

# Assessing Endangered Ecosystems in the Inland Skeena Region

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## ABSTRACT

The southeastern Skeena region of British Columbia supports a rich variety of ecosystems with distinctive transitional or ecotonal characteristics. A 2-year pilot study was carried out to inventory and assess rare and endangered terrestrial ecosystems in the low-elevation Sub-Boreal Spruce (SBS) and Interior Cedar–Hemlock (ICH) biogeoclimatic zones. Scrub-steppe or savanna-steppe, grassland, and herbaceous meadow ecosystems are highly threatened by changes to fire and grazing regimes, invasive species, and urban/rural development. Riparian or swamp forest ecosystems are other centres of local biodiversity at risk on private, municipal, and Crown land. The Red- and Blue-listing scheme for plant communities is an important first step in raising awareness about rare ecosystems, but will provide little protection in populated areas unless human communities adopt these ecosystems as symbols of local uniqueness and identity.

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Key words: floodplain, grasslands, inventory, mapping, scrub-steppe, Skeena, swamp forest.

Many speakers at this conference (Eastman 2000, Pojar 2000, Scudder 2000) have called for a shift in conservation efforts from a species-centered to a whole-ecosystem approach. To reinforce that message we paraphrase Rowe (1994, 1998): It is time for biologists and ecologists to set aside the conviction that the entities of prime importance on earth are plants, animals, and, especially, people. Our focus must instead become “the globe’s miraculous life-filled skin,” acknowledging that life arises not within strands of DNA, but from the complex air-land-water support system that provides organized forms of matter and energy to all organisms.

Reed Noss, keynote speaker at this conference, outlined how conservation of regional ecosystems on a very large scale is needed to retain viable wildlife populations. However, as noted by our plenary speakers, ecosystems of highest value and diversity typically lie outside potential protection corridors in areas of high human population, where it is unrealistic to expect a complete cross-section of habitats to receive full or even partial protection. By default, the target of conservation efforts in such areas must often be those unusual, diverse, and highly productive ecosystems that are at highest risk. This paper reports on a pilot project to begin that process by identifying, mapping, and assessing endangered ecosystems in a portion of the Skeena region of British Columbia.

## THE INLAND SKEENA REGION

The study area is located in west-central British Columbia, just east of the spine of the Coast Mountain Range. It lies mainly within the watershed of the Skeena River and its major inland tributaries (Bulkley, Babine, and Kispiox rivers), but spills over into the far reaches of the Fraser system, taking in the network of large lakes (Francois, Ootsa, etc.) at the western edge of the Nechako Plateau. Three ecoprovinces, 5 ecoregions, and 8 ecosections, as well as 7 biogeoclimatic zones, 10 biogeoclimatic subzones, and 6 biogeoclimatic variants are represented (Pojar et al. 1988, DeMarchi et al. 1990, Banner et al. 1993). It has a total area of 4.6 million ha, encompassing 4 forest districts (Bulkley, Kispiox, Lakes, and Morice), and taking in much of the traditional territories of the Gitksan, Wet’suwet’en, Nat’oot’en, Lake Babine, and Cheslatta, as well as peripheral territories of several other First Nations. The study area is not restricted by land ownership, tenure, or zoning, and includes the municipalities of Hazelton, Smithers, Telkwa, Houston, and Burns Lake.

In terms of endemism, species richness, or rarity, the inland Skeena region does not rank as a global biodiversity hot spot. But, like all regions of British Columbia, it has unique characteristics that contribute to the ecological diversity of this richly endowed province. Specifically, the study area occupies the junction of 3 biomes (the temperate rainforest, the taiga, and the [inter]montane forest-steppe), with many plant and animal species at northern, southern, or eastern peripheries of their ranges, and has an exceptionally broad tran-

sition zone between coastal and interior climatic zones. Cannings and Cannings (1996) recognize the area as a biological suture zone, where biota formerly separated by glaciation come into contact. It is also situated at the northern margin of the intensely developed temperate urban-agricultural zone. The inland Skeena region thus supports a great variety of minimally damaged ecosystems, many with distinctive transitional or ecotonal characteristics.

