

ECOSYSTEM MOSAICS OF THE NORTHERN BOREAL
WHITE AND BLACK SPRUCE BIOGEOCLIMATIC SUBZONE,
FORT NELSON TIMBER SUPPLY AREA

NORTHERN FIRE ECOLOGY PROJECT

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Objective

To subdivide the extensive lowland subzone or Northern Boreal White and Black Spruce biogeoclimatic subzone (BWBSa) at a scale of 1:250 000 into map units that:

1. indicate the location and extent of productive forest ecosystems;
2. provide a basis for the prioritization of fire control efforts; and,
3. provide an indication of terrain character and its impact on fire control methods.

The BWBSa occupies the Fort Nelson Lowland proper, the Etsho Plateau and parts of the Alberta and Liard plateaus (Holland, 1976).

Existing Sources of Information

The most relevant published sources of information are:

1. Forest cover maps of the B.C. Forest Service Inventory Branch. Mainly 1:50 000 and fewer 1:125 000 reductions of original 1:20 chain maps are available for the T.S.A.
2. Soil maps and reports:
 - a) Valentine (1971): B.C. Soil Survey Report #12. The survey was at a scale of 1:126 720 and covers map sheets 94 J/9,10,15 and 16.
 - b) Kowall (1980): Soils of the Fort Simpson Trail Area. The survey was at a scale of 1:50 000 and covers all of map sheets 94 O/1 to 8 and 94 J/14; and portions of 94 J/11 to 13.
 - c) Annas (1977): Ph.D. thesis, on ecosystems of the Boreal White and Black Spruce Zone.

Other sources of information include sample strips of 1:80 chain black and white air photography and several LANDSAT images.

Fieldwork

Fieldwork encompassed a period of three weeks in June and July of 1980. Helicopter traverses and access were relied on heavily due to the extent of the area to be examined and the broad scale of the mapping project. A total of 49 hours helicopter time was used.

Data Synthesis Strategy

A. Forest Cover

Since forest cover information completely covered the area and was the most detailed information available, it forms the foundation for the 1:250 000 ecosystem mosaic maps. For each of the main cover types, field and aerial observations were made in order to assign the cover type to one of four broad ecosystem associations -

B1 Association

- white spruce, trembling aspen or various white spruce - aspen mixtures of well- to imperfectly-drained upland sites.
- cover types assigned to B1 and colored light green (Prismacolor #913) in the interpretation procedures include:
 - S, A, SA, AS - that is, all mixtures of white spruce and trembling aspen occurring on medium (-M) and poor (-P) sites.
 - NSR-M, or NSR-P with S or A vets
 - NC Br with S or A vets
 - stands that include Bi or Pl mixed with white spruce and/or aspen. Note: the Pl on well drained sites becomes more prevalent flanking the Liard upstream from the Grand Canyon and in the Smith and Coal River drainages.
 - stands that include Cot with S and/or A on medium sites away from the rivers.
 - the third member of a species mix was ignored if bracketed.
e.g. SA(Sb)

B2 Association

- black spruce and lodgepole pine - black spruce mixtures with feathermoss communities on poorly drained mineral upland sites.
- cover types assigned to B2 and colored dark brown (Prismacolor #945)
include: - Sb, age classes 3 to 8 inclusive with height class 2
(also NP Sb with height class 2)
 - SbPl or PlSb mixtures

B3 Association

- black spruce, black spruce - tamarack, open tamarack and treeless communities of poorly to very poorly drained organic terrain; including shallow and deep organics, mainly sphagnum bogs, with lesser fens and other wetland associations.
- cover types assigned to B3 and colored chestnut brown (Prismacolor #944)
include: - Sb, age classes 3 to 8 inclusive with height class 1
 - most NP Sb
 - all muskeg and $\downarrow \downarrow$ (non-forested wetlands, fens)
 - SbL or Sb(L) of height class 1.

