Ontario

Silvicultural Guide to Managing
for Black Spruce, Jack Pine, and Aspen
on Boreal Forest Ecosites in Ontario

Book III: Ecological and Management Interpretations for Northeast Site Types

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MNR's Strategic Directions and its Statement of Environmental Values

The Ministry of Natural Resources (MNR) is responsible for managing Ontario's natural resources in accordance with the statutes it administers. As the province's lead conservation agency, the Ministry of Natural Resources is steward of provincial parks, natural heritage areas, forests, fisheries, wildlife, mineral aggregates, fuel minerals, and Crown lands and waters which make up 87 percent of Ontario.

In 1991, the Ministry of Natural Resources released a document MNR: Direction '90s which outlines the goal and objectives for the Ministry, which are based on the concept of sustainable development, as expressed by the World Commission on Environment and Development. Within MNR, policy and program development take their lead from Direction '90s. Those strategic directions are also considered in Ministry land use and resource management planning.

More recently, in 1994, the Ministry of Natural Resources finalized its Statement of Environmental Values (SEV) under the Environmental Bill of Rights. The Statement of Environmental Values is a document which describes how the purposes of the Environmental Bill of Rights (EBR) are to be considered whenever decisions that might significantly affect the environment are made in the Ministry.

The Ministry's SEV is based on MNR: Direction '90s. The Ministry has taken this approach to its SEV because the strategic direction outlined in MNR: Direction '90s reflect the purposes of the EBR.

During the development of this silvicultural guide, the Ministry has considered both MNR: Direction '90s and its Statement of Environmental Values. This guide is intended to reflect the directions set out in those documents and to further the objectives of managing our resources on a sustainable basis.

FOREWORD

Silvicultural Guides

This is the Silvicultural Guide for Boreal Forest Ecosites in Ontario. This guide replaces *A Silvicultural Guide to the Spruce Working Group in Ontario* (Arnup *et al.* 1988), *Jack Pine Working Group* (OMNR 1986), and *A Silvicultural Guide to the Poplar Working Group in Ontario* (Davison *et al.* 1988).

The project to review, revise and rewrite the silvicultural guides grew out of a legal requirement stated in Term and Condition 94 (T&C 94) of the class environmental assessment for timber management on Crown lands in Ontario (MOEE 1994). T&C 94 states that "all existing silvicultural guides shall be reviewed to ensure that they reflect current scientific knowledge as it applies to Ontario, and to provide descriptions of general standard site types for use in developing silvicultural ground rules in timber management plans."

General standard site types, as defined in the *Forest Management Planning Manual for Ontario's Crown Forests* (OMNR 1996), are synonymous with ecosites and site types, the working units of forest ecosystem classification (FEC) systems.

The *Silvicultural Guide to Managing for Black Spruce, Jack Pine, and Aspen on Boreal Forest Ecosites in Ontario* provides silvicultural information within the context of forest ecosystems. This represents a significant change from the working group (crop species) approach used in the earlier silvicultural guides.

Guideline Revision

Ecosystems and our understanding of them are never static. As science, knowledge and experience add to our understanding of Boreal Forest ecosystems, this guide will continue to evolve. It is a work in progress that we will revise, improve and update so that it continues to reflect current knowledge and experience, while providing us with the tools to adapt to the challenges that lie ahead.

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ACKNOWLEDGMENTS

This silvicultural guide was designed and built by an integrated team from MNR's Northeast Science & Technology (NEST) unit in Timmins, and Northwest Science & Technology (NWST) unit in Thunder Bay.

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This guide is presented in memory of Neil Maurer, a dedicated forester who was very much at home in Boreal Ontario, and who believed very strongly in the application of science to make forest practices better.

About this Guide

This guide provides silvicultural and ecological information for the management of black spruce (*Picea mariana* (Mill.) B.S.P.), jack pine (*Pinus banksiana* Lamb.) and aspen (*Populus tremuloides* Michx., *Populus grandidentata* Michx.), within the context of sustainable forest management.

Our intention in developing this silvicultural guide is to provide:

- a reference tool for developing forest units and silvicultural ground rules
- an overview of current boreal silvicultural science and knowledge in Ontario
- a repository for silvicultural experience in Ontario's boreal forest
- a training and educational tool.

This guide is one of several publications associated with the Forest Management Planning Manual (OMNR 1996), which is a regulating document under the Crown Forest Sustainability Act (CFSA 1994). This guide specifically identifies silvicultural practices (required in silvicultural ground rules) within the ecological framework provided by general standard site types.

This guide is not intended to be the sole source of silvicultural information, or a substitute for local knowledge and experience. It is also not intended to constrain the application of sound silvicultural practices. It provides a framework and a context for generating, collecting, validating and applying local knowledge and experience in the Boreal Forest of Ontario. For more information on the science of silviculture in Ontario, see *Regenerating Ontario's Forests* (Columbo and Wagner in prep.).

How this Guide is Organized

This guide includes three books. Book I: Silviculture in Ontario, includes:

Section I. **Introduction,** presents the legislative, philosophical, and ecological context in which the guide was developed.

Section II. **Silvicultural Practices,** provides an overview of the science, art and practice of silviculture in Ontario's boreal forest. This section also attempts to rationalize and present a standard set of silvicultural terms for use in the forest management planning process.

Section III. **Autecology of Selected Forest Plants,** provides information about the response and adaptation of selected crop trees and competitor species to the physical environment, disturbance, and management intervention.

Section IV. **Silvicultural Decision Tools,** presents a catalogue and short description of decision-support tools available for boreal Ontario.

Section V. **Applying this Guide,** demonstrates how to use the guide to build forest units, silvicultural ground rules and silvicultural treatment packages.

Book II: Ecological and Management Interpretations for Northwest Ecosites, includes:

Section I. **The Ecological Framework** introduces and explains the ecological and management interpretations in Section II, the terms and graphical conventions used, how the interpretations were derived, the limitations to their application, and data sources.

Section II. **Ecological and Management Interpretations** delivers a suite of ecological and silvicultural information, within the framework of general standard site types, as defined by the Terrestrial and Wetland Ecosites of Northwestern Ontario (Racey et al. 1996).

Book III: Ecological and Management Interpretations for Northeast Site Types (this book), includes:

Section I. **The Ecological Framework** introduces and explains the ecological and management interpretations in Section II, the terms and graphical conventions used, how the interpretations were derived, the limitations to their application, and data sources. This section also includes a comparative cross-reference of selected Central Ecosites and Northeast FEC Site Types.

Section II. **Ecological and Management Interpretations** delivers a suite of ecological and silvicultural information, within the framework of general standard site types, as defined by the Forest Ecosystem Classification for Northeastern Ontario (McCarthy et al. 1994).

Section I

The Ecological Framework

Site specific management requires integrating silvicultural practices with ecological conditions to meet desired objectives. Objectives may be ecological, social or economic, and are often combinations of all three. The interpretations in Book III are described in this section and build a knowledge bridge between ecology and management. Management interpretations presented in Book III were developed with a view of achieving at least 80 percent stocking of black spruce, jack pine or aspen (i.e. favoring the regeneration of that species). However, these interpretations are not restricted to obtaining an 80 percent stocking of a single species, but can be combined towards achieving any desired future forest condition.

Ecological and management interpretations are presented. Ecological interpretations describe the interactions among plants, animals and abiotic factors associated with the site and related to forest productivity, successional relationships or understorey species composition. Management interpretations combine knowledge about silvicultural practices and their suitability to meet renewal objectives for a given site.

Natural ecosystems are inherently variable. All individual land units are essentially unique. As a result, any attempt to classify a set of ecological conditions into site types will result in a description of a *modal* condition—a generalized depiction of average conditions. Ecological descriptions of the modal condition may approximate many specific locations while at the same time perfectly describe none. Therefore, verification of site and stand conditions in the field is essential for formulating site specific prescriptions.

The Ecological Interpretations section provides a framework for including additional local ecological data for a management unit. Adaptive management, which uses new data to improve the ecological description of the modal condition will improve the precision and accuracy of these ecosystem descriptions. Examples of such data include natural ingress rates, advance growth and successional changes.

Northeast Region Site Types

The Northeast Region Forest Ecosystem Classification (McCarthy *et al.* 1994) has three primary components:

Site Type (ST):	identifies mappable, management-oriented groupings of vegetation on specific ranges of soil conditions.
Vegetation Type (V):	identifies mature forest plant communities based on specific ranges of plant species composition and abundance.
Soil Type (SS or S):	identifies groups of forest soil profiles based on texture, depth, moisture regime, calcareousness and forest humus form.

There are 22 Northeast Site Types, but only the 19 containing black spruce, jack pine and/or aspen will be addressed in this guide.

NORTHEAST FEC FACT SHEET (FACING PAGE)

1. **Site Type Name:** a name chosen to highlight visually distinct soil and/or vegetation features.
2. **Site Type Number:** provides a quick reference. Site types with the same number have similar vegetation. The 'a', 'b', 'c' subscripts indicate a gradient of increasingly coarse soil textures among site types with the same number.
3. **Stand Structure Silhouette:** a representation of the composition and structure of a typical site type cross section.
4. **Description:** a general text description indicating the dominant overstorey, soil and understorey characteristics. Sample sizes are shown in brackets.
5. **Overstorey:** a listing of the tree species, ranked by frequency of occurrence in the sample (e.g. black spruce [7] indicates that black spruce occurred in 70 percent of the samples).
6. **Understorey (saplings & shrubs, herbs, mosses & lichens):** a listing of the shrubs, herbs, mosses and lichens in descending order of percent cover. Species listed occurred on more than 40 percent of the sample plots.
7. **Vegetation Types:** a listing of the vegetation types, ranked by frequency of occurrence in the sample (e.g. V2 [8] indicates that vegetation type 2 occurred in 80 percent of the samples).
8. **Soil Profile:** a cross-sectional diagram showing the typical sequence of horizons and their range in thickness. Note that the scale used for the forest floor is larger than that used for the mineral soil.
9. **Ground Surface:** a general description of surface features, microtopography and typical materials of the forest floor.
10. **Soil Material:** a listing of common modes of deposition, abundance of coarse fragments and landforms.
11. **Soil Types:** a listing of the soil types, ranked by frequency of occurrence in the FEC.
12. **Soil Feature Histograms (Moisture Regime, Soil Texture, Organic Matter Depth and Humus Form):** a visual representation of the frequency of occurrence in the sample, for these soil features. Darker = more frequent.
13. **Comments:** a description of additional characteristics or unique features.

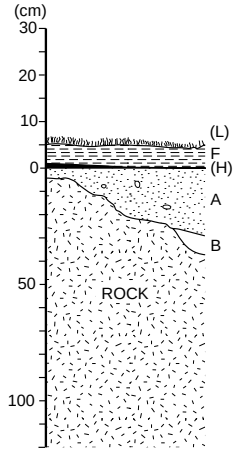
1

Very Shallow Soil

ST 1

3 2

4 **Description:** Coniferous mixedwood stands on dry to fresh, very shallow soils (0 to 30 cm) over bedrock. Medium number of shrubs, herb poor (n = 20).



8

5 **Overstorey:** Black spruce[6], Jack pine[5], White spruce[2], Aspen[2], White birch[1], Balsam fir[1], White pine[1], Larch[1].

6 **Shrubs:** Black spruce, Balsam fir, White birch, White spruce; Early low blueberry, Velvetleaf blueberry, Mountain ash spp., Serviceberry spp., Twinflower, Creeping snowberry, Bush honeysuckle, Labrador-tea.

Herbs: Bunchberry, Blue bead lily, Wild lily-of-the-valley, Bracken fern, Goldthread, Starflower.

Mosses & Lichens: Schreber's moss, Broom moss, Reindeer lichen, Liverworts, Yellow-green lichen, Coral lichen.

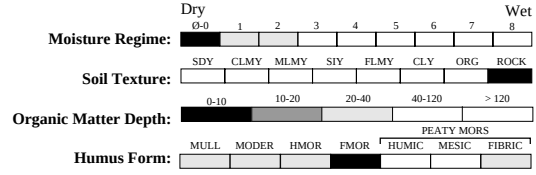
7 **Vegetation Types:** V16[2] V13[2] V14[1] V22[1] other[4]

9 **Ground Surface:** Varying proportions of exposed rock, stones, feathermoss, deciduous and coniferous litter. Occasionally local concave pockets contain sphagnum moss.

10 **Soil Material:** Bedrock or shallow till over rock, on bedrock knobs, ridges, or plateaus. Many coarse fragments.

11 **Soil Types:** (SS1 - 4)[10]

12



13 **Comments:** On bedrock-controlled terrain, associated with bare rock outcroppings and shallow pockets of soil or organic matter in crevices or depressions.

Short Forms, Symbols and Definitions for Northeast FEC Factsheets


Black spruce


Jack pine


Balsam fir


White spruce

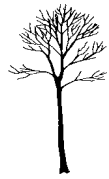

Larch


White cedar


Speckled alder


Balsam poplar


Trembling aspen


White birch


Yellow birch


Sugar maple


Red maple

Conifer: a stand dominated by coniferous tree species, with less than ten percent cover of hardwoods in the overstorey.

Coniferous Mixedwood: a stand dominated by coniferous tree species, with less than 30 percent cover of hardwoods in the overstorey.

Mixedwood: a stand with approximately equal percent cover of coniferous and hardwood trees.

Hardwood Mixedwood: a stand dominated by hardwood tree species, with less than 30 percent cover of conifers in the overstorey.

Hardwood: a stand dominated by hardwood tree species, with less than ten percent cover of conifers in the overstorey.

Overstorey: all trees that are greater than 10 m in height.

Understorey: trees and woody shrubs less than 10 m in height, herbaceous vegetation, mosses, liverworts, and lichens.

Ericaceous: a group of shrubs in the heath (Ericaceae) family, including blueberry, cranberry, wintergreen, laurel, bearberry, bog rosemary, leatherleaf, trailing arbutus and Labrador-tea.

Feathermoss: a group of branched, feather-like mosses, which in this guide, refers to Schreber's moss, stair-step moss, and plume moss.

Sphagnum: refers to any species of the genus *Sphagnum*.

Occurrence/Abundance Classes for Plant Species and Forest Floor Materials

abundant	occurred in > 66 percent of sample plots, with average cover > 10 percent
common	occurred in 40 to 66 percent of sample plots, with average cover > 10 percent
sparse	occurred in < 40 percent of sample plots, with average cover > 10 percent
present	occurred in > 66 percent of sample plots with average cover < 10 percent

Species Richness Classes - based on mean values from FEC database

poor	< 10 species
medium	10 to 15 species
rich	> 15 species

Soil Feature Histograms – Frequency Classes - based on FEC database

■	> 50 percent
▬	20 to 50 percent
▬	5 to 19 percent
▭	< 5 percent

Abundance of Coarse Fragments in Soil Profile - based on mean value from FEC database

many	> 30 percent by volume
moderate	10 to 30 percent
few	< 10 percent

Hummock Height Classes - based on mean from FEC database

high	> 60 cm
moderate	30 to 60 cm
low	< 30 cm

Moisture Regime Classes - On the Moisture Regime histograms, note that the dry (Ø) and moderately dry (0) classes are grouped together.

Particle Sizes

S	sand or sandy	v	very
L	loam or loamy	c	coarse
Si	silt or silty	m	medium
C	clay	f	fine

Soil Texture Classes

SDY	sandy (vcS, cS, mS, fS, LvcS, LcS, LmS and LfS)
CLMY	coarse loamy (vfS, LvfS, SivcS, SicS, SimS, SifS, SivfS)
MLMY	medium loamy (vcSL, cSL, mSL, fSL, vfSL and L)
SIY	silty (Si and SiL)
FLMY	fine loamy (SCL, CL and SiCL)
CLY	clayey (SC, SiC and C)
ORG	organic soils

Humus Forms

Upland Humus Forms

MULL	includes compact, fine, medium and coarse mulls
MODER	includes typical, raw and mull-like moders
HMOR	fibrihumimor and humimor
FMOR	humifibrimor and fibrimor

Organic Humus Forms

PEATY MORS	classified according to the degree of decomposition (HUMIC, MESIC and FIBRIC)

ECOLOGICAL INTERPRETATIONS

A discussion of the ecological and management interpretations developed for each ecosite, including the source of the information used to prepare the interpretation, is presented below.

There are many knowledge and information gaps and additional work is required to complete and improve the reliability of some of the interpretations.

Moisture/Richness Grid

These figures provide a two-dimensional representation of FEC plot distribution for each site type by moisture regime and herb species richness class. Moisture regimes range from theta to nine, while herb species richness classes were 0 to 4, 5 to 9, 10 to 14, 15 to 19 and 20+ herb species per plot. The mean for the site type is indicated by the site type number against a white background. The legend indicates the percentage of FEC plots with a particular moisture regime/species richness class, with shadings to indicate different frequency classes. For example, in ST1, more than 20 percent of the plots had a moisture regime between theta and zero with zero to five herb species. On the same site type, one to five percent of the plots had a moisture regime of three with five to ten herb species.

The data set was modified to represent the modal condition by deleting plots with a low frequency of occurrence for a particular moisture regime and species richness class. The figure for each site type represents at least 80 percent of the FEC plots.

The size of each cell is delineated by gradations on each axis. The moisture regime is described by the upper gradation of each square. For example, a cell lying between moisture regime four and five was originally recorded as a four.

These figures are useful for understanding the range of moisture regimes and species richness for a particular site type based on the FEC.

Source data for the moisture/richness grids included 1,168 sample plots installed for the development of the forest ecosystem classification system for northeastern Ontario (McCarthy *et al.* 1994).

Texture/Richness Grid

The texture/richness grid is similar in design and intent to the moisture/richness grid. However, the mean for the site type is not shown. The legend indicates the percentage of FEC plots with a particular soil texture/herb species richness class with shadings to indicate different frequency classes. For example in ST5a, greater than 20 percent of the FEC plots were on clay (CLY) with five to ten herb species per plot. Six to ten percent of the plots were on clay with less than five herb species per plot. The same source data used to develop the moisture/richness diagrams were used to develop the soil texture/herb species richness grid. The soil texture classes correspond to those listed in McCarthy *et al.* (1994). Only the dominant conditions are shown.

Typical Landscape Associations

Landscape associations depict the typical sequence of site types that occur on a particular landform. The most commonly encountered landform complexes in northeastern Ontario are shown for each site type. The landscape toposequences depicted help to determine the relationship among neighbouring site types and may be useful for building forest units for management planning. Landscape context is also an important consideration in understanding habitat value, operational constraints and interpreting aerial photographs. Information for the landscape association diagrams was obtained from a forest ecosystem mapping project sponsored by the Canadian Forest Service under the Northern Forestry Program, Northern Ontario Development Agreement (Arnup 1996). In this study, approximately 12,000 points were sampled from linear transects across landscape gradients.

Site Structure and Composition Table

Site characteristics for each site type consisting of overstorey composition, understorey composition, advance growth, seedbed and coarse woody debris are presented for three stand development stages (immature, mature and overmature). The stand development stages correspond to those listed in the *Forest Habitat Suitability Matrix for Northeastern Ontario* (D'Eon and Watt 1994). These figures are based on 1,168 FEC plots (McCarthy *et al.* 1994).

a) Overstorey Composition

The percent cover in each figure is based on the proportion of the total percent canopy cover for each species. Tree species are identified by acronym. The overstorey species shown in each figure are only those that occurred in at least 20 percent of the sample plots for a development stage. The dot indicates the median value for that species. The median value is the middle value, rather than the mean value. In other words, half of the values were less than this number and half were greater than this number. This method is particularly useful for skewed, or non-normal distribution data sets. The upper and lower bars indicate the 10th and 90th percentile, giving a range of 80 percent, rather than 100 percent of the data set. These values were calculated after deleting from the data set for each site type ten percent of the samples with the highest percent cover and ten percent of the samples with the lowest percent cover values for each species. Adding ten percent to these bars will not necessarily give the entire range.

If more than one species shared similar values for the lower limit of the range and the median, but differed in the upper limit of the range, they were combined into the same column. The upper limit of the range is indicated by the species code. This was done for efficient use of the space when depicting data for diverse stands.

b) Understorey Composition

The understorey composition figures are similar in design and intent to the overstorey composition figures. Understorey species are grouped into four classes:

a) woody shrubs and trees up to 10 m in height (Shrub)

b) ericaceous shrubs up to 2 m in height (Ericaceous)

c) herbs, excluding graminoids (Herb)

d) graminoids, including all sedges, grasses, and rushes (Grass)

The total percent cover for each vegetation class was calculated for each FEC plot. The median value and the upper and lower limits of the 80 percent range are shown for each understorey vegetation class that occurred in at least 20 percent of the plots, as described above. For a list of the common species within each group, refer to *Forest Plants of Northeastern Ontario* (Legasy *et al.* 1995). The *Field Guide to the Autecology of Selected Crop Trees and Competitor Species in Northeastern Ontario* (Arnup *et al.* 1995) gives a detailed list of species present on any given site type.

c) Advance Growth

For each site type and age class combination, median values are given for black spruce and balsam fir advance growth density (stems/ha) and percentage stocking (based on 4m ^{2} plot size). Advance growth as described in this table provides a general picture and includes all stems less than 10 m tall. An absence of information for some site types and age classes is due to the use of different methodologies in each study and not sampling some variables for a particular site and age class. Source data for the advance growth information included 249 plots used in the development of the forest ecosystem classification for the Clay Belt (Jones *et al.* 1983), 30 plots from the Clay Belt Advance Growth Survey (Dr. Art Groot, Canadian Forest Service) and 338 plots from the Northeastern Ontario Advance Growth Survey (Arnup 1996).

d) Seedbed and Coarse Woody Debris (CWD)

For seedbeds, the mean percent cover of sphagnum moss (Sphag), feathermoss (Fthr), broadleaf litter (Bdlf), coniferous litter (Con) and lichen (Lichen) are listed for each site type. For coarse woody debris, the mean percent cover of logs (fallen dead wood greater than 7 cm in diameter), and debris (fallen dead woody material less than or equal to 7 cm in diameter) are listed. Source data for the seedbed information included 1,168 FEC plots for northeastern Ontario (McCarthy *et al.* 1994).

Vegetation and Soil Type Relationships Table

This table shows the percent frequency distribution of the soil and vegetation type combinations for each site type. Soil and vegetation combinations that represented less than five percent of the total samples for each site type are not shown. These tables are based on 616 FEC plots and approximately 1,000 plots used to develop an ecological data base for the Lake Abitibi Model Forest.

Selected Species Habitat Use

Habitat value for selected species is given for five forest stages; pre-sapling, sapling, immature, mature and overmature. The immature stage given in the site structure and composition figure corresponds with the pre-sapling, sapling and immature stage. Habitat value is described as follows:

- **no symbol -** not used or selected
- **open circle -** used as encountered, when population is high, or when preferred habitat is in short supply
- **closed circle -** preferred, sought-out habitat or habitat used specifically for breeding, reproduction or survival during a critical period in their life cycle.

Additional notes on specific habitat preferences refer to habitat components not readily described by the site type, or requiring a landscape context. (Source: Wildlife Habitat Matrix, unpublished. D'Eon and Watt 1994).

Successional Relationships — Natural

These figures show the changes under natural conditions in percent cover of stand components over time. The left graph depicts changes in percent cover of understorey components. The right graph depicts changes in percent cover of canopy species. This information is useful in understanding temporal changes in site type composition. Notes on typical successional trends in the absence of human disturbances follow. The figures are derived from FEC data, growth and yield permanent sample plot data and other sources of written documentation and expert opinion (Chambers 1993).

Successional Relationships — Post-treatment

This section describes expected vegetation responses following harvest and mechanical site preparation, prescribed fire or herbicide treatment, based on scientific literature and expert opinion. This information supports decisions affecting selection of renewal and vegetation management strategies. The main sources of information used to develop the successional relationships after disturbance includes Bell (1991), Chambers (1993) and Arnup *et al.* (1995).

Site Productivity

This figure indicates the frequency of occurrence of black spruce, jack pine and aspen by site class for each site type, based on the FEC database (1,168 plots). The limitations of these data are that ages from FEC are based on age at breast height (1.3 m), while the FRI ages are based on estimated date of stand origin. Consequently, FEC can give an overestimate of productivity relative to the FRI, especially on lowland (nutrient poor) sites. This chart is ideal for inserting local data for a management unit to provide a better indication of local conditions.

Advance Growth Density Table

This table provides a more detailed picture of advance growth density than that in Site Structure and Composition. From the data, the following stand types were dominant based on percent canopy cover by species: Spruce (black spruce-dominated stands with greater than or equal to 80 percent cover of black spruce), Hardwood (stands with a hardwood component greater than or equal to 20 percent cover by hardwoods), and Conifer (mixed coniferous stands, with less than 20 percent cover by hardwoods and less than 80 percent cover by black spruce). For each site type, stand type and age class combination, median values are given for black spruce and balsam fir advance growth density (stems/ha) and percent stocking (based on 4m ^{2} plot size). Gray shading within a square indicates that the sample size was greater than five plots. Those with no shading had a sample size less than five plots. An empty square indicates that no data were available. An absence of information for some site types and age classes is due to the use of different methodologies in each study and not sampling some variables for a particular site and age class. Apparent inconsistencies in trends are due to the same reasons. Source data for the advance growth information included 249 plots used to develop the forest ecosystem classification for the Clay Belt, 30 plots from the Clay Belt Advance Growth Survey and 338 plots from the Northeastern Ontario Advance Growth Survey.

Natural Ingress Probability and Density

Quantitative data on expected levels of natural ingress are not presently available for site types in the Northeast Region. In this section, comments are provided based on expert opinion using comparable ecosites from Northwest Region (Book II) based on similarities of overstorey, understorey and soil features. Ingress is discussed in terms of the probability of being present at a given density. High probability indicates that 60 percent or more of the sample plots contained the density of ingress reported. Extremely high probability indicates that 80 percent or more of the sample plots contained the density of ingress reported. Levels of natural ingress are given for black spruce and/or jack pine at ten years post-disturbance (Symons 1996, Bowling *et al.* 1997).

Critical Comments

When included, these comments address ecological information that provide further insight into the physical and biological characteristics of the site.

MANAGEMENT INTERPRETATIONS

Management interpretations were developed for each site type. Many ecological factors interact with management practices to produce observed outcomes. Often those observed outcomes have been documented in scientific and technical literature and field inspection reports, or have been synthesized solely from the collective experience of resource managers. The management interpretations represent a synthesis of both the literature and expert opinion. Because there is an inherent variability in the actual ecological condition represented by these site types, there will be considerable variation in treatment response to silvicultural practices.

The Management Interpretation tables provide quick reference information for determining the opportunities for managing either black spruce, jack pine or aspen on the site. Resource managers must understand the ecology of the sites on which they are making management decisions. This understanding, combined with the management interpretations, may assist in designing cost-effective and biologically appropriate silvicultural treatment packages.

Site Characteristics, Limitations and Hazard Potential

This table flags potential concerns and considerations that should be recognized when management (i.e. silvicultural intervention) occurs on this site type. Three categories of silvicultural intervention are recognized: harvesting, renewal and tending. Hazards include those potential impacts on the physical environment which could negatively influence site productivity or contribute to environmental degradation. The site characteristics which are listed refer to those aspects of the physical and biological environment which contribute to hazard potential. Environmental variables such as intensity and duration of precipitation and temperature extremes must also be considered when interpreting and applying this table.

Opportunities

This section describes additional opportunities for managing the site type. Opportunities for red or white pine enhancement, mixedwood management and specific structural attributes or uneven age management are also indicated.

Silvicultural Intensity Considerations

This chart describes the productivity class and the relative degree of effort which will be required to achieve a free-growing stand for each of the three species (black spruce, jack pine and aspen) on each site type. The degree of effort ranking was subjectively derived though expert opinion. Site productivity class is based upon the FRI site class designations.

The degree of effort categories are:

Extensive:	natural regeneration
Basic:	assisted natural: cone scattering, scarification and direct seeding
Intensive:	site preparation, planting, vegetation management, natural and pre-commercial thinning.
Elite:	intensive plus multiple tendings and cleaning.

Silvicultural Interpretations

A species specific silvicultural interpretation table (for black spruce, jack pine and aspen) is presented for each site type. These tables are designed to provide foresters with site specific information to promote a particular species on a site and in reaching a desired future forest condition. They should not be construed as monoculture promotion for any site. Managers can consider more diverse stands where appropriate. These tables will also indicate when certain species are not appropriate for a site and should not be considered as a management objective.

These interpretation tables have three columns. The left column identifies a specific treatment belonging to a silvicultural system, logging method, renewal treatment or tending treatment, as described in Section II of Book I.

The centre column contains a code that identifies the treatment item as recommended (R), conditionally recommended (CR) or not recommended (NR). The definitions of these terms are:

R = **Recommended:** This activity is ecologically appropriate (it relates well to the biology of the species and the conditions of the site type, and minimizes the potential for damage to the physical environment) and can contribute to the management objectives. Recommended means that the activity can work based on field experience and current knowledge. Recommended does not necessarily suggest that this activity is the best or only option from a biological, ecological or management objective perspective.

CR = Conditionally Recommended: This activity is ecologically appropriate (it relates well to the biology of the species and conditions of the site type, and minimizes the potential for damage to the physical environment) and can contribute to the management objectives, **only if the conditions or limitations referenced in the comments section are addressed.** The conditions or limitations in the comments section must be addressed each and every time the activity is referenced in the silvicultural ground rules or in a specific silvicultural treatment package. Otherwise use of the activity will be deemed to be "Not Recommended", which will trigger the "exception" process. Refer to the FMPM for details on this process.

NR = Not Recommended: This activity is not ecologically appropriate (it does not relate well to the biology of the species or the conditions of the site type, or it presents potential for damage to the physical environment), or will not contribute to the management objectives, or is not supported by field experience or current knowledge. Selection of this activity in the silvicultural ground rules or in a specific silvicultural treatment package triggers the "exception" process. Refer to the FMPM for details on this process.

The third column of this table specifies the conditions that must be met if a treatment is conditionally recommended or provides additional information about treatments on this ecosite.

Comparison of Northeast Site Types and Central Ecosites Which contain Black Spruce, Jack Pine or Aspen

This comparison of Central Region and Northeast Region site types was written for use by Great Lakes-St. Lawrence forest managers managing for black spruce, jack pine, or aspen on their management units. It is based on a non-analytical comparison of information on the northeast and central site types. It should in no way be construed as an indication that these site types and ecosites are the same. In fact, they are completely different communities occurring in different site districts and site regions. The northeast site types were used in this comparison because of geographical proximity to Central Region. The purpose of the comparison is to determine which of the northeast site types are most like the central ecosites. Decisions on similarity were first based on soil texture. Treating a central ecosite like a northeast site type should be done with extreme caution as they are not the same community and frequently vary in both soil texture and moisture regime, as well as competitive species composition. Forest managers familiar with the response of these species in Central Region should call upon their experience along with information in the following tables when determining how to treat a central ecosite when managing for black spruce, jack pine, or aspen.

NE ST 3b Mixedwood - Coarse Soil

Poplar - White Birch - White Spruce - Balsam Fir **C ES 18.1**

Variable	Similarities	Differences
Overstorey	Both have aspen, white birch, white spruce and balsam fir.	ST3b has jack pine, red pine and black spruce in the overstorey.
Regeneration	Both have balsam fir, white birch, aspen and white spruce.	NE has black spruce as a common understorey member, while Central has some red maple.
Shrubs	Both have bush honeysuckle, low sweet blueberry and twinflower.	NE has velvetleaf blueberry, serviceberry, mountain ash, creeping snowberry and willow, while Central has beaked hazel, mountain maple, fly honeysuckle, and northern wild raisin.
Herbs	Both have starflower, wild lily-of-the-valley, large-leaved aster, wild sarsaparilla, blue bead lily, bunchberry, ground pine, bracken fern, goldthread and clubmosses.	Central has rose twisted-stalk and spinulose shield fern.
Number of Herbs		NE is herb poor, while Central has a moderate number of herbs.
Mosses, Liverworts and Lichens	Both have Schreber's moss, broom moss, and *Brachythecium* spp.	Central has *Plagiothecium laetum, Ptilidium pulcherrimium, Callicladium haldanianum, Sanionia uncinatus, Cladonia coniocraea* and *Cladonia chlorophaea.* NE has plume moss, reindeer lichen and stair-step moss.
Ground Surface	Both have a mix of deciduous and coniferous litter.	NE has sparse patches of reindeer lichen while the Central site type has *Cladonia coniocrea* and *Cladonia chlorophaea* which do not form the same kind of obvious patches.
Soil Material	Both are glaciofluvial and morainal landforms which may have coarse fragments in the soil.	NE is shallow water lacustrine and sometimes on stratified soils.
Moisture Regime	Both 0 – 1.	NE 0 – 5, often 1 and 2, Central 0 – 1
Soil Texture		NE SDY and CLMY with most SDY. Central CSDY, FSDY, CLMY, FLMY, SIY with most CLMY.
Organic Matter Depth	Both typically less than 10 cm.	NE may have up to 20 cm.
Humus Form	Both dominantly FMOR.	NE also MODER, HMOR.

Major differences in these two site types come in the moisture regime which is much broader and wetter in the NE, and in species composition. Of concern in the Central region ecosite is the abundance of balsam fir, beaked hazel, large-leaved aster and mountain maple in the understorey. These species are significant competitors after disturbance . The interpretation for aspen is the one of interest for this site while those for jack pine and black spruce would be of lesser importance.

COMPARISON TABLE FOR

NORTHEAST SITE TYPES AND CENTRAL ECOSITES

NE ST 6c Hardwood Mixedwood - Coarse Soil

Poplar - Jack Pine - White Spruce - Black Spruce **C ES 19.1**

Variable	Similarities	Differences
Overstorey	Both have aspen, jack pine, white birch, white spruce and balsam fir.	NE also has black spruce, white cedar, red pine and white pine in the overstorey.
Regeneration	Both have balsam fir, white birch and white spruce.	NE has aspen while Central has red maple and black spruce.
Shrubs	Both have bush honeysuckle, low sweet blueberry, velvetleaf blueberry, beaked hazel, twinflower, mountain maple, fly honeysuckle, showy mountain-ash.	NE has dwarf raspberry and bristly wild rose.
Herbs	Both have wild lily-of-the-valley, sarsaparilla, bunchberry, blue bead lily, large-leaved aster, starflower, ground pine, goldthread, twinflower and rose twisted-stalk.	NE has wood anemone, kidney-leaved violet and fragrant bedstraw. Central has bracken fern and spinulose shield fern.
Number of Herbs	Both have a moderate number of herbs.	
Mosses, Liverworts and Lichens	Both have Schreber's moss and broom mosses.	NE has no lichens while Central has *Cladonia coniocraea.* NE has plume moss, electrified cat's tail moss and *Brachythecium* spp.
Ground Surface		NE is dominantly deciduous litter with feathermoss while the Central is a mixture of deciduous and conifer litter. Lower moss cover on the Central ecosite.
Soil Material	Both are glaciofluvial and morainal with coarse fragments.	NE may be lacustrine and is often stratified. NE frequently on outwash, esker complexes, kame complexes, ground moraine, ablation moraine, end moraine, beaches and deltas.
Moisture Regime	Both 0 – 1.	NE 0 to 4 with a bimodal distribution with many 0 and many 2's and 3's.
Soil Texture	Both are SDY and CLMY.	Central makes distinction between CSDY and FSDY.
Organic Matter Depth		NE usually less than 10 cm but may be up to 20 cm. Central less than 20 cm.
Humus Form	Both are mostly Fibrimors.	NE may also be MODER and HMOR.

Main differences seem to come in the moisture regime and soil texture with only slight differences in the vegetation. The NE site type can be more moist than the Central and has a stronger tendency to be sandy rather than coarse loamy. Many of the species are similar with a notable exception in the presence of bracken fern on the Central site type. This species can be a strong competitor with tree species after disturbance. It is also worthy of note that NE has black spruce, white cedar, as well as red and white pine on ST6c. The interpretations for both aspen and jack pine would be of interest for this ecosite while the interpretation for black spruce may be of secondary importance when dealing with the understorey.

COMPARISON TABLE FOR

NORTHEAST SITE TYPES AND CENTRAL ECOSITES

NE ST 2a Jack Pine - Coarse Soil

Jack Pine - Black Spruce **C ES 15.1**

Variable	Similarities	Differences
Overstorey	Both have jack pine.	NE has aspen and black spruce in the overstorey.
Regeneration	Both have black spruce and balsam fir.	Central has white birch and red maple.
Shrubs	Both have low sweet blueberry, velvetleaf blueberry, creeping snowberry, northern bush honeysuckle, and twinflower.	Central has wintergreen while NE has willow, serviceberry, and sheep laurel.
Herbs	Both have wild lily-of-the-valley and bunchberry.	Central has blue bead lily, bracken fern, starflower and moccasin flower.
Number of Herbs	Both are herb poor.	
Mosses, Liverworts and Lichens	Both have Schreber's moss, reindeer lichen and broom mosses.	Central has *Sphagnum girgensonhii,* and *Ptilidium pulcherrimum*. NE has coral lichen and plume moss.
Ground Surface	Both have moss cover and conifer litter.	Central has some broadleaf litter.
Soil Material	Both are glaciofluvial.	NE may also be shallow water lacustrine or eolian with few coarse fragments. Central may be morainal and can have few to abundant coarse fragments.
Moisture Regime	Both may be 1.	NE 1 – 3, Central 0 – 1.
Soil Texture	Both may be SDY to CLMY.	Central may also be on ROCK.
Organic Matter Depth	Both have organic matter depth less than 20 cm.	NE is commonly less than 10 cm.
Humus Form	Both are typically FMOR.	

Both site types could be considered jack pine/black spruce stands though Central does not have black spruce in the overstorey. Of specific note is the presence of bracken fern, red maple and white birch in the Central ecosite since they can be strong competitors after a disturbance. The NE site type also occurs over a much broader moisture regime. The interpretations for jack pine and black spruce would be of interest.

COMPARISON TABLE FOR

NORTHEAST SITE TYPES AND CENTRAL ECOSITES

NE ST 7b Hardwood - Medium Soil

Poplar - White Birch **C ES 17.2**

Variable	Similarities	Differences
Overstorey	Both have white birch and trembling aspen.	Central has large tooth aspen, while NE has white spruce, balsam fir, jack pine, balsam poplar, black spruce and white cedar.
Regeneration	Both have white birch, balsam fir and aspen.	NE has white spruce. Central has red and sugar maple.
Shrubs	Both have beaked hazel, mountain maple, fly honeysuckle and northern bush honeysuckle.	Central has low sweet blueberry, velvetleaf blueberry and northern wild raisin. NE has dwarf raspberry, swamp red currant, mountain-ash, squashberry, currant, wild red raspberry, twinflower and bristly wild rose.
Herbs	Both have wild sarsaparilla, blue bead lily, wild lily-of-the-valley, large-leaved aster, starflower, ground pine, bunchberry, rose twisted-stalk and spinulose shield fern.	NE has kidney-leaved violet, sedges, naked mitrewort, wood anemone and goldthread. Central has bracken fern and rice grass.
Number of Herbs		Central has a moderate number of herbs while NE is herb rich.
Mosses, Liverworts and Lichens	Both have Schreber's moss and *Brachythecium* spp.	NE has electrified cat's tail moss and plume moss. Central has *Callicladium haldanianum.*
Ground Surface	Both have abundant broadleaf litter.	NE tends to have sparse patches of feathermoss.
Soil Material	Both occur on morainal, glaciofluvial and lacustrine landforms.	NE is often alluvial and found on ground, ablation, or end moraines, esker and kame complexes, deltas, floodplains and riverbanks. Commonly stratified.
Moisture Regime	Both commonly on 2 – 3.	NE range 1 – 5, Central 2 – 6.
Soil Texture	Both may be MLMY. Coarse fragments are frequently present.	NE may also be SIY while Central may also be FSDY and CLMY.
Organic Matter Depth	Both usually less than 10 cm. May be as deep as 20 cm in the NE.	
Humus Form	Both may be MULL, MODER, HMOR, or FMOR.	

Notable differences occur in the overstorey of these two site types with Central having large tooth aspen, and NE having a mixture of coniferous and hardwood species. The presence of red and sugar maple in the regeneration layer of the Central sites may mean that after moderate disturbance these species may increase in number due to their shade tolerance. Bracken fern in the Central ecosite is also of note since this species may increase after disturbance. The interpretation of interest would be for aspen.

