on to MELP. It is recommended that the rare and endangered species specialist meet with interested consultants and relevant agency personnel (e.g. MOF Inventory Section) to discuss methods of data collection and funding arrangements for the additional work.

3. Existing TEM maps should be colour-themed and have their database analysed to locate and summarize occurrences of red- and blue-listed plant communities.

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