B4 Association

- alluvial white spruce forests and seral balsam poplar and willow communities of floodplains and river terraces.
- cover types assigned to B4 and colored orange (Prismacolor #918)
include: - S, SCot and CotS on good (-G) sites near larger rivers
 - any pure Cot stand.

On the majority of mapsheets (8 of 10) the above scheme resulted in the assignment of at least 90 percent of the mapsheet area to the four broad ecosystem associations. The residual uncolored area included either cover types of relatively minor ecosystem associations of very limited extent, OR cover types which could not be assigned with reasonable certainty to B1, B2, B3 or B4.

Two kinds of cover types prevented allocation to one of the four broad associations:

- a) Cover, really the lack of forest cover, that results from forest fires of the last \pm 20-25 years:

- NP⁶¹_⊖ etc.
- NP Br⁷²_⊖

Where extensive areas of such types were encountered, areas large enough to prevent the 1:250 000 mapping, either air-photo interpretation or a helicopter traverse, or both, was undertaken to ascertain the appropriate ecosystem association(s).

- b) Cover types that could not rationally be assigned to one of the ecosystem associations but indicated either a complex area containing a mix of two or three of the ecosystem associations or a transition between two ecosystems.

- e.g. - SbA or ASb
- SSb or SbS

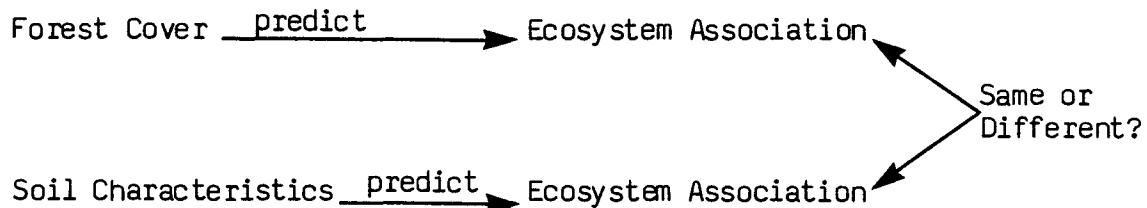
As a rule, these types were not so extensive as to require checking from the air.

B. Soil Maps and Forest Cover

Where either 1:50 000 or 1:126 720 soil maps were available, the broad ecosystem associations (B1, B2, B3 and B4) were predicted from a knowledge of soil - vegetation relationships. Essentially, allocation of soils to the broad ecosystem association was made on the following basis -

- well-, moderately-well and imperfectly-drained mineral soils, except on floodplains (Luvisols) \longrightarrow B1
- poorly drained mineral soils (Gleysols) \longrightarrow B2
- poorly to very poorly drained organic soils (Mesisols, Fibrisols, Organic Cryosols) \longrightarrow B3
- well, moderately well and imperfectly drained mineral soils of floodplains and river terraces (Regosols, Brunisols) \longrightarrow B4

The double coverage of both soil and forest cover maps over part of the T.S.A. also enabled the verification of ecosystem predictions based solely on forest cover - as follows:



Agreement was found to be excellent, thereby allowing the conclusion that the prediction of broad ecosystem associations from forest cover alone is feasible in the BWBSa particularly on the Fort Nelson Lowland and Etsho Plateau. This came about primarily because of the profound differences in both soil and vegetation (ecosystem association) that result from soil drainage conditions on the subdued topography of the Ft. Nelson Lowland. Agreement between forest cover boundaries and soil unit boundaries is further reinforced because of the use of vegetation differences by soil mappers in interpreting soil boundaries from air photographs.