COMPARISON TABLE FOR

NORTHEAST SITE TYPES AND CENTRAL ECOSITES

NE ST 7a Hardwood - Fine Soil

Poplar - White Birch - White Spruce - Balsam Fir **C ES 18.2**

Variable	Similarities	Differences
Overstorey	Both have aspen and white birch.	NE also has white spruce, balsam poplar, black spruce, balsam fir and jack pine.
Regeneration	Both have balsam fir, white birch, balsam fir, aspen and white spruce.	Central has red maple.
Shrubs	Both have beaked hazel, fly honeysuckle, mountain maple, northern bush honeysuckle, dwarf raspberry and twinflower.	Central also has low sweet blueberry. NE has squashberry, bristly wild rose, mountain-ash, serviceberry, swamp red currant, currant, speckled alder and wild red raspberry.
Herbs	Both have wild lily-of-the-valley, sarsaparilla, large-leaved aster, bunchberry, blue bead lily, starflower, rose twisted-stalk, spinulose shield fern and fragrant bedstraw.	Central has bracken fern, ground pine and goldthread. NE has kidney-leaved violet, naked mitrewort, bluebells, sweet coltsfoot, wood anemone, sedge, oak fern and interrupted clubmoss.
Number of Herbs		Central has a moderate number of herbs while NE is herb rich.
Mosses, Liverworts and Lichens	Both have Schreber's moss.	NE also has stair-step moss, electrified cat's tail moss, *Brachythecium* spp. and plume moss.
Ground Surface	Both have deciduous litter.	Central also has some conifer litter, while NE often has sparse patches of feathermoss.
Soil Material	Both may be morainal and lacustrine.	Central may be glaciofluvial with few to many coarse fragments. NE usually has few coarse fragments.
Moisture Regime	Both 2 – 5.	Central 2 – 5, NE 2 – 6.
Soil Texture		Central has a much broader texture range going from CSDY to CLY, while NE may be FLMY or CLY.
Organic Matter Depth	Both less than 20 cm.	NE usually less than 10 cm.
Humus Form	Both may be FMOR, HMOR or MODER.	NE may also be MULL.

Major differences occur between the two site types in the number of soil textures that they can occur on. Central region ES18.2 can occur on soils ranging from sandy to clayey while the NE site type occurs on only the finer soil textures. Care must be taken when disturbing the Central ecosite since it has both bracken fern and red maple in the understorey. Both of these species may be stimulated after disturbance. Balsam fir in the Central site type is also of concern due to its strong competitive ability. The interpretation for aspen may be of interest for this ecosite.

COMPARISON TABLE FOR

NORTHEAST SITE TYPES AND CENTRAL ECOSITES

NE ST 6b Conifer - Mixedwood - Medium Soil

Poplar - Jack Pine - White Spruce - Black Spruce **C ES 19.2**

Variable	Similarities	Differences
Overstorey	Both have aspen, white spruce and jack pine.	NE has balsam fir, white spruce, black spruce, white birch and white pine.
Regeneration	Both have balsam fir, black spruce, aspen and white birch.	Central has white spruce.
Shrubs	Both have beaked hazel, dwarf raspberry, northern bush honeysuckle, low sweet blueberry, twinflower, fly honeysuckle, velvetleaf blueberry and mountain maple.	Central has northern wild raisin. NE has mountain-ash, serviceberry, creeping snowberry, bristly wild rose, squashberry.
Herbs	Both have sarsaparilla, blue bead lily, wild lily-of-the-valley, bunchberry, large-leaved aster, goldthread, starflower and rose twisted-stalk.	Central has bracken fern, ground pine and spinulose shield fern. NE has kidney-leaved violet, rattlesnake plantain, naked mitrewort, fragrant bedstraw, wood anemone and clubmoss.
Number of Herbs	Both have a moderate number of herbs.	
Mosses, Liverworts and Lichens	Both have Schreber's moss.	Central has *Plagiothecium laetum*, NE has plume moss, broom moss, stair-step moss and electrified cat's tail moss.
Ground Surface	Both have deciduous and conifer litter.	NE tends to have greater moss cover.
Soil Material	Both may be morainal, or glaciofluvial.	NE may be alluvial and is often stratified with a moderate number of coarse fragments. Central may have few to abundant coarse fragments.
Moisture Regime	Both may be 2 – 5.	Central 2 – 5, NE 1 – 5
Soil Texture	Both may be MLMY to SIY.	Central may also be SDY and CLMY.
Organic Matter Depth	Both less than 20 cm.	NE usually less than 10 cm.
Humus Form	Both are typically FMOR.	NE may also be MODER or HMOR.

The Central site type occurs on a broader range of soil textures so this must be taken into account when disturbing the site. The presence of red maple and bracken fern are of note since these two species can respond positively to disturbance. The interpretation of primary interest would be the one for aspen. However, jack pine and black spruce may also be of interest.

NE ST 13 Conifer - Speckled Alder

Eastern White Cedar - Black Spruce - Tamarack **C ES 32**

Variable	Similarities	Differences
Overstorey	Both have black spruce, larch and eastern white cedar.	NE also has white spruce and balsam fir.
Regeneration	Both have black spruce and balsam fir.	Central has eastern white cedar, red maple and yellow birch.
Shrubs	Both have creeping snowberry, Labrador-tea, speckled alder, velvetleaf blueberry, dwarf raspberry, showy mountain ash and twinflower.	NE has northern honeysuckle, red osier dogwood, bristly black currant, bristly wild rose, swamp red currant, serviceberry, Canada honeysuckle, wild red raspberry, and squashberry. Central has northern wild raisin, low sweet blueberry and mountain-holly.
Herbs	Both have bunchberry, starflower, goldthread, blue bead lily and wild lily-of-the-valley.	Central has spinulose shield fern, three-fruited sedge, and cinnamon fern. NE has sedges, kidney-leaved violet, naked mitrewort, fragrant bedstraw, wood anemone, three-leaved smilacina, oak fern, blue-joint grass, woodland horsetail, sweet coltsfoot and ciliolate aster.
Number of Herbs		Central has a moderate number of herbs while NE is herb rich.
Mosses Liverworts, and Lichens	Both have *Sphagnum girgensohnii, Sphagnum capillifolium (nemoreum),* Schreber's moss and broom moss.	Central has *Sphagnum magellanicum, Plagiothecium laetum, Bazzania trilobata, Cladonia coniocraea* and *Cladonia chlorophaea.* NE has stair-step moss, electrified cat's tail moss, plume moss, *Mnium* spp., sickle moss and ribbed bog moss.
Ground Surface	Both have abundant moss cover and conifer litter.	NE tends to have small water filled depressions.
Soil Material	Both occur on organic soils.	Central may also occur on glaciofluvial and lacustrine landforms.
Moisture Regime	Both may be 6 – 8.	Central 2 – 8, NE 6 – 8.
Soil Texture	Both are on organic soils.	Central may also be on SDY and CLMY.
Organic Matter Depth	Both typically have greater than 40 cm of organics.	
Humus Form		Central ranges from peatymors to fibrimors and moders on the uplands. NE is all peatymors.

One of the major differences between these two sites is that they can occur on uplands in Central region. Thus, the range of soil moisture, texture, and humus form are all greater in Central region. Both tend to be considered black spruce sites and care should be taken due to the moisture regime. The presence of red maple and yellow birch may be of concern when disturbing this site. The interpretation of interest would be the one for black spruce.

COMPARISON TABLE FOR

NORTHEAST SITE TYPES AND CENTRAL ECOSITES

NE ST 9 Conifer - Moist Soil

Eastern White Cedar - Other Conifer **C ES 22**

Variable	Similarities	Differences
Overstorey	Both have black spruce, white birch, white cedar and balsam fir.	NE also has larch, jack pine and aspen.
Regeneration	Both have balsam fir and black spruce.	Central has white cedar, red maple and white birch.
Shrubs	Both have mountain maple, twinflower, showy mountain-ash, low sweet blueberry and velvetleaf blueberry.	Central has fly honeysuckle and beaked hazel. NE has dwarf raspberry, creeping snowberry, speckled alder, serviceberry, Labrador-tea, bristly wild rose, swamp red currant, other currants, and red osier dogwood.
Herbs	Both have starflower, bunchberry, goldthread, blue bead lily, wild lily-of-the-valley, sarsaparilla, spinulose shield fern, oak fern and rose twisted-stalk.	Central has ground pine and bracken fern. NE has kidney-leaved violet, sedge, naked mitrewort, fragrant bedstraw, sweet coltsfoot, wood anemone and woodland horsetail.
Number of Herbs	Both have a medium number of herbs.	
Mosses, Liverworts and Lichens	Both have Schreber's moss, broom moss and stair-step moss.	Central has *Bazzania trilobata, Plagiothecium laetum, Cladonia coniocraea* and *Cladonia chlorophaea.* NE has plume moss, electrified cat's tail moss and *Sphagnum* spp.
Ground Surface	Both have moss, deciduous and coniferous litter.	NE has scattered low sphagnum hummocks and small water-filled depressions.
Soil Material		NE site type occurs on a variety of landforms with many coarse fragments on tills. Central site type occurs on morainal, glaciofluvial and lacustrine landforms.
Moisture Regime	Both may be 4 – 5.	Central 0 – 5, NE 4 – 6.
Soil Texture		NE CLMY to CLY, Central SDY to SIY.
Organic Matter Depth		Central less than 20 cm though NE may be up to 40 cm.
Humus Form		Central FMOR to HMOR, NE MODER to PEATYMOR.

Species to note in the Central site type are beaked hazel, bracken fern, red maple, and white birch which may be strong competitors after disturbance. The interpretation for black spruce may be of interest.

NE ST 13 Conifer - Speckled Alder

Eastern White Cedar - Other Conifer **C ES 33**

Variable	Similarities	Differences
Overstorey	Both have eastern white cedar and black spruce.	NE also has larch, white spruce and balsam fir.
Regeneration	Both have balsam fir and black spruce.	Central has eastern white cedar, red maple, white birch and yellow birch.
Shrubs	Both have creeping snowberry, fly honeysuckle, twinflower, showy mountain-ash, speckled alder, dwarf raspberry and velvetleaf blueberry.	Central has mountain maple, northern wild raisin, low sweet blueberry, beaked hazel and mountain-holly. NE has Labrador-tea, red osier dogwood, bristly black currant, bristly wild rose, swamp red currant, wild red raspberry and squashberry.
Herbs	Bunchberry, goldthread, starflower, blue bead lily, wild sarsaparilla, wild lily-of-the-valley and oak fern.	Central has spinulose shield fern and wood sorrel. NE has kidney-leaved violet, naked mitrewort, fragrant bedstraw, wood anemone, three-leaved smilacina, woodland horsetail, sweet coltsfoot and ciliolate aster.
Number of Herbs		Central has a moderate number of herbs while NE is herb rich.
Mosses, Liverworts, and Lichens	Both have *Sphagnum girgensohnii, Sphagnum capillifolium (nemoreum)*, broom mosses and Schreber's moss.	Central has *Bazzania trilobata, Plagiothecium laetum*, *Sphagnum magellanicum* and *Cladonia coniocraea.* NE has stair-step moss, electrified cat's tail moss, plume moss, sickle moss and ribbed bog moss.
Ground Surface	Both have conifer litter and abundant moss cover.	Central also has deciduous litter. NE has abundant water filled depressions.
Soil Material	Both occur on organic soils.	Central may also occur on morainal and glaciofluvial landforms.
Moisture Regime	Both occur on 6 – 8.	
Soil Texture	Both occur on organics.	Central may also occur on SDY, CLMY, and FLMY soils.
Organic Matter Depth		Central greater than 40 cm on organic sites and less than 20 cm on upland sites. NE usually 40 – 120 cm but may be over 120 cm.
Humus Form	Both may be peatymors.	Central may also be fibrimors.

The main difference between the two sites is that the Central ecosite may occur in upland situations, while NE is on peatlands. The presence of red maple, white birch and yellow birch is also significant. After a disturbance these species can be strong competitors. The occurrence of mountain maple and beaked hazel, which are very competitive shrub species in the Central site type, is also of note. The interpretation for black spruce may be of interest.

COMPARISON TABLE FOR

NORTHEAST SITE TYPES AND CENTRAL ECOSITES

NE ST4 Jack Pine - Black Spruce

Jack Pine - Black Spruce **C ES 15.2**

Variable	Similarities	Differences
Overstorey	Both have jack pine and black spruce.	NE also has aspen and balsam fir.
Regeneration	Both have black spruce and balsam fir.	Central also has white birch and red maple.
Shrubs	Both have low sweet blueberry, velvetleaf blueberry, creeping snowberry, sheep laurel, Labrador-tea, trailing arbutus and twinflower.	Central has northern bush honeysuckle, mountain-holly, showy mountain-ash and northern wild raisin.
Herbs	Both have wild lily-of-the-valley, bunchberry, goldthread, blue bead lily and starflower.	Central has bracken fern, large-leaved aster and sarsaparilla.
Number of Herbs	Both are herb poor.	
Mosses, Liverworts and Lichens	Both have Schreber's moss and broom moss.	Central has *Sphagnum girgensohnii*. NE has plume moss, reindeer lichen, *Sphagnum nemoreum* and stair-step moss.
Ground Surface	Both have moss and conifer litter.	Central also has broadleaf litter.
Soil Material	Both may be glaciofluvial or lacustrine.	NE may also be eolian with few coarse fragments. Central may also be morainal with few to many coarse fragments.
Moisture Regime	Both may be 2 – 5.	NE 0 – 5 with most as 3 or 4, Central 2-6 with most as 6.
Soil Texture	Both may be SDY or CLMY.	Central may also be SIY.
Organic Matter Depth	Both usually less than 20 cm.	
Humus Form	Both mostly FMOR	Central may also have peatymors.

Central ES15.2 may occur on SDY, CLMY and SIY soils, which is probably the reason for more moist soil conditions than those usually found on NE ST4. Both white birch and red maple in the regeneration layer of the Central ecosite may respond positively to disturbance as will bracken fern and large-leaved aster (the aster spreading by vegetative reproduction). The interpretations for both jack pine and black spruce may be of interest.

COMPARISON TABLE FOR

NORTHEAST SITE TYPES AND CENTRAL ECOSITES

NE ST 12 Black Spruce - Speckled Alder

Black Spruce - Tamarack **C ES 31**

Variable	Similarities	Differences
Overstorey	Both have black spruce and larch.	
Regeneration	Both have black spruce and balsam fir.	
Shrubs	Both have low sweet blueberry, creeping snowberry, Labrador-tea, velvetleaf blueberry and speckled alder.	Central also has sheep laurel, northern wild raisin, and mountain-holly. NE also has small cranberry, dwarf raspberry and leatherleaf.
Herbs	Both have bunchberry, goldthread and three-leaved smilacina.	Central has blue bead lily, while NE has naked mitrewort, woodland horsetail, wood anemone and northern comandra.
Number of Herbs		Central is herb poor while NE has a moderate number of herbs.
Mosses, Liverworts and Lichens	Both have Schreber's moss, *Sphagnum girgensohnii, Sphagnum nemoreum (capillifolium),* broom moss, *Sphagnum magellanicum* and reindeer moss.	Central has *Ptilidium ciliare, Cladonia coniocraea, Cladonia chlorophaea.* NE has plume moss.
Ground Surface	Both have abundant moss cover with patches of litter.	NE has small water-filled depressions.
Soil Material	Both occur on organic soils.	Central may also occur on glaciofluvial, morainal and lacustrine landforms.
Moisture Regime	Both may be 6 – 8.	Central 2 – 8, NE 6 – 8.
Soil Texture	Both will occur on organics.	Central will also occur on CLMY and SIY.
Organic Matter Depth	Both typically greater than 40 cm.	NE may also be greater than 120 cm.
Humus Form	Both have peatymors.	Central may also be FMOR.

The major difference between these two site types is that the Central one may occur on both organic and mineral soils. Consequently, these substrates must be treated differently. The Central ecosite has sheep laurel which is known to be allelopathic to black spruce and balsam fir. The interpretation for black spruce may be of interest.

COMPARISON TABLE FOR

NORTHEAST SITE TYPES AND CENTRAL ECOSITES

NE ST 2b Jack Pine - Very Coarse Soil

White Pine - Red Pine - Jack Pine **C ES 13.2**

Variable	Similarities	Differences
Overstorey	Both have jack pine, white spruce, red pine and occasional white pine.	NE also has black spruce.
Regeneration	Both have balsam fir and white birch.	Central also has red maple, white spruce, white pine and red oak.
Shrubs	Both have low sweet blueberry, northern bush honeysuckle, velvetleaf blueberry and serviceberry.	Central has wintergreen and beaked hazel. NE has twinflower, trailing arbutus and creeping snowberry.
Herbs	Both have bunchberry and wild lily-of-the-valley.	Central also has bracken fern, rice grass, large-leaved aster, starflower, sarsaparilla and ground cedar.
Number of Herbs	Both are herb poor.	
Mosses, Liverworts and Lichens	Both have Schreber's moss and broom moss.	Central has *Brachythecium salebrosum, Callicladium haldanianum, Cladonia coniocraea, Cladonia chlorophaea* and *Cladonia mitis.* NE has reindeer moss, coral lichen and plume moss.
Ground Surface	Both have mosses and conifer litter.	There is a continuous carpet of moss in the NE. Central has some deciduous litter.
Soil Material	Both occur on glaciofluvial and morainal landforms.	Central may be eolian, while NE may be shallow water lacustrine. NE may have many coarse fragments, Central may have few to many coarse fragments.
Moisture Regime		NE 0 – 3, Central 2 – 3.
Soil Texture		Central occurs on a broad array of soil textures, SDY, CLMY, SIY, FLMY. NE may be on SDY and CLMY.
Organic Matter Depth	Both usually less than 10 cm.	NE may be up to 20 cm.
Humus Form	Both may be MODER or FMOR.	Central may also be HMOR.

Central ES13.2 is a poor match for any NE site type. Central Region foresters managing for jack pine on this ecosite may consider management interpretations for NE ST2b, with caution. The major differences in soil texture are significant. The presence of beaked hazel, bracken fern and large-leaved aster are of concern due to their competitive ability after a disturbance. This site would probably not be managed for any boreal species.

NE ST 8 Black Spruce - Feathermoss - Sphagnum

Black Spruce - Mixedwood **C ES 16.2**

Variable	Similarities	Differences
Overstorey	Both have black spruce and aspen.	NE also has jack pine.
Regeneration	Both have black spruce and balsam fir.	Central has red maple and white birch.
Shrubs	Both have low sweet blueberry, velvetleaf blueberry, creeping snowberry, twinflower, sheep laurel and Labrador-tea.	Central has northern bush honeysuckle, northern wild raisin, and mountain-holly.
Herbs	Both have bunchberry, wild lily-of-the-valley and goldthread.	Central has blue bead lily, bracken fern, large-leaved aster and ground pine. NE has woodland horsetail and sedges.
Number of Herbs	Both are herb poor.	
Mosses, Liverworts, and Lichens	Both have Schreber's moss, reindeer lichen and broom moss.	Central has *Ptilidium ciliare*, while NE has *Sphagnum girgensohnii,* plume moss, stair-step moss, liverworts, and *Sphagnum* spp. The lack of sphagnum in Central region is significant.
Ground Surface	Both have conifer litter and feathermoss.	Central has broadleaf litter. NE has sphagnum mosses on low hummocks.
Soil Material		Central is glaciofluvial or morainal while NE may occur on a variety of materials and landforms.
Moisture Regime	Both may be 4 – 6.	Central may be 2 – 6 while NE is 4 – 6.
Soil Texture	Both may be CLMY, MLMY or SIY.	Central may be SDY or organic, while NE may be FLMY or CLY.
Organic Matter Depth		Central typically less than 20 cm, while NE is commonly 20 – 40 cm and may go as low as 0-10.
Humus Form	Both typically fibrimors	NE may also be HMOR or Fibric peatymor.

Central ES16.2 is a poor match for any NE site types. Management interpretations for NE ST8 could be used with caution by managers in Central region. Differences to consider would include soil texture, moisture regime and presence of sphagnum in ST8. Bracken fern and large-leaved aster are found on the Central ecosite. Both respond positively to disturbance. The primary interpretation is for black spruce, while aspen is a secondary interpretation.

NORTHEAST SITE TYPES AND CENTRAL ECOSITES

NE ST 3b Mixedwood Coarse Soil

Poplar - White Birch **C ES 17.1**

Variable	Similarities	Differences
Overstorey	Both have white birch.	Central has largetooth aspen, while NE has aspen, jack pine, black spruce, white spruce, balsam fir and red pine.
Regeneration	Both have balsam fir, white birch and aspen.	Central has red and sugar maple. NE has black spruce and white spruce.
Shrubs	Both have low sweet blueberry, northern bush honeysuckle and velvetleaf blueberry.	Central has beaked hazel, fly honeysuckle and mountain maple. NE has twinflower, serviceberry, mountain-ash, creeping snowberry and willow.
Herbs	Both have blue bead lily, sarsaparilla, wild lily-of-the-valley, starflower, bracken fern, bunchberry and goldthread.	Central has large-leaved aster, rose twisted-stalk and shining clubmoss. NE has other clubmosses.
Number of Herbs		NE is herb poor while Central has a medium number of herbs.
Mosses, Liverworts and Lichens	Both have Schreber's moss.	Central has *Callicladium haldanianum,* and *Cladonia coniocraea.* NE has broom moss, plume moss, reindeer lichen, stair-step moss and *Brachythecium* spp.
Ground Surface	Both have broadleaf litter.	NE also has conifer litter with sparse patches of lichens.
Soil Material	Both may be glaciofluvial or morainal.	NE may also be lacustrine on various landforms and often on stratified soils or at landform boundaries. Coarse fragments are frequent, especially on tills.
Moisture Regime	Both may be 0 – 1.	NE may also be 2 – 5.
Soil Texture	Both may be SDY or CLMY.	Central may also be SIY.
Organic Matter Depth	Both typically less than 10 cm.	NE may be as high as 20 cm.
Humus Form	Both are typically fibrimor.	NE may also be MODER or HMOR.

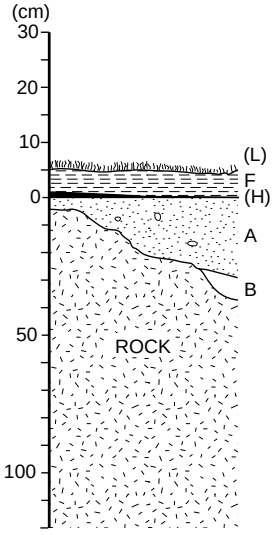
ES17.1 does not closely match any site types in the NE, due to the dominance of white birch and largetooth aspen and different soil textures. The presence of red and sugar maple in the understorey are of note since they can respond positively to disturbance. There are further concerns in the shrub layer with beaked hazel and mountain maple, both of which respond positively to disturbance. In the herb layer large-leaved aster may be of concern. The interpretation for aspen is of interest for this ecosite.

Section II
Ecological and Management Interpretations

Very Shallow Soil

ST 1

Description: Coniferous mixedwood stands on dry to fresh, very shallow soils (0 to 30 cm) over bedrock. Medium number of shrubs, herb poor (n = 20).



Overstorey: Black spruce[6], Jack pine[5], White spruce[2], Trembling aspen[2], White birch[1], Balsam fir[1], White pine[1], Larch[1].

Shrubs: Black spruce, Balsam fir, White birch, White spruce; Early low blueberry, Velvetleaf blueberry, Mountain ash spp., Serviceberry spp., Twinflower, Creeping snowberry, Bush honeysuckle, Labrador-tea.

Herbs: Bunchberry, Blue bead lily, Wild lily-of-the-valley, Bracken fern, Goldthread, Starflower.

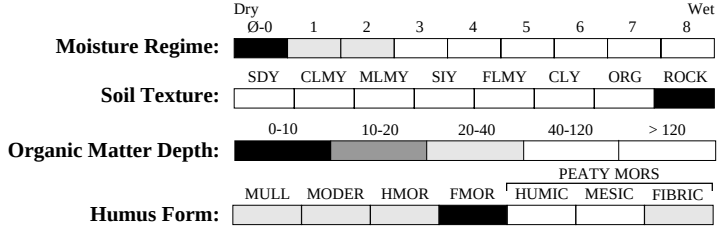
Mosses & Lichens: Schreber's moss, Broom moss, Reindeer lichen, Liverworts, Yellow-green lichen, Coral lichen.

Vegetation Types: V16[2] V13[2] V14[1] V22[1] other[4]

Ground Surface: Varying proportions of exposed rock, stones, feathermoss, deciduous and coniferous litter. Occasionally local concave pockets contain sphagnum moss.

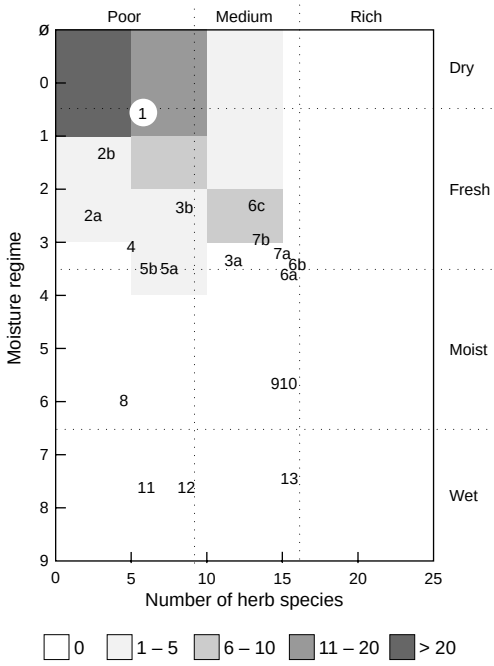
Soil Material: Bedrock or shallow till over rock, on bedrock knobs, ridges, or plateaus. Many coarse fragments.

Soil Types: (SS1 - 4)[10]

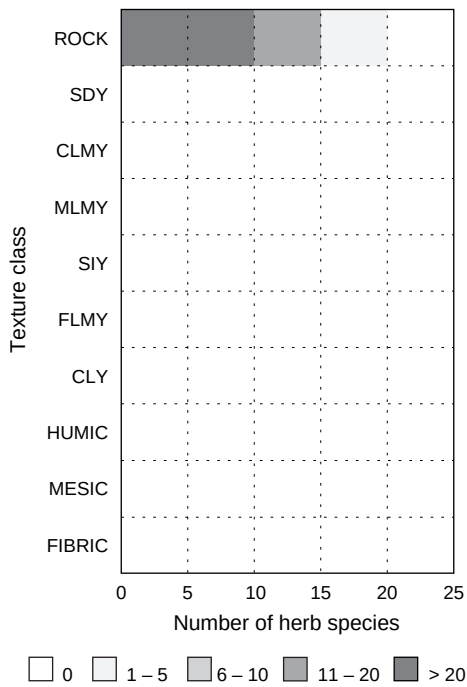


Comments: On bedrock-controlled terrain, associated with bare rock outcroppings and shallow pockets of soil or organic matter in crevices or depressions.

Moisture / Richness Grid

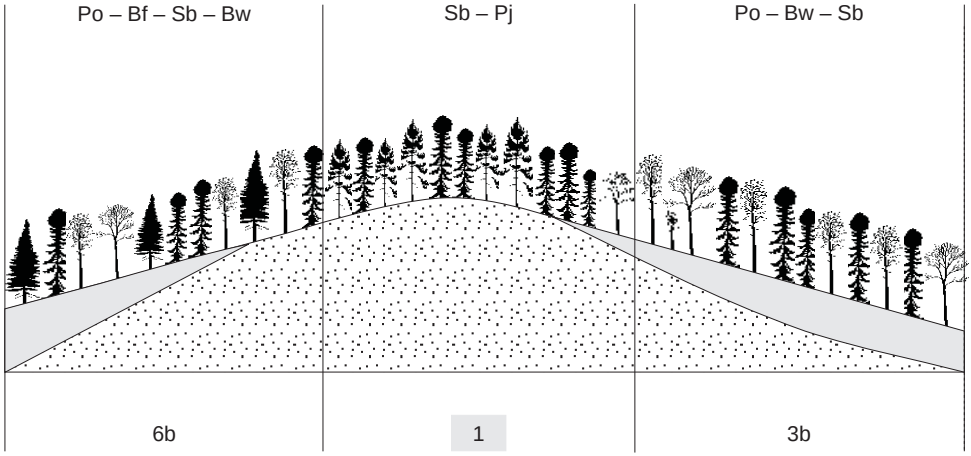


Texture / Richness Grid



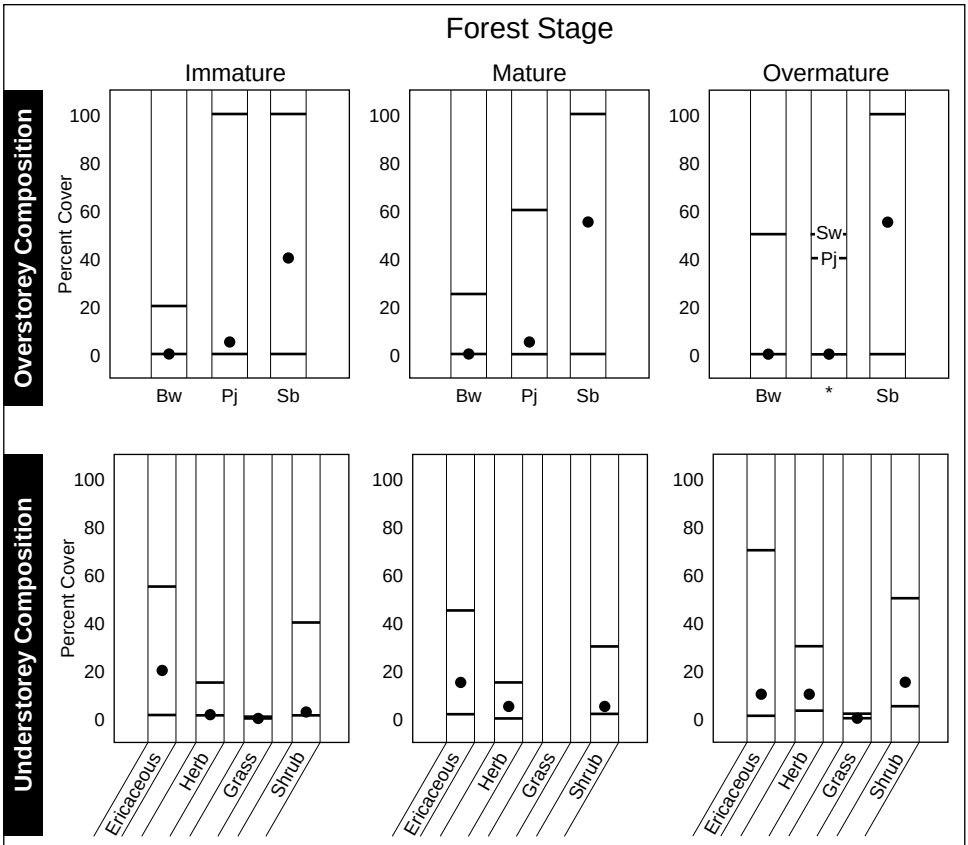
Typical Landscape Associations

Hardwood - Mixedwood Sequence on Shallow Coarse Loamy to Silty Soil



Occurs on bedrock outcrops and associated shallow soils, typically on middle slopes to crests of bedrock ridges and hummocks, or on level bedrock plateaus. A wide range of tree species occupy very shallow soils: black spruce, white cedar, and larch on wet areas; red, white and jack pine, and white birch on dry to fresh; balsam fir, and white spruce on fresh to moist; with pockets of aspen on pockets of deeper soil. Overall the stand is mainly coniferous with hardwoods in scattered pockets. There can be evidence of poor growth in the stand (stunted trees - site class 4), although considerable variation in tree height is typical, due to variation in soil depth and moisture regime. Can occur adjacent to most other site types, depending on the surrounding soil material, depth, and moisture regime.

Site Structure and Composition



Advance Growth

Forest Stage

	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	28600	84	5525	64	9650	66
Bf	5100	48	4275	52	4350	60

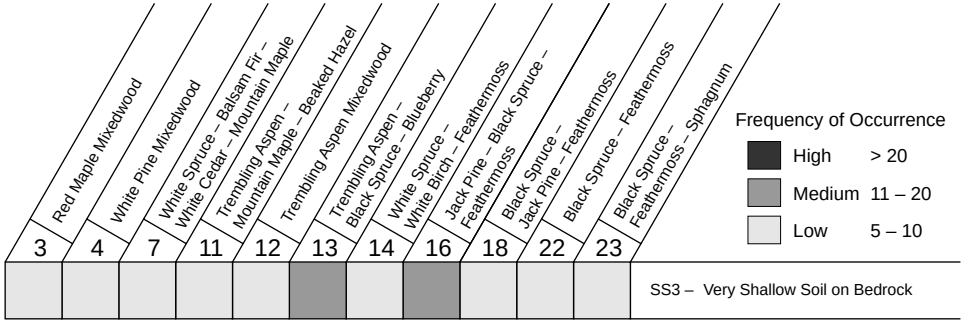
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	6	45	11	13	26	3	56	14	19	8	12	30	34	20	4

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	1	3	6	6	3	6

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

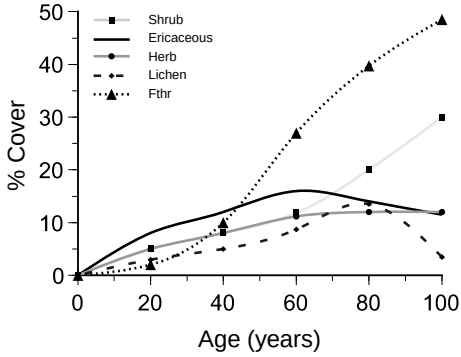


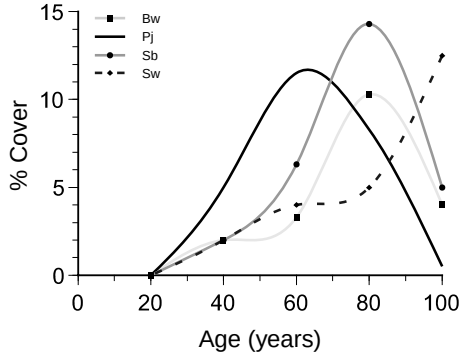
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Sapling	Immature	Mature	Overmature	Special Habitat Preferences
Woodland Caribou				O	O	forage on ground and aboreal lichens / proximity to fen/bog/peatland complexes
Moose (summer)	O	O				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)						
Black Bear (fall foraging)	O					blueberries, raspberries, beaked hazel
Black Bear (cover)		O	O	O	O	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		O	O	O	O	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten						large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		O	O	O	O	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				O	O	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse		O	O	O	O	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker						
Spruce Grouse			O	O	O	young jack pine forest with small open areas for display
Ruffed Grouse						
Black-backed Woodpecker				●	●	large (>30 cm) conifer cavity trees, abundant wood-boring insects
Boreal Chickadee				O	O	dead trees/stumps with soft heartwood for cavities
Least Flycatcher						
White Throated Sparrow	O	O			O	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			O	O	O	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						small breeding ponds, stumps and logs, deep litter

O Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
Varying soil conditions on very shallow sites produce different responses depending on forest stand types. Where the pre-cut stand was dominated by conifers, proliferation of woody shrubs is uncommon, but ericaceous shrubs will dominate the site. An increase in herb species is common on the richer mixedwood sites, especially where the soil veneer is fine-textured.

Response following harvest and mechanical site preparation:
On richer, mixedwood sites with a relatively uniform veneer of mineral soil, an increase in graminoids and hardwood suckering will typically be observed.

Response following harvest and prescribed fire:
Following fire, the growth of grasses, ericaceous shrubs and herbs (especially fireweed) is stimulated. These species can quickly dominate the site within two years. Prescribed fire will control suckering of hardwoods and woody shrubs on the richer mixedwood sites.

Response following harvest and herbicide:
Herbicides will slow the growth of ericaceous shrubs, and reduce the suckering of hardwoods and other shrubs.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature	28600	84	1350			
Mature	10200	68		25	5200	76
Overmature	9900	68	9300	55		
Bf						
Immature	5100	48				
Mature	4600	76	2750	23	4200	64
Overmature	4300	60	6900	64		

shaded sample size ≥ 5 unshaded sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

High probability of obtaining black spruce and jack pine >1000 sph.

Critical Comments

- occasional presence of white cedar, larch, and black ash (associated with moist depressions in the bedrock surface) and red and white pine on very shallow soils
- mixedwood stands occur on richer sites (e.g. level bedrock plateaus with a uniformly thick soil veneer, and sites with very shallow fine-textured mineral soils such as silts and clays), clay veneers occur mainly in the Clay Belt, whereas silty tills are common in some areas in the south part of northeastern Ontario
- this site type is often associated with protection forest (PF) and protection forest reserve (PFR) designations in the forest resource inventory (FRI)

Site Characteristics, Limitations and Hazard Potential

Characteristics									Limitations						Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
	5		1	3		4		2			7	9	9	10	11	Harvesting
	5		1	3	8			2		6	7	9	9	10		Renewal
																Tending

Footnotes

1. These are sites with ≤ 30 cm of mineral soil or < 40 cm of organic over bedrock.
2. Trees on these sites are susceptible to windthrow following harvest.
3. Bare rock outcrops may cause difficulties with harvesting equipment.
4. Terrain can impede harvesting.
5. LFH layer is typically very thin (5 cm or less).
6. Seed and/or seedlings could experience desiccation on these sites.
7. Seasonal flooding due to bedrock may cause problems for renewal.
8. The greatest percentage of these sites range from Ø to 1 moisture regime (very dry).
9. Normal operations may cause site damage when soils are moist, and will cause site damage when wet. Use "best practices" to minimize site damage, or wait until conditions change.
10. Normal operations may cause erosion on soil types SS1 and SS2 (see description in FEC guide) on slopes > 10%. Normal operations may cause erosion of soil types SS3 and SS4 on slopes of 11 to 30% and will cause erosion on slopes > 30%. Best practices may minimize site damage where erosion is possible, but in most high risk cases, normal operations should not be done.
11. High risk of nutrient loss using full tree or tree-length clearcut methods on this site type.

Opportunities

- good site for direct planting
- this site occurs in two phases: a very dry phase with jack pine and black spruce and a fresh phase with white spruce and other conifers
- jack pine cone scattering has worked well on this site

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	2 – 3
Jack pine	M	2 – 3
Aspen	L	1

Site Productivity = FRI Site Class

Degree of Effort		
1	=	Extensive
2	=	Basic
3	=	Intensive
4	=	Elite
N/A	=	Not Appropriate

Site Productivity		
H	=	1 – 2
M	=	2
L	=	2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	Use CLAAG to minimize site damage and protect advance growth.
- Strip/Block	CR	Strips must be no wider than the height of the trees as this is a dry sensitive site. Patch size width must not be wider than one and a half times the height of the trees as this is a dry sensitive site. Cuts should be oriented to minimize the effects of prevailing winds. This cutting technique may be prescribed to meet other management objectives.
- Patch	R	See Conventional comment.
- Seed-tree	CR	Group seed tree. Potential for seasonal drought will limit success of this treatment. Windthrow may be a hazard on this site.
- HARP	NR	HARP applies to peatland black spruce stands only.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		Harvest on frozen ground or use high flotation equipment.
Full-tree	CR	Avoid this technique on the dry phase of this site (i.e. black spruce, jack pine only in overstorey). See Logging Method comment.
Tree-length	CR	See Logging Method comment.
Cut-to-length/Shortwood	CR	See Logging Method comment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Use light site preparation on this site due to thin LFH layer.
• Chemical	R	
• Prescribed Burn	CR	Low severity fires on this site (average depth of burn should not remove more than 20 % of organic matter).
Regeneration		
• Natural		
- Advance Growth	R	
- Seed	R	
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	R	
- Planting	R	
- Scarification	R	
Tending Treatments		
Cleaning		
• Manual	R	Treatment generally not required.
• Mechanical	R	See Manual Cleaning comment.
• Chemical		
- Ground	R	See Manual Cleaning comment.
- Aerial	R	See Manual Cleaning comment.
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Jack Pine

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Cuts should be oriented to minimize the effects of prevailing winds. Residual stand will not contribute seed of sufficient quantity or genetic quality. However, this cutting technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	NR	Potential for seasonal drought will limit success of this treatment. Windthrow may be a hazard on this site.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This species is shade intolerant. It is generally not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		Harvest on frozen ground or use high flotation equipment.
Full-tree	CR	Avoid this technique on the dry phase of this site (i.e. black spruce, jack pine only in overstorey). See Logging Method comment.
Tree-length	CR	See Logging Method comment.
Cut-to-length/Shortwood	CR	See Logging Method comment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

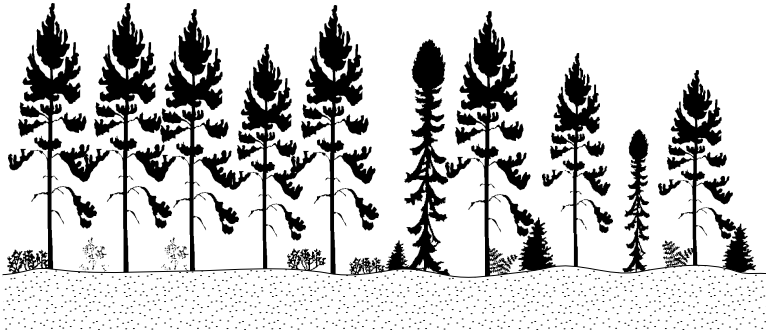
Silvicultural Interpretations for the Establishment of Jack Pine (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Use light site preparation on this site due to thin LFH layer.
• Chemical	R	
• Prescribed Burn	CR	Low severity fires on this site (average depth of burn should not remove more than 20 % of organic matter).
Regeneration		
• Natural		
- Advance Growth	NR	Jack pine does not regenerate under a closed canopy.
- Seed	CR	Requires good distribution of mineral soil and a seed source to remain on site.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	R	
- Planting	R	
- Scarification	CR	Use light scarification on this site due to thin LFH layer. Jack pine cone scattering has worked well on these sites.
Tending Treatments		
Cleaning		
• Manual	R	Treatment generally not required.
• Mechanical	R	See Manual Cleaning comment.
• Chemical		
- Ground	R	See Manual Cleaning comment.
- Aerial	R	See Manual Cleaning comment.
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

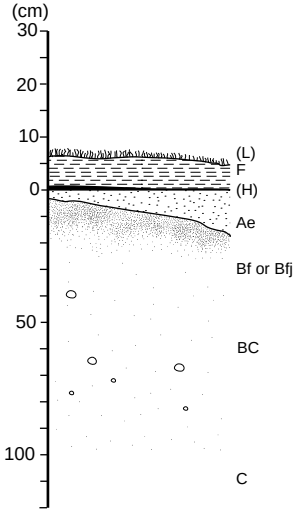
The establishment of aspen is not an appropriate management objective for this site type.