## INVENTORY METHODS

The 2-year inventory focused on Red-listed grassland, scrub-steppe, and floodplain ecosystems in the Bulkley Basin (BUB) ecoregion and dry cool Sub-Boreal Spruce (SBSdk) biogeoclimatic subzone, with the objective of mapping all Red-listed occurrences in the Bulkley District SBSdk at 1:20,000 scale. Other objectives were to provide an overview assessment of rare and endangered ecosystems throughout the 4 forest districts, including plant communities not currently listed, and to raise awareness about rare and endangered ecosystems and their management, among British Columbia Ministry of Environment, Lands and Parks and Ministry of Forests staff in the 4 districts.

Site visits were made to 131 rare community element occurrences. Full or reconnaissance-level ecosystem descriptions (B.C. MOF and B.C. MELP 1996, Cadrin et al. 1996) were made at each site, and plant voucher specimens and rock samples were collected. Each ground-truthed element occurrence was marked on aerial photographs, and photographic slides were taken. Fifty-seven permanent photo-tiepoints were established to allow changes in ecosystems to be monitored. Field records from 107 additional element occurrences were obtained from other sources.

Twenty-six 1:20,000 TRIM (Terrain Resource Information Management) mapsheets were either partially or completely mapped with 871 plant community polygons delineated (total area 6,795 ha). These mapsheets encompass the Bulkley Valley SBSdk corridor, with a few partial mapsheets completed in other drainages and in other forest districts. The project maps were digitized in ARC-INFO format by the British Columbia Conservation Data Centre (CDC) and linked to a computerized database that is compatible with Terrestrial Ecosystem Mapping (TEM) standards (Cadrin et al. 1996) and allows each element occurrence or polygon to be queried.

## RARE AND ENDANGERED ECOSYSTEMS

Rare and endangered ecosystems usually possess 1 or more of the following features:

- unusual physiographic setting (climate, geology);
- unusual or exceptionally diverse biota (e.g., peripheral species);

- unusual or exceptionally complex disturbance history;
- attractive to humans.

These attributes are highly interrelated. The more attributes a particular ecosystem possesses, the more rare and endangered it is likely to be.

The CDC Red List currently includes 3 plant communities that fell within the purview of our study (Table 1). There are 2 situations where these Red-listed ecosystems and other rare-but-unlisted ecosystems most commonly occur: (a) warm, dry, southwest-facing slopes with mineral-rich parent materials; and (b) riparian or rich minerotrophic swamp systems. Both are low-elevation, nutrient-rich environments with active disturbance cycles (dominated in the first case by fire, and in the second case by flooding), heavy wildlife use, and high biotic diversity. They also have some of the highest agricultural capability in the region and a long history of use by both aboriginals and European settlers.

## SOUTHWEST-FACING STEPPE, GRASSLAND, AND MEADOW ECOSYSTEMS

### SASKATOON - SLENDER WHEATGRASS SCRUB STEPPE

Saskatoon - slender wheatgrass is a very diverse xeric to sub-mesic scrub-steppe community found in the SBSdk, SBSmc, and ICHmc subzones (Pojar et al. 1984, Banner et al. 1993). It is a mosaic of stunted saskatoon (*Amelanchier alnifolia*), snowberry (*Symphoricarpos albus*), cherry (*Prunus virginiana*, *P. pensylvanica*), and prickly rose (*Rosa acicularis*) scrub, mixed with patches of grasses (*Elymus* spp., *Stipa* spp., *Festuca saximontana*, *Poa* spp.) and forbs (peavine [*Lathyrus nevadensis*], northern bedstraw [*Galium boreale*], yarrow [*Achillea millefolium*], wild onion [*Allium cernuum*]). Thickets of taller willow (*Salix scouleriana*), aspen, cherry, and hawthorn (*Crataegus douglasii*) are common. With their high insolation and low snowpacks, these ecosystems provide critical habitat for many wildlife species, notably mule deer (*Odocoileus hemionus*) and western garter snakes (*Thamnophis sirtalis*), and support xerophytic plant and insect species not found elsewhere in the landscape.