C. Generalization to 1:250 000 Scale

Allocation of the various soils or cover types to the ecosystem associations yielded a set of 1:50 000 maps with a highly complex pattern. Closer examination of these maps and extensive helicopter traversing both indicated that broader patterns were discernable and indeed mappable at 1:250 000 scale. These derived, generalized map units consist of a number of subjectively defined ecosystem mosaics. Six mosaics were defined, as follows:

- Mosaic 1 - Dominantly (70→80%) white spruce and/or trembling aspen sites of freely draining (well to imperfect) mineral terrain - (B1).
- Minor (20→30%) black spruce associations, either feathermoss (B2) or sphagnum (B3) associations.
- Mosaic 3 - Dominantly (70→80%) black spruce - sphagnum sites (and other wetlands) of very poorly drained organic terrain - (B3).
- Minor (20→30%) white spruce - trembling aspen associations of freely draining mineral soils.
- Mosaic 2 - Intermediate between Mosaics 1 and 3; a complex of 1 and 3.
- 30→70% white spruce - aspen communities.
- 70→30% black spruce - sphagnum (and other wetlands).
- Mosaic 5 - Dominantly (70→80%) black spruce - feathermoss communities - (B2).
- Minor, (20→30%) black spruce - sphagnum communities - (B3).
- Mosaic 4 Intermediate between Mosaics 1 and 5, a complex of 1 and 5:
- 30→70% black spruce - feathermoss communities - (B2).
- 70→30% white spruce - aspen communities - (B1).
- Mosaic 6 Alluvial mosaic:
- Consists of alluvial white spruce communities and seral stages including white spruce, balsam poplar, alder and willows - (B4).

Table 1. Summary of the composition and environmental properties of the ecosystem mosaics of the Northern Boreal White and Black Spruce Subzone, Fort Nelson Timber Supply Area.

Ecosystem Mosaic	Dominant Association	Minor Association	Terrain	Forest Productivity ¹	Fire ²	Fire Control Priority ³	Fire Control Measures
1	B1	B3, B2	Dry Mineral	Good C.L.I. 3-5	Spring: mosaic burns due to fuel variation ranging from Sw-moss to aspen-shrub-herb. Spring fires may be driven into Sw from adjacent S0 stands. Summer: resists fire in summer.	High	Fire lines OK in mineral, good trafficability
3	B3	B1	Wet organic - shallow to deep permafrost	Very poor C.L.I. 7	Spring and summer: mosaic burns due to fuel variation and high rates of spread. Many unburned islands.	Very low	Fire lines problematic in organic terrain
2	complex of B1, B2, B3		Dry mineral - wet organic mosaic	Complex of mosaics #1 and 3	Spring: mosaic burns due to great fuel diversity. Spring fires often driven into Sw or SwAt mikes from interfingered more flammable S0 stands. Summer: B2 and B3 burned preferentially; Association B1 resists fire.	Medium	Interfingering of associations strongly complicates fire line construction
5	B2	B3	Wet mineral with shallow peaty surface	Poor C.L.I. 6-5	Spring and summer: relatively uniform burns, very few unburned islands. High spread rates.	Low	Fire lines OK in mineral, moderate trafficability due to wetness in B2.
4	complex of B2 and B1		Dry mineral - wet mineral mosaic	Complex of mosaics #1 and 5	Spring: mosaic burns due to fuel diversity. Fire often driven into Sw or SwAt from interfingered S0 stands. Summer: B2 burned preferentially; Association B1 resists fire.	Medium	
6	Alluvial Sw	seral Cot. and willow	Dry mineral, subject to inundation	Excellent C.L.I. 2-3	Very rare.	High	

1. Forest productivity ratings are estimates only, no productivity plots were undertaken in this project. (C.L.I. = Canada Land Inventory)
2. Forests of Mosaics 1 to 5 have developed under the repeated influence of fire, typically long return interval crown fires. Evidence of fire is present throughout.
3. Fire Control priority ratings consider only the relative intrinsic value of the mosaic to produce fibre.

Literature Cited

- Annas, R.M. 1977. Boreal ecosystems of the Fort Nelson area of northeastern British Columbia. Unpublished Ph.D. thesis. Department of Botany, University of British Columbia, Vancouver, British Columbia, Canada.
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