Jack Pine – Coarse Soil



ST 2a

Description: Jack pine stands on deep, fresh, sandy to coarse loamy soils. Shrub and herb poor with abundant feathermoss and lichens (n = 21).



Overstorey: Jack pine[10], Black spruce[2], Trembling aspen[1].

Shrubs: Black spruce, Balsam fir; Early low blueberry, Velvetleaf blueberry, Trailing arbutus, Creeping snowberry, Twinflower, Willow spp., Bush honeysuckle, Serviceberry spp., Sheep laurel.

Herbs: Bunchberry, Wild lily-of-the-valley.

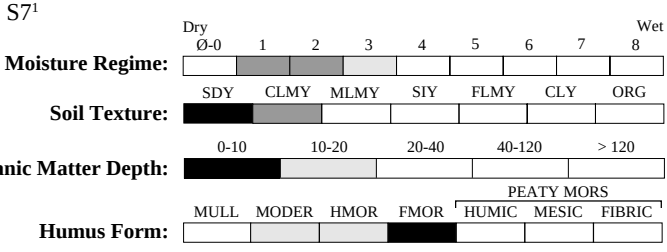
Mosses & Lichens: Schreber's moss, Reindeer lichen, Broom moss, Coral lichen, Plume moss.

Vegetation Types: V15[6] V16[3] V18[1]

Ground Surface: Usually a continuous carpet of feathermoss, with sparse patches of lichen and coniferous litter.

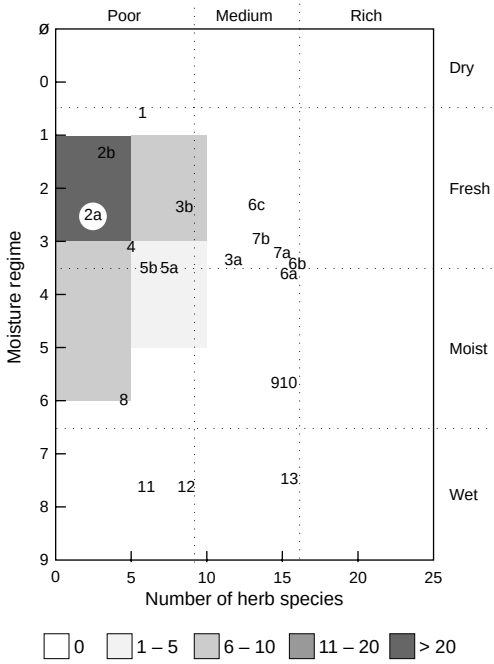
Soil Material: Glaciofluvial, shallow water lacustrine or eolian, fine or very fine sands with few coarse fragments. On outwash plains, deltas, sides of eskers, esker complexes, sand dunes.

Soil Types: S1[4] (S2, S5)[3] S6[2] S7[1]

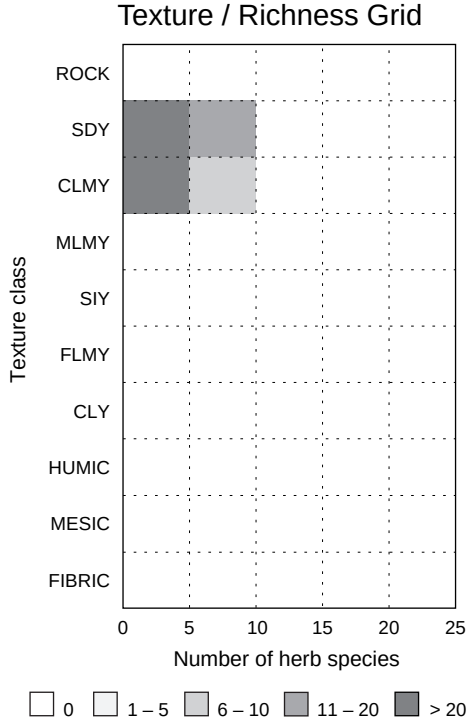


Comments: Black spruce shrubs often present in the understorey.

Moisture / Richness Grid

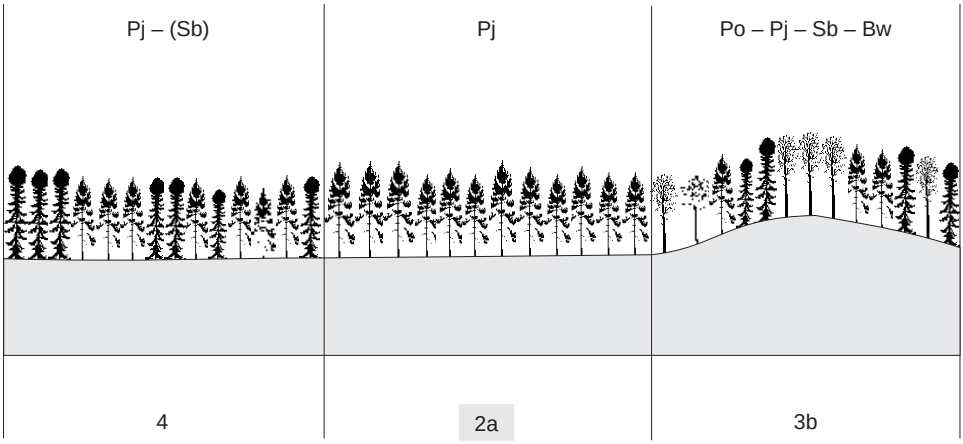


Texture / Richness Grid



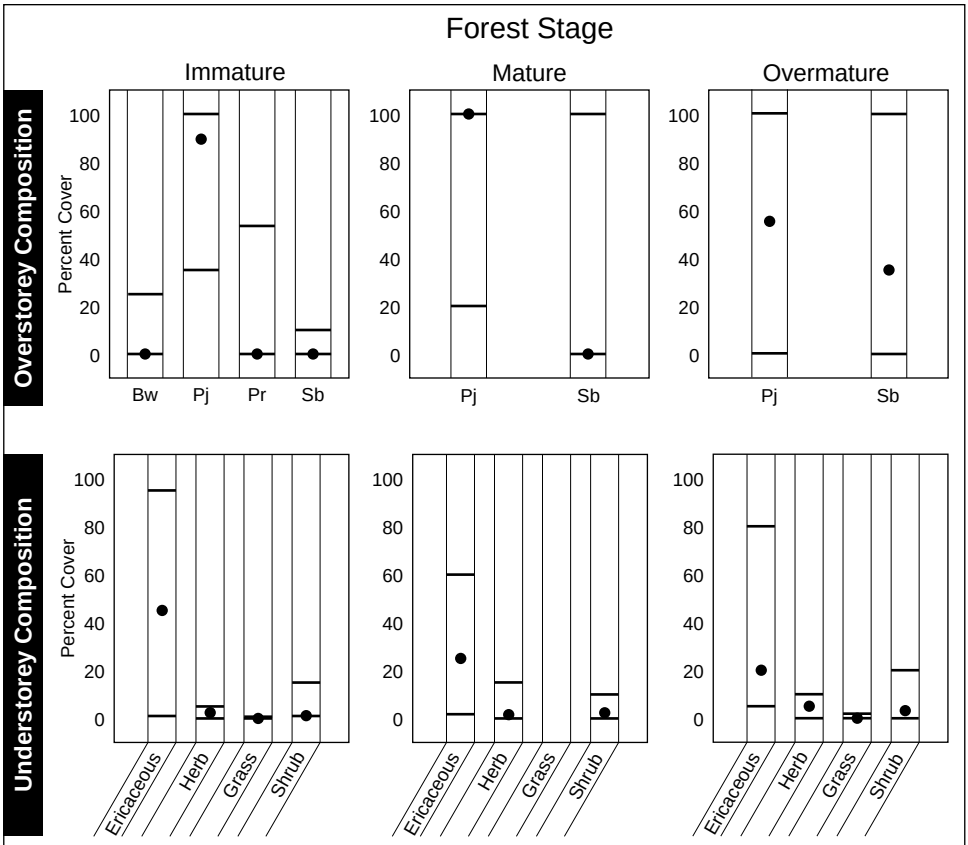
Typical Landscape Associations

Jack Pine - Mixedwood Sequence on Sandy to Coarse Loamy Soil



These site types occur most often on sandy glaciofluvial (water-laid) landforms, including freely-drained, level outwash plains, ridged or hummocky eskers, esker complexes, kames, kettle and kame sequences, and sand dunes; or on sandy lacustrine deposits including beach ridges, and freely-drained sandy lake plains. Stand types include nearly pure stands of uniformly tall jack pine and/or red pine, jack pine stands with a black spruce component, and occasionally pure black spruce stands. ST2a is associated with the fine and medium sands found on level sandy outwash, flanks of eskers, lakebed sand plains and deltas. ST3b, 4, and 6c occur on similar landforms.

Site Structure and Composition



Advance Growth

	Forest Stage					
	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	0	0	7250	65	4450	52
Bf	125	5	500	20	400	10

Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	0	67	6	27	0	6	66	3	19	7	11	71	1	13	3

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	1	2	2	6	2	3

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

15 Jack Pine – Blueberry – Feathermoss	16 Jack Pine – Black Spruce – Feathermoss	18 Black Spruce – Jack Pine – Feathermoss	
■	■		S1 – Dry to Fresh Non-calcareous Sandy
			S2 – Dry to Fresh Calcareous Sandy
			S3 – Fresh to Moist Non-calcareous Sandy
			S5 – Dry to Fresh Non-calcareous Coarse
			S6 – Dry to Fresh Calcareous Coarse
			S7 – Fresh to Moist Non-calcareous Coarse Loamy

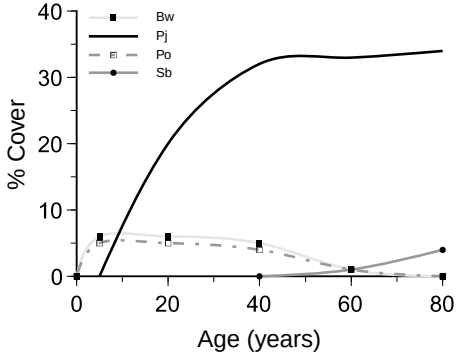
Frequency of Occurrence
- High > 20
- Medium 11 – 20
- Low 5 – 10

Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Sapling	Immature	Mature	Overmature	Special Habitat Preferences
Woodland Caribou				●	●	forage on ground and aboreal lichens / proximity to fen/bog/peatland complexes
Moose (summer)	○	○				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)						
Black Bear (fall foraging)	●					blueberries, raspberries, beaked hazel
Black Bear (cover)		○	○	○	○	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		○	○	○	○	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	○	○	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		○	○	○	○	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	○	○	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker						
Spruce Grouse			●	●	○	young jack pine forest with small open areas for display
Ruffed Grouse						
Black-backed Woodpecker				●	●	large (>30 cm) conifer cavity trees, abundant wood-boring insects
Boreal Chickadee				○	○	dead trees/stumps with soft heartwood for cavities
Least Flycatcher						
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	○	○	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural



Successional Relationships — Post-treatment

Response following harvest:
Woody shrubs increase in abundance from sprouts. Ericaceous shrubs increase in vigor and abundance with a corresponding increase in fruit yields.

Response following harvest and mechanical site preparation:
Soil disturbance will stimulate the growth of woody shrubs and hardwood suckering, especially from aspen (if present prior to cutting). Buried branch parts of shrubs and hardwoods will root and produce new plants. Ericaceous shrubs will increase in abundance by sprouting from rhizomes.

Response following harvest and prescribed fire:
Long slow burns will decrease sprouting of woody shrubs, whereas quick hot fires will increase sprouting. Ericaceous shrubs sprout following light fires, but sprouting is suppressed by severe fires. Deep-rooted herb species are well adapted to survive and re-establish after fire, and tend to increase in abundance.

Response following harvest and herbicide:
Herbicide use is generally not required until two to five years following harvest, for control of hardwood and woody shrub growth.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature			0	0		
Mature			7250	65		
Overmature	3800	48	5100	56		
Bf						
Immature			125	5		
Mature			500	20		
Overmature	0	0	800	20		

▒ sample size ≥ 5 ☐ sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

Extremely high probability of obtaining > 5000 sph of jack pine.

Critical Comments

- a small hardwood component is sometimes present, generally less than ten percent basal area

Site Characteristics, Limitations and Hazard Potential

Characteristics									Limitations					Hazard Potential			
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
	1	4					3				5	5	6	7		Harvesting
	1				2		3		2		5	5	6			Renewal
																Tending

Footnotes

1. Care must be taken due to thin LFH layer and low nutrient capital of this site.
2. Desiccation of planting stock and seed may take place if very dry season. This can be more of a problem if you don't leave slash on site.
3. Stand and cut boundaries may experience some windthrow.
4. Due to ease of road building on these coarse soils, there is a chance of excessive loss of productive landbase.
5. Normal operations may cause site damage on wet sandy soils, and moist coarse loamy soils. Normal operations will cause damage on wet coarse loamy soils. Use 'best practices' to minimize site damage, or wait until conditions change.
6. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.
7. Moderate to high risk of nutrient loss using full tree clearcut logging, on sandy soils < 60 cm deep or with < 5 cm surface organic matter. Moderate to low risk of nutrient loss using tree-length clearcut logging on sandy soils < 60 cm deep with < 5 cm surface organic matter.

Opportunities

- medium potential site for cone scattering (except on sites with moisture regime between Ø and 0)
- low cost regeneration options are possible
- low competition for regeneration
- all season harvesting
- direct planting possible

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	N/A	N/A
Jack pine	M	2 – 3
Aspen	N/A	N/A

Site Productivity = FRI Site Class

Degree of Effort

1 = Extensive
2 = Basic
3 = Intensive
4 = Elite
N/A = Not Appropriate

Site Productivity

H = 1 – 2
M = 2
L = 2 – 3

Silvicultural Interpretations for the Establishment of Jack Pine

Silvicultural System • Harvest Method	Comments	
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Residual stand will not contribute seed of sufficient quantity or genetic quality. However, this harvest method may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Only use this harvest method on sites with moisture regime greater than or equal to 1. Use prescribed fire of low to moderate severity to open cones and prepare a receptive seedbed.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species which is not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

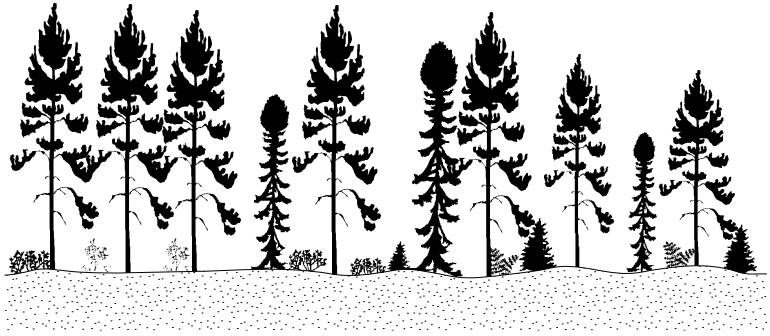
Silvicultural Interpretations for the Establishment of Jack Pine (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Use light site preparation on this site due to thin LFH layer.
• Chemical	R	
• Prescribed Burn	CR	Low to moderate severity fires on this site (no more than 50 % LFH removal).
Regeneration		
• Natural		
- Advance Growth	NR	Jack pine does not regenerate under a closed canopy.
- Seed	CR	Can only be done where a seed source remains on site and there is good mineral soil exposure. Seeding more likely to be successful on moister sites.
- Vegetative (coppice)	NR	Jack pine does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	CR	Only use this regeneration method on sites with moisture regime greater than or equal to 1.
- Planting	R	
- Scarification	CR	See Mechanical Site Preparation comment.
Tending Treatments		
Cleaning		
• Manual	R	Treatment generally not required.
• Mechanical	R	See Manual Cleaning comment.
• Chemical		
- Ground	R	See Manual Cleaning comment.
- Aerial	R	See Manual Cleaning comment.
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

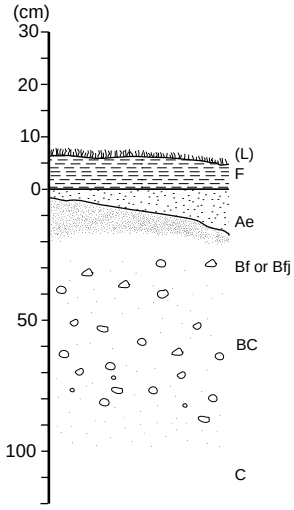
The establishment of aspen or black spruce is not an appropriate management objective for this site type.

Jack Pine – Very Coarse Soil



ST 2b

Description: Coniferous stands on deep, dry to fresh, sandy or coarse loamy soils with many coarse fragments. Shrub and herb poor with abundant feathermoss and lichens (n = 23).



Overstorey: Jack pine [9], Black spruce [4], Red pine [1].

Shrubs: Black spruce, Balsam fir , White birch; Early low blueberry , Velvetleaf blueberry , Twinflower, Trailing arbutus, Creeping snowberry , Serviceberry spp., Bush honeysuckle.

Herbs: Bunchberry , Wild lily-of-the-valley.

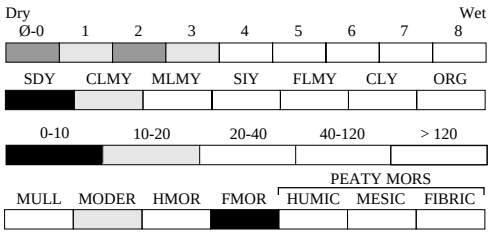
Mosses & Lichens: Schreber 's moss, Reindeer lichen, Broom moss, Coral lichen, Plume moss.

Vegetation Types: V16[4] V15[3] V17[1] V18[1] V5[1]

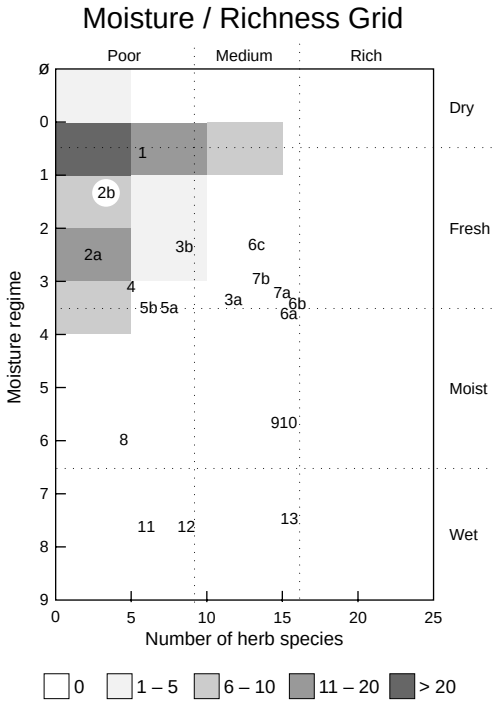
Ground Surface: Usually a continuous carpet of feathermoss and lichens with sparse coniferous litter.

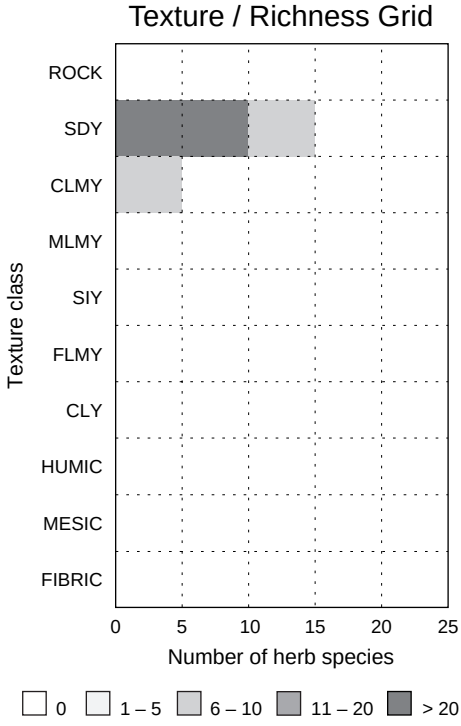
Soil Material: Glaciofluvial, shallow water lacustrine, or morainal. Medium or coarse sands; many coarse fragments. On coarse outwash, tops of eskers, kames, beaches.

Soil Types: S1[7] S2[1] S3[1] (S5, S6) [1]



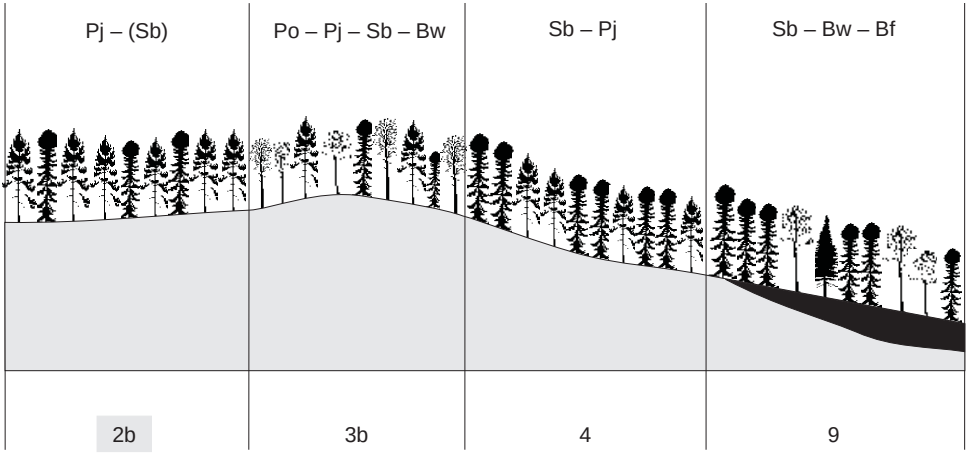
Comments: Red pine stands occur in the south half of the Northeast Region. Sparse presence of white birch trees. Black spruce shrubs common in the understorey .


Moisture / Richness Grid
Poor
Medium
Rich
Ø
0
1
2
3
4
5
6
7
8
9
Dry
Fresh
Moist
Wet
Moisture regime
1
2b
2a
3b
6c
7b
4
7a
3a
6b
5b
5a
6a
910
8
11
12
13
0
5
10
15
20
25
Number of herb species
0
1 – 5
6 – 10
11 – 20
> 20


Texture / Richness Grid
ROCK
SDY
CLMY
MLMY
SIY
FLMY
CLY
HUMIC
MESIC
FIBRIC
Texture class
0
5
10
15
20
25
Number of herb species
0
1 – 5
6 – 10
11 – 20
> 20

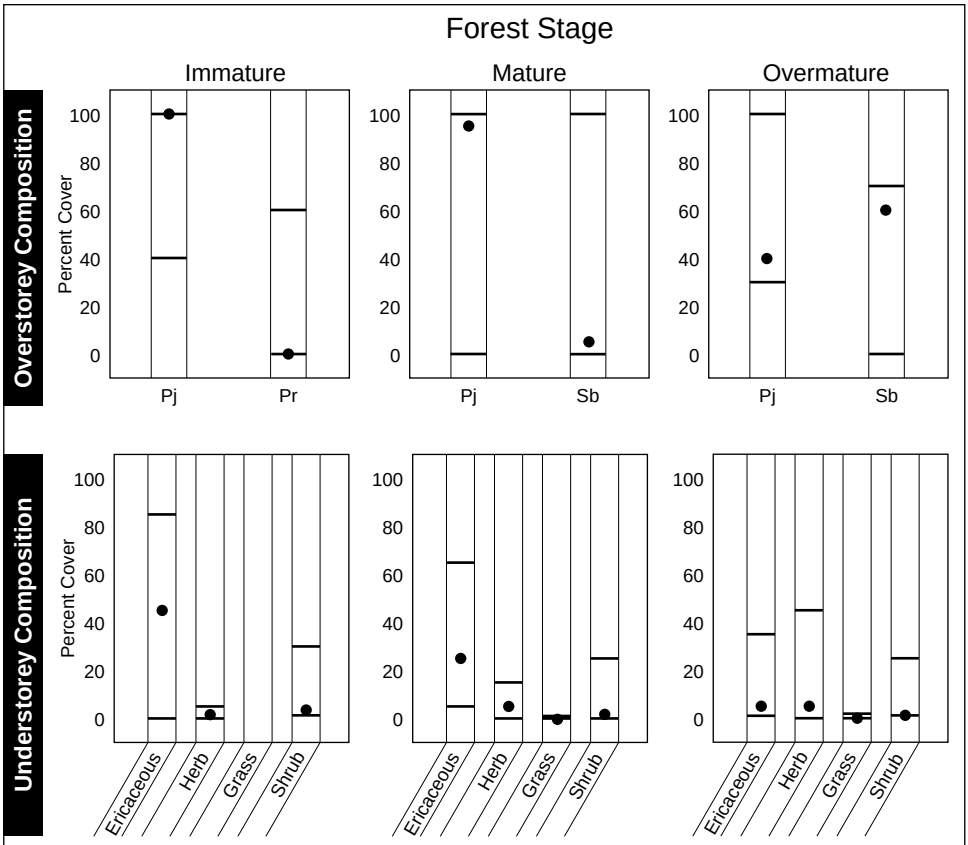
Typical Landscape Associations

Jack Pine - Mixedwood Sequence on Sandy to Coarse Loamy Soil



These site types occur most often on sandy glaciofluvial (water-laid) landforms, including freely-drained, level outwash plains, ridged or hummocky eskers, esker complexes, kames, kettle and kame sequences, and sand dunes; or on sandy lacustrine deposits including beach ridges. ST2b occurs on the coarse sands and gravels found on the upper slopes and crests of eskers, kames, abandoned beach ridges, and on coarse outwash and till. Jack pine and/or black spruce are the dominant species, with more pine than black spruce and some white birch, aspen, or white pine. ST2b also occurs on fresh till materials with high coarse fragment content, sometimes associated with red or white pine stands. ST3b, 4, and 6c occur on similar landforms.

Site Structure and Composition



Advance Growth

Forest Stage

	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	125	5	1500	50	26350	94
Bf	0	0	325	13	0	0

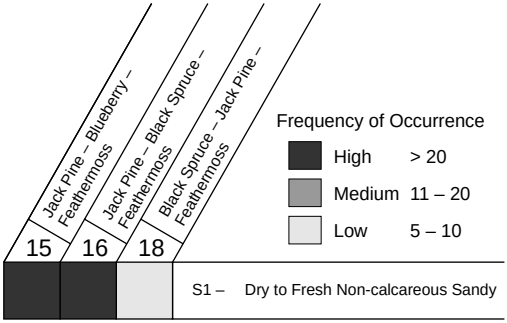
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	0	30	4	51	15	0	70	7	18	6	0	86	3	10	1

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	2	3	3	4	4	3

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

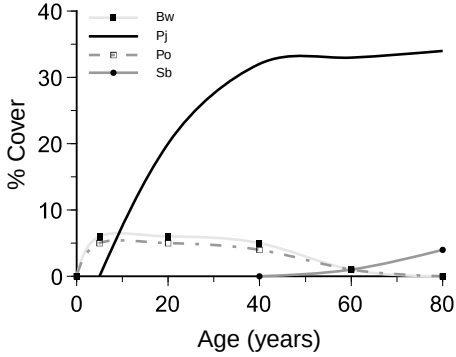


Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Sapling	Immature	Mature	Overmature	Special Habitat Preferences
Woodland Caribou				●	●	forage on ground and aboreal lichens / proximity to fen/bog/peatland complexes
Moose (summer)	○	○				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)						
Black Bear (fall foraging)	●					blueberries, raspberries, beaked hazel
Black Bear (cover)		○	○	○	○	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		○	○	○	○	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	○	○	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		○	○	○	○	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	○	○	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker						
Spruce Grouse			●	●	○	young jack pine forest with small open areas for display
Ruffed Grouse						
Black-backed Woodpecker				●	●	large (>30 cm) conifer cavity trees, abundant wood-boring insects
Boreal Chickadee				○	○	dead trees/stumps with soft heartwood for cavities
Least Flycatcher						
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	○	○	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural



Successional Relationships — Post-treatment

Response following harvest:
Woody shrubs increase in abundance from sprouts. Ericaceous shrubs increase in vigor and abundance with a corresponding increase in fruit yields.

Response following harvest and mechanical site preparation:
Soil disturbance will stimulate the growth of woody shrubs and will stimulate hardwood suckering, especially from aspen (if present prior to cutting). Buried branch parts of shrubs and hardwoods will root and produce new plants. Ericaceous shrubs will increase in abundance by sprouting from rhizomes.

Response following harvest and prescribed fire:
Long slow burns will decrease sprouting of woody shrubs, whereas quick hot fires will increase sprouting. Ericaceous shrubs sprout following light fires, but sprouting is suppressed by severe fires. Deep-rooted herb species are well adapted to survive and re-establish after fire, and tend to increase in abundance.

Response following harvest and herbicide:
Herbicide use is generally not required until two to five years following harvest for control of hardwood and woody shrub growth.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature			125	5		
Mature			1500	50		
Overmature	26600	92	26100	95		
Bf						
Immature			0	0		
Mature			313	13		
Overmature	0	0	0	0		

sample size ≥ 5 sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

Extremely high probability of obtaining > 5000 sph of jack pine.

Critical Comments

- red and white pine mixedwoods sometimes occur on coarse tills with high coarse fragment content
- a small hardwood component is sometimes present, usually less than ten percent basal area

Site Characteristics, Limitations and Hazard Potential

Characteristics									Limitations						Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
	1	4					3				5	5	6	7		Harvesting
	1				2		3		2		5	5	6			Renewal
																Tending

Footnotes

1. Care must be taken due to thin LFH layer and low nutrient capital of this site.
2. Desiccation of planting stock and seed may take place if very dry season. More of a problem if you don't leave slash on site.
3. Stand and cut boundaries may experience some windthrow.
4. Due to ease of road building on these coarse soils, there is a chance of excessive loss of productive landbase.
5. Normal operations may cause site damage on wet sandy soils, and moist coarse loamy soils. Normal operations will cause damage on wet coarse loamy soils. Use 'best practices' to minimize site damage, or wait until conditions change.
6. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.
7. Moderate to high risk of nutrient loss using full tree clearcut logging, on sandy soils < 60 cm deep or with < 5 cm surface organic matter. If sands are coarse or medium, the risk increases by one class, moderate risk of nutrient loss with sandy soils > 60 cm deep and with < 5 cm organic matter. Moderate to low risk of nutrient loss using tree-length clearcut logging on sandy soils < 60 cm deep with < 5 cm surface organic matter.

Opportunities

- medium potential site for cone scattering (except on sites with moisture regime between Ø and 0)
- low cost regeneration options are possible
- low competition for regeneration
- all season harvesting
- direct planting possible
- opportunity for red pine establishment

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	N/A	N/A
Jack pine	M	2 – 3
Aspen	N/A	N/A

Site Productivity = FRI Site Class

Degree of Effort

1 = Extensive
2 = Basic
3 = Intensive
4 = Elite
N/A = Not Appropriate

Site Productivity

H = 1 – 2
M = 2
L = 2 – 3

Silvicultural Interpretations for the Establishment of Jack Pine

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Residual stand will not contribute seed of suf ficient quantity or genetic quality . However , this cutting technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Can only use this harvest method on sites with moisture regime greater than or equal to 1. Use prescribed fire of low to moderate severity to open cones and prepare a receptive seedbed.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species which is not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	Refer to Site Characteristics, Limitations and Hazard Potential Table.
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

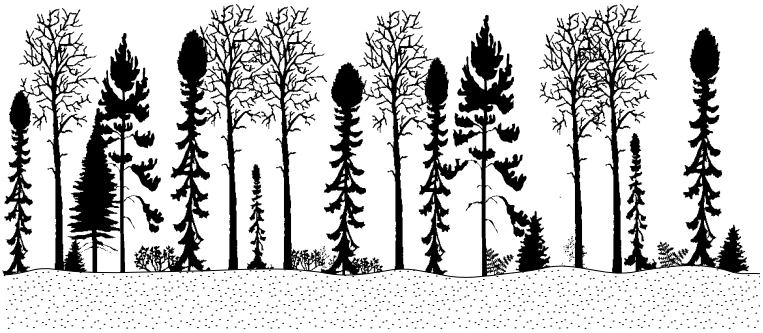
Silvicultural Interpretations for the Establishment of Jack Pine (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Use light site preparation on this site due to thin LFH layer .
• Chemical	R	
• Prescribed Burn	CR	Low to moderate severity fires on this site (no more than 50 % LFH removal).
Regeneration		
• Natural		
- Advance Growth	NR	Jack pine does not regenerate under a closed canopy .
- Seed	CR	Can only be done where a seed source remains on site and there is good mineral soil exposure. Seeding more likely to be successful on moister sites.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	CR	Can only use this regeneration method on sites with moisture regime greater than or equal to 1.
- Planting	R	
- Scarification	CR	See Mechanical Site Preparation comment.
Tending Treatments		
Cleaning		
• Manual	R	Treatment generally not rquired.
• Mechanical	R	See Manual Cleaning comment.
• Chemical		
- Ground	R	See Manual Cleaning comment.
- Aerial	R	See Manual Cleaning comment.
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

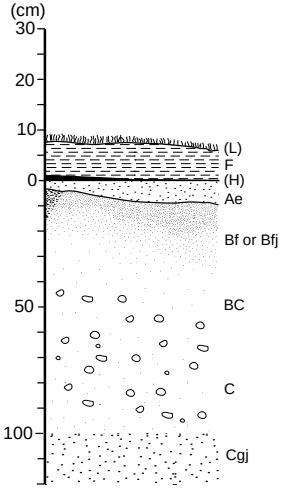
The establishment of aspen or black spruce is not an appropriate management objective for this site type.

Mixedwood – Medium Soil



ST 3a

Description: Mixedwood stands on fresh to moderately moist, silty or medium loamy soils. Medium number of shrubs and herbs, with abundant bush honeysuckle (n = 13).



Overstorey: Trembling aspen [6], Jack pine [5], Black spruce [3], Balsam fir [2], White spruce [1], Balsam poplar [1].

Shrubs: Balsam fir, Black spruce, White birch, Trembling aspen; Twinflower, Bush honeysuckle, Early low blueberry, Velvetleaf blueberry, Creeping snowberry, Labrador-tea, Serviceberry spp., Mountain ash spp.

Herbs: Bunchberry, Wild lily-of-the-valley, Blue bead lily, Goldthread, Starflower, Sarsaparilla, Large-leaved aster, Clubmoss spp., Bracken fern.

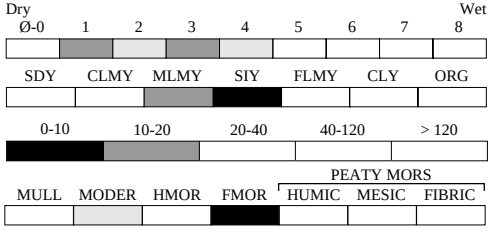
Mosses & Lichens: Schreber's moss, Broom moss, Plume moss, *Brachythecium* spp., Stair-step moss, Common hair-cap moss.

Vegetation Types: V13 [5] V14 [2] (V10, V12, V17, V23) [3]

Ground Surface: Varying proportions of deciduous and coniferous litter and feathermoss, depending on stand composition.

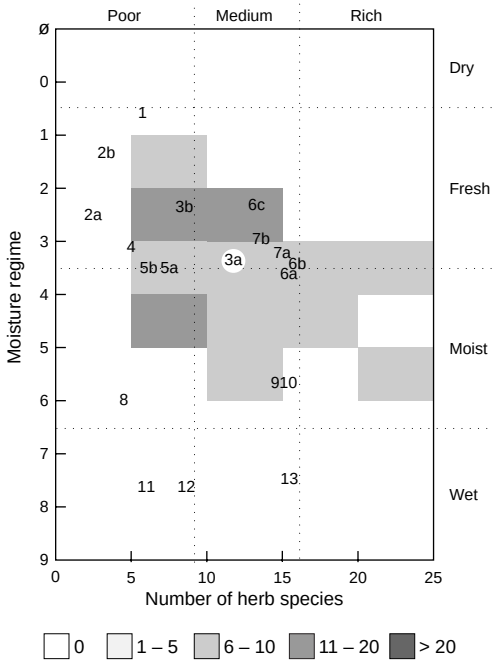
Soil Material: Morainal, glaciofluvial, shallow water lacustrine or eolian. Many coarse fragments, especially on tills. On various landforms, often on stratified soils or at landform boundaries.

Soil Types: S11 [4] S9 [2] S12 [2] S10 [1] S15 [1]

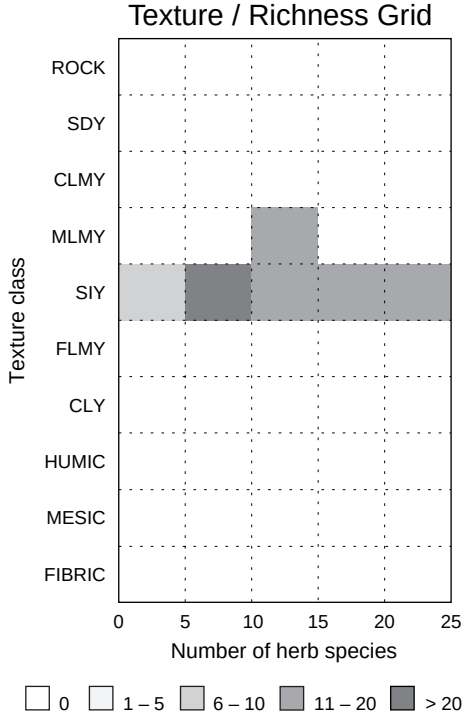


Comments: Abundant balsam fir shrubs present in the understorey. In the Clay Belt, free carbonates often present.