In total, 187 occurrences of scrub-steppe (937 ha) were mapped in the Bulkley District. Seventy-four occurrences were recorded in other forest districts (Table 1), but casual inspection of aerial photos and satellite imagery suggests there are several hundred more occurrences. Although not particularly rare, this plant community is threatened by changes to its disturbance regime, including climatic change, fire suppression, urbanization, heavy grazing or browsing, and invasive nonnative plants. There is excellent representation of Saskatoon - slender wheatgrass ecosystems within newly approved or proposed Goal 1 and 2 protected areas, particularly in the Lakes District; however, active management of fire and herbivores, and some control of invasive species will be needed to maintain their diversity over time. We identified 2 variations of the ecosystem that are rare, highly threatened,

**Table 1.** Current and proposed Red- and Blue-listed plant community occurrences mapped in the inland Skeena region.

Plant Community	BEC <sup>a</sup> site series	TEM <sup>b</sup> map code	current list	proposed list	n	Bulkley Forest District			Other Districts <sup>c</sup> n
						ha	%E/G <sup>d</sup>	% Crown <sup>e</sup>	
Saskatoon - slender wheatgrass scrub steppe	SBSdk/81	SW	Red	Blue	226	1074	39	37	74
Bluegrass - slender wheatgrass grasslands	SBSdk/82	BW	Red	Red	5 <sup>f</sup>	58	73	73	14
Black cottonwood - red osier dogwood - prickly rose floodplain forest	SBSdk/08	CD	Red	Red?	227	1363	36	22	40
Western redcedar - Roche spruce - horsetail - skunk cabbage swamp forest	ICHmc2/07	RC	Blue	Red?	1	22	100	100	no data
Douglas-fir - juniper - pinegrass open forest	SBSdk/04	DSxw	Blue	Red?	0				2
Rocky mountain juniper - saskatoon - slender wheatgrass savanna steppe	undescribed	JS	unlisted	Red	13	84	87	0	2
Aster - meadow rue - peavine - fireweed mesic montane meadow	undescribed	AM	unlisted	Red	54	148	51	77	13
Trembling aspen - wild cherry - beaked hazelnut deciduous scrub	ICHmc2/55	bt	unlisted	Red	0				5
Bracken - cow parsnip - fireweed fern meadow	undescribed	CA/br	unlisted	Red?	4	143	18	50	2
Hybrid white spruce - common horsetail floodplain forest	SBSdk/07a	SHa/c	unlisted	Red	36	108	51	24	19
Paper birch - black twinberry - common horsetail floodplain forest	undescribed	SH/bt	unlisted	Red	2	6	100	100	no data
Roche spruce - black cottonwood - hybrid alder - ostrich fern floodplain forest	ICHmc2/06	CD or SD	unlisted	Red	0				5
Black spruce - Roche spruce - scrub birch - sedge forested fen	ICHmc2/08	BB	unlisted	Red?	0				5

<sup>a</sup> Biogeoclimatic Ecosystem Classification (Banner et al. 1993)

<sup>b</sup> Terrestrial Ecosystem Mapping (Cadrin et al. 1996)

<sup>c</sup> Kispiox, Lakes and Morice Forest Districts, mapping very incomplete

<sup>d</sup> Percent by area in excellent or good condition

<sup>e</sup> Percent by area crown-owned land including protected areas, provincial forest, grazing tenures, and other unalienated land

<sup>f</sup> Bulkley District grasslands do not closely fit BW community description

and occur mostly on private land: (a) savanna-steppe with well-developed stands of Rocky Mountain juniper (*Juniperus scopulorum*; 15 known occurrences, with all but 2 on private land); (b) scrub-steppe ecosystems with deep soil on steep fluvial or lacustrine scarps. We recommended that the Saskatoon - slender wheatgrass community be down-listed to Blue status with special attention paid to occurrences on non-rocky soils, and that the Rocky Mountain juniper savanna-steppe receive separate status as a Red-listed plant community.

#### **BLUEGRASS - SLENDER WHEATGRASS GRASSLANDS**

True grasslands dominated by native bluegrasses (*Poa* spp.), slender wheatgrass (*Elymus trachycaulus*), and needlegrasses

(*Stipa* spp.) are rare and highly endangered in the inland Skeena region. They are essentially absent from the Skeena watershed but exist on deep fluvial, lacustrine, and, occasionally, morainal parent materials along the north shorelines of major lakes of the Nechako Plateau. Much of the original grassland was submerged by the Nechako Reservoir in 1954, and most occurrences not under cultivation are now dominated by introduced Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), and dandelion (*Taraxacum officinale*). Some of the best remaining grasslands are found on steep slopes below basalt buttes where soils are deep and rich, but too steep for intensive livestock use, and too dry and exposed for tree invasion. These sites are characterized by abundant pasture sage (*Artemisia frigida*) and teem with animal life.