Moisture / Richness Grid

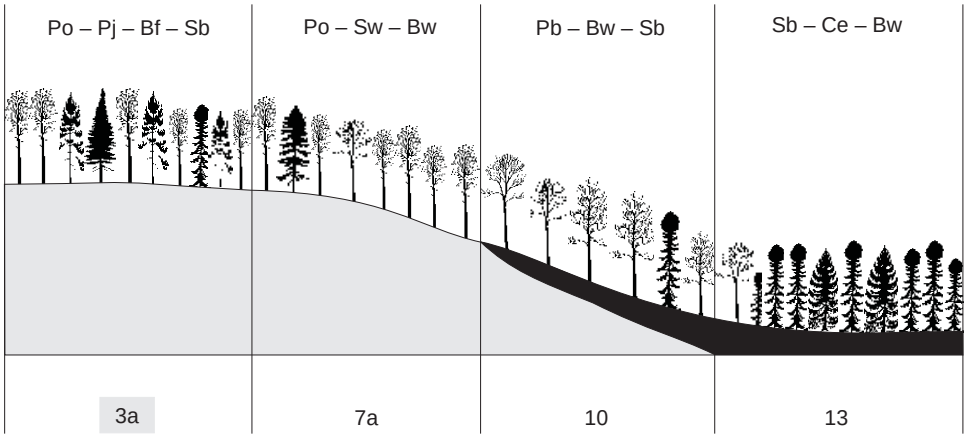


Texture / Richness Grid



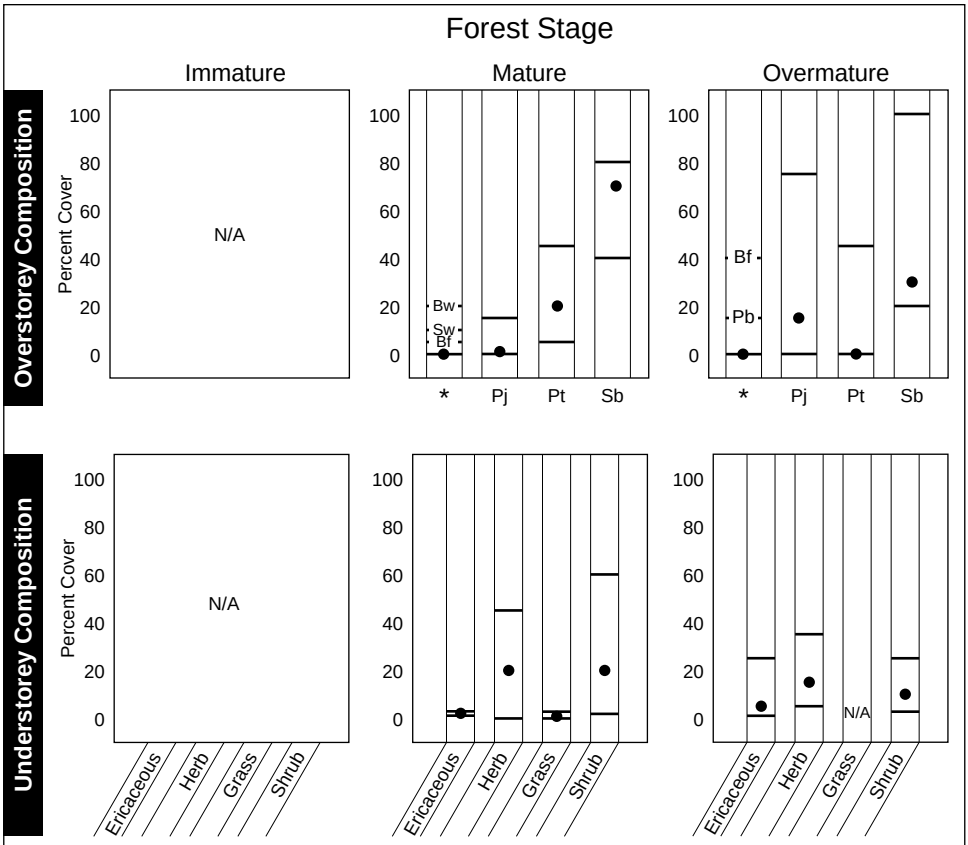
Typical Landscape Associations

Mixedwood Sequence on Medium Loamy to Silty Soil



Associated with silty glaciofluvial deposits (deltas, flanks of esker ridges); silty lakebed deposits (e.g. near the margins of the Clay Belt); stratified soils occurring at landforms edges (e.g. a sandy loam till cap over lacustrine clay); silty alluvial soils on gently sloping areas, especially areas adjacent to waterbodies that undergo periodic flooding; on loams, sandy loams, or silty till soils on middle to lower slopes, in hummocky ablation moraine; on gentle to moderate slopes within enclosed depressional areas and valleys, which are sometimes terraced; and on areas of low relief in rolling to undulating till terrain. In ST3a, mixedwoods dominated by aspen and jack pine, with varying amounts of white birch, black spruce, balsam fir, white spruce, and balsam poplar can be found. ST5b, 6b and 7b occur on similar landforms. ST3a also occurs as small pockets within areas of coarser materials.

Site Structure and Composition



Advance Growth

Forest Stage

	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	375	35	2450	48	7750	60
Bf	10375	100	450	10	25000	95

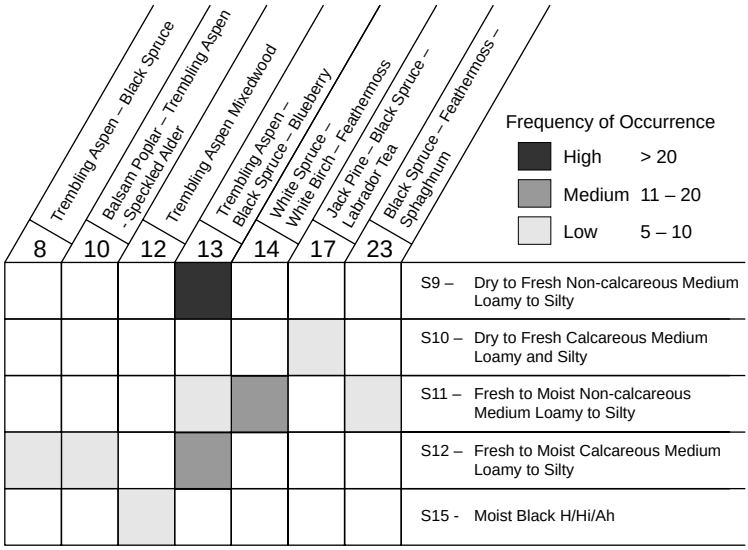
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	N/A	N/A	N/A	N/A	N/A	0	48	37	14	0	0	61	18	20	1

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	N/A	N/A	4	9	7	19

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

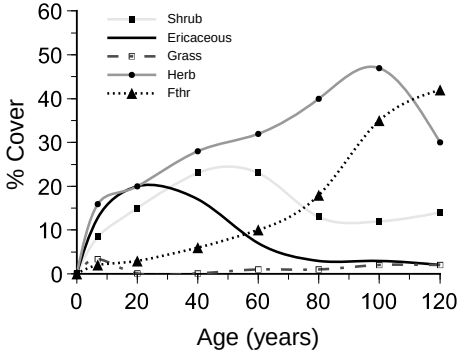


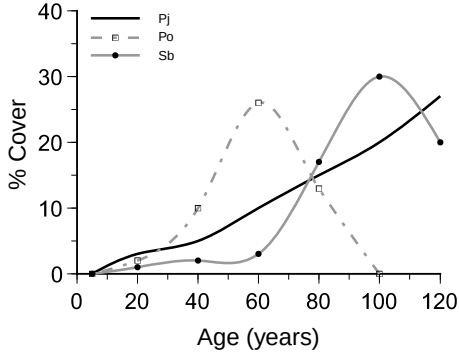
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Sapling	Immature	Mature	Overmature	Special Habitat Preferences
Woodland Caribou						
Moose (summer)	○	○				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)						
Black Bear (fall foraging)	○					blueberries, raspberries, beaked hazel
Black Bear (cover)		○	○	●	●	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		●	○	○	●	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	○	○	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		●	○	○	●	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	●	●	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker				○	○	large (>45 cm) cavity trees, preferably aspen, carpenter ants
Spruce Grouse			○	○	○	young jack pine forest with small open areas for display
Ruffed Grouse		●	●	●	●	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker						
Boreal Chickadee				○	○	dead trees/stumps with soft heartwood for cavities
Least Flycatcher						
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	○	○	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
Aspen increases in abundance following harvest and is the main competitor on these sites. There is a moderate increase in woody shrubs, graminoids, and herbs.

Response following harvest and mechanical site preparation:
Mechanical site preparation stimulates suckering of aspen and increases sprouting of woody shrubs (e.g. beaked hazel). Grasses, raspberry, pin cherry, and herbs also increase in abundance due to stimulation of buried seed and sprouting of rhizomes.

Response following harvest and prescribed fire:
Fire stimulates the growth of grasses and ericaceous shrubs. Severe fires will discourage suckering and sprouting of aspen, white birch and woody shrubs.

Response following harvest and herbicide:
Herbicide application at year three following logging will control most competition problems.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature					375	35
Mature					2450	48
Overmature					7750	60
Bf						
Immature					10375	100
Mature					450	10
Overmature					25000	95

sample size ≥ 5 sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

No information available.

Critical Comments

- largetooth aspen may be present in stands in ST3a along the southern edge of northeastern Ontario in Site Region 4E
- white and red pine sometimes occur as a small component of mixed stands

Site Characteristics, Limitations and Hazard Potential

Characteristics									Limitations						Hazard Potential			
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities		
				2								5	5	6		Harvesting		
				2	1		4		3			5	5	6		Renewal		
							4									Tending		

Footnotes

1. A small percentage of these sites are dry (moisture regime = 1) which will not favor aspen production and desiccation of some planted species and seed may occur.
2. Coarse fragments may hinder some harvesting equipment.
3. Frost heaving may occur if the entire LFH is removed.
4. This site is subject to moderate competition in the understorey.
5. Normal operations may cause site damage when soils are moist, and will cause site damage when wet. Use "best practices" to minimize site damage, or wait until conditions change.
6. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.

Opportunities

- good site for direct planting
- can harvest this site in all seasons
- good site for white spruce establishment
- potential for mixedwood management

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black Spruce	H	3 – 4
Jack Pine	H	3 – 4
Aspen	M	1

Site Productivity = FRI Site Class

Degree of Effort		
1	=	Extensive
2	=	Basic
3	=	Intensive
4	=	Elite
N/A	=	Not Appropriate

Site Productivity		
H	=	1 – 2
M	=	2
L	=	2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method	Comments	
Clearcut	R	CLAAG may favor balsam fir.
• Harvest Method - Conventional	R	
- Strip/Block	CR	This cutting technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Group seed tree. However, additional regeneration treatments will be required.
- HARP	NR	HARP applies to lowland black spruce.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Use light site preparation to minimize excessive mineral soil exposure. Total removal of the LFH layer could result in frost heaving.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	CR	Black spruce advance growth is not of sufficient quantity or distribution to form a major part of the new stand and will have to be augmented with another regeneration option. May also favour balsam fir.
- Seed	CR	Competitive site.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	NR	
• Artificial		
- Seeding	CR	This treatment by itself will not bring back a black spruce dominated site and should only be used when augmented with other regeneration methods.
- Planting	R	
- Scarification	NR	See Natural Seed comment.
Tending Treatments		
Cleaning		
• Manual	CR	This treatment by itself will not give a black spruce dominated site and should only be used when augmented with other cleaning treatments.
• Mechanical	CR	See Manual Cleaning comment.
• Chemical		
- Ground	R	
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Jack Pine

Silvicultural System • Harvest Method	Comments	
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Residual stand will not contribute seed of sufficient quantity or genetic quality. However, this cutting technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	NR	Potential for natural seeding is very low due to low density of jack pine in the original stand.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species which is not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	
Renewal Treatments		
Site Preparation • Mechanical	CR	Apply techniques that maintain a high percentage of the forest floor. Use light site preparation on this site to avoid frost heaving.
• Chemical	R	

R = Recommended **CR = Conditionally Recommended** **NR = Not Recommended**

Silvicultural Interpretations for the Establishment of Jack Pine (con't)

Renewal Treatments		Comments
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Jack pine does not regenerate under a closed canopy.
- Seed	NR	Seed supply is limiting for a jack pine dominated stand. Distribution, abundance and vigour of competitive woody and herbaceous species will inhibit germination, survival and growth of jack pine.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	CR	This treatment by itself will not bring back a jack pine dominated site and should only be used when augmented with other regeneration methods.
- Planting	R	
- Scarification	NR	Potential for natural seeding is very low due to low density of jack pine in the original stand.
Tending Treatments		
Cleaning		
• Manual	CR	This treatment by itself will not give a jack pine dominated site and should only be used when augmented with other cleaning treatments.
• Mechanical	CR	See Manual Cleaning comment.
• Chemical		
- Ground	R	
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Aspen

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strips should be at least 20 m wide to warm the soil and stimulate suckering. This cutting technique may be prescribed to meet other management objectives.
- Patch	CR	Openings 0.4 ha in size are the minimum acceptable to stimulate aspen suckering. This cutting technique may be prescribed to meet other management objectives.
- Seed-tree	NR	Leaving live aspen will reduce suckering.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species which is not suited to this silvicultural system.
Selection	NR	See shelterwood comments.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Aspen (con't)

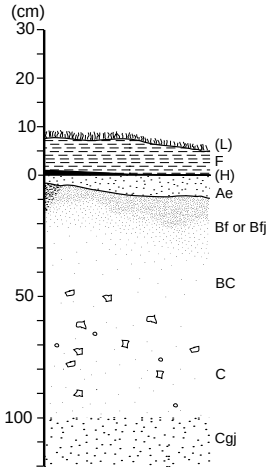
Renewal Treatments		Comments
Site Preparation		
• Mechanical	NR	See Scarification (Section II, Book I).
• Chemical	R	Chemical site preparation may be used on sites where the residual overstorey will negatively affect root suckering. 2,4-D is recommended since it will remove the overstorey without damaging the root systems.
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Aspen does not regenerate under a closed canopy.
- Seed	NR	Reproduction by seed is not an important factor in aspen regeneration.
- Vegetative (coppice)	R	
• Blended	NR	Insufficient data and/or field experience exist to recommend this technique on this site type.
• Artificial		
- Seeding	NR	See Blended comment.
- Planting	NR	See Blended comment.
- Scarification	R	
Tending Treatments		
Cleaning		The literature dealing with pure aspen stands gives the impression that a hands off approach may be the most appropriate form of cleaning for this species.
• Manual	NR	
• Mechanical	NR	
• Chemical		
- Ground	NR	
- Aerial	NR	
Spacing	R	Site quality and timing is critical for the success of this treatment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Mixedwood – Coarse Soil

ST 3b

Description: Mixedwood stands on fresh to moderately moist, sandy to coarse loamy soils. Medium number of shrubs, herb poor, with abundant bush honeysuckle (n=70).



Overstorey: Trembling aspen [6], Jack pine [6], Black spruce [3], White spruce [2], White birch [2], Balsam fir [1], Red pine [1].

Shrubs: Balsam fir, Black spruce, White birch, White spruce, Trembling aspen; Bush honeysuckle, Early low blueberry, Twinflower, Velvetleaf blueberry, Serviceberry spp., Mountain ash spp., Creeping snowberry, Willow spp.

Herbs: Bunchberry, Wild lily-of-the-valley, Blue bead lily, Starflower, Sarsaparilla, Goldthread, Clubmoss spp., Bracken fern.

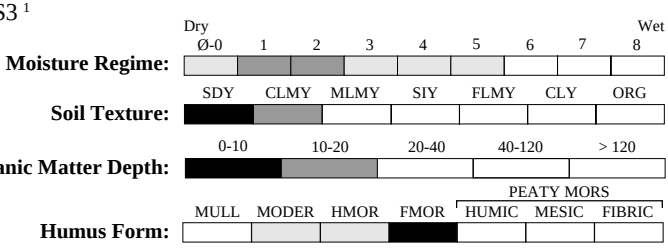
Mosses & Lichens: Schreber's moss, Broom moss, Plume moss, *Brachythecium* spp., Reindeer lichen, Stair-step moss.

Vegetation Types: V13[5] V14[2] V12[1] V17[1] (V5, V15, V23)[1]

Ground Surface: Varying proportions of deciduous and coniferous litter and feathermoss, depending on stand composition, with sparse patches of lichen.

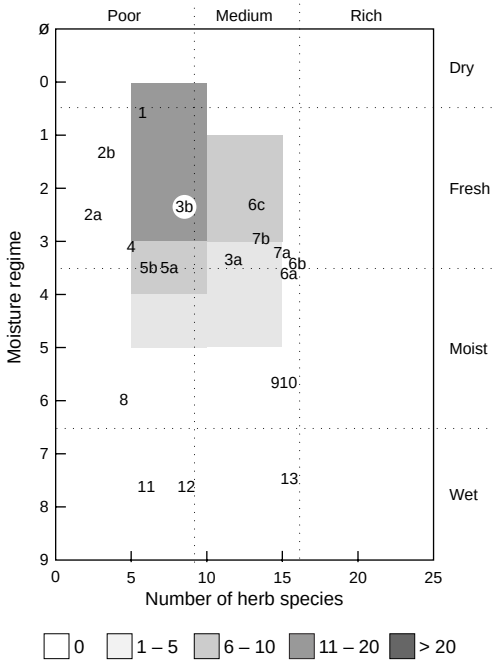
Soil Material: Glaciofluvial, shallow water lacustrine, or morainal. Many coarse fragments, especially on tills. On various landforms, often on stratified soils or at landform boundaries.

Soil Types: S1[3] S2[2] S5[2] S7[2] S3[1]

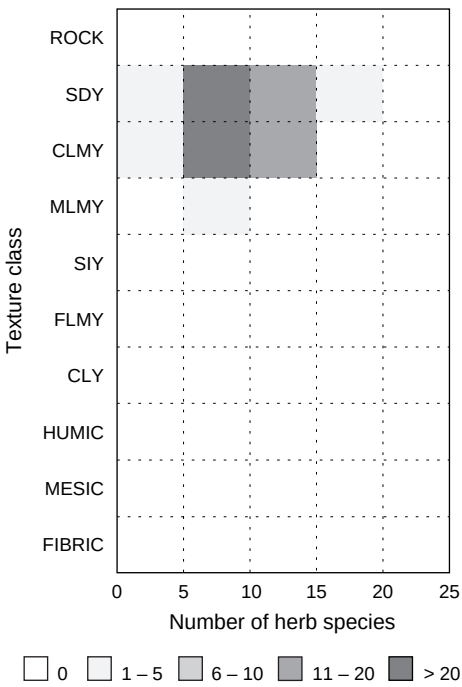


Comments: Balsam fir shrubs common in the understorey. In the Clay Belt, free carbonates often present.

Moisture / Richness Grid

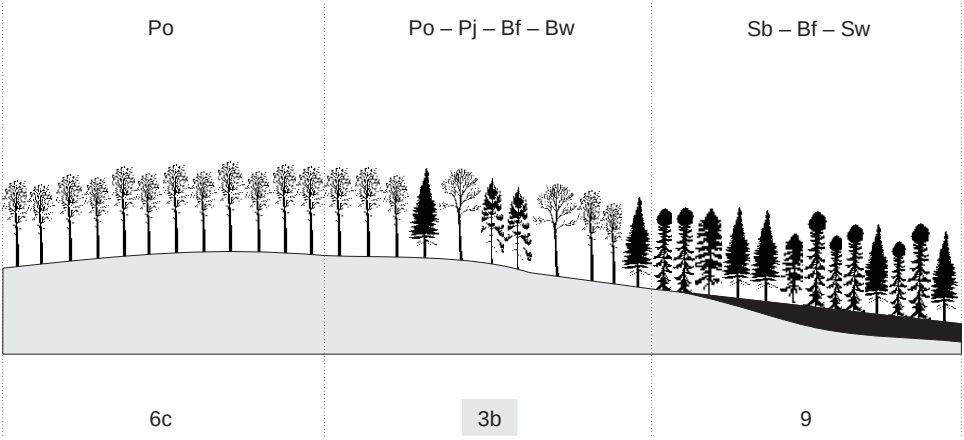


Texture / Richness Grid



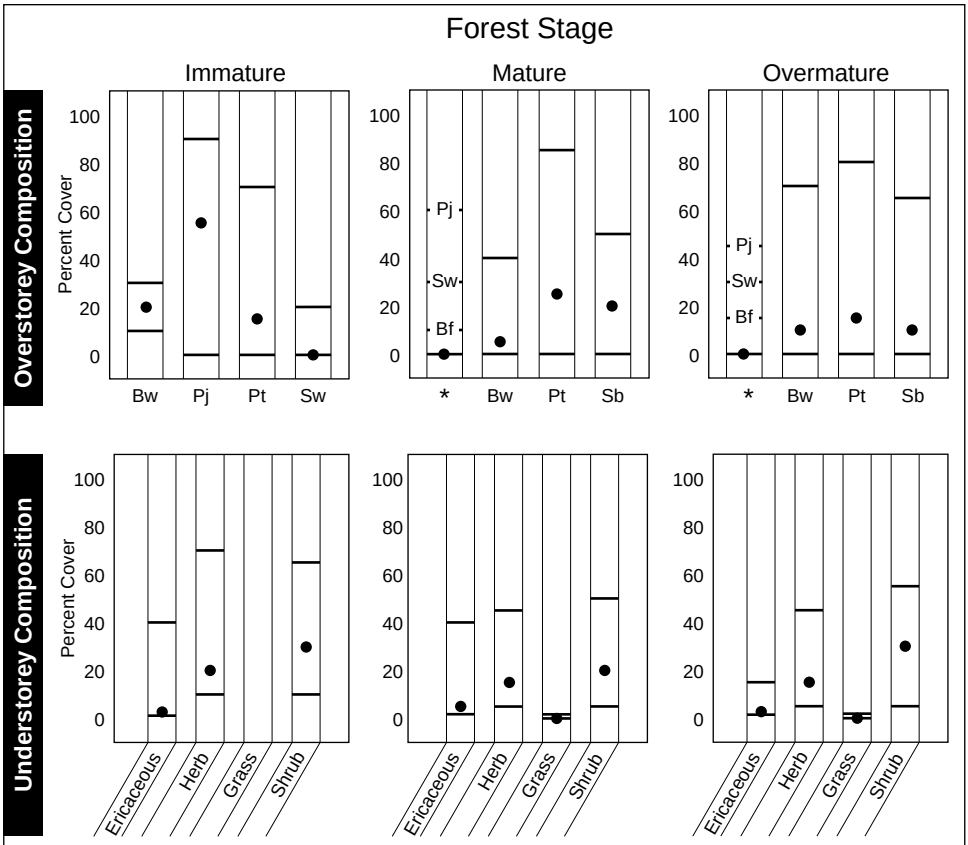
Typical Landscape Associations

Mixedwood Sequence on Coarse Loamy to Silty Soil



Most commonly found on sandy to coarse loamy till, end or ground moraines, glaciofluvial deposits, or on sandy lacustrine deposits and beach ridges. Sandy glaciofluvial landforms include freely-drained, level outwash plains, ridged or hummocky eskers, esker complexes, kames, kettle and kame sequences, and sand dunes. Coarse till deposits include ground moraines, ablation moraines, end and recessional moraines, and shallow drift over bedrock. On sandy glaciofluvial or lacustrine deposits, this site type occurs on level to gently sloping areas. On till deposits, it occurs on gentle to moderate side slopes, or on upper slopes and crests or steep side slopes, often in conjunction with very shallow soils and exposed bedrock. Forest types include mixedwoods dominated by aspen and jack pine, with varying components of black spruce, white spruce, white birch, balsam fir, red and white pine. Associated ST 2a, 2b, 4, and 6c occur on similar landforms.

Site Structure and Composition



Advance Growth

	Forest Stage					
	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	0	0	125	5	8300	32
Bf	175	8	1675	43	10500	88

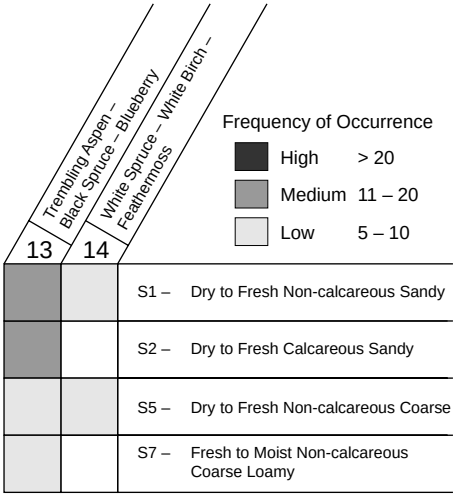
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	0	21	53	26	1	0	25	50	24	1	1	26	53	19	1

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	4	N/A	4	6	5	10

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

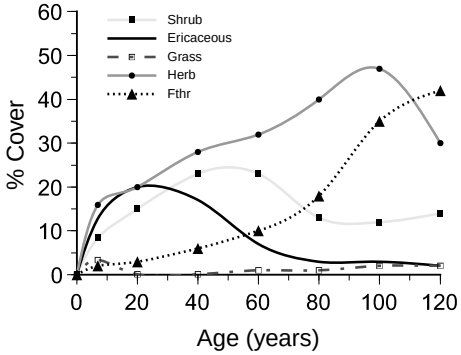


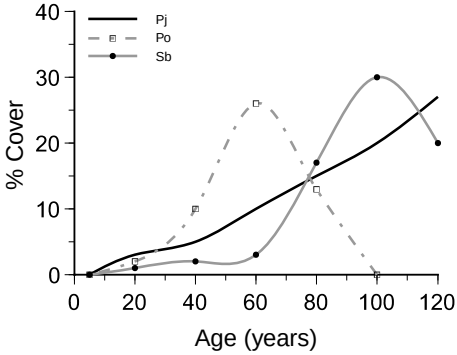
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Sapling	Immature	Mature	Overmature	Special Habitat Preferences
Woodland Caribou						
Moose (summer)	○	○				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)						
Black Bear (fall foraging)	○					blueberries, raspberries, beaked hazel
Black Bear (cover)		○	○	●	●	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		●	○	○	●	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	○	○	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		●	○	○	●	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	●	●	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker				○	○	large (>45 cm) cavity trees, preferably aspen, carpenter ants
Spruce Grouse			○	○	○	young jack pine forest with small open areas for display
Ruffed Grouse		●	●	●	●	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker						
Boreal Chickadee				○	○	dead trees/stumps with soft heartwood for cavities
Least Flycatcher						
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	○	○	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						

○ Used Habitat ● Preferred Habitat

Successional Relationships - Natural





Successional Relationships - Post-Treatment

Response following harvest:
Aspen increases in abundance following harvest and is the main competitor on these sites.
Moderate increase in woody shrubs, graminoids and herbs.

Response following harvest and mechanical site preparation:
Mechanical site preparation stimulates suckering of aspen and increases sprouting of woody shrubs (e.g. beaked hazel). Grasses, raspberry, pincherry and herbs also increase in abundance due to stimulation of buried seed and sprouting of rhizomes.

Response following harvest and prescribed fire:
Fire stimulates the growth of grasses and ericaceous shrubs. Severe fires will discourage suckering and sprouting of aspen, white birch and woody shrubs.

Response following harvest and herbicide:
Herbicide application at year three post harvest will control most competition problems.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature			0	0	0	0
Mature					125	5
Overmature	4650	26	8300	36	5675	40
Bf						
Immature			125	5	250	10
Mature					1688	43
Overmature	9700	82	10500	80	19368	94

shaded sample size ≥ 5 unshaded sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

No information available.

Critical Comments

- white and red pine sometimes occur as a small component of mixed stands

Site Characteristics, Limitations and Hazard Potential

				Characteristics							Limitations					Hazard Potential			
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
			2								4	4	5	6		Harvesting
			2	1		3					4	4	5			Renewal
						3										Tending

Footnotes

1. Certain percentage of these sites are dry (Ø to 0) and could desiccate planting stock or seed.
2. Coarse fragments may hinder some harvesting equipment.
3. Low to moderate amount of competition occurs on this site and may require tending.
4. Normal operations may cause site damage on wet sandy soils and moist coarse loamy soils. Normal operations will cause damage on wet coarse loamy soils. Use "best practices" to minimize site damage, or wait until conditions change.
5. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.
6. Moderate to high risk of nutrient loss using full tree clearcut logging, on sandy soils < 60 cm deep or with < 5 cm surface organic matter. Moderate to low risk of nutrient loss using tree-length clearcut logging on sandy soils < 60 cm deep with < 5 cm surface organic matter.

Opportunities

- good site for direct planting
- all season harvest
- herbs, grasses and raspberry levels typically low
- this site can establish red pine, white pine and white spruce
- balsam fir advance growth on this site
- opportunity for conifer mixedwood management

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	3 – 4
Jack pine	H	3 – 4
Aspen	M	1

Site Productivity = FRI Site Class

Degree of Effort		
1	=	Extensive
2	=	Basic
3	=	Intensive
4	=	Elite
N/A	=	Not Appropriate

Site Productivity		
H	=	1 – 2
M	=	2
L	=	2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method	Comments	
Clearcut	R	
• Harvest Method - Conventional	R	CLAAG will strongly favour balsam fir.
- Strip/Block	CR	Residual stand will not contribute seed of sufficient quantity. However, this cutting technique may be prescribed to meet other management objectives. Natural seeding not recommended due to competitive nature of this site.
- Patch	R	
- Seed-tree	CR	Group seed tree. However, additional regeneration treatments will be required.
- HARP	NR	HARP applies to peatland black spruce stands only.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-Length/Shortwood	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	R	
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	CR	Black spruce advance growth is not of sufficient quantity or distribution to form a significant part of the new stand and will have to be augmented with another regeneration option. CLAAG may promote balsam fir.
- Seed	NR	Competitive site.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	CR	This treatment by itself will not bring back a black spruce dominated site and should only be used when augmented with other regeneration methods.
- Planting	R	
- Scarification	NR	See Natural Seed comment.
Tending Treatments		
Cleaning		
• Manual	CR	This treatment by itself will not yield a black spruce dominated site and should only be used when augmented with other cleaning treatments.
• Mechanical	CR	See Manual Cleaning comment.
• Chemical		
- Ground	R	
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Jack Pine

Silvicultural System • Harvest Method	Comments	
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Residual stand will not contribute seed of sufficient quantity or genetic quality. However, this cutting technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	NR	Residual stand will not contribute seed of sufficient quantity.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	Jack pine is shade intolerant.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	
Renewal Treatments		
Site Preparation • Mechanical	CR	Techniques, timing and sequencing of treatments should be carefully considered to inhibit competition. Apply techniques that maintain a high percentage of the forest floor. Avoid LFH removal as it will increase aspen suckering.
• Chemical	R	
• Prescribed Burn	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Jack Pine (con't)

Renewal Treatments		Comments
Regeneration		
• Natural		
- Advance Growth	NR	Jack pine does not regenerate under a closed canopy.
- Seed	NR	Distribution, abundance and vigor of competitive woody and herbaceous species may preclude germination, survival and growth of jack pine, unless controlled.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	CR	Distribution, abundance and vigour of competitive woody and herbaceous species may preclude germination, survival and growth of jack pine, unless controlled.
- Planting	R	
- Scarification	NR	See Artificial Seeding comment.
Tending Treatments		
Cleaning		
• Manual	R	Cutting may stimulate stem sprouting and/or root suckering of other species.
• Mechanical	R	See Manual Cleaning comment.
• Chemical		
- Ground	R	
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Aspen

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strips should be at least 20 m wide to warm the soil and stimulate suckering. This technique may also be prescribed to meet other management objectives.
- Patch	CR	Openings 0.4 ha in size are the minimum acceptable to stimulate aspen suckering. This technique may also be prescribed to meet other management objectives.
- Seed-tree	NR	Leaving live aspen will reduce suckering.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species which is not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	
Renewal Treatments		
Site Preparation • Mechanical	NR	See Scarification (Section II, Book I).
• Chemical	R	Chemical site preparation may be used on sites where the residual overstorey will negatively affect root suckering. 2,4-D is recommended since it will remove the overstorey without damaging the root systems.
• Prescribed Burn	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Aspen (con't)

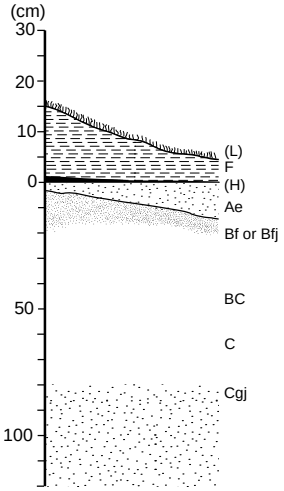
Renewal Treatments		Comments
Regeneration		
• Natural		
- Advance Growth	NR	Aspen does not regenerate under a closed canopy.
- Seed	NR	Reproduction by seed is not an important factor for aspen regeneration.
- Vegetative (coppice)	R	
• Blended	NR	Insufficient data and/or field experience exist to recommend this technique on this site type.
• Artificial		
- Seeding	NR	See Blended comment.
- Planting	NR	See Blended comment.
- Scarification	CR	Apply techniques that maintain a high percentage of the forest floor.
Tending Treatments		
Cleaning		The literature dealing with pure aspen stands indicates the impression that a hands off approach may be the most appropriate form of cleaning for this species.
• Manual	NR	
• Mechanical	NR	
• Chemical		
- Ground	NR	
- Aerial	NR	
Spacing	R	Site quality and timing is critical for the success of this treatment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Jack Pine – Black Spruce – Coarse Soil

ST 4

Description: Coniferous stands on very fresh to moist, sandy to coarse loamy soils. Medium number of ericaceous shrubs, herb poor, with abundant feathermoss (n = 32).



Overstorey: Jack pine [7], Black spruce [7], Trembling aspen [1], Balsam fir [1].

Shrubs: Black spruce, Balsam fir; Early low blueberry, Creeping snowberry, Labrador-tea, Velvetleaf blueberry, Twinflower, Trailing arbutus, Sheep laurel.

Herbs: Bunchberry, Wild lily-of-the-valley, Goldthread, Blue bead lily, Starflower.

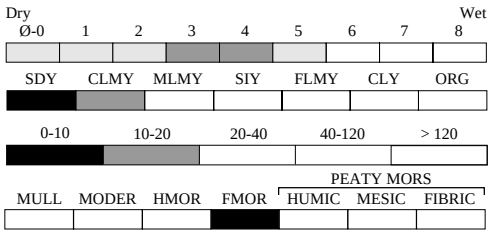
Mosses & Lichens: Schreber's moss, Plume moss, Broom moss, Reindeer lichen, *Sphagnum nemoreum*, Stair-step moss.

Vegetation Types: V18[4] V23[4] V17[1] (V13, V14, V22)[1]

Ground Surface: Abundant feathermoss with coniferous litter.

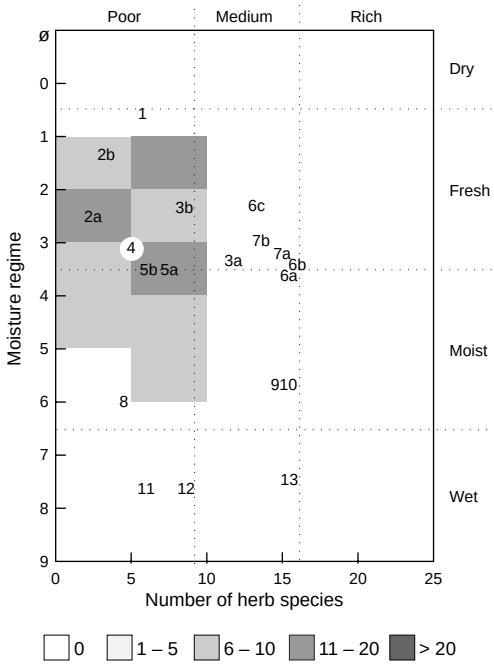
Soil Material: Glaciofluvial, shallow water lacustrine or aeolian. Few coarse fragments. On outwash plains, deltas, eskers, kames, esker complexes, kame complexes and beaches. Usually in middle to lower slope positions.

Soil Types: S3[3] S1[3] S7[2] S4[1] S5[1]

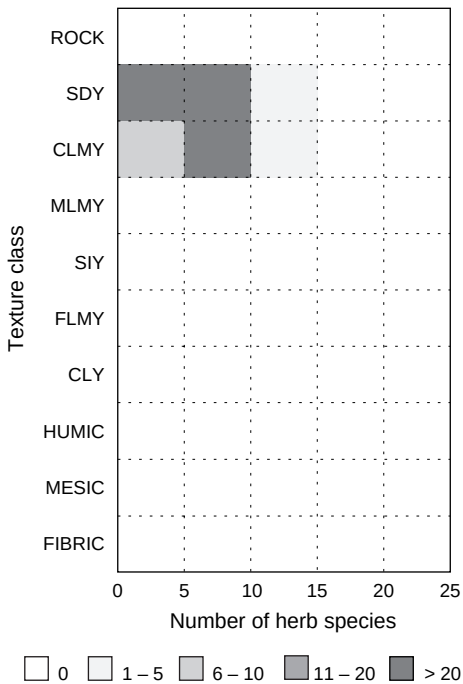


Comments: Black spruce shrubs common in the understorey.

Moisture / Richness Grid

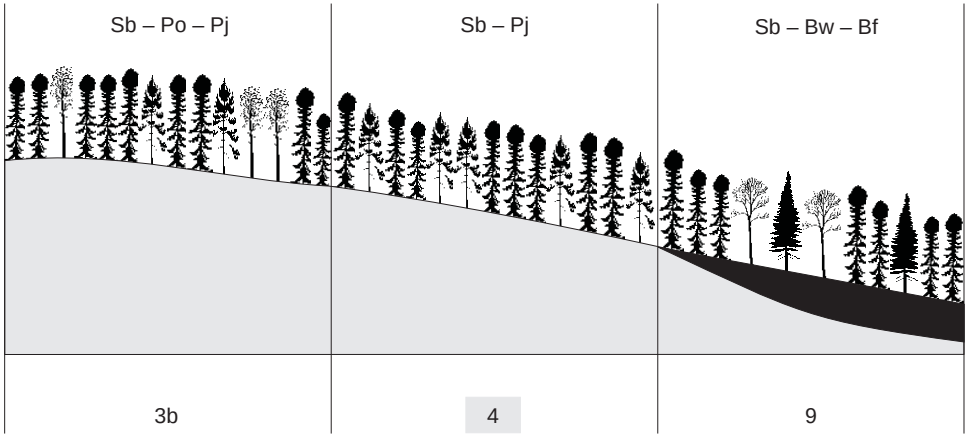


Texture / Richness Grid

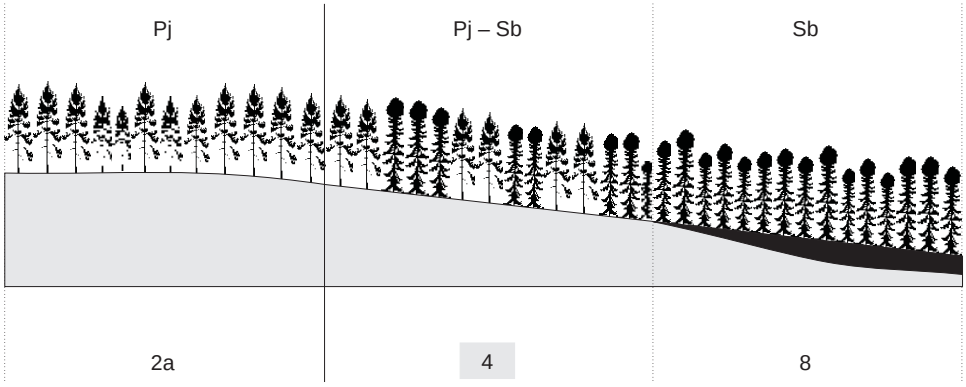


Typical Landscape Associations

Jack Pine - Mixedwood Sequence on Sandy to Coarse Loamy Soil

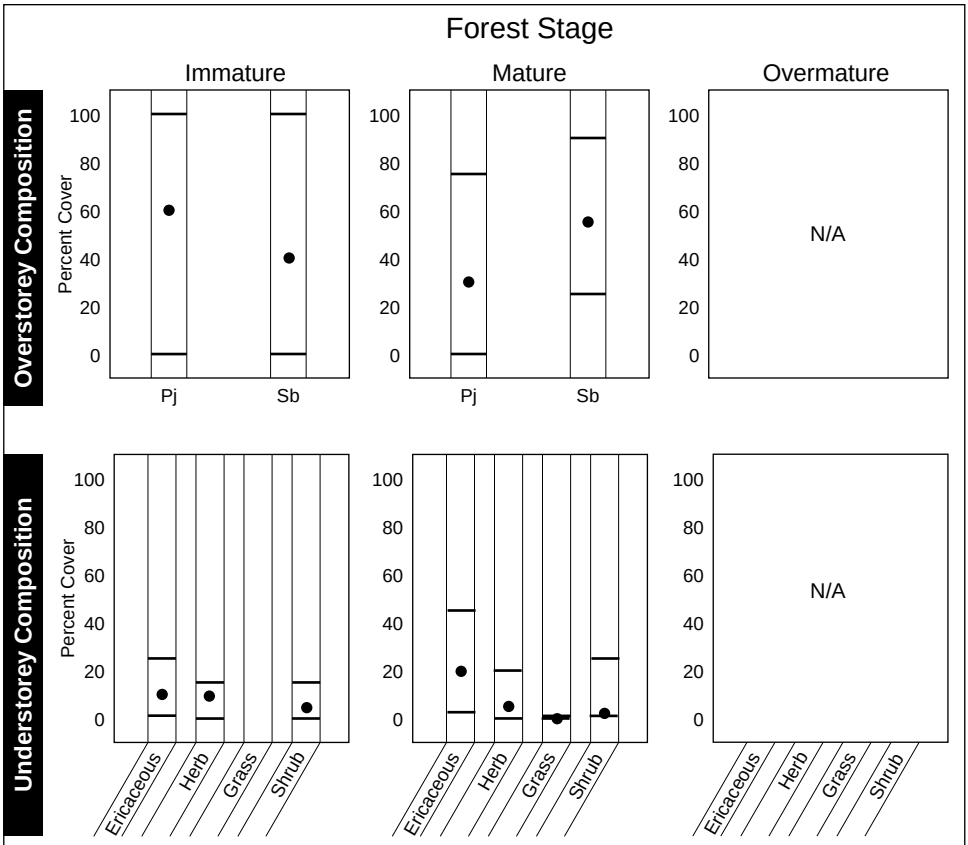


Jack Pine - Black Spruce on Sandy Soil



Occurs on imperfectly drained sandy soils associated with glaciofluvial (water-laid) landforms, including freely-drained, level outwash plains, ridged or hummocky eskers, esker complexes, kames, kettle and kame sequences, and sand dunes; on sandy lacustrine deposits including beach ridges, and freely-drained sandy lake plains. Also occurs on sandy tills on ground moraines, end and recessional moraines, and ablation tills; or on shallow sandy drift over bedrock. Typically occurs on middle to lower slope positions, and on lower slopes on the flanks of eskers or kames.
Jack pine and/or black spruce are the dominant species. Associated ST 2a, 2b, 3b, and 6c occur on similar landforms.

Site Structure and Composition



Advance Growth

Forest Stage

	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	8400	70	5875	40	3850	54
Bf	300	12	3200	40	3500	52

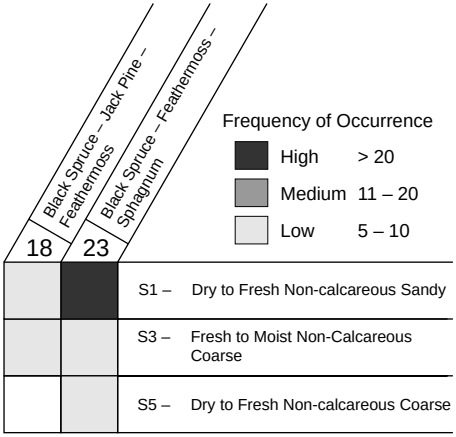
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	8	71	5	15	1	5	73	4	15	2	N/A	N/A	N/A	N/A	N/A

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	3	4	3	6	N/A	N/A

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

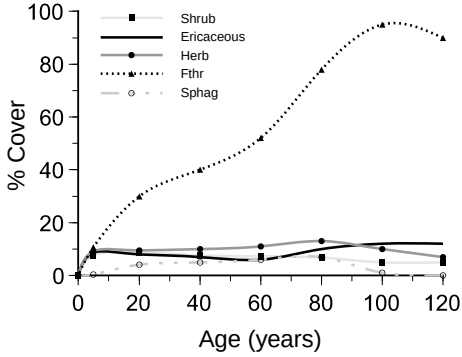


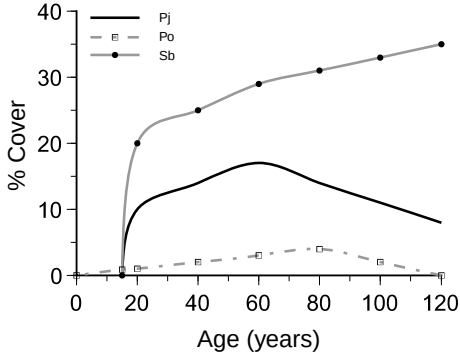
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Sapling	Immature	Mature	Overmature	Special Habitat Preferences
Woodland Caribou				O	O	forage on ground and aboreal lichens / proximity to fen/bog/peatland complexes
Moose (summer)	O	O				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)			O	O	O	dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)	●					blueberries, raspberries, beaked hazel
Black Bear (cover)		O	O	O	O	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		O	O	O	O	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			O	●	●	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		O	O	O	O	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				O	O	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	O	O	O	O	O	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker						
Spruce Grouse			O	O	O	young jack pine forest with small open areas for display
Ruffed Grouse		O	O	O	O	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker				O	O	large (>30 cm) conifer cavity trees, abundant wood-boring insects
Boreal Chickadee				O	O	dead trees/stumps with soft heartwood for cavities
Least Flycatcher						
White Throated Sparrow	O	O			O	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			O	O	O	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						

O Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
Woody shrubs increase moderately in abundance from sprouts. Ericaceous shrubs increase in vigor and abundance with a corresponding increase in fruit yields.

Response following harvest and mechanical site preparation:
May stimulate some hardwood suckering and sprouting of shrubs, especially willow (if present in the pre-cut stand). Mechanical site preparation will stimulate a moderate increase in grasses, raspberry and herbs.

Response following harvest and prescribed fire:
No information.

Response following harvest and herbicide:
No information.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature	8100	74	8400	68		
Mature	7200	64	1500	32	5800	36
Overmature	3850	54				
Bf						
Immature	563	15	300	12		
Mature	4300	64	100	4	8600	76
Overmature	3500	52				

shaded sample size ≥ 5 unshaded sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

High probability of obtaining 5000 sph of jack pine.

Critical Comments

- black spruce component is usually greater on moist soils (moisture regime 4 to 8)

Site Characteristics, Limitations and Hazard Potential

		Characteristics						Limitations						Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
		1					3				4	4	5	6		Harvesting
					2		3				4	4	5			Renewal
																Tending

Footnotes

1. Due to ease of road building on these coarse soils, there is a chance of excessive loss of productive landbase.
2. Moderate consideration, site can be very dry.
3. Moderate consideration.
4 Normal operations may cause site damage on wet sandy soils, and moist coarse loamy soils. Normal operations will cause damage on wet coarse loamy soils. Use "best practices" to minimize site damage, or wait until conditions change.
5. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.
6. Moderate to high risk of nutrient loss using full tree clearcut logging, on sandy soils < 60 cm deep or with < 5 cm surface organic matter. Moderate to low risk of nutrient loss using tree-length clearcut logging on sandy soils < 60 cm deep with < 5 cm surface organic matter.

Opportunities

- potential for some white pine on this site
- potential for CLAAG on this site
- year-round operations on this site
- good site for jack pine seed tree underburning; prescribed fire boundaries are typically lowland moister sites
- good site for cone scattering

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	1 – 3
Jack pine	H	2 – 3
Aspen	N/A	N/A

Site Productivity = FRI Site Class

Degree of Effort

1 = Extensive
2 = Basic
3 = Intensive
4 = Elite
N/A = Not Appropriate

Site Productivity

H = 1 – 2
M = 2
L = 2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method		Comments
Clearcut	R	Black spruce and balsam fir advance growth typically occur together on this site. Balsam fir is a minor overstorey species on this site type. Use CLAAG to protect black spruce advance growth when present.
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strip widths may range from 40 to 60 m. This harvest method may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Group seed tree. This harvest method may be prescribed to meet other management objectives.
- HARP	NR	Applies to lowland black spruce.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended **CR = Conditionally Recommended** **NR = Not Recommended**

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	R	
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	R	
- Seed	CR	Seedbed must be available with seed source on site.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	CR	Seedbed must be available.
- Planting	R	
- Scarification	CR	See Natural Seed comment.
Tending Treatments		
Cleaning		
• Manual	R	Treatment generally not required.
• Mechanical	R	See Manual Cleaning comment.
• Chemical		
- Ground	R	See Manual Cleaning comment.
- Aerial	R	See Manual Cleaning comment.
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Jack Pine

Silvicultural System • Harvest Method	Comments	
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Residual stand will not contribute seed of sufficient quantity or genetic quality. However, this cutting technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Must leave a minimum of 20 healthy, vigorous seed trees per hectare.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species which is not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended **CR = Conditionally Recommended** **NR = Not Recommended**

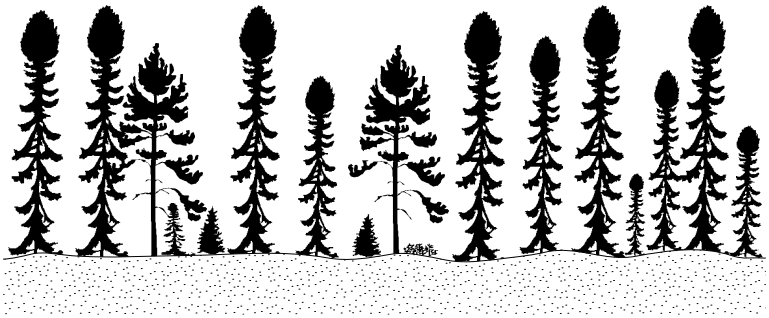
Silvicultural Interpretations for the Establishment of Jack Pine (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	R	
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Jack pine does not regenerate under a closed canopy.
- Seed	CR	Requires good distribution of mineral soil and a seed source on site.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	CR	Must ensure adequate seedbed (i.e. requires a minimum 10 to 25 % receptive seedbed).
- Planting	R	
- Scarification	CR	Only use this activity when you are leaving cone bearing slash on site.
Tending Treatments		
Cleaning		
• Manual	R	Treatment generally not required.
• Mechanical	R	See Manual Cleaning comment.
• Chemical		
- Ground	R	See Manual Cleaning comment.
- Aerial	R	See Manual Cleaning comment.
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

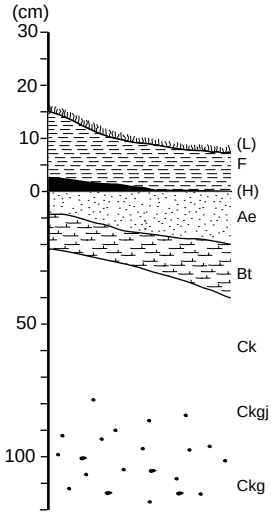
The establishment of aspen is not an appropriate management objective for this site type.

Black Spruce – Fine Soil



ST 5a

Description: Coniferous stands on fresh to moderately moist, fine loamy to clayey soils. Medium number of shrubs, herb poor, with abundant feathermoss (n = 14).



Overstorey: Black spruce [9], Jack pine [4], Trembling aspen [1], Balsam fir [1], Larch [1].

Shrubs: Black spruce, Balsam fir; Creeping snowberry, Early low blueberry, Labrador-tea, Velvetleaf blueberry, Twinflower, Dwarf raspberry, Bristly wild rose, Serviceberry spp.

Herbs: Bunchberry, Goldthread, Wild lily-of-the-valley, Starflower, Woodland horsetail, Sweet coltsfoot.

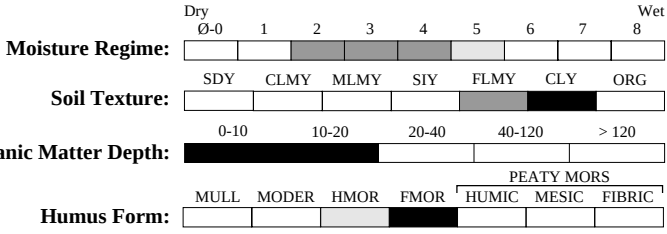
Mosses & Lichens: Schreber's moss, Plume moss, Broom moss, Stair-step moss, *Sphagnum nemoreum*, other *Sphagnum* spp., *Cladina* spp.

Vegetation Types: V23[4] V18[2] (V8, V13, V14, V16, V21, V22)[4]

Ground Surface: Usually a continuous carpet of feathermoss, with sparse mounds of sphagnum moss and patches of coniferous litter.

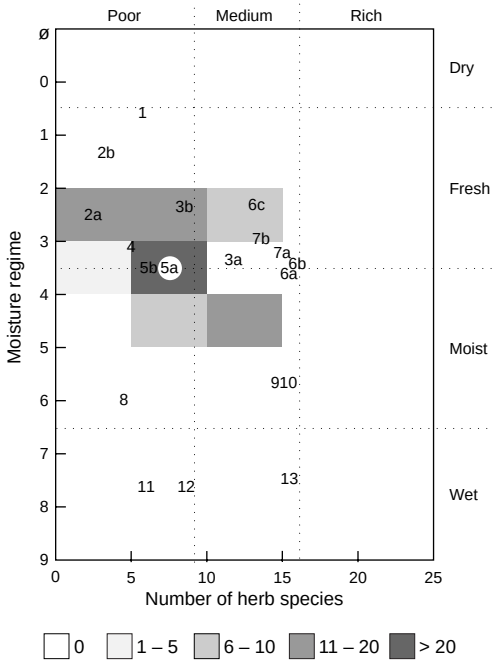
Soil Material: Morainal (clay till) or deep water lacustrine. Few coarse fragments. On lacustrine clay, till plains or undulating drumlinoid formations.

Soil Types: S13[6] S14[4]

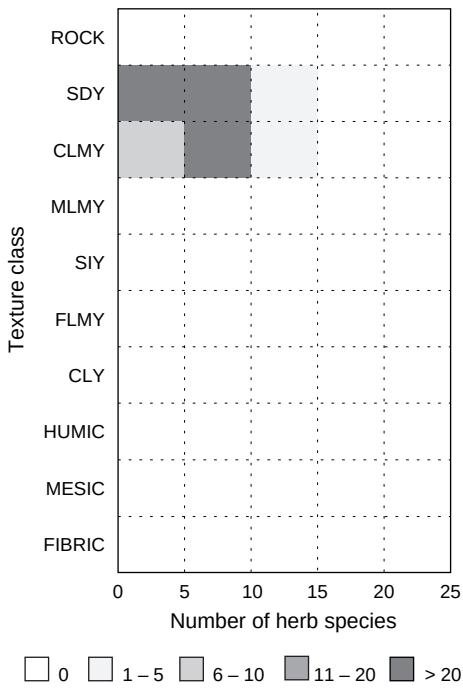


Comments: Found mainly in the Clay Belt. Free carbonates common within 60 cm of the soil surface. Black spruce shrubs common in the understorey.

Moisture / Richness Grid

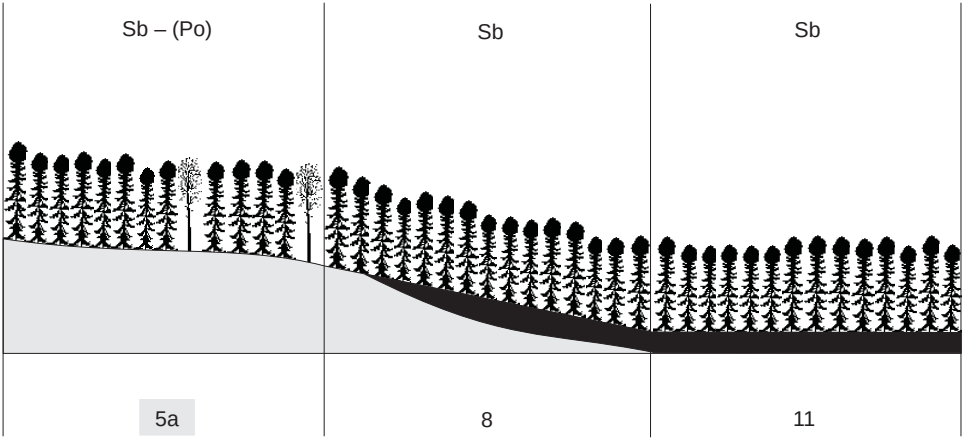


Texture / Richness Grid



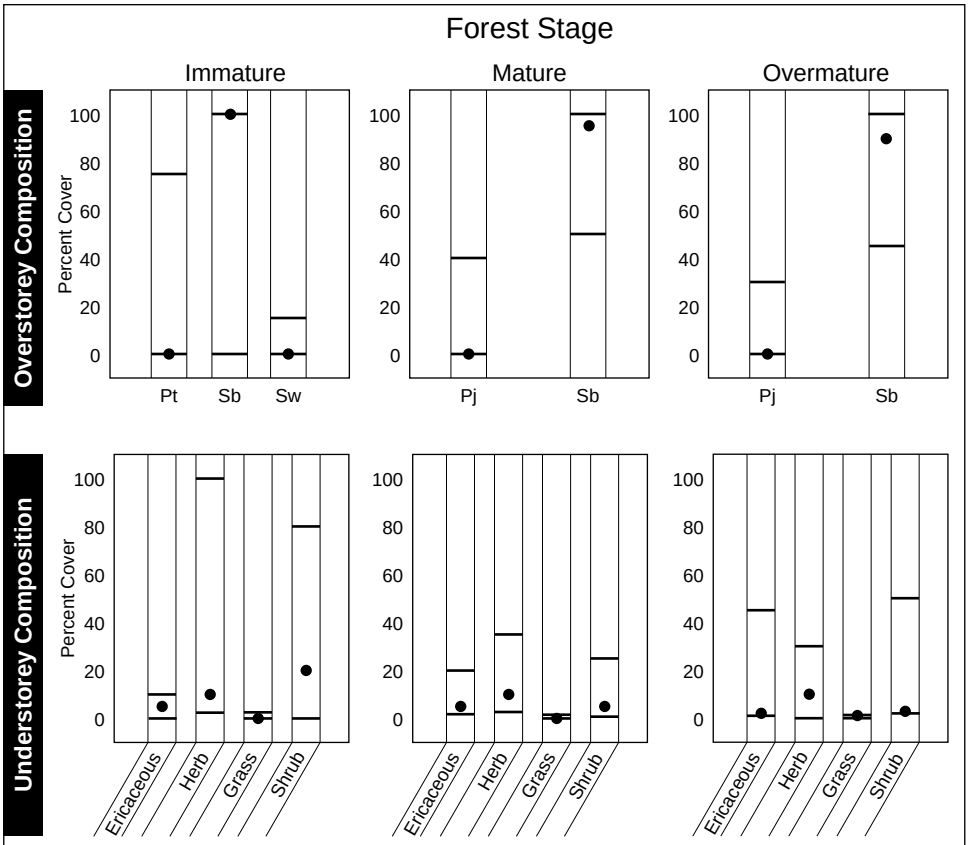
Typical Landscape Associations

Black Spruce Sequence on Fine Loamy to Clayey Soil



Occurs on elevated terrain, on well to imperfectly drained fine loamy or clayey soils within glaciolacustrine or clay till plains, usually on middle slopes or on elevated hummocks in areas of low relief. Outside of the northeastern Clay Belt, clay soils are uncommon and occur mainly in enclosed depressions in areas of glaciolacustrine soils, and as scattered pockets of fine loamy to clayey ablation till. Black spruce is the dominant species. Balsam fir, balsam poplar or aspen may also be present. Stands are usually very productive, well-stocked and uniform. ST5a usually occurs as small pockets within complex associations with other STs, typically ST8, 9, and 13.

Site Structure and Composition



Advance Growth

	Forest Stage					
	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	1875	35	7750	74	3750	70
Bf	1375	20	2400	38	5950	60

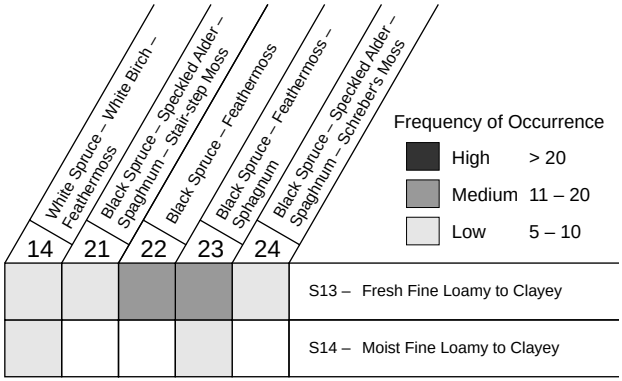
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	3	62	26	8	0	8	80	4	7	1	31	59	1	6	3

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	2	4	3	5	3	4

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

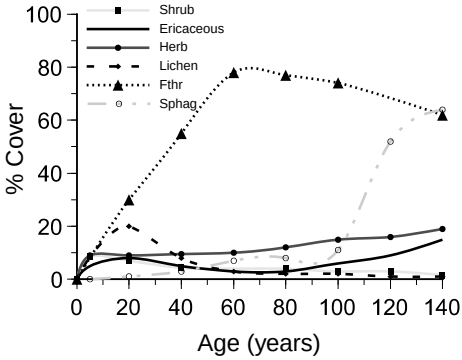


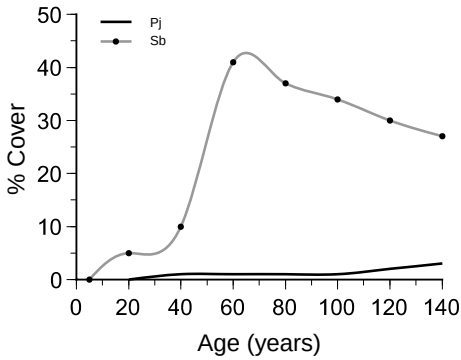
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Sapling	Immature	Mature	Overmature	Special Habitat Preferences
Woodland Caribou				O	O	forage on ground and aboreal lichens / proximity to fen/bog/peatland complexes
Moose (summer)	O	O				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)			O	O	O	dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)	O					blueberries, raspberries, beaked hazel
Black Bear (cover)		O	O	O	O	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		O	O	O	O	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			O	●	●	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		O	O	O	O	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				O	O	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	O	O	O	O	O	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker						
Spruce Grouse			O	O	O	young jack pine forest with small open areas for display
Ruffed Grouse		O	O	O	O	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker				O	O	large (>30 cm) conifer cavity trees, abundant wood-boring insects
Boreal Chickadee				●	●	dead trees/stumps with soft heartwood for cavities
Least Flycatcher				O	O	tall aspen cavity trees, open mid-canopy layer for foraging
White Throated Sparrow	O	O			O	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			O	O	O	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						

O Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
A moderate increase in herbs and graminoids can occur depending on the amount of soil disturbance . Ericaceous shrubs will increase . Woody shrubs, if present in the pre-cut stand, may also increase in abundance.

Response following harvest and mechanical site preparation:
Heavy site preparation stimulates the growth of grasses and raspberries, while light site preparation that retains a portion of the feathermoss layer and minimizes the exposure of mineral soil will decrease competition.

Response following harvest and prescribed fire:
No information.

Response following harvest and herbicide:
This site generally does not require herbicide application for at least three years following harvest.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb						
Immature	900	24	2000	53		
Mature	7025	66	9500	80	12500	80
Overmature	9438	80	3638	56		
Bf						
Immature	125	5	1625	30		
Mature	4350	50	563	20	15688	50
Overmature	5938	60	8763	51		

shaded sample size ≥ 5 unshaded sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

Depending on quantity of jack pine in overstorey, high probability of obtaining 1000 to 5000 sph of jack pine. Extremely high probability of obtaining 1000 to 5000 sph of black spruce.

Critical Comments

- a small jack pine component is occasionally present. Pure jack pine stands on fine loamy to clayey soils exist in the Clay Belt but are uncommon

Site Characteristics, Limitations and Hazard Potential

Characteristics										Limitations				Hazard Potential			
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
			1			2			4				5	5	6	Harvesting
			1			2			4	3			5	5	6	Renewal
													5	5		Tending

Footnotes

1. Heavy clay soil will affect choice of harvest and site preparation techniques used.
2. Potential for soil damage on fine textured soils when soil is saturated.
3. Exposed soil will frost heave making renewal difficult.
4. Trees on edges of cuts and seed trees will likely blow down.
5. Normal operations may cause site damage when soils are moist, and will cause damage when soils are wet. Use "best practices" to minimize site damage, or wait until conditions change.
6. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.

Opportunities

- good site for using CLAAG to regenerate black spruce
- this site responds well to a broad spectrum of silvicultural treatment packages
- establishment of jack pine is possible, but only on sites with moisture regime up to and including 4

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	1 – 3
Jack pine	M	3
Aspen	N/A	N/A

Site Productivity = FRI Site Class

Degree of Effort

1 = Extensive
2 = Basic
3 = Intensive
4 = Elite
N/A = Not Appropriate

Site Productivity

H = 1 – 2
M = 2
L = 2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method		Comments
Clearcut	R	Black spruce advance growth may be of sufficient quantity and distribution to form a major part of the new stand. Use CLAGG to minimize site damage and protect black spruce advance growth.
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strip widths may range from 40 to 60 m. This harvest method may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Group seed tree. This harvest method may be prescribed to meet other management objectives.
- HARP	NR	HARP applies to peatland black spruce stands only.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		Harvest on frozen ground or use high flotation equipment.
Full-tree	CR	See Logging Method comment.
Tree-length	CR	See Logging Method comment.
Cut-to-length/Shortwood	CR	See Logging Method comment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Use methods that avoid excessive mineral soil exposure to minimize frost heaving.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	R	60% mean stocking for black spruce advance growth.
- Seed	CR	Check that there is sufficient suitable seedbed.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	R	See Natural Seed comment.
- Planting	R	
- Scarification	CR	See Mechanical comment.
Tending Treatments		
Cleaning		
• Manual	R	
• Mechanical	R	Avoid this activity when soils are saturated.
• Chemical		
- Ground	R	See Mechanical Cleaning comment.
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Jack Pine

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	This harvest method may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	This harvest method may be prescribed to meet other management objectives.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species that does not regenerate under a closed canopy.
Selection	NR	See Shelterwood comment.
Logging Method		Harvest on frozen ground or use high flotation equipment.
Full-tree	CR	See Logging Method comment.
Tree-length	CR	See Logging Method comment.
Cut-to-length/Shortwood	CR	See Logging Method comment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

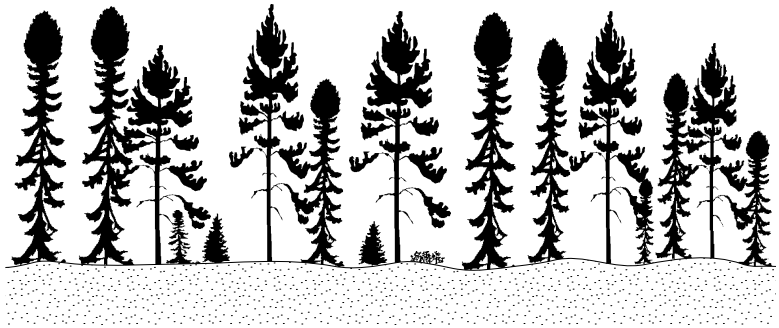
Silvicultural Interpretations for the Establishment of Jack Pine (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Use methods that avoid excessive mineral soil exposure to minimize frost heaving.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Jack pine does not regenerate under a closed canopy.
- Seed	NR	Potential for natural seeding is very low due to low density of jack pine in the original stand.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	R	
- Planting	R	
- Scarification	NR	See Natural Seed comment.
Tending Treatments		
Cleaning		
• Manual	R	
• Mechanical	R	Avoid this activity when soils are saturated.
• Chemical		
- Ground	R	See Mechanical Cleaning comment.
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

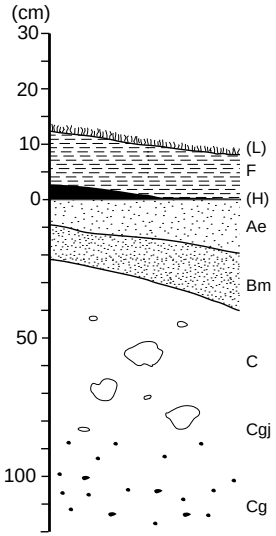
The establishment of aspen is not an appropriate management objective for this site type.

Black Spruce – Medium Soil



ST 5b

Description: Coniferous stands on fresh to moderately moist, medium loamy to silty soils. Shrub and herb poor, with abundant feathermoss (n = 10).



Overstorey: Black spruce [7], Jack pine [7].

Shrubs: Black spruce, Balsam fir; Early low blueberry, Labrador-tea, Velvetleaf blueberry, Creeping snowberry, Bristly wild rose, Twinflower, Serviceberry spp.

Herbs: Bunchberry, Wild lily-of-the-valley, Large-leaved aster.

Mosses & Lichens: Schreber's moss, Broom moss, Plume moss, Liverworts, Stair-step moss, *Sphagnum* spp., *Cladina* spp.

Vegetation Types: V16[3] V18[3] V23[2] V22[1] V15[1]

Ground Surface: Usually a continuous carpet of feathermoss, with sparse mounds of sphagnum moss and patches of coniferous litter.

Soil Material: Morainal or glaciofluvial, may be stratified. Moderate number of coarse fragments. On ground moraine, ablation moraine, end moraine, outwash.

Soil Types: S12[4] S10[3] S11[2] S9[1]

Moisture Regime: Dry Ø-0 1 2 3 4 5 6 7 8 Wet

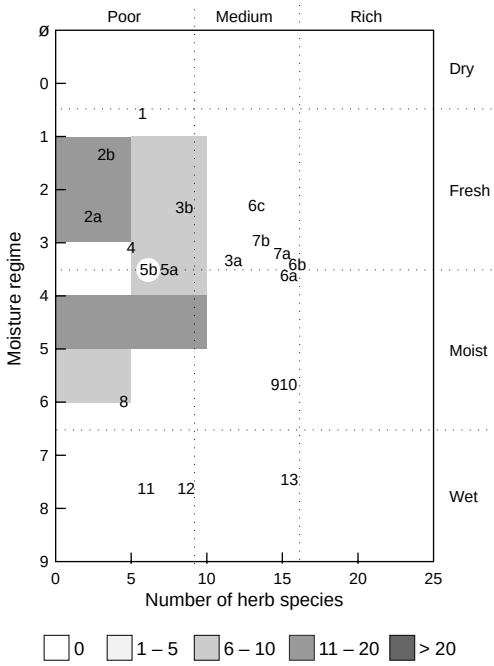
Soil Texture: SDY CLMY MLMY SIY FLMY CLY ORG

Organic Matter Depth: 0-10 10-20 20-40 40-120 > 120

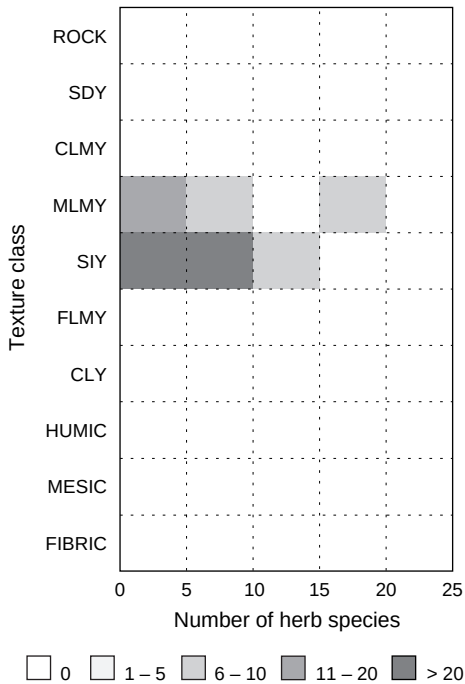
Humus Form: MULL MODER HMOR FMOR PEATY MORS: HUMIC MESIC FIBRIC[1]

Comments: Black spruce shrubs common in the understorey.

Moisture / Richness Grid

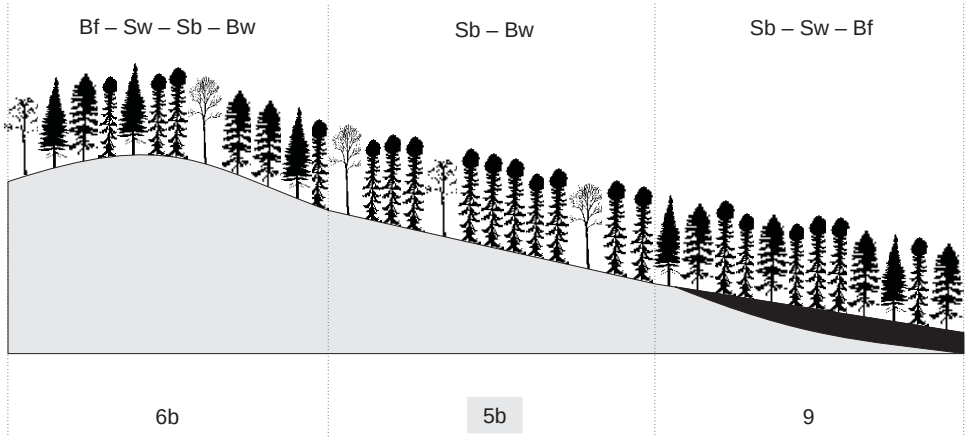


Texture / Richness Grid



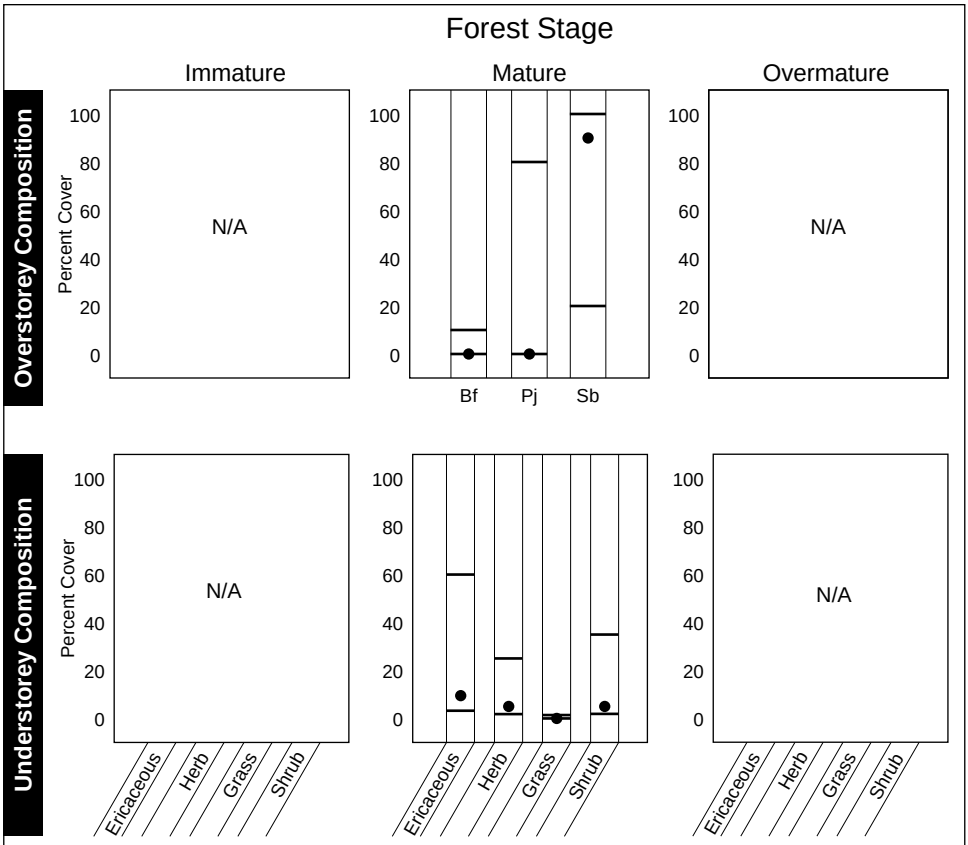
Typical Landscape Associations

Conifer Sequence on Medium Loamy to Silty Soil



Occurs on well or moderately well-drained sandy loam to silt textures, including silty alluvial soils on gently sloping areas, especially areas adjacent to large waterbodies that undergo periodic flooding; on loams, sandy loams, or silty till soils on middle to lower slopes in hummocky ablation moraine; or on gentle to moderate slopes within enclosed depressional areas and valleys. Found generally on areas of low relief in rolling to undulating, sometimes terraced, till terrain. Black spruce is the dominant species. Balsam fir, balsam poplar, aspen, jack pine or white birch may also be present. Stands are usually very productive, well-stocked and uniform. ST5b usually occurs as small pockets within complex associations with other STs, typically ST6b, 8, and 9, and is sometimes associated with very shallow soils (ST1).

Site Structure and Composition



Advance Growth

Forest Stage

	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	1875	73	4300	60	1325	44
Bf	4375	33	1000	28	3400	36

Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	N/A	N/A	N/A	N/A	N/A	15	76	2	5	1	N/A	N/A	N/A	N/A	N/A

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	N/A	N/A	3	7	N/A	N/A

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

6	14	15	16	18	21	22	23	24	25	
	■		■		■	■	■		■	S9 – Dry to Fresh Non-calcareous Medium Loamy to Silty
			■	■						S10 – Dry to Fresh Calcareous Medium Loamy to Silty
	■	■					■	■		S11 – Fresh to Moist Non-calcareous Medium Loamy to Silty
■			■	■	■	■	■	■		S12 – Fresh to Moist Calcareous Medium Loamy to Silty

6 – Black Spruce – Speckled Alder – Feathermoss
14 – White Spruce – White Birch – Feathermoss
15 – Jack Pine – Blueberry – Feathermoss
16 – Jack Pine – Black Spruce – Feathermoss
18 – Black Spruce – Jack Pine – Feathermoss
21 – Black Spruce – Speckled Alder – Sphagnum – Star-step Moss
22 – Black Spruce - Feathermoss
23 – Black Spruce – Feathermoss – Sphagnum
24 – Black Spruce – Speckled Alder – Sphagnum – Schreber's Moss
25 – Black Spruce – Labrador Tea – Sphagnum

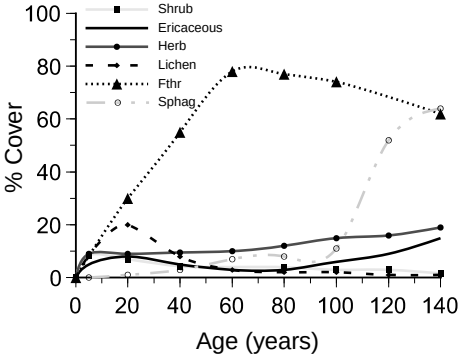
Frequency of Occurrence
■ High > 20
■ Medium 11 – 20
□ Low 5 – 10

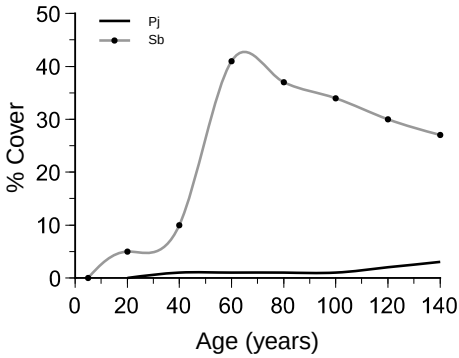
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Sapling	Immature	Mature	Overmature	Special Habitat Preferences
Woodland Caribou				○	○	forage on ground and aboreal lichens / proximity to fen/bog/peatland complexes
Moose (summer)	○	○				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)			○	○	○	dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)	○					blueberries, raspberries, beaked hazel
Black Bear (cover)		○	○	○	○	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		○	○	○	○	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	●	●	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		○	○	○	○	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	○	○	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker						
Spruce Grouse			○	○	○	young jack pine forest with small open areas for display
Ruffed Grouse		○	○	○	○	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker				○	○	large (>30 cm) conifer cavity trees, abundant wood-boring insects
Boreal Chickadee				●	●	dead trees/stumps with soft heartwood for cavities
Least Flycatcher				○	○	tall aspen cavity trees, open mid-canopy layer for foraging
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	○	○	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
A moderate increase in herbs and graminoids can occur depending on the amount of soil disturbance .Ericaceous shrubs will increase .Wood y shrubs, if present in the pre-cut stand, ma y also increase in abundance.

Response following harvest and mechanical site preparation:
Heavy site preparation stimulates the growth of grasses and raspberries, while light site preparation that retains a portion of the feathermoss layer and minimizes the exposure of mineral soil will decrease competition.

Response following harvest and prescribed fire:
No information.

Response following harvest and herbicide:
This site generally does not require herbicide application for at least three years following harvest.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature			1875	73		
Mature	4300					
Overmature		60	1625	75	1000	12
Bf						
Immature			4375	33		
Mature	1000	28				
Overmature			0	0	6800	72

shaded sample size ≥ 5 unshaded sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

Where jack pine present in the overstorey, extremely high probability of obtaining > 5000 sph of jack pine after harvest. Extremely high probability of black spruce up to 1000 sph.

Critical Comments

- compared to ST5a, jack pine occurs more often and at higher densities in other site types

Site Characteristics, Limitations and Hazard Potential

Characteristics									Limitations						Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
				1		2						4	4	5		Harvesting
	6	6		1				3	6			4	4	5		Renewal
								3								Tending

Footnotes

1. Coarse fragments may impede some harvesting and renewal treatments.
2. The terrain of this site may make operability of harvesting equipment difficult.
3. Windthrow may be a problem on stony soils because of root development restrictions.
4. Normal operations may cause site damage when soils are moist, and will cause site damage when soils are wet. Use "best practices" to minimize site damage, or wait until conditions change.
5. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.
6. Excessive removal of LFH will cause frost heaving.