We mapped 5 grasslands that marginally fit the Bluegrass - slender wheatgrass description in the Bulkley District and located 14 occurrences in other forest districts. We strongly recommended that the Red-list designation be retained for all low-elevation grasslands, although further work is needed to properly describe and classify grassland and closely related herb meadow communities.

#### **OTHER ENDANGERED GRASSLAND, HERB MEADOW, AND SCRUB-STEPPE ECOSYSTEMS**

Within the Skeena watershed most low-elevation herbaceous plant communities are not true grasslands, but moist, rich meadows dominated by cow parsnip (*Heracleum sphondylium*). We proposed 2 new herbaceous communities for Red-listing: a dry to mesic montane meadow ecosystem with extremely variable species composition (tentatively named Aster - meadow rue - peavine - fireweed) occurring on southwest-facing slopes and on inactive fluvial terraces, and a bracken-dominated (*Pteridium aquilinum*) variation of the more common cow parsnip meadow found on ICHmc sites that appear to have a long history of anthropogenic burning (Table 1). A mid- to higher-elevation grassland type (proposed Blue List) dominated by timber oat grass (*Danthonia intermedia*) and spike trisetum (*Trisetum spicatum*) was identified on coarse-textured, frost-prone fluvial terraces.

#### **MANAGEMENT**

Management options for these non-forest ecosystems are complex and controversial. Eliminating livestock grazing will not recreate the presettlement plant community and may accelerate tree and shrub encroachment. Carefully developed range use plans that control the distribution and season of use by livestock to avoid overgrazing can potentially benefit wildlife, encourage native grassland species, prevent degradation of sensitive sites, and assist recovery of degraded areas. However, livestock grazing should probably not be used to reduce tree encroachment on sites that currently have few nonnative species. Prescribed burning should be reintroduced where possible, with careful monitoring to avoid increasing the dominance of nonnative species.

A system of large and small benchmark ecosystems was proposed for the southwest-facing shrub-steppe, grassland, herb meadows, 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 was recommended to encourage private landowners to conserve and restore these ecosystems.

## **FLOODPLAIN AND SWAMP FORESTS**

### **BLACK COTTONWOOD - RED OSIER**

#### **DOGWOOD - PRICKLY ROSE FLOODPLAINS**

The Red-listed Black cottonwood - red osier dogwood - prickly rose ecosystem is dominant on the active floodplains of major rivers in the inland Skeena region. In the SBSdk and adjacent SBSmc subzones it is extensive along the Bulkley and Morice rivers but rare on smaller rivers and creeks and along the shores of major lakes. Most of the 227 mapped occurrences (1,363 ha) in the Bulkley District are on private or municipal land (78%) and in marginal to poor condition (64%; Table 1). Extant cottonwood stands on the Bulkley mainstem are threatened over the long term by flood control measures and bank erosion. High ungulate browsing levels and invasive nonnative plant species are also concerns. Fortunately, the Morice River occurrences (mostly unmapped) are in good to excellent condition and probably more than double the total area of this ecosystem. It is difficult to justify Red-listing the Black cottonwood - red osier dogwood - prickly rose plant community based on abundance alone, but the listing is probably warranted by the degree of threat to occurrences away from the Morice River and the critical value of the ecosystem as wildlife habitat.

#### **OTHER FLOODPLAIN AND SWAMP FOREST ECOSYSTEMS**

There are a wide variety of other forested and non-forested riparian plant communities on low-elevation SBS floodplains. Most are undescribed, and all are less abundant than the Red-listed Black cottonwood - red osier dogwood - prickly rose community. We identified the Hybrid white spruce - common horsetail floodplain or swamp forest community (Pojar et al. 1984) as rare and highly threatened on floodplains and slow-moving stream systems in settled areas within the SBSdk subzone, although a broadly similar community is widespread across northern British Columbia. Only 36 occurrences (115 ha, median size 1.9 ha) of this distinctive ecosystem, rich in fire-sensitive, nonvascular, and invertebrate species, were located in the Bulkley District. Several other new riparian plant communities were tentatively described and proposed for Red- or Blue-listing.