Opportunities

- high potential for successful jack pine cone scattering when organic matter is less than 10 cm
- all season harvest
- good site for using CLAAG to regenerate black spruce
- relatively non-competitive site

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	1 – 3
Jack pine	H	2 – 3
Aspen	N/A	N/A

Site Productivity = FRI Site Class

Degree of Effort

1 = Extensive
2 = Basic
3 = Intensive
4 = Elite
N/A = Not Appropriate

Site Productivity

H = 1 – 2
M = 2
L = 2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method		Comments
Clearcut	R	Black spruce and balsam fir advance growth typically occur together on this site. Balsam fir does not naturally occur in the overstorey on this site type. Use CLAGG to minimize site damage and protect black spruce advance growth.
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strip widths may range from 40 to 60 m. This technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Group seed tree. This harvest method may be prescribed to meet other management objectives.
- HARP	NR	HARP applies to peatland black spruce stands only.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended **CR = Conditionally Recommended** **NR = Not Recommended**

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Use methods that avoid excessive mineral soil exposure and minimize frost heaving.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	R	
- Seed	CR	Requires good distribution of mineral soil and a seed source on site.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	R	
- Planting	R	
- Scarification	CR	See Mechanical comment.
Tending Treatments		
Cleaning		
• Manual	R	Treatment generally not required.
• Mechanical	R	See Manual Cleaning comment.
• Chemical		
- Ground	R	See Manual Cleaning comment.
- Aerial	R	See Manual Cleaning comment.
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Jack Pine

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Residual stand will not contribute seed of sufficient quantity or genetic quality. However, this cutting technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Leave a minimum of 20 healthy, vigorous seed trees per hectare. This technique may be prescribed to meet other management objectives.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species that does not regenerate under a closed canopy.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended **CR = Conditionally Recommended** **NR = Not Recommended**

Silvicultural Interpretations for the Establishment of Jack Pine (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Use methods that avoid excessive mineral soil exposure to minimize frost heaving.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Jack pine does not regenerate under a closed canopy.
- Seed	CR	Requires good distribution of mineral soil and a seed source to remain on site.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	R	
- Planting	R	
- Scarification	CR	See Mechanical comment.
Tending Treatments		
Cleaning		
• Manual	R	Treatment generally not required.
• Mechanical	R	See Manual Cleaning comment.
• Chemical		
- Ground	R	See Manual Cleaning comment.
- Aerial	R	See Manual Cleaning comment.
Spacing	R	

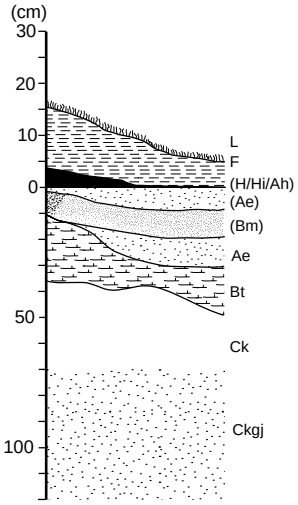
R = Recommended CR = Conditionally Recommended NR = Not Recommended

The establishment of aspen is not an appropriate management objective for this site type.

Mixedwood – Fine Soil

ST 6a

Description: Mixedwood stands on fresh to moist, fine loamy to clayey soils. Shrub and herb rich (n = 28).



Overstorey: Trembling aspen[6], Black spruce[5], Balsam poplar[3], Jack pine[2], White birch[1], Balsam fir[1], White spruce[1].

Shrubs: Balsam fir, Black spruce, Trembling aspen, White birch, White spruce; Dwarf raspberry, Bristly wild rose, Twinflower, Velvetleaf blueberry, Bush honeysuckle, Serviceberry spp., Creeping snowberry, Mountain ash spp., Honeysuckle spp., Currant spp., Squashberry, Speckled alder.

Herbs: Bunchberry, Naked mitrewort, Wild lily-of-the-valley, Large-leaved aster, Sarsaparilla, Kidney-leaved violet, Wood anemone, Blue bead lily, Sweet coltsfoot, Starflower, Fragrant bedstraw, Goldthread, Rattlesnake plantain, Rose twisted-stalk, Interrupted clubmoss, Wild strawberry, Woodland horsetail, Oak fern, Sedge spp.

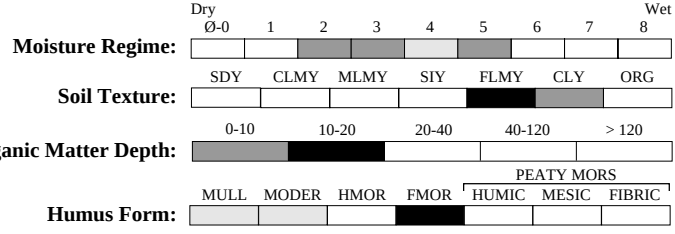
Mosses & Lichens: Schreber's moss, Plume moss, Electrified cat's tail moss, Stair-step moss, Broom moss.

Vegetation Types: V8[3] V7[2] (V9, V13)[3] V10[1] (V14, V18, V22)[1]

Ground Surface: Varying proportions of deciduous litter, feathermoss and coniferous litter.

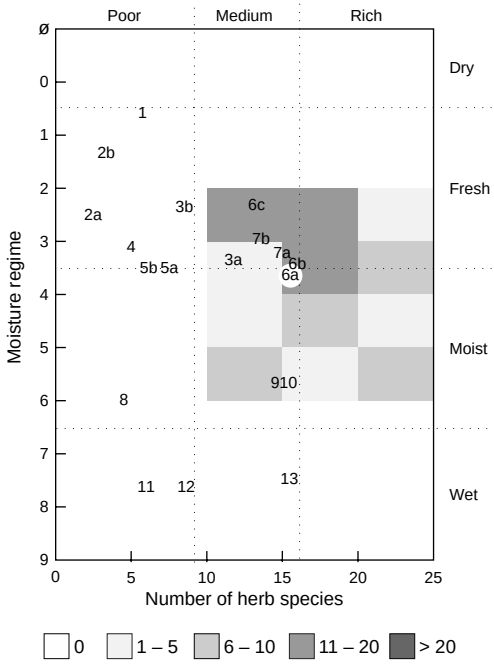
Soil Material: Morainal (clay till) or deep water lacustrine. Few coarse fragments. On lacustrine clay till plains or undulating drumlinoid formations.

Soil Types: S13[6] S14[4]

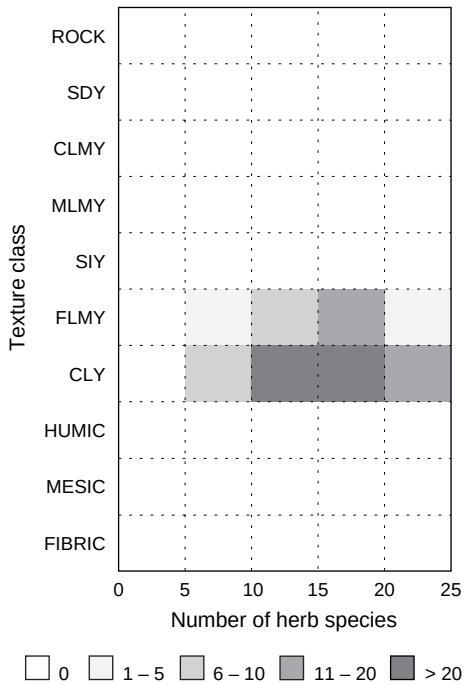


Comments: Found mainly in the Clay Belt. Free carbonates common within 120 cm of the soil surface. Abundant balsam fir shrubs.

Moisture / Richness Grid

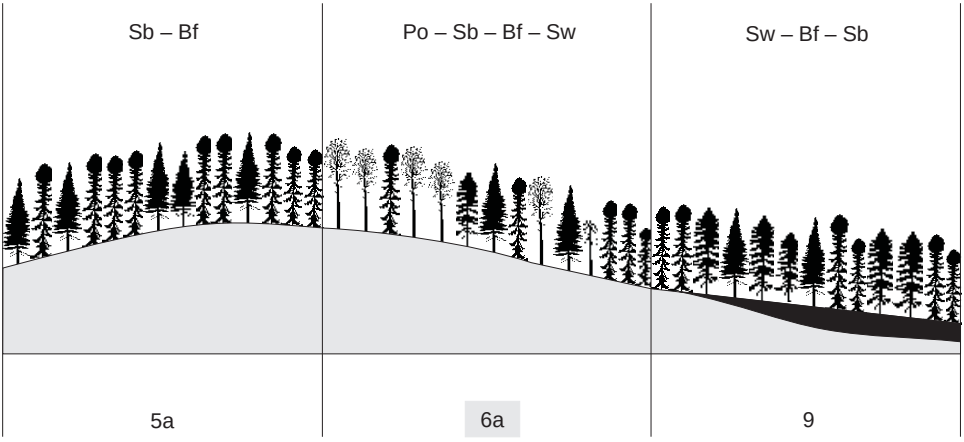


Texture / Richness Grid



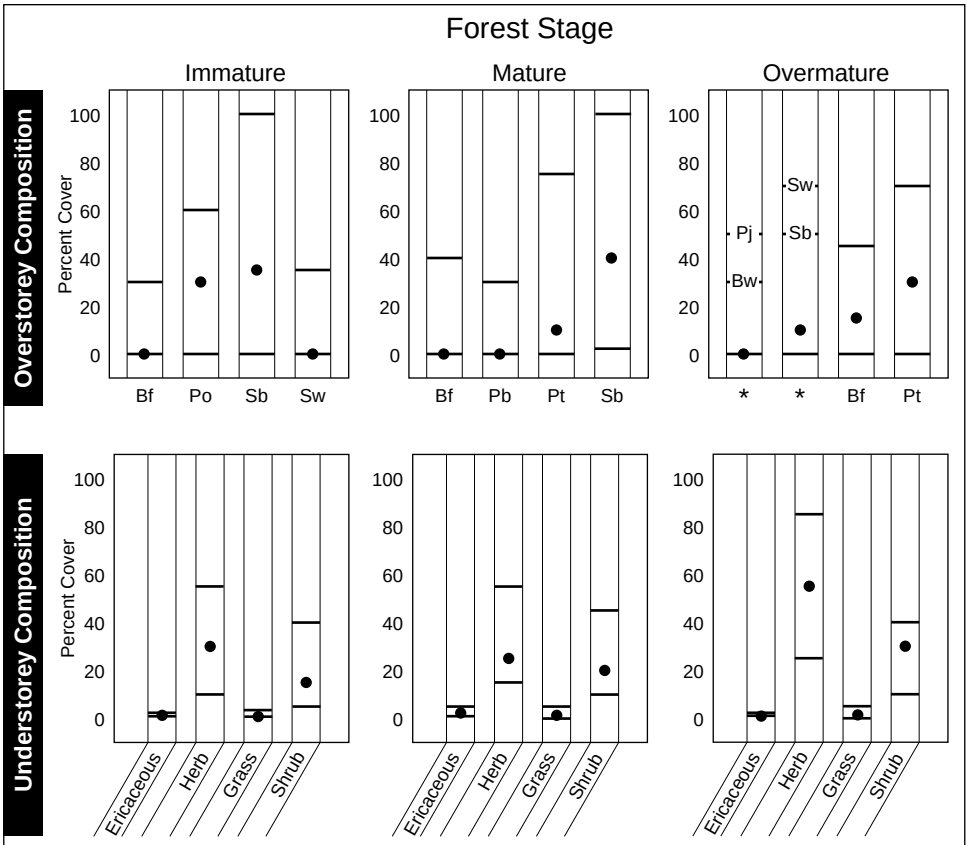
Typical Landscape Associations

Conifer - Mixedwood Sequence on Fine Loamy to Clayey Soil



Occurs on well or moderately well drained soils on fine loamy to clayey soils, on elevated terrain within glaciolacustrine or clay till plains, typically on middle to upper slopes and crests of hills. Stands are usually mixedwoods dominated by conifers, with varying proportions of black spruce, balsam fir, and white spruce, interspersed with scattered pockets of jack pine, aspen, balsam poplar, and white birch. ST5a and 7a occur on similar landforms and slope positions. ST9 occurs in conjunction with ST6a in imperfectly or poorly drained level areas or small depressions.

Site Structure and Composition



Advance Growth

	Forest Stage					
	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	1000	23	425	20	3625	45
Bf	9050	78	1875	45	13125	85

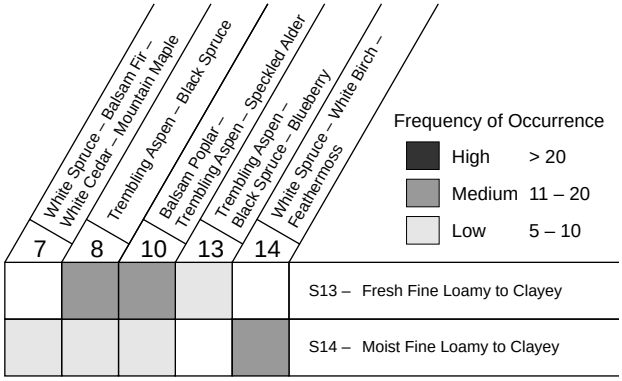
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	0	33	60	7	0	1	51	40	7	0	0	24	61	14	0

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	3	10	3	7	3	5

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

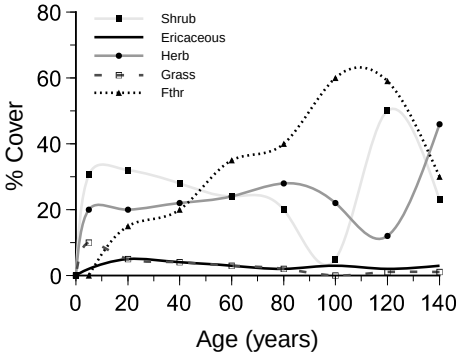


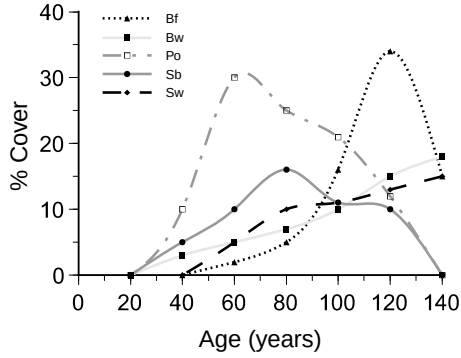
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Sapling	Immature	Mature	Overmature	Special Habitat Preferences
Woodland Caribou				○	○	forage on ground and aboreal lichens / proximity to fen/bog/peatland complexes
Moose (summer)	●	●				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)			●	●	●	dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)	○	○				blueberries, raspberries, beaked hazel
Black Bear (cover)		○	○	●	●	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		●	○	○	●	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	●	●	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		●	○	○	●	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	●	●	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker				○	○	large (>45 cm) cavity trees, preferably aspen, carpenter ants
Spruce Grouse			○	○	○	young jack pine forest with small open areas for display
Ruffed Grouse		○	○	○	○	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker				○	○	large (>30 cm) conifer cavity trees, abundant wood-boring insects
Boreal Chickadee				○	○	dead trees/stumps with soft heartwood for cavities
Least Flycatcher						
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	●	●	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
Following harvest, poplar and white birch increase in abundance due to sprouting and suckering. There is also an increase in woody shrubs and herbs.

Response following harvest and mechanical site preparation:
Site preparation stimulates hardwood suckering and sprouting of shrubs (especially beaked hazel and mountain maple). Raspberry, grasses and herbs also increase. The exposure of mineral soil provides a favorable seedbed for available seed.

Response following harvest and prescribed fire:
On hardwood and mixedwood sites, severe burns conducted after tramping and spraying are considered effective for competition control. White birch is easily killed by fire. Herbs will grow back quickly following fire. Ericaceous shrubs, when present, will increase by sprouting from rhizomes.

Response following harvest and herbicide:
Recovery of hardwoods, graminoids and herbs is usually rapid after herbicide application, which may necessitate a re-application. Grasses can dominate the site for a few years after the woody vegetation is reduced by the first spray. Aspen, white birch, woody shrubs and herbs can be controlled by herbicides but a second spray is usually required within two to five years.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature	875	15	1750	23	1125	25
Mature	2800	12	200	8	425	25
Overmature			6188	53	125	5
Bf						
Immature	4625	75	15875	90	250	5
Mature	300	12	6875	90	1875	45
Overmature			16750	48	13125	85

▒ sample size ≥ 5 ☐ sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

No information available.

Critical Comments

- there are two “phases” to this site type, conifer dominated (spruce-fir), and hardwood mixedwood (aspen or birch with conifers). Both phases have a herb-poor understorey and relatively abundant feathermoss, in contrast to the richer understorey of ST7

Site Characteristics, Limitations and Hazard Potential

Characteristics									Limitations					Hazard Potential			
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
		1										4	4	5		Harvesting
	3	1,3					2		3			4	4	5		Renewal
							2					4	4			Tending

Footnotes

1. Heavy clay soil will affect harvest and site preparation techniques used.
2. Highly competitive site that may make renewal and tending difficult.
3. Clay soil can frost heave making renewal difficult.
4. Normal operations may cause site damage when soils are moist, and will cause site damage when soils are wet. Use "best practices" to minimize site damage, or wait until conditions change.
5. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.

Opportunities

- good site to promote mixedwoods
- good site for establishment of white spruce
- all season harvest

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	3 – 4
Jack pine	N/A	N/A
Aspen	M	1

Site Productivity = FRI Site Class

Degree of Effort		
1	=	Extensive
2	=	Basic
3	=	Intensive
4	=	Elite
N/A	=	Not Appropriate

Site Productivity		
H	=	1 – 2
M	=	2
L	=	2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method	Comments	
Clearcut	R	Balsam fir stocking typically greater than 55%.
• Harvest Method - Conventional	R	
- Strip/Block	CR	This harvest method may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Group seed tree. This harvest method may be prescribed to meet other management objectives.
- HARP	NR	HARP applies to peatland black spruce stands only.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Highly competitive site. Use methods that avoid excessive mineral soil exposure to minimize competition and frost heaving.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Predominantly balsam fir advance growth.
- Seed	NR	Competitive site.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	CR	This treatment by itself will not bring back a black spruce dominated site and should only be used when augmented with other regeneration methods.
- Planting	R	
- Scarification	NR	Highly competitive site.
Tending Treatments		
Cleaning		
• Manual	CR	Cutting may stimulate stem sprouting and/or root suckering of competition.
• Mechanical	CR	See Manual Cleaning comment.
• Chemical		
- Ground	R	
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

The establishment of jack pine is not an appropriate management objective for this site type.

Silvicultural Interpretations for the Establishment of Aspen

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strips should be at least 20 m wide to warm the soil and stimulate suckering. This technique may be prescribed to meet other management objectives.
- Patch	CR	Openings 0.4 ha in size are the minimum acceptable to stimulate aspen suckering. This technique may be prescribed to meet other management objectives.
- Seed-tree	NR	Leaving live aspen will reduce suckering.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species which is generally not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	
Renewal Treatments		
Site Preparation • Mechanical	NR	See Scarification (Section II, Book I).
• Chemical	R	Chemical site preparation may be used on sites where the residual overstorey will negatively affect root suckering. 2,4-D is recommended since it will remove the overstorey without damaging the root systems.
• Prescribed Burn	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Aspen (con't)

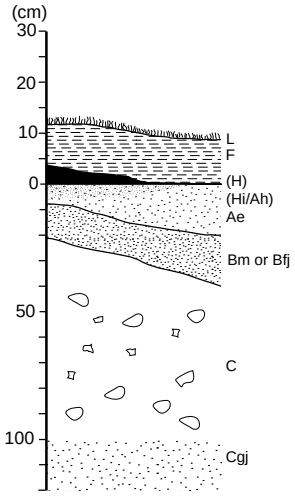
Renewal Treatments		Comments
Regeneration		
• Natural		
- Advance Growth	NR	Aspen does not regenerate under a closed canopy.
- Seed	NR	Reproduction by seed is not an important factor for aspen regeneration.
- Vegetative (coppice)	R	
• Blended	NR	Insufficient data and/or field experience exists to recommend this technique on this site type.
• Artificial		
- Seeding	NR	See Blended comment.
- Planting	NR	See Blended comment.
- Scarification	R	
Tending Treatments		
Cleaning		The literature dealing with pure aspen stands indicates that a hands off approach may be the most appropriate form of cleaning for this species.
• Manual	NR	
• Mechanical	NR	
• Chemical		
- Ground	NR	
- Aerial	NR	
Spacing	R	Site quality and timing is critical for the success of this treatment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Conifer Mixedwood – Medium Soil

ST 6b

Description: Coniferous mixedwood stands on fresh to moderately moist, medium loamy to silty soils. Medium number of shrubs, herb rich (n = 19).



Overstorey: Trembling aspen[6], Jack pine[5], Balsam fir[4], White spruce[3], Black spruce[3], White birch[2], Balsam poplar[2], White pine[1].

Shrubs: Balsam fir, Black spruce, White birch, Trembling aspen; Mountain ash spp., Twinflower, Serviceberry spp., Velvetleaf blueberry, Bush honeysuckle, Creeping snowberry, Bristly wild rose, Dwarf raspberry, Canada honeysuckle, Early low blueberry, Beaked hazel, Mountain maple, Squashberry.

Herbs: Blue bead lily, Wild lily-of-the-valley, Sarsaparilla, Bunchberry, Kidney-leaved violet, Starflower, Large-leaved aster, Goldthread, Rose twisted-stalk, Rattlesnake plantain, Naked mitrewort, Fragrant bedstraw, Wood anemone, Clubmoss spp.

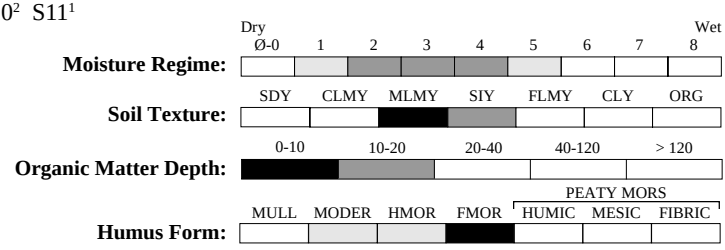
Mosses & Lichens: Schreber's moss, Plume moss, Broom moss, Stair-step moss, Electrified cat's tail moss.

Vegetation Types: V8[3] V12[3] V13[3] (V4, V7, V9, V17)[1]

Ground Surface: Varying proportions of feathermoss, deciduous and coniferous litter.

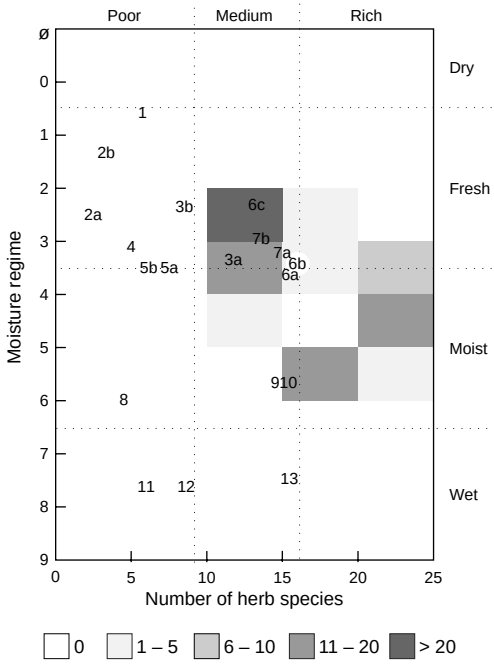
Soil Material: Morainal, glaciofluvial or alluvial, may be stratified, moderate number of coarse fragments. On ground moraine, ablation moraine, end moraine, esker complexes, kame complexes, deltas, floodplains and riverbanks.

Soil Types: S12[4] S9[3] S10[2] S11[1]

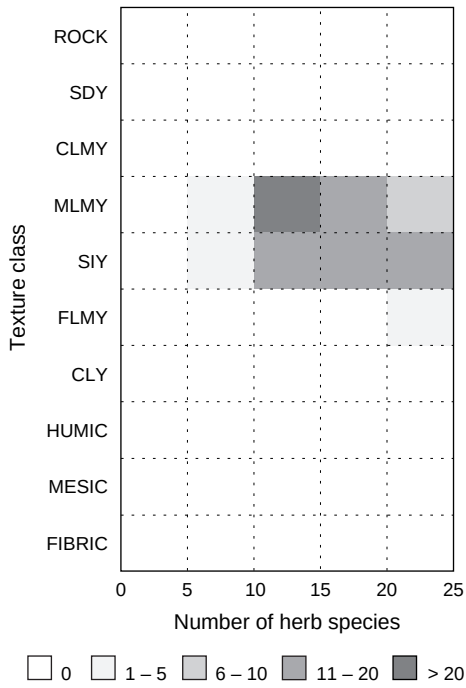


Comments: Abundant balsam fir shrubs.

Moisture / Richness Grid

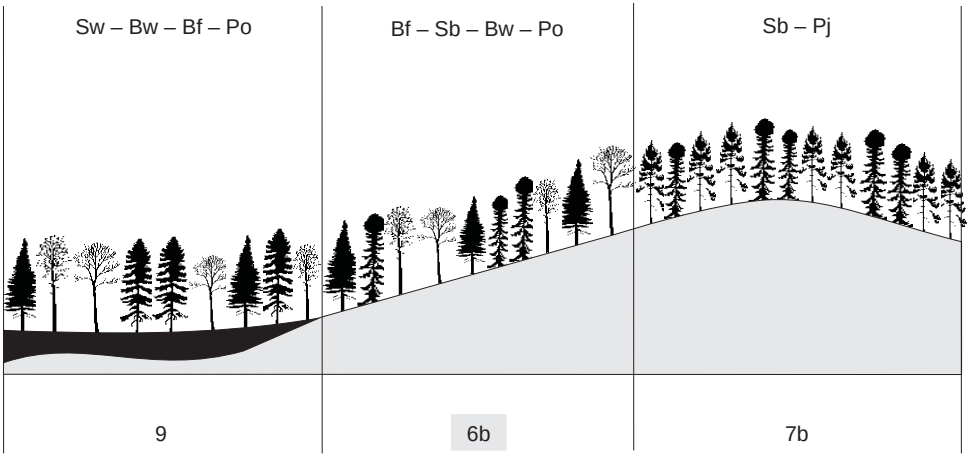


Texture / Richness Grid



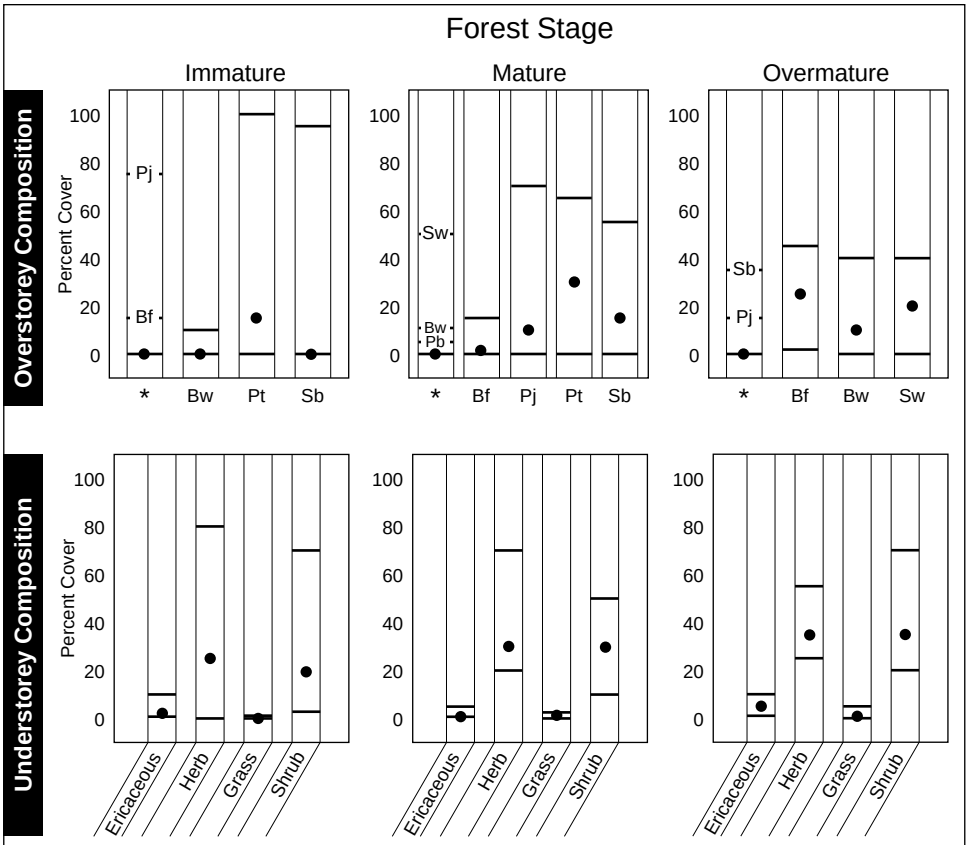
Typical Landscape Associations

Hardwood - Mixedwood Sequence on Shallow Coarse Loamy to Silty Soil



Occurs on well or moderately well-drained sandy loam to silt textures, including silty alluvial soils on gently sloping areas; on loams, sandy loams, or silty till soils on middle to lower slopes in hummocky ablation moraine; or on gentle to moderate slopes within enclosed depressional areas and valleys. Found generally on areas of low relief in rolling to undulating, sometimes terraced, till terrain. Stands are usually mixedwoods dominated by conifers, with varying proportions of black spruce, balsam fir, white spruce, jack pine, red pine, and white pine, interspersed with scattered pockets of aspen and white birch. Associated ST5b and 7b occur on similar landforms and slope positions. ST9 occurs in imperfectly or poorly drained level areas or small depressions, in conjunction with ST6b. ST6b is sometimes associated with shallow soils (ST1).

Site Structure and Composition



Advance Growth

Forest Stage

	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	875	35	625	15	0	0
Bf	14750	100	16375	95	8750	80

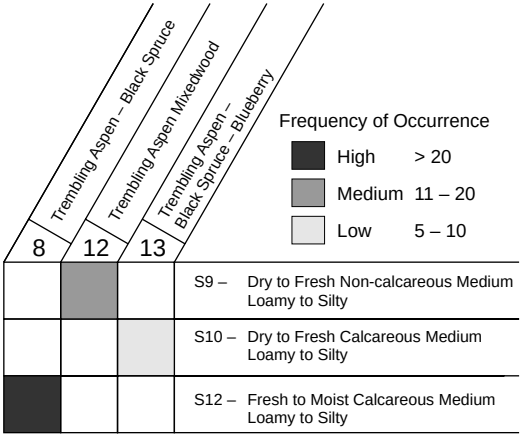
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	0	27	53	20	0	0	30	49	21	0	0	41	32	27	0

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	5	4	3	5	5	N/A

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

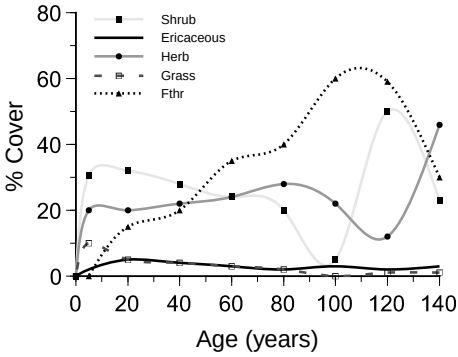


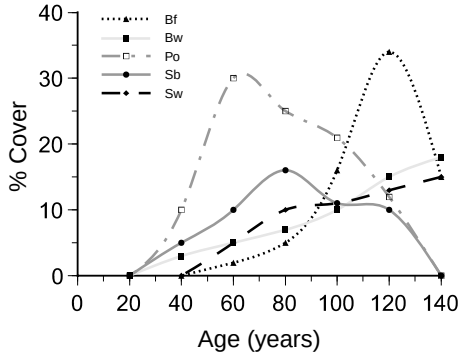
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Sapling	Immature	Mature	Overmature	Special Habitat Preferences
Woodland Caribou				○	○	forage on ground and aboreal lichens / proximity to fen/bog/peatland complexes
Moose (summer)	●	●				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)			●	●	●	dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)	○	○				blueberries, raspberries, beaked hazel
Black Bear (cover)		○	○	●	●	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		●	○	○	●	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	●	●	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		●	○	○	●	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	●	●	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker				○	○	large (>45 cm) cavity trees, preferably aspen, carpenter ants
Spruce Grouse			○	○	○	young jack pine forest with small open areas for display
Ruffed Grouse		○	○	○	○	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker				○	○	large (>30 cm) conifer cavity trees, abundant wood-boring insects
Boreal Chickadee				○	○	dead trees/stumps with soft heartwood for cavities
Least Flycatcher						
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	●	●	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						

○ Used Habitat ● Preferred Habitat

Successional Relationships - Natural





Successional Relationships - Post-Treatment

Response following harvest:
Following harvest, poplar and white birch increase in abundance due to sprouting and suckering. There is also an increase in woody shrubs and herbs.

Response following harvest and mechanical site preparation:
Site preparation stimulates hardwood suckering and sprouting of shrubs (especially beaked hazel and mountain maple). Raspberry, grasses and herbs also increase. The exposure of mineral soil provides a favourable seedbed for available seed.

Response following harvest and prescribed fire:
On hardwood and mixedwood sites, severe burns conducted after tramping and spraying are considered effective for competition control. White birch is easily killed by fire. Herbs will grow back quickly following fire. Ericaceous shrubs, when present, will increase by sprouting from rhizomes.

Response following harvest and herbicide:
Recovery of hardwoods, graminoids and herbs is usually rapid after herbicide application which may necessitate a re-application. Grasses can dominate the site for a few years after the woody vegetation is reduced by the first spray. Aspen, white birch, woody shrubs and herbs can be controlled by herbicides but a second spray is usually required within two to five years.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature					875	35
Mature			875	10	500	20
Overmature					0	0
Bf						
Immature					14750	100
Mature			3000	40	17550	95
Overmature					8750	80

sample size ≥ 5 sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

No information available.

Critical Comments

- there are two “phases” to this site type:conifer dominated (spruce-fir), and hardwood mixedwood (aspen or birch with conifers). Both phases have a herb-poor understorey and relatively abundant feathermoss, in contrast to the richer understorey of ST7a and 7b.

Site Characteristics, Limitations and Hazard Potential

Characteristics										Limitations					Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
			2									4	4	5		Harvesting
	3	3	2			1		3				4	4	5		Renewal
						1										Tending

Footnotes

1. Abundance of competitive plants in understorey may require vegetation management.
2. Coarse fragments may hinder some harvesting equipment.
3. Removal of LFH may cause frost heaving.
4. Normal operations may cause damage when soils are moist, and will cause site damage when soils are wet. Use "best practices" to minimize site damage, or wait until conditions change.
5. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.

Opportunities

- all season harvest
- opportunity for white spruce and white pine establishment
- opportunity for mixedwood management

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	3 – 4
Jack pine	H	3 – 4
Aspen	H	1

Site Productivity = FRI Site Class

Degree of Effort		
1	=	Extensive
2	=	Basic
3	=	Intensive
4	=	Elite
N/A	=	Not Appropriate

Site Productivity		
H	=	1 – 2
M	=	2
L	=	2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method		Comments
Clearcut	R	Balsam fir stocking typically greater than 70%.
• Harvest Method - Conventional	R	
- Strip/Block	CR	This harvest method may be prescribed to meet other management objectives. This is a competitive site and natural seed generally does not do well.
- Patch	R	
- Seed-tree	CR	Group seed tree. This harvest method may be prescribed to meet other management objectives. This is a competitive site and natural seed generally does not do well.
- HARP	NR	HARP applies to peatland black spruce stands only.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended **CR = Conditionally Recommended** **NR = Not Recommended**

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Total removal of the LFH layer could result in frost heaving.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Predominantly balsam fir advance growth.
- Seed	NR	Competitive site.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	NR	Predominantly balsam fir advance growth.
• Artificial		
- Seeding	CR	Use to augment other regeneration methods only.
- Planting	R	
- Scarification	NR	Competitive site.
Tending Treatments		
Cleaning		
• Manual	CR	Cutting may stimulate stem sprouting and/or root suckering of competition.
• Mechanical	CR	See Manual Cleaning comment.
• Chemical		
- Ground	R	
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Jack Pine

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Residual stand will not contribute seed of sufficient quantity or genetic quality. However, this cutting technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	See Strip/Block comment.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species which is not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended **CR = Conditionally Recommended** **NR = Not Recommended**

Silvicultural Interpretations for the Establishment of Jack Pine (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Total removal of the LFH layer could result in frost heaving.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Jack pine does not regenerate under a closed canopy.
- Seed	NR	Distribution, abundance and vigor of competitive woody and herbaceous species will preclude germination, survival and growth of jack pine.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	NR	See Natural Seed comment.
- Planting	R	
- Scarification	NR	See Natural Seed comment.
Tending Treatments		
Cleaning		
• Manual	CR	Cutting may stimulate stem sprouting and/or root suckering of competition.
• Mechanical	CR	See Manual Cleaning comment.
• Chemical		
- Ground	R	
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Aspen

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strips should be at least 20 m wide to warm the soil and stimulate suckering. This technique may be prescribed to meet other management objectives.
- Patch	CR	Openings 0.4 ha in size are the minimum acceptable to stimulate aspen suckering. This technique may be prescribed to meet other management objectives.
- Seed-tree	NR	Leaving live aspen will reduce suckering.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species which is generally not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

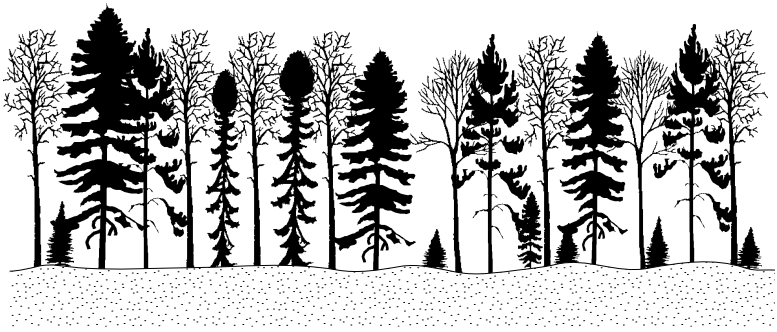
R = Recommended **CR = Conditionally Recommended** **NR = Not Recommended**

Silvicultural Interpretations for the Establishment of Aspen (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	NR	See Scarification (Section II, Book I).
• Chemical	R	Chemical site preparation may be used on sites where the residual overstorey will negatively affect root suckering. 2,4-D is recommended since it will remove the overstorey without damaging the root systems.
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Aspen does not regenerate under a closed canopy.
- Seed	NR	Reproduction by seed is not an important factor for aspen regeneration.
- Vegetative (coppice)	R	
• Blended	NR	Insufficient data and/or field experience exist to recommend this technique on this site type.
• Artificial		
- Seeding	NR	See Blended comment.
- Planting	NR	See Blended comment.
- Scarification	R	
Tending Treatments		
Cleaning		The literature dealing with pure aspen stands indicates that a hands off approach may be the most appropriate form of cleaning for this species.
• Manual	NR	
• Mechanical	NR	
• Chemical		
- Ground	NR	
- Aerial	NR	
Spacing	R	Site quality and timing is critical for the success of this treatment.

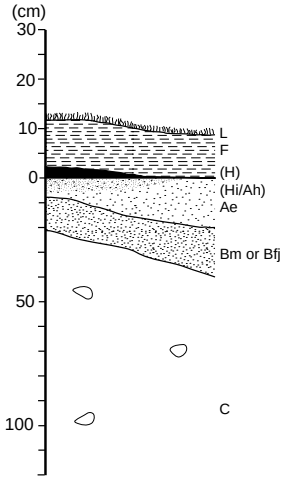
R = Recommended CR = Conditionally Recommended NR = Not Recommended

Hardwood Mixedwood – Coarse Soil



ST 6c

Description: Hardwood mixedwood stands on dry to moderately moist, sandy to coarse loamy soils. Medium number of shrubs and herbs (n = 47).



Overstorey: Trembling aspen[7], White spruce[3], Jack pine[3], White birch[3], Black spruce[2], Balsam fir[1], White cedar[1], Red pine[1], White pine[1].

Shrubs: Balsam fir, Trembling aspen, White birch, White spruce; Mountain maple, Beaked hazel, Bush honeysuckle, Dwarf raspberry, Twinflower, Canada honeysuckle, Mountain ash spp., Early low blueberry, Velvetleaf blueberry, Bristly wild rose.

Herbs: Blue bead lily, Sarsaparilla, Wild lily-of-the-valley, Kidney-leaved violet, Bunchberry, Starflower, Rose twisted-stalk, Large-leaved aster, Wood anemone, Ground pine, Clubmoss spp., Fragrant bedstraw, Goldthread.

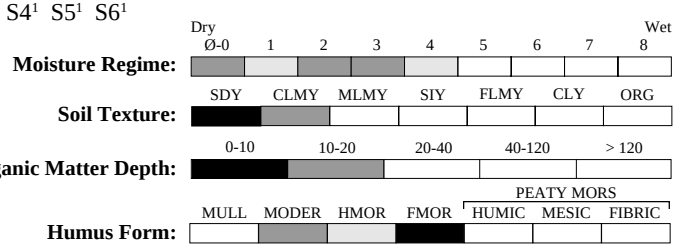
Mosses & Lichens: Schreber's moss, *Brachythecium* spp., Plume moss, Broom moss, Electrified cat's tail moss.

Vegetation Types: V12[5] V9[1] V11[1] V14[1] (V5, V7, V8, V13)[2]

Ground Surface: Dominantly deciduous litter with patches of feathermosses and coniferous litter.

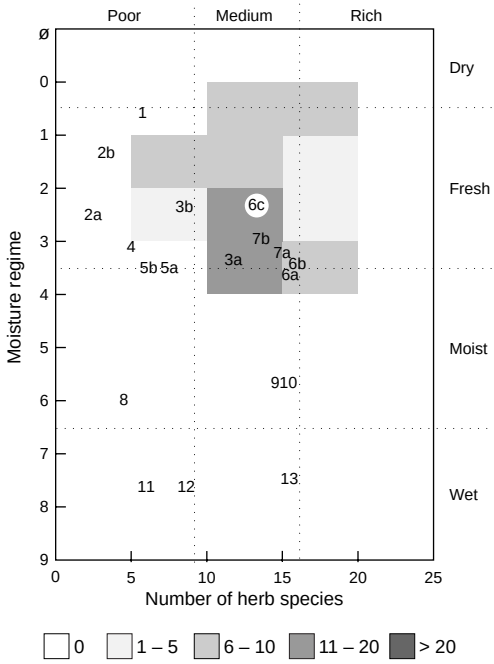
Soil Material: Typically glaciofluvial, morainal or shallow water lacustrine, may be stratified. Moderate number of coarse fragments. On outwash, esker complexes, kame complexes, ground moraine, ablation moraine, end moraine, beaches, deltas.

Soil Types: S1[2] S2[2] S7[2] S3[1] S4[1] S5[1] S6[1]

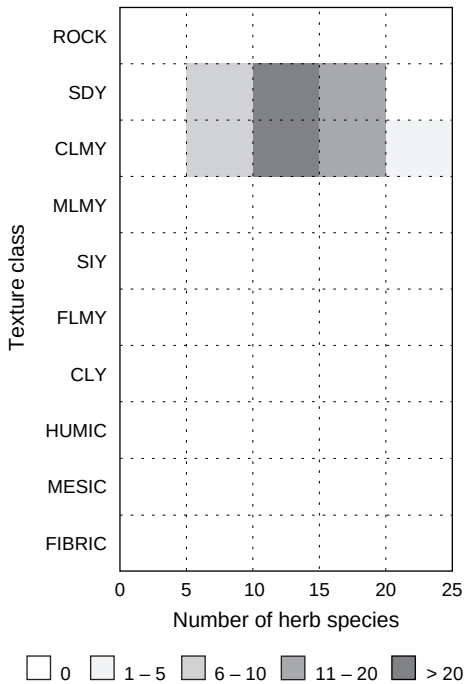


Comments: Balsam fir shrubs are present in the understorey of many stands. Balsam poplar does not occur in this site type as in ST 3a and 3b.

Moisture / Richness Grid

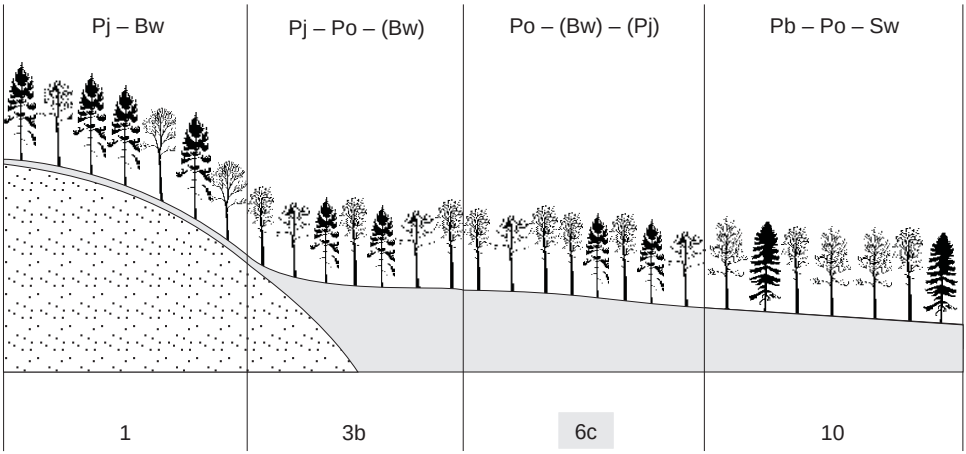


Texture / Richness Grid



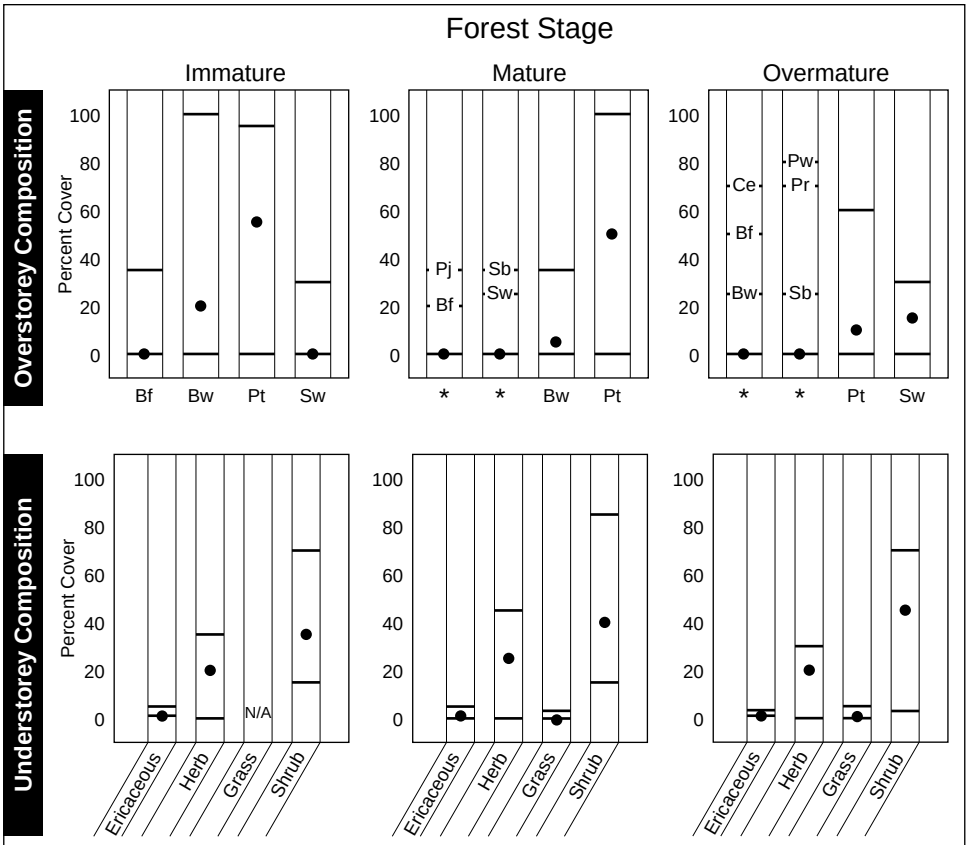
Typical Landscape Associations

Hardwood - Mixedwood Sequence on Sandy to Coarse Loamy Soil



Most commonly found on sandy to coarse loamy till, end or ground moraines, glaciofluvial deposits, or on sandy lacustrine deposits. Sandy glaciofluvial landforms include freely-drained, level outwash plains, ridged or hummocky eskers, esker complexes, kames, kettle and kame sequences, and sand dunes. Sandy lacustrine deposits include beach ridges and freely-drained sandy lake plains. Coarse till deposits include ground moraines, ablation moraines, end and recessional moraines, and shallow drift over bedrock. On sandy glaciofluvial or lacustrine deposits, this site type occurs on level to gently sloping areas. On till deposits, this site type typically occurs on gentle to moderate side slopes, or on upper slopes and crests or steep side slopes, where it often occurs in conjunction with very shallow soils and exposed bedrock. Stands are usually hardwood-dominated mixedwoods. Hardwood species (aspen, balsam poplar, or white birch) are dominant, with varying proportions of conifer species (jack pine, red pine, white pine, balsam fir, white spruce, and black spruce). Associated ST2a, 2b, 3b, and 4 occur on similar landforms.

Site Structure and Composition



Advance Growth

Forest Stage

	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	250	10	125	10	1500	28
Bf	11625	85	6875	90	21050	100

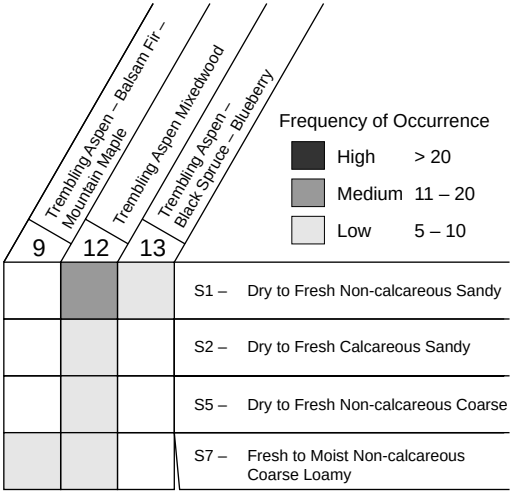
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	0	6	90	4	0	0	5	80	15	0	0	32	42	26	0

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	5	8	4	7	4	13

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

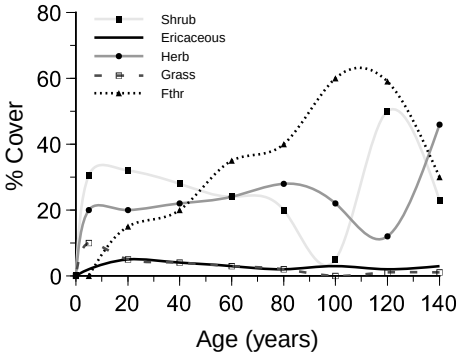


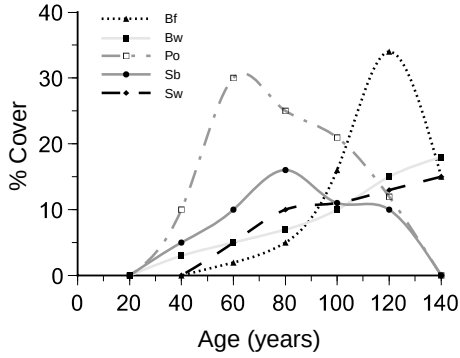
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Sapling	Immature	Mature	Overmature	Special Habitat Preferences
Woodland Caribou				○	○	forage on ground and aboreal lichens / proximity to fen/bog/peatland complexes
Moose (summer)	●	●				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)			●	●	●	dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)	○	○				blueberries, raspberries, beaked hazel
Black Bear (cover)		○	○	●	●	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		●	○	○	●	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	●	●	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		●	○	○	●	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	●	●	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker				○	○	large (>45 cm) cavity trees, preferably aspen, carpenter ants
Spruce Grouse			○	○	○	young jack pine forest with small open areas for display
Ruffed Grouse		○	○	○	○	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker				○	○	large (>30 cm) conifer cavity trees, abundant wood-boring insects
Boreal Chickadee				○	○	dead trees/stumps with soft heartwood for cavities
Least Flycatcher						
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	●	●	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
Following harvest, poplar and white birch increase in abundance due to sprouting and suckering. There is also an increase in woody shrubs and herbs.

Response following harvest and mechanical site preparation:
Site preparation stimulates hardwood suckering and sprouting of shrubs (especially beaked hazel and mountain maple). Raspberry, grasses and herbs also increase. The exposure of mineral soil provides a favourable seedbed for available seed.

Response following harvest and prescribed fire:
On hardwood and mixedwood sites, severe burns conducted after tramping and spraying are considered effective for competition control. White birch is easily killed by fire. Herbs will grow back quickly following fire. Ericaceous shrubs, when present, will increase by sprouting from rhizomes.

Response following harvest and herbicide:
Recovery of hardwoods, graminoids and herbs is usually rapid after herbicide application which may necessitate a re-application. Grasses can dominate the site for a few years after the woody vegetation is reduced by the first spray. Aspen, white birch, woody shrubs and herbs can be controlled by herbicides but a second spray is usually required within two to five years.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature					250	10
Mature			63	3	1375	28
Overmature					1500	28
Bf						
Immature					11625	85
Mature			4813	65	12188	93
Overmature					21063	100

sample size ≥ 5 sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

No information available.

Critical Comments

- typically hardwood-dominated stands (aspen or white birch), but the mixedwood phase occurs occasionally
- ericaceous shrubs, especially blueberries are occasionally abundant

Site Characteristics, Limitations and Hazard Potential

Characteristics									Limitations						Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
				1		4						5	5	6	7	Harvesting
				1	2		3					5	5	6		Renewal
							3									Tending

Footnotes

1. Coarse fragments may hinder some harvesting equipment.
2. Certain percentage of these sites are dry (Ø to 0) and could desiccate planting stock or seed.
3. High amount of competition occurs on this site and will require tending.
4. On some sites, terrain may impede harvesting equipment operability.
5. Normal operations may cause site damage on wet sandy soils, and moist coarse loamy soils. Normal operations will cause damage on wet coarse loamy soils. Use "best practices" to minimize site damage, or wait until conditions change.
6. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.
7. Moderate to high risk of nutrient loss using full tree clearcut logging, on sandy soils < 60 cm deep or with < 5 cm surface organic matter. Moderate to low risk of nutrient loss using tree-length clearcut logging on sandy soils < 60 cm deep with < 5 cm surface organic matter.

Opportunities

- best managed as a mixedwood site
- site can establish red and white pine, white spruce
- potential for cone scattering on drier sites
- all season harvest on this site

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	3 – 4
Jack pine	H	3 – 4
Aspen	M	1

Site Productivity = FRI Site Class

Degree of Effort		
1	=	Extensive
2	=	Basic
3	=	Intensive
4	=	Elite
N/A	=	Not Appropriate

Site Productivity		
H	=	1 – 2
M	=	2
L	=	2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method		Comments
Clearcut	R	Balsam fir stocking typically greater than 70%.
• Harvest Method - Conventional	R	
- Strip/Block	CR	Potential for natural seeding is very low due to low density of black spruce in the original stand. This harvest method may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Group seed tree. See Strip/Block comment.
- HARP	NR	HARP applies to peatland black spruce stands only.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended **CR = Conditionally Recommended** **NR = Not Recommended**

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	R	
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Black spruce advance growth is not of sufficient quantity or distribution to form a significant part of the new stand.
- Seed	NR	Distribution, abundance and vigour of competitive woody and herbaceous species will preclude germination, survival and growth of black spruce.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	NR	See Natural Seed comment.
- Planting	R	
- Scarification	NR	See Natural Seed comment.
Tending Treatments		
Cleaning		
• Manual	CR	Cutting may stimulate stem sprouting and/or root suckering of competition.
• Mechanical	CR	See Manual Cleaning comment.
• Chemical		
- Ground	R	
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Jack Pine

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Residual stand will not contribute seed of sufficient quantity or genetic quality. However, this cutting technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Potential for natural seeding is very low due to low density of jack pine in the original stand. This harvest method may be prescribed to meet other management objectives.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This species is shade intolerant. It is generally not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Jack Pine (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	R	
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Jack pine does not regenerate under a closed canopy.
- Seed	NR	Potential for natural seeding is very low due to low density of jack pine in the original stand. Abundance and vigor of competition will limit germination, survival and growth of jack pine.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	CR	This treatment by itself will not bring back a jack pine dominated site and should only be used when augmented with other regeneration methods.
- Planting	R	
- Scarification	NR	See Natural Seed comment.
Tending Treatments		
Cleaning		
• Manual	CR	Cutting may stimulate stem sprouting and/or root suckering of competition.
• Mechanical	CR	See Manual Cleaning comment.
• Chemical	R	
- Ground		
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Aspen

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strips should be at least 20 m wide to warm the soil and stimulate suckering. This harvest method may be prescribed to meet other management objectives.
- Patch	CR	Minimum patch size of 0.4 ha to stimulate suckering. This harvest method may be prescribed to meet other management objectives.
- Seed-tree	NR	Leaving live aspen will inhibit suckering.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This species is shade intolerant. It is generally not suited to this silvicultural system.
Selection	NR	See Shelterwood comment
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Aspen (con't)

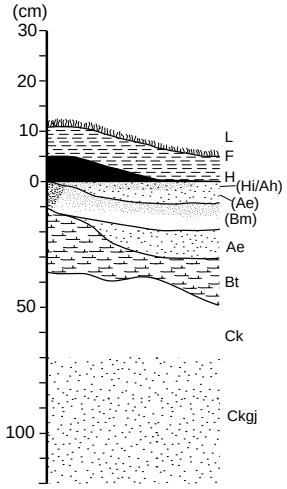
Renewal Treatments		Comments
Site Preparation		
• Mechanical	NR	See Scarification (Section II, Book I).
• Chemical	R	Chemical site preparation may be used on sites where the residual overstorey will negatively affect root suckering. 2,4-D is recommended since it will remove the overstorey without damaging the root systems.
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Aspen does not regenerate under a closed canopy.
- Seed	NR	Reproduction by seed is not an important factor in aspen regeneration.
- Vegetative (coppice)	R	
• Blended	NR	Insufficient data and/or field experience exist to recommend this technique on this site type.
• Artificial		
- Seeding	NR	See Blended comment.
- Planting	NR	See Blended comment.
- Scarification	R	
Tending Treatments		
Cleaning		The literature dealing with pure aspen stands gives the impression that a hands off approach may be the most appropriate form of cleaning for this species.
• Manual	NR	
• Mechanical	NR	
• Chemical		
- Ground	NR	
- Aerial	NR	
Spacing	R	Site quality and timing is critical for the success of this treatment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Hardwood – Fine Soil

ST 7a

Description: Hardwood mixedwood stands on fresh to very moist, fine loamy to clayey soils. Medium number of shrubs, herb rich, with abundant tall woody shrubs (n = 37).



Overstorey: Trembling aspen[8], White spruce[2], Balsam poplar[2], Black spruce[1], Balsam fir[1], White birch[1], Jack pine[1].

Shrubs: Balsam fir, Trembling aspen; Dwarf raspberry, Mountain maple, Squashberry, Canada honeysuckle, Bush honeysuckle, Bristly wild rose, Mountain ash spp., Beaked hazel, Swamp red currant, Currant spp., Twinflower, Honeysuckle spp., Speckled alder, Serviceberry spp., Wild red raspberry.

Herbs: Sarsaparilla, Kidney-leaved violet, Blue bead lily, Naked mitrewort, Bunchberry, Starflower, Fragrant bedstraw, Wild lily-of-the-valley, Large-leaved aster, Rose twisted-stalk, Bluebells, Sweet coltsfoot, Wood anemone, Sedge spp., Oak fern, Interrupted clubmoss, Spinulose shield fern.

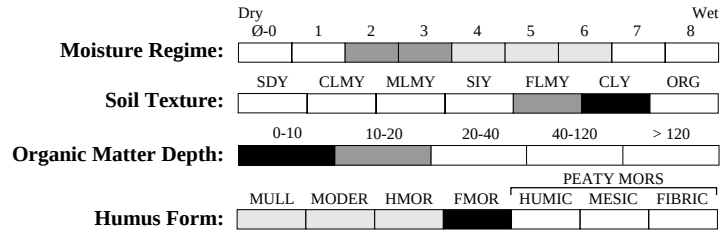
Mosses & Lichens: Sparse Schreber's moss, Stair-step moss, Electrified cat's tail moss, *Brachythecium* spp., Plume moss.

Vegetation Types: V9[5] V7[1] V10[1] V8[1] V11[1] (V12, V14)[1]

Ground Surface: Abundant deciduous litter with sparse patches of feathermoss.

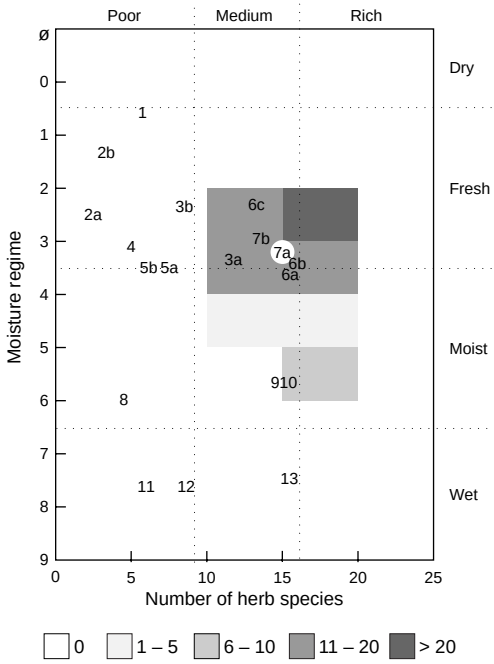
Soil Material: Morainal (clay till) or deep water lacustrine. Few coarse fragments. On lacustrine or clay till plains or undulating drumlinoid formations.

Soil Types: S13[7] S14[3]

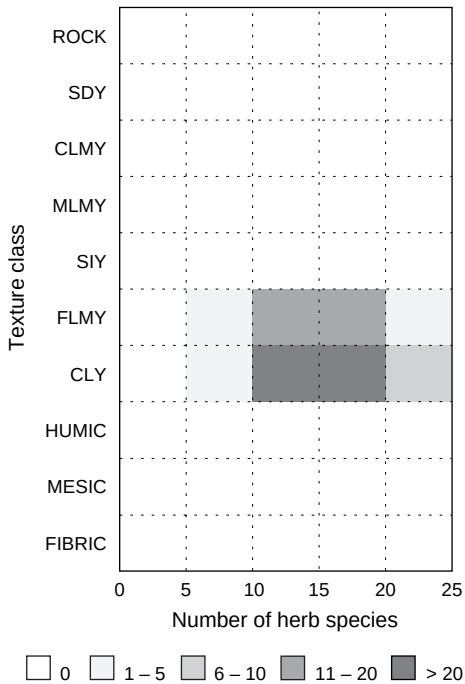


Comments: Found mainly in the Clay Belt. Free carbonates common within 120 cm of soil surface. Abundant balsam fir shrubs.

Moisture / Richness Grid

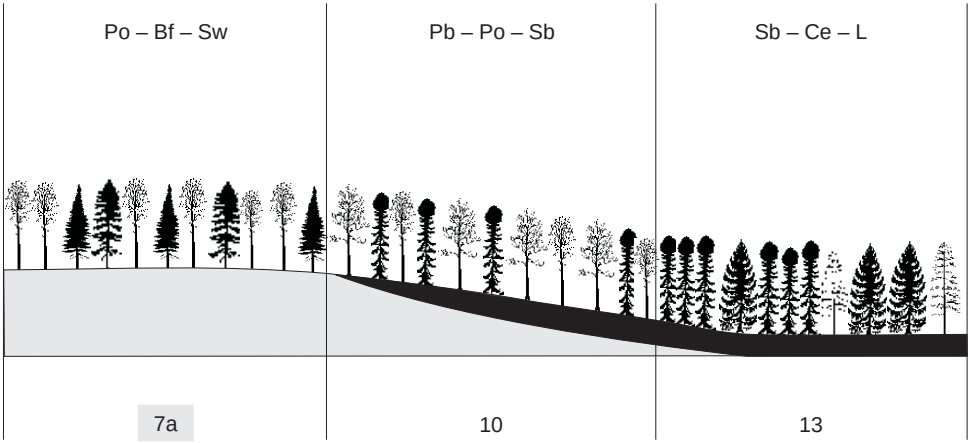


Texture / Richness Grid



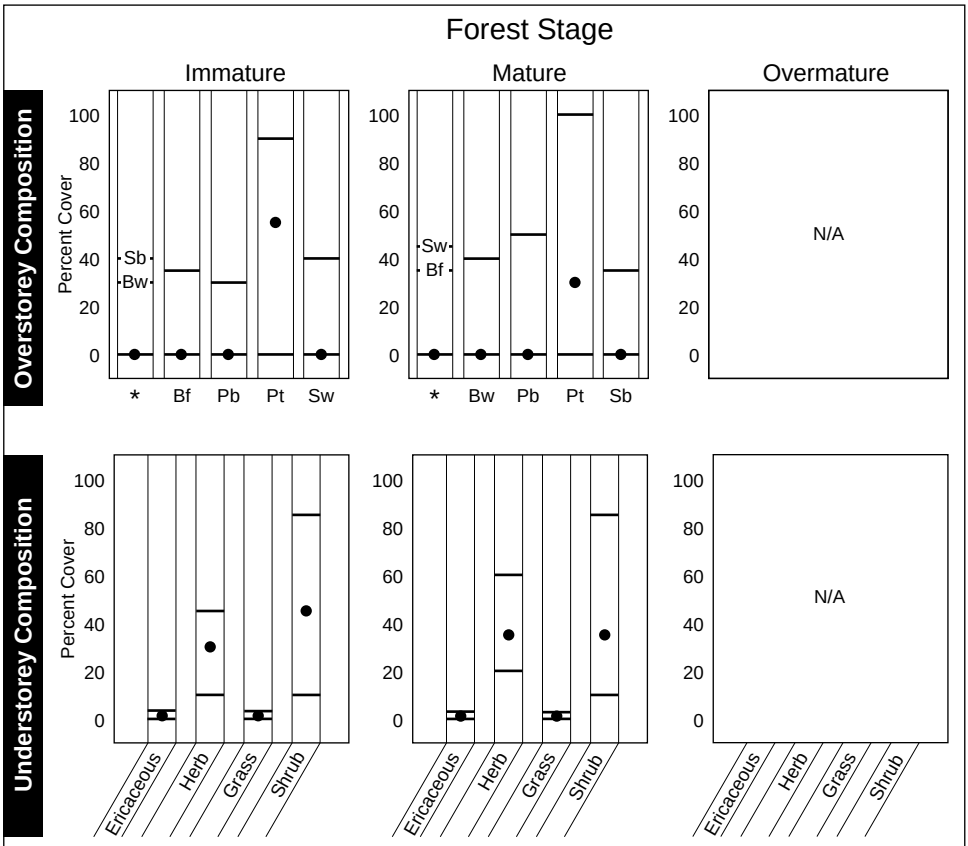
Typical Landscape Associations

Hardwood - Mixedwood Sequence on Fine Loamy to Clayey Soil



Occurs on well or moderately well drained soils on fine loamy to clayey soils, on elevated terrain, within glaciolacustrine or clay till plains, typically on middle to upper slopes and crests of hills. Stands are typically hardwood-dominated mixedwoods. Hardwood species (aspen, balsam poplar, and/or white birch) are dominant, with scattered pockets of conifer, including black spruce, white spruce, and balsam fir. Commonly occurs in complexes with ST10, less often with ST6a and 9. ST13 may also occur in small wet depressions or within linear drainage corridors.

Site Structure and Composition



Advance Growth

	Forest Stage					
	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	125	5	0	0	875	25
Bf	11125	90	3875	65	0	0

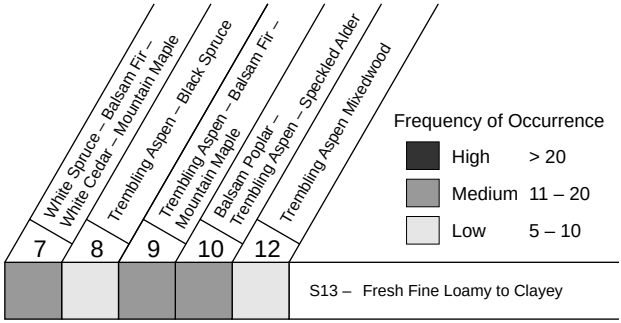
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	0	16	77	7	0	0	16	75	9	0	N/A	N/A	N/A	N/A	N/A

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	4	8	6	12	N/A	N/A

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

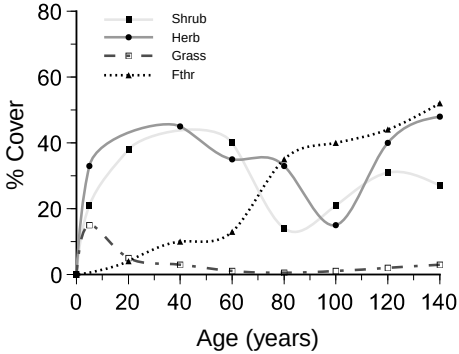


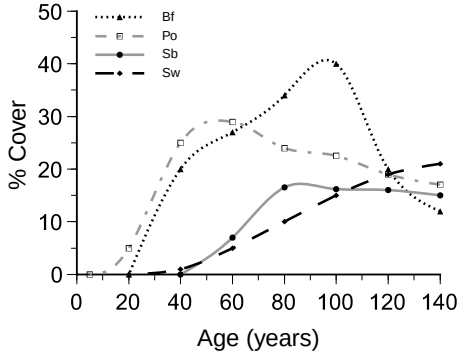
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling		Immature		Overmature	Special Habitat Preferences
Woodland Caribou						
Moose (summer)	●	●				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)			○	○	○	dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)	○	○				blueberries, raspberries, beaked hazel
Black Bear (cover)		○	○	●	●	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		●	○	○	●	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	○	○	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		●	○	○	●	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	●	●	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker				○	●	large (>45 cm) cavity trees, preferably aspen, carpenter ants
Spruce Grouse						
Ruffed Grouse		●	●	●	●	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker						
Boreal Chickadee				○	○	dead trees/stumps with soft heartwood for cavities
Least Flycatcher				●	●	tall aspen cavity trees, open mid-canopy layer for foraging
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	●	●	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
Harvesting promotes increased suckering from roots or stumps especially if cut during winter. Regeneration of hardwoods, woody shrubs, graminoids, and herbs from seed will occur on areas of exposed mineral soil.

Response following harvest and mechanical site preparation:
Unless soil disturbance is minimized, site preparation greatly stimulates hardwood suckering, and sprouting of woody shrubs (especially beaked hazel and mountain maple). Great increase in raspberry, grasses and herbaceous vegetation.

Response following harvest and prescribed fire:
Severe burns after tramping and spraying are considered an effective method of competition control. Light burning will promote the suckering of poplar species and woody shrubs. Herbs will increase by seeding after fire.

Response following harvest and herbicide:
Recovery of hardwoods, graminoids and herbs is usually rapid after herbicide application which may necessitate a re-application. Grasses can dominate the site for a few years after the woody vegetation is reduced by the first spray. Aspen, white birch, woody shrubs and herbs can be controlled by herbicides but a second spray is usually required within two to five years.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature			250	15	75	3
Mature	0	0	0	0	0	0
Overmature					875	25
Bf						
Immature			17000	90	6950	78
Mature	800	20	16625	95	3500	65
Overmature					0	0

sample size ≥ 5 sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

All conifer ingress < 1000 sph.

Critical Comments

- very diverse and rich herb and woody shrub understorey

Site Characteristics, Limitations and Hazard Potential

Characteristics										Limitations					Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities	
		1										4	4	5		Harvesting	
		1,3					2		3			4	4	5		Renewal	
							2									Tending	

Footnotes

1. Heavy clay soil will affect harvest and site preparation techniques used.
2. Highly competitive site that may make conifer renewal and tending difficult.
3. Clay soil will frost heave making renewal difficult.
4. Normal operations may cause site damage when soils are moist, and will cause site damage when soils are wet Use "best practices" to minimize site damage, or wait until conditions change.
5. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.

Opportunities

- good site to promote mixedwoods
- good site for establishment of white spruce

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	3 – 4
Jack pine	N/A	N/A
Aspen	H	1

Site Productivity = FRI Site Class

Degree of Effort

1 = Extensive
2 = Basic
3 = Intensive
4 = Elite
N/A = Not Appropriate

Site Productivity

H = 1 – 2
M = 2
L = 2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method		Comments
Clearcut	R	Balsam fir stocking typically greater than 58%.
• Harvest Method - Conventional	R	
- Strip/Block	CR	Potential for natural seeding is very low due to low density of black spruce in the original stand. This harvest method may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Group seed tree. See Strip/Block comment.
- HARP	NR	HARP applies to peatland black spruce stands only.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Highly competitive site. Use methods that do not cause excessive mineral soil exposure to minimize competition and avoid frost heaving.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Predominantly balsam fir advance growth.
- Seed	NR	Competitive site and potential for natural seeding is very low due to low density of black spruce in the original stand.
- Vegetative (coppice)	NR	This species does not coppice.
• Blended	R	
• Artificial		
- Seeding	CR	This treatment by itself will not bring back a black spruce dominated site and should only be used when augmented with other regeneration methods.
- Planting	R	
- Scarification	NR	See Natural Seed comment.
Tending Treatments		
Cleaning		
• Manual	CR	Cutting may stimulate stem sprouting and/or root suckering of competition.
• Mechanical	CR	See Manual Cleaning comment.
• Chemical		
- Ground	R	
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

The establishment of jack pine is not an appropriate management objective for this site type.

Silvicultural Interpretations for the Establishment of Aspen

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strips should be at least 20 m wide to warm the soil and stimulate suckering. This harvest method may be prescribed to meet other management objectives.
- Patch	CR	Openings 0.4 ha in size are the minimum acceptable to stimulate aspen suckering. This harvest method may be prescribed to meet other management objectives.
- Seed-tree	NR	Leaving live aspen will inhibit suckering.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species which is generally not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Aspen (con't)

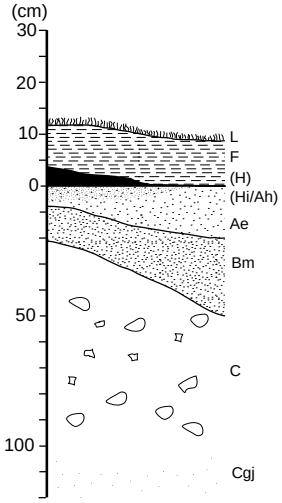
Renewal Treatments		Comments
Site Preparation		
• Mechanical	NR	See Scarification (Section II, Book I).
• Chemical	R	Chemical site preparation may be used on sites where the residual overstorey will negatively affect root suckering. 2,4-D is recommended since it will remove the overstorey without damaging the root systems.
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Aspen does not regenerate under a closed canopy.
- Seed	NR	Reproduction by seed is not an important factor for aspen regeneration.
- Vegetative (coppice)	R	
• Blended	NR	Insufficient data and/or field experience exist to recommend this technique on this site type.
• Artificial		
- Seeding	NR	See Blended comment.
- Planting	NR	See Blended comment.
- Scarification	R	
Tending Treatments		
Cleaning		The literature dealing with pure aspen stands indivates that a hands off approach may be the most appropriate form of cleaning for this species.
• Manual	NR	
• Mechanical	NR	
• Chemical		
- Ground	NR	
- Aerial	NR	
Spacing	R	Site quality and timing is critical for the success of this treatment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Hardwood – Medium Soil

ST 7b

Description: Hardwood mixedwood stands on moderately fresh to moist, medium loamy to silty soils. Medium number of shrubs, herb rich, with abundant tall woody shrubs (n = 31).



Overstorey: Trembling aspen[8], White spruce[3], White birch[2], Balsam fir[1], Jack pine[1], Balsam poplar[1], Black spruce[1], White cedar[1].

Shrubs: Balsam fir, Trembling aspen, White birch, White spruce; Mountain maple, Beaked hazel, Bush honeysuckle, Dwarf raspberry, Canada honeysuckle, Swamp red currant, Mountain ash spp., Squashberry, Currant spp., Wild red raspberry, Twinflower, Bristly wild rose.

Herbs: Large-leaved aster, Sarsaparilla, Blue bead lily, Bunchberry, Wild lily-of-the-valley, Fragrant bedstraw, Kidney-leaved violet, Starflower, Rose twisted-stalk, Sedge spp., Spinulose shield fern, Naked mitrewort, Wood anemone, Ground pine, Goldthread.

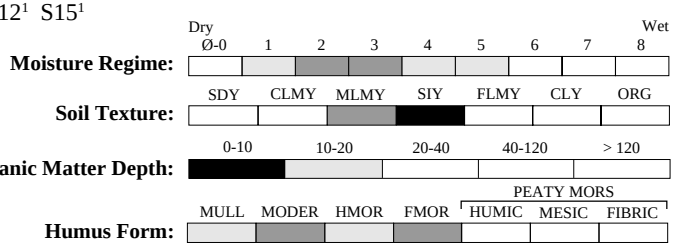
Mosses & Lichens: Sparse *Brachythecium* spp., Schreber's moss, Electrified cat's tail moss, Plume moss.

Vegetation Types: V9[3] V11[3] V12[1] (V8, V10, V13)[2] other[1]

Ground Surface: Abundant deciduous litter with sparse patches of feathermoss.

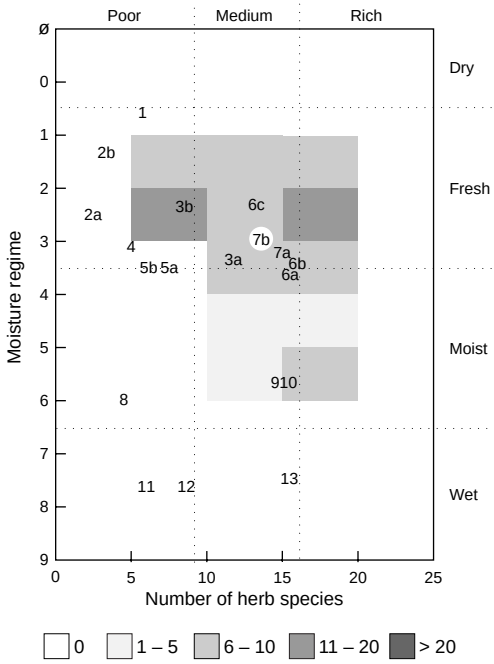
Soil Material: Morainal, glaciofluvial, shallow water lacustrine, or alluvial. Commonly stratified. Moderate number of coarse fragments. On ground moraine, ablation moraine, end moraine, esker complexes, kame complexes, deltas, floodplains and riverbanks.

Soil Types: S9[3] S11[3] S10[2] S12[1] S15[1]

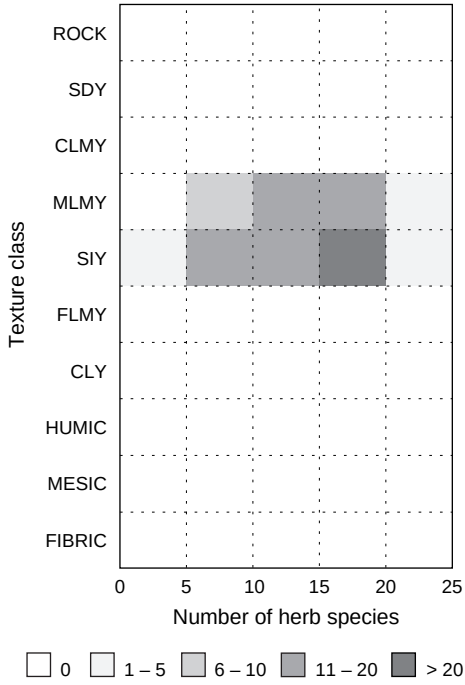


Comments: Sparse balsam fir shrubs. Red pine or white pine may be present.

Moisture / Richness Grid

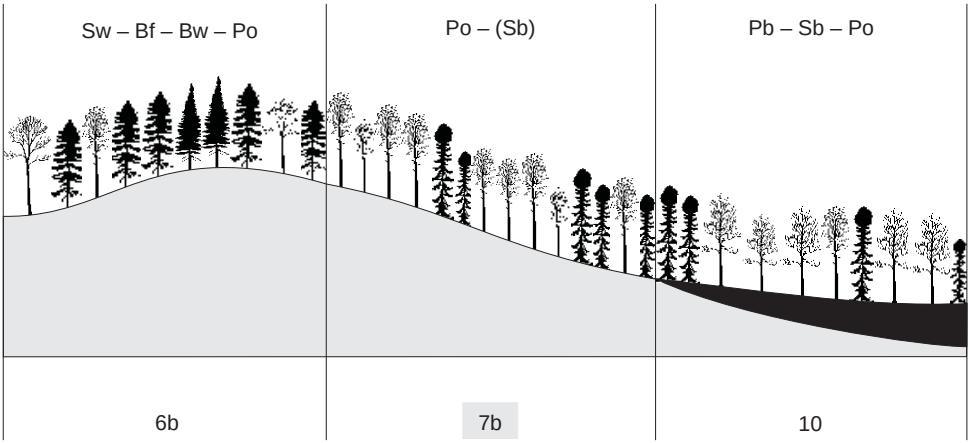


Texture / Richness Grid



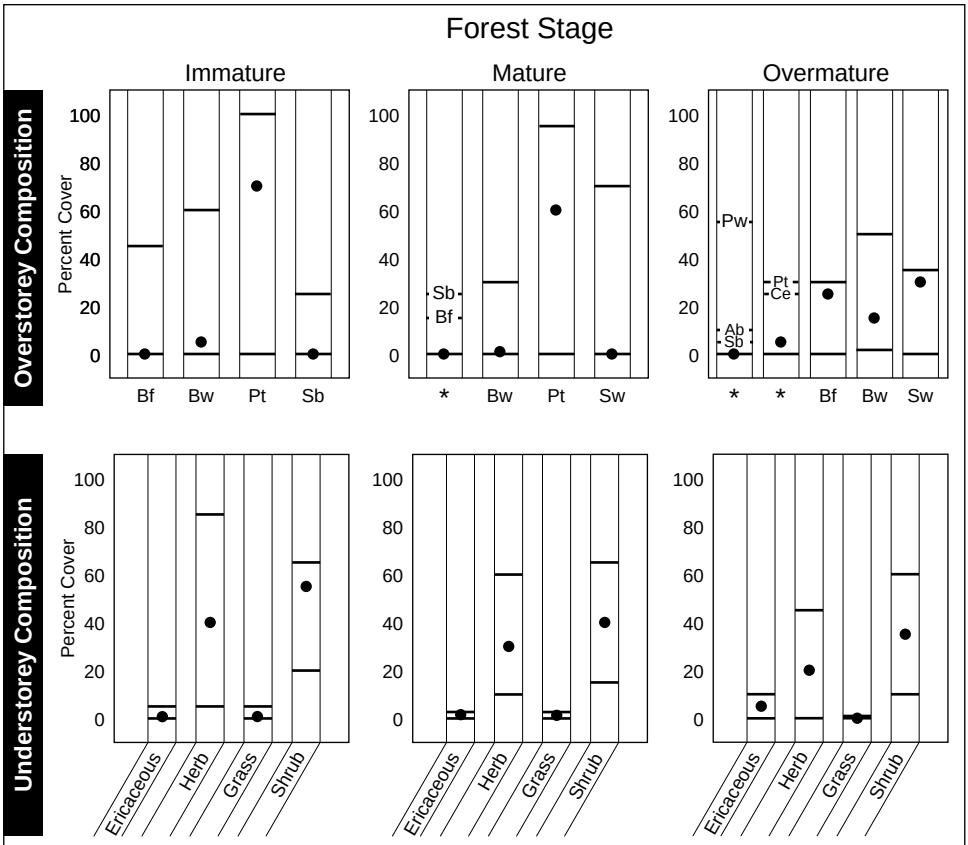
Typical Landscape Associations

Mixedwood Sequence on Medium Loamy to Silty Soil



Occurs on well or moderately well-drained sandy loam to silt textures, including silty alluvial soils on gently sloping areas; on loams, sandy loams, or silty till soils on middle to lower slopes in hummocky ablation moraine; or on gentle to moderate slopes within enclosed depressional areas and valleys. Found generally on areas of low relief in rolling to undulating, sometimes terraced, till terrain. Stands are hardwood-dominated mixedwoods. Hardwood species (aspen, balsam poplar, and/or white birch) dominate, with scattered pockets of conifer, including black spruce, white spruce, and balsam fir. Commonly occurs in complexes with ST10, 6b and 9. Sometimes occurs in combination with ST7a on the boundaries between fine lacustrine materials and coarser till or outwash materials.

Site Structure and Composition



Advance Growth

Forest Stage

	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	0	0	150	8	N/A	N/A
Bf	50	3	825	28	N/A	N/A

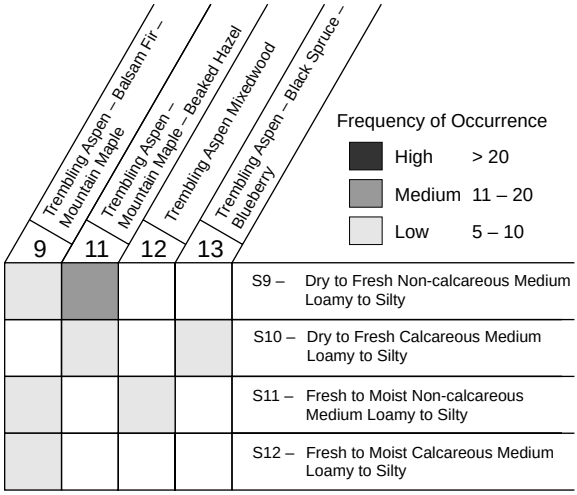
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	0	1	92	6	1	0	5	78	16	1	0	8	64	27	1

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	4	11	6	18	7	8

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

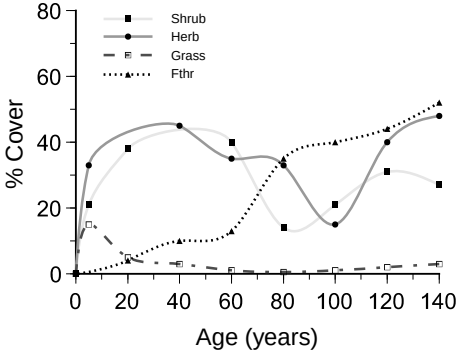


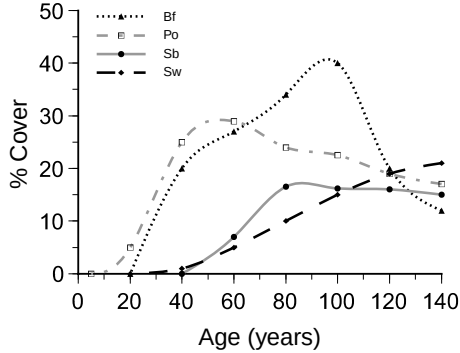
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling		Immature		Overmature	Special Habitat Preferences
Woodland Caribou						
Moose (summer)	●	●				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)			○	○	○	dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)	○	○				blueberries, raspberries, beaked hazel
Black Bear (cover)		○	○	●	●	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		●	○	○	●	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	○	○	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		●	○	○	●	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	●	●	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl						
Pileated Woodpecker				○	●	large (>45 cm) cavity trees, preferably aspen, carpenter ants
Spruce Grouse						
Ruffed Grouse		●	●	●	●	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker						
Boreal Chickadee				○	○	dead trees/stumps with soft heartwood for cavities
Least Flycatcher				●	●	tall aspen cavity trees, open mid-canopy layer for foraging
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	●	●	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander						

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
Harvesting promotes increased suckering from roots or stumps especially if cut during winter. Regeneration of hardwoods, woody shrubs, graminoids, and herbs from seed will occur on areas of exposed mineral soil.

Response following harvest and mechanical site preparation:
Unless soil disturbance is minimized, site preparation greatly stimulates hardwood suckering, and sprouting of woody shrubs (especially beaked hazel and mountain maple). Great increase in raspberry, grasses and herbaceous vegetation.

Response following harvest and prescribed fire:
Severe burns after tramping and spraying are considered an effective method of competition control. Light burning will promote the suckering of poplar species and woody shrubs. Herbs will increase by seeding after fire.

Response following harvest and herbicide:
Recovery of hardwoods, graminoids and herbs is usually rapid after herbicide application which may necessitate a re-application. Grasses can dominate the site for a few years after the woody vegetation is reduced by the first spray. Aspen, white birch, woody shrubs and herbs can be controlled by herbicides but a second spray is usually required within two to five years.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature					0	0
Mature					163	8
Overmature						
Bf						
Immature					63	3
Mature					813	28
Overmature						

sample size ≥ 5 sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

No information available.

Critical Comments

- occasional occurrence of largetooth aspen along the southern edge of northeastern Ontario in Site Region 4E

Site Characteristics, Limitations and Hazard Potential

Characteristics										Limitations					Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
			2									4	4	5		Harvesting
		3	2			1		3				4	4	5		Renewal
						1										Tending

Footnotes

1. Abundance of understorey competition will require vegetation management.
2. Coarse fragments may hinder some harvesting equipment.
3. Removal of LFH may cause frost heaving.
4. Normal operations may cause site damage when soils are moist, and will cause site damage when soils are wet. Use "best practices" to minimize site damage, or wait until conditions change.
5. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.

Opportunities

- all season harvest
- opportunity for white spruce, white and red pine establishment
- opportunity for mixedwood management

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	3 – 4
Jack pine	N/A	N/A
Aspen	H	1

Site Productivity = FRI Site Class

Degree of Effort

1 = Extensive
2 = Basic
3 = Intensive
4 = Elite
N/A = Not Appropriate

Site Productivity

H = 1 – 2
M = 2
L = 2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method		Comments
Clearcut	R	Minimal advance growth and, if present, mostly balsam fir.
• Harvest Method - Conventional	R	
- Strip/Block	CR	This is a competitive site and natural seed generally does not do well. Potential for natural seeding is very low due to low density of black spruce in the original stand. This harvest method may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	See Strip/Block comment.
- HARP	NR	HARP applies to peatland black spruce stands only.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Highly competitive site: use methods that do not cause excessive mineral soil exposure to minimize competition and frost heaving.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Low stocking of black spruce advance growth.
- Seed	NR	Competitive site. Potential for natural seeding is very low due to low density of black spruce in the original stand.
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	CR	This treatment by itself will not bring back a black spruce dominated site and should only be used when augmented with other regeneration methods.
- Planting	R	
- Scarification	NR	See Natural Seed comment.
Tending Treatments		
Cleaning		
• Manual	CR	Cutting may stimulate stem sprouting and/or root suckering of competition.
• Mechanical	CR	See Manual Cleaning comment.
• Chemical		
- Ground	R	
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

The establishment of jack pine is not an appropriate management objective for this site type.

Silvicultural Interpretations for the Establishment of Aspen

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strips should be at least 20 m wide to warm the soil and stimulate suckering. This harvest technique may also be prescribed to meet other management objectives.
- Patch	CR	Openings 0.4 ha in size are the minimum acceptable to stimulate aspen suckering. This harvest technique may also be prescribed to meet other management objectives.
- Seed-tree	NR	Leaving live aspen will inhibit suckering.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species which is generally not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		
Full-tree	R	
Tree-length	R	
Cut-to-length/Shortwood	R	

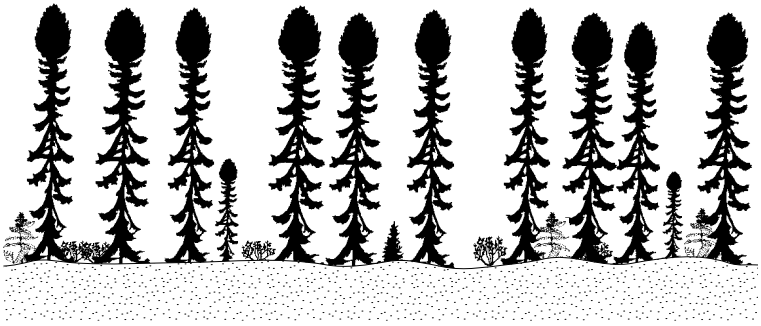
R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Aspen (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	NR	See Scarification (Section II, Book I).
• Chemical	R	Chemical site preparation may be used on sites where the residual overstorey will negatively affect root suckering. 2,4-D is recommended since it will remove the overstorey without damaging the root systems.
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Aspen does not regenerate under a closed canopy.
- Seed	NR	Reproduction by seed is not an important factor in aspen regeneration.
- Vegetative (coppice)	R	
• Blended	NR	Insufficient data and/or field experience exist to recommend this technique on this ecosite.
• Artificial		
- Seeding	NR	See Blended comment.
- Planting	NR	See Blended comment.
- Scarification	R	
Tending Treatments		
Cleaning		The literature dealing with pure aspen stands indicates that a hands off approach may be the most appropriate form of cleaning for this species.
• Manual	NR	
• Mechanical	NR	
• Chemical		
- Ground	NR	
- Aerial	NR	
Spacing	R	Site quality and timing is critical for the success of this treatment.

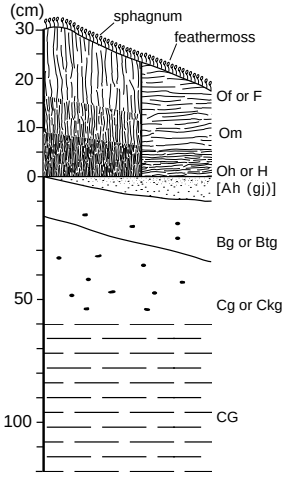
R = Recommended CR = Conditionally Recommended NR = Not Recommended

Black Spruce – Feathermoss – Sphagnum



ST 8

Description: Black spruce stands on moist soils, shrub and herb poor, with abundant feathermoss and sphagnum (n = 30).



Overstorey: Black spruce[10], Jack pine[1], Trembling aspen[1].

Shrubs: Black spruce, Balsam fir; Labrador-tea, Creeping snowberry, Early low blueberry, Velvetleaf blueberry, Twinflower, Sheep laurel.

Herbs: Bunchberry, Goldthread, Woodland horsetail, Sedge spp., Wild lily-of-the-valley.

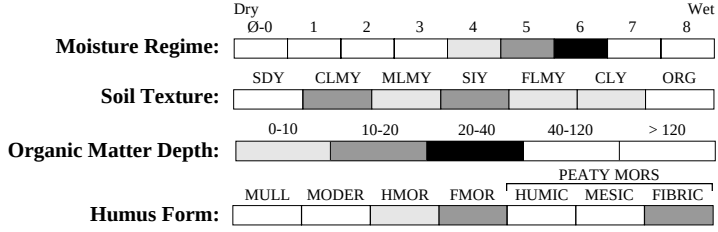
Mosses & Lichens: Schreber's moss, *Sphagnum nemoreum*, Broom moss, Reindeer lichen, *Sphagnum girgensohnii*, Plume moss, Stair-step moss, Liverworts, *Sphagnum* spp.

Vegetation Types: V23[6] V24[2] V22[1] (V25, V18)[1]

Ground Surface: Abundant feathermoss and sphagnum mosses on low hummocks, with sparse patches of coniferous litter, and lichens.

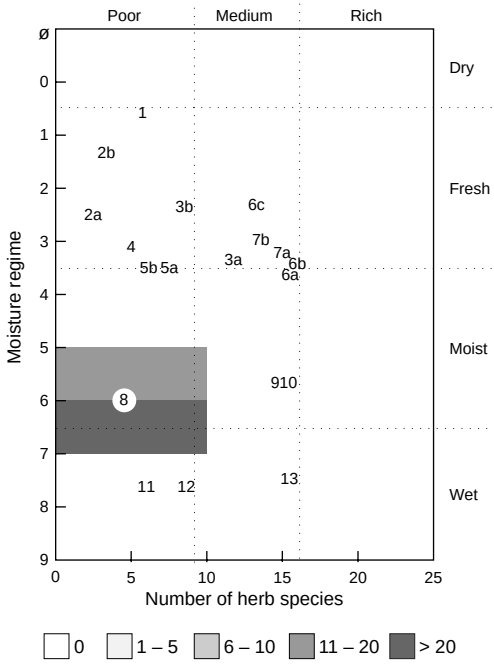
Soil Material: Variety of materials and landforms. Moderate number of coarse fragments on tills.

Soil Types: S16[7] S7[1] S14[1] (S3, S4, S8, S15)[1]

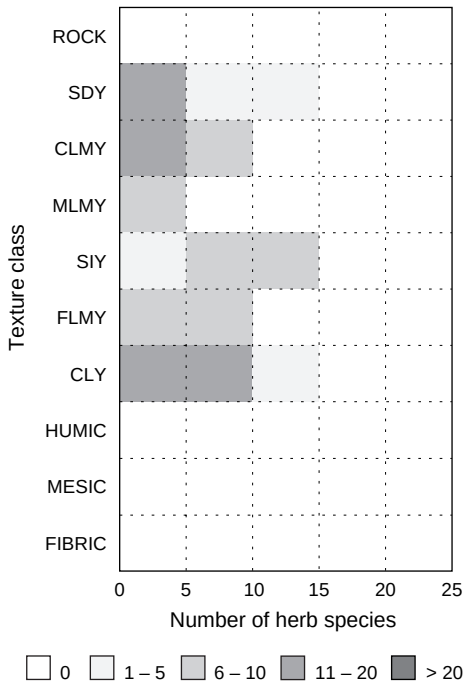


Comments: Poorly drained, peaty-phase soils on lower slopes or flat terrain. Abundant black spruce shrubs. Larch or white birch trees may be present.

Moisture / Richness Grid

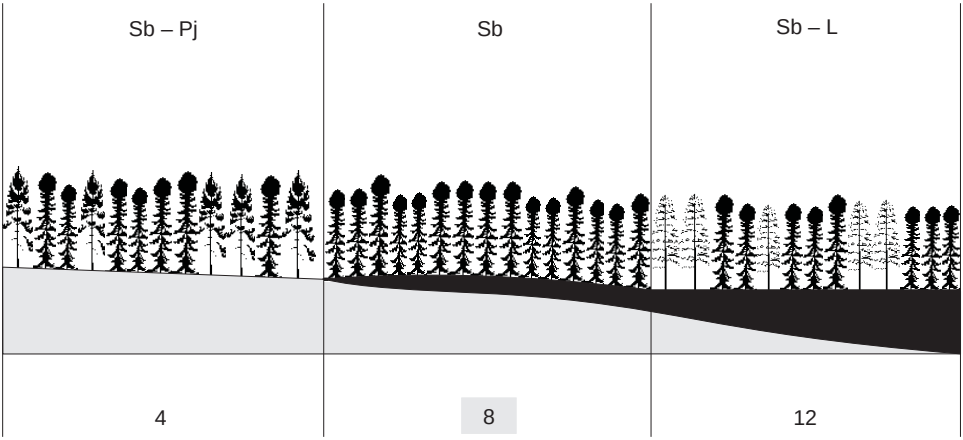


Texture / Richness Grid



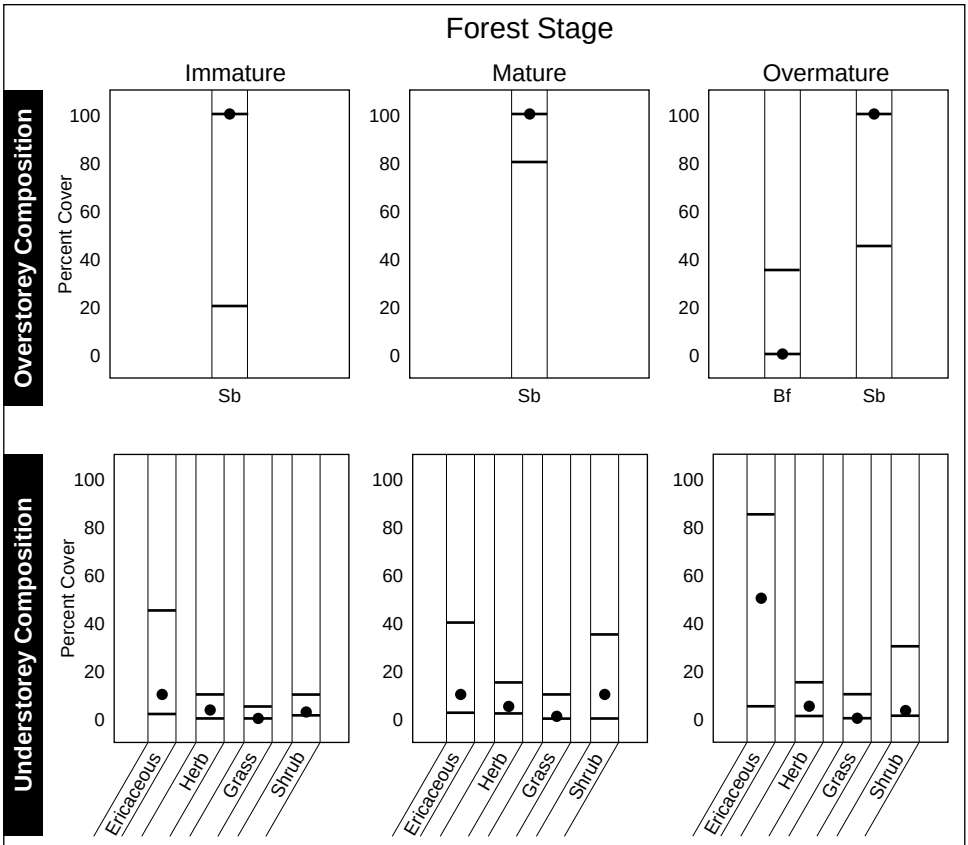
Typical Landscape Associations

Mixed Conifer Sequence on Sandy to Coarse Loamy Soil



Occurs on imperfectly to poorly drained soils; on gently sloping areas adjacent to wetlands, lakes, rivers, and creeks; in small, bowl-like depressions and level areas within long slopes; on toe slope positions on moderate to steep slopes; on lower to toe slope positions on gentle slopes; and on slightly elevated hummocks within organic terrain. The boundary between this site type and the adjacent uplands usually occurs at the point of inflexion of the slope (the point where the slope gradient changes). Black spruce is the dominant species. Stands are usually productive and well-stocked. Scattered pockets or individuals of balsam fir, white birch, white cedar, larch, or balsam poplar may be present. The species composition usually contrasts with the adjacent uplands (e.g. higher black spruce component). ST8 often occurs as a narrow band between mineral soil uplands and wet organic soils. Associated site types include ST5a and 5b on fresh soils, and ST11 and 12 in wet pockets, depressions and drainageways.

Site Structure and Composition



Advance Growth

	Forest Stage					
	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	8900	80	10250	60	9000	62
Bf	875	32	3875	60	8550	44

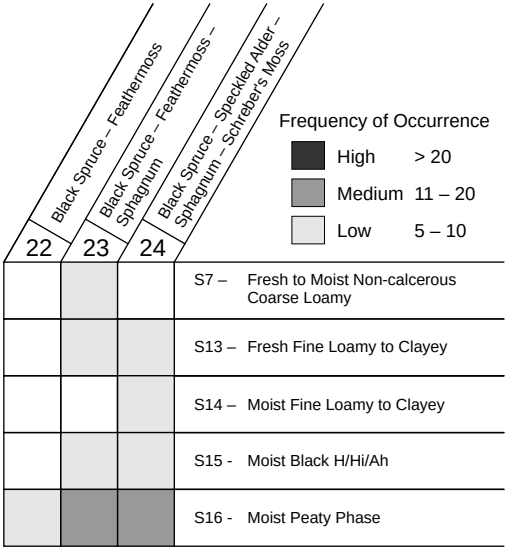
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	19	68	3	9	1	56	36	2	4	2	33	58	3	4	1

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	2	4	3	3	1	2

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

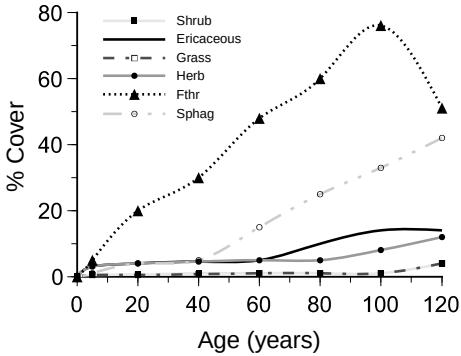


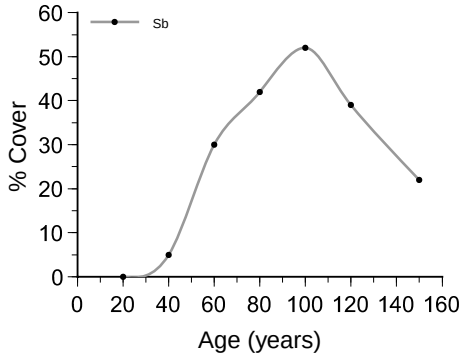
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling		Immature		Overmature	Special Habitat Preferences
Woodland Caribou						
Moose (summer)	○	○				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)			○	○	○	dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)	○					blueberries, raspberries, beaked hazel
Black Bear (cover)		○	○	○	○	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		○	○	○	○	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	●	●	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		○	○	○	○	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	○	○	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl				○	○	large aspen and larch nest trees near open meadows, fens, bogs
Pileated Woodpecker						
Spruce Grouse			○	○	○	young jack pine forest with small open areas for display
Ruffed Grouse		○	○	○	○	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker				●	●	large (>30 cm) conifer cavity trees, abundant wood-boring insects
Boreal Chickadee				●	●	dead trees/stumps with soft heartwood for cavities
Least Flycatcher				●	●	tall aspen cavity trees, open mid-canopy layer for foraging
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	○	○	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander	○	○	○	○	○	small breeding ponds, stumps and logs, deep litter

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
Grasses, sedges and speckled alder will increase in abundance, especially if the organic layer is disturbed. Cattails may invade water-filled ruts and persist for several years.

Response following harvest and mechanical site preparation:
No information.

Response following harvest and prescribed fire:
No information.

Response following harvest and herbicide:
If soil disturbance is minimal, herbicide application is usually not necessary. Application two to five years after harvest may be needed to control speckled alder.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature	8900	80	14000	56	6300	60
Mature	10250	60				
Overmature	8400	68			13500	48
Bf						
Immature	800	16	14400	88	4700	52
Mature	3875	60				
Overmature	8500	35			36700	80

sample size ≥ 5 sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

No information available.

Critical Comments

No information available.

Site Characteristics, Limitations and Hazard Potential

Characteristics								Limitations						Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
1					2			3				4	4	5	6	Harvesting
1					2			3				4	4	5		Renewal
1												4	4			Tending

Footnotes

1. Minimal disturbance of peat layer to avoid site damage.
2 Wet site restricts harvesting options.
3. Edges of cut areas will experience some windthrow.
4. Normal operations will cause site damage on shallow peaty phase of this site type when not frozen. On mineral phase, normal operations may cause site damage when soils are moist, and will cause site damage when wet. Use "best practices" to minimize site damage, or wait until conditions change.
5. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.
6. Moderate to low risk of nutrient loss using full tree clearcut logging on the peaty phase of this site type.

Opportunities

- good opportunity for black spruce seeding
- site has high amount of advance growth
- wide range of silvicultural packages that will promote black spruce on this site
- can “hold over” for a period of time (non-competitive)

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	1 – 3
Jack pine	N/A	N/A
Aspen	N/A	N/A

Site Productivity = FRI Site Class

Degree of Effort		
1	=	Extensive
2	=	Basic
3	=	Intensive
4	=	Elite
N/A	=	Not Appropriate

Site Productivity		
H	=	1 – 2
M	=	2
L	=	2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method -Conventional	R	
- Strip/Block	CR	Strips should be from 70 to 100 m wide. This technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Group seed tree. This technique may be prescribed to meet other management objectives.
- HARP	CR	On peaty phase of this site type (soil types S15 and S16). This technique may be prescribed to meet other management objectives.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		Peaty phase (soil types S15 and S16) sensitive to site damage. On these soil types, harvest on frozen ground or use high flotation equipment during the frost-free season.
Full-tree	CR	See Logging Method comment.
Tree-length	CR	See Logging Method comment.
Cut-to-length/Shortwood	CR	See Logging Method comment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	Peaty phase (soil types S15 and S16) sensitive to site damage. On these soil types, site prepare on frozen ground or use high flotation equipment during the frost-free season.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	R	
- Seed	R	
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	R	
- Planting	R	
- Scarification	CR	See Mechanical Site Preparation comment.
Tending Treatments		
Cleaning		
• Manual	R	
• Mechanical	CR	Use on non-peaty phase of this soil type (soil types S3, S4, S7, S8, S14).
• Chemical		
- Ground	CR	On peaty phase, ground pressure of equipment should be under 10 psi.
- Aerial	R	
Spacing	R	

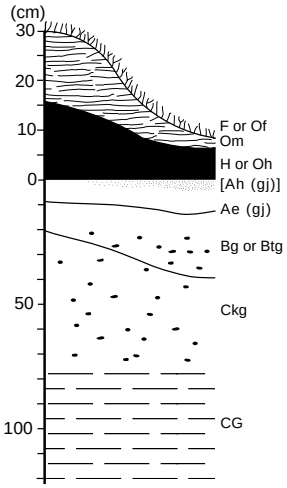
R = Recommended CR = Conditionally Recommended NR = Not Recommended

The establishment of jack pine or aspen is not an appropriate management objective for this site type.

Conifer – Moist Soil

ST 9

Description: Coniferous mixedwood stands on moist soils. Medium number of shrubs, herb and moss rich (n = 46).



Overstorey: Black spruce[7], White spruce[4], Balsam fir[2], Larch[2], White birch[1], Jack pine[1], White cedar[1], Trembling aspen[1].

Shrubs: Balsam fir, Black spruce; Dwarf raspberry, Twinflower, Creeping snowberry, Speckled alder, Mountain ash spp., Serviceberry spp., Labrador-tea, Bristly wild rose, Swamp red currant, Currant spp., Early low blueberry, Velvetleaf blueberry, Honeysuckle spp., Red osier dogwood, Mountain maple.

Herbs: Bunchberry, Goldthread, Starflower, Wild lily-of-the-valley, Blue bead lily, Kidney-leaved violet, Sedge spp., Sarsaparilla, Naked mitrewort, Fragrant bedstraw, Oak fern, Sweet coltsfoot, Wood anemone, Woodland horsetail, Spinulose shield fern, Rose twisted-stalk.

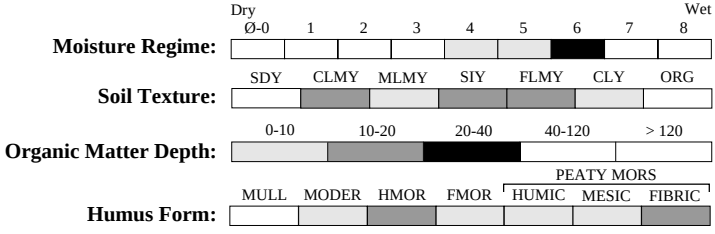
Mosses & Lichens: Schreber's moss, Plume moss, Stair-step moss, Broom moss, Electrified cat's tail moss, *Sphagnum* spp.

Vegetation Types: V7[3] V6[2] V22[1] V19[1] V14[1] V23[1] other[1]

Ground Surface: Abundant feathermoss, deciduous and coniferous litter, with sparse low hummocks of sphagnum, and small water-filled depressions.

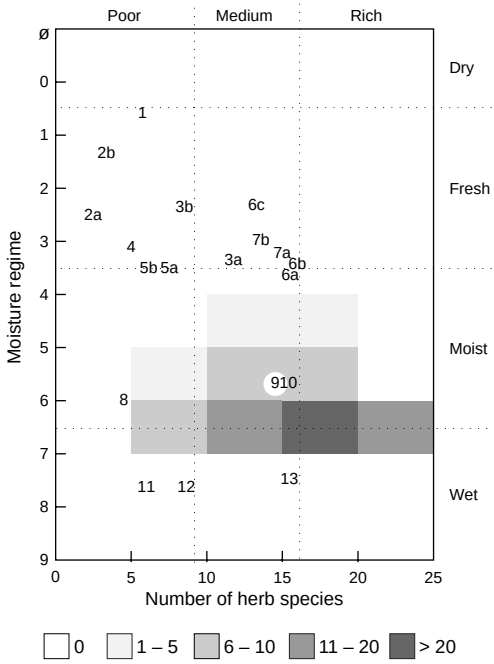
Soil Material: Variety of materials and landforms, with many coarse fragments on tills.

Soil Types: S16[5] S15[2] S12[1] S7[1] S11[1]

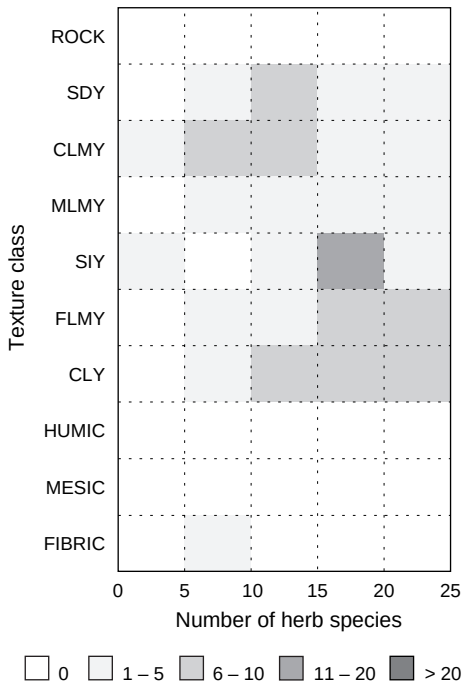


Comments: Often found on telluric lower slope positions associated with nutrient-enriched seepage flow. Sparse balsam fir shrubs.

Moisture / Richness Grid

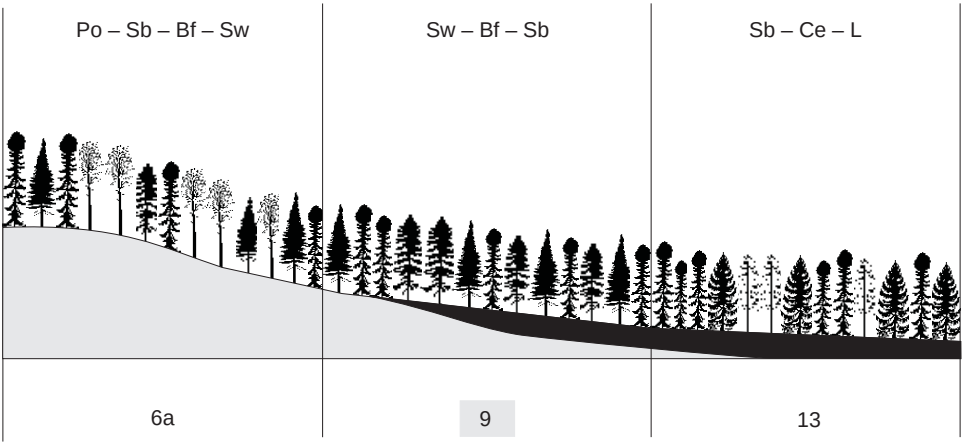


Texture / Richness Grid

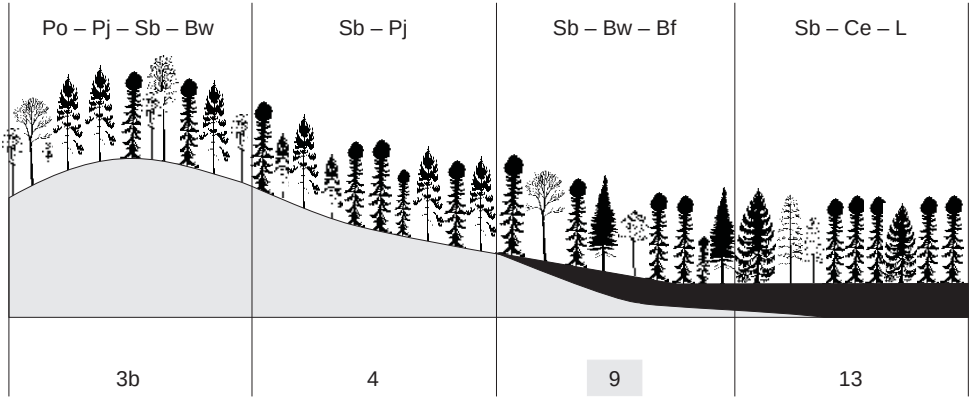


Typical Landscape Associations

Conifer - Mixedwood Sequence on Fine Loamy to Clayey Soil

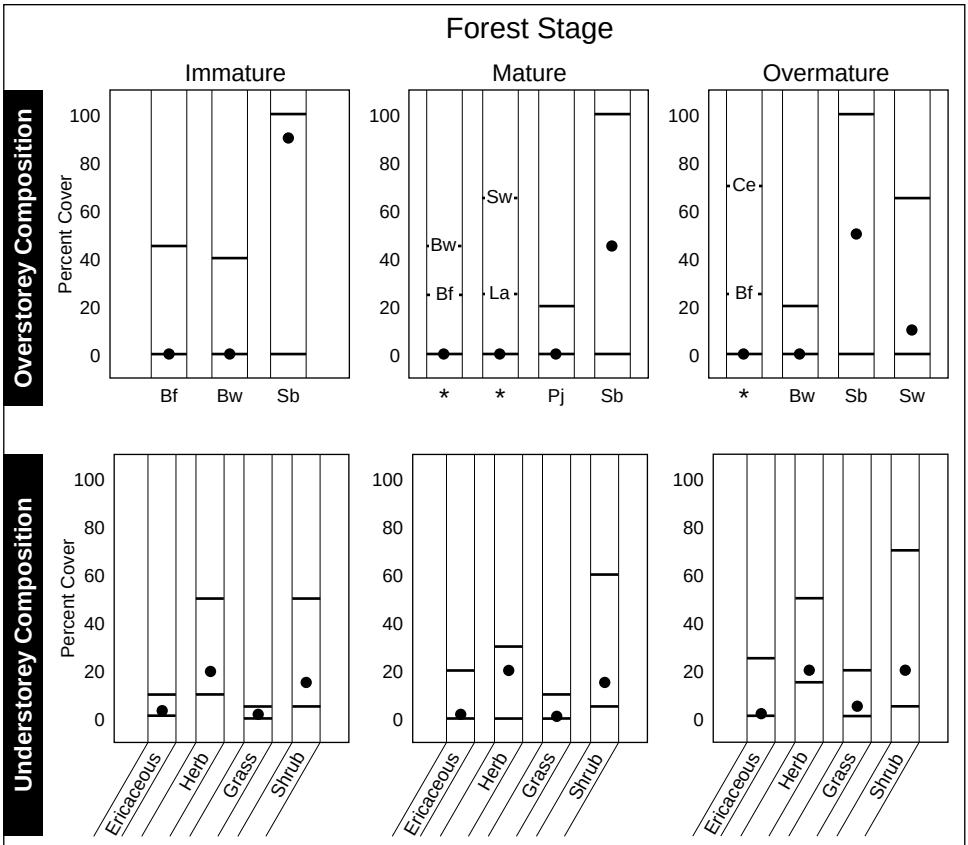


Jack Pine - Mixedwood Sequence on Sandy to Coarse Loamy Soil



Occurs on imperfectly to poorly drained soils, on gently sloping areas adjacent to wetlands, lakes, rivers, and creeks, in small, bowl-like depressions and level areas within long slopes, on toe slope positions on moderate to steep slopes, on lower to toe slope positions on gentle slopes, and on slightly elevated hummocks within organic terrain. Sometimes occurs as a narrow band between mineral soil uplands and wet organic soils. Stands consist of conifer-dominated mixedwoods, with varying proportions of black spruce, white spruce and balsam fir; with scattered larch, jack pine, white cedar, white birch, balsam poplar or aspen. The stands are usually very productive, especially where they occur on telluric sites (associated with mineral-enriched water flow). Commonly associated site types include mixedwoods on fresh soils (ST6a, 6b, 7a, 7b, and 3a), and ST13, which occurs on organic soils in wet pockets, depressions and drainageways.

Site Structure and Composition



Advance Growth

	Forest Stage					
	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	625	40	2650	36	2750	44
Bf	8300	85	1500	40	7350	75

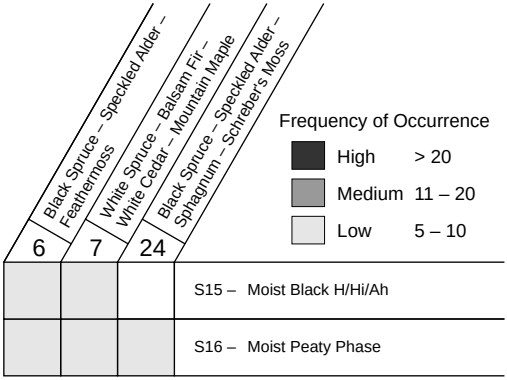
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	18	34	25	22	1	28	29	20	23	0	16	43	24	16	1

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	2	8	4	7	4	6

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

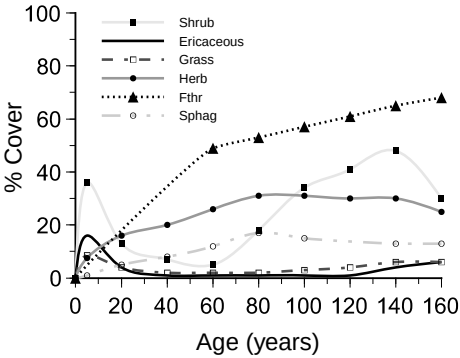


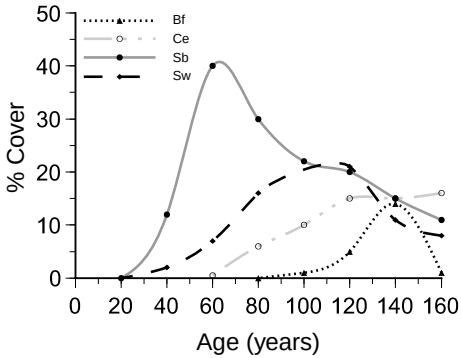
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling		Immature		Overmature	Special Habitat Preferences
Woodland Caribou						
Moose (summer)	○	○				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)			●	●	●	dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)						
Black Bear (cover)		○	○	○	○	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		●	○	○	●	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	●	●	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		●	○	○	●	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	○	○	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl				○	○	large aspen and larch nest trees near open meadows, fens, bogs
Pileated Woodpecker				○	○	large (>45 cm) cavity trees, preferably aspen, carpenter ants
Spruce Grouse			○	○	○	young jack pine forest with small open areas for display
Ruffed Grouse		○	○	○	○	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker				●	●	large (>30 cm) conifer cavity trees, abundant wood-boring insects
Boreal Chickadee				○	○	dead trees/stumps with soft heartwood for cavities
Least Flycatcher				○	○	tall aspen cavity trees, open mid-canopy layer for foraging
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	●	●	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander	○	○	○	○	○	small breeding ponds, stumps and logs, deep litter

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
Sprouting may occur at the base of residual hardwood trees. Shrubs increase in growth with the increase in light. Ericaceous shrubs increase in vigor. Where Labrador-tea is present, the establishment and survival of black spruce shrubs is reduced. Herbs increase in abundance and vigor.

Response following harvest and mechanical site preparation:
Stimulates competition from sprouting shrubs (e.g. mountain maple, beaked hazel, and speckled alder), grasses, sedges, raspberries and herbaceous vegetation.

Response following harvest and prescribed fire:
Severe fires minimize sprouting of hardwoods, woody shrubs, and ericaceous shrubs. Following light fires, hardwoods and woody shrubs sprout from roots and seed in abundance. Light fires promote sprouting of ericaceous