In the mountainous ICHmc subzone, cottonwood floodplains are more common than in the SBS and less threatened by agriculture or settlement. However, some riparian and rich swamp forest communities unique to the coast-interior transition warrant special recognition. Unusual forms of hybridization, exemplified by the 3-way hybrid Roche spruce (*Picea sitchensis* x *glauca* x *engelmannii*) and hybrid red alder (*Alnus rubra* x *incana*), and large, well-developed populations of peripheral or disjunct species such as western redcedar (*Thuja plicata*), skunk cabbage (*Lysichiton americanum*), ostrich fern (*Matteucia struthiopteris*), and agrimony (*Agrimonia striata*), are characteristic features. These outstanding ecosystems are

naturally rare and are threatened because they invariably occur at major river intersections or on other unusual landforms that have long served as focal points for human activity.

#### MANAGEMENT

There are few occurrences of large river floodplains in proposed protected areas. The Morice River corridor is the best opportunity in the southeastern Skeena region to maintain the Black cottonwood - red osier dogwood - prickly rose and associated SBS plant communities in near-natural condition with unrestricted flooding regimes. Mapping and preparing strategies for the scattered occurrences of rare riparian and swamp forest ecosystems along lakeshores and other stream systems in the region must become a management priority. On the Bulkley River and its tributaries, opportunities for restoration of natural communities and hydrological processes are greatly restricted. Further alienation and disturbance of remaining Crown land occurrences must be prevented. Efforts to restore connectivity should begin by working with Fisheries Canada, regional and municipal governments, and private landowners to develop a greenway system to prevent further clearing, stabilize banks, restore riparian vegetation, and allow natural flooding of backchannels and lower benches wherever possible.

#### LISTING RARE AND ENDANGERED ECOSYSTEMS

The provincial Red and Blue lists of plant communities maintained by the CDC in British Columbia are a very important first step towards recognizing and protecting special ecosystems. However, the program is limited by its lack of legislative teeth. Of the 241 plant communities currently listed by the CDC (94 on the Red List), only 4, none in Skeena Region, are recognized under the Forest Practices Code Act of British Columbia (B.C. MOF and B.C. MELP 1999). Pending federal endangered species legislation makes no provision for endangered ecosystems. As it currently stands, the primary value of the listing program is the awareness it creates among land managers, politicians, and the public.

A major technical limitation, particularly for nonforested ecosystems, is the absence of a detailed, widely agreed upon classification framework. Our work in the inland Skeena region showed that most rare ecosystems were not listed because they have not yet been adequately described or classified, or because they represent an unrecognized subset of a more widespread and recognized entity, such as a biogeoclimatic site series. Existing classifications such as BEC (Biogeoclimatic Ecosystem Classification; Banner et al. 1993) provide broad treatment of the most common and economically important (mainly forested) ecosystems, while detailed classifications of nonforested ecosystems are geographically

restricted (e.g., Brett et al. 1998).

A potential negative side-effect of the Red- and Blue-listing scheme is that it may focus management attention on a static and narrowly defined target (a "climax" plant association or old growth successional stage) when a more appropriate goal for long-term ecosystem management may be to maintain a dynamic ecosystem complex encompassing a spectrum of closely linked ecosystems at various successional stages.

#### COMMUNITY INVOLVEMENT

For the foreseeable future, we cannot expect strong legislation or an expanded protected areas network to save ecosystems at risk. In the inland Skeena region, as elsewhere, the rarest, most endangered ecosystems are chiefly located in settled, valley-bottom corridors, largely on private land, where few opportunities exist to restore a wilderness setting or create new protected areas. Humans, like other animals, find these warm, productive, and diverse environments irresistible.

It is no coincidence that all major municipalities in the study area (Smithers, Telkwa, Hazelton, Houston, and Burns Lake) are situated directly on, or are immediately surrounded by, 1 or more endangered ecosystems. In many ways each town derives its unique character and identity from that physical setting. The willingness of local residents to adopt endangered ecosystems as symbols of community and to take responsibility for their health and productivity will determine not only the future viability of these ecosystems, but also the beauty and vitality of their human settlements. As biologists and ecologists concerned about natural ecosystems and species at risk we have a crucial role to play in helping our local, human communities make this vital connection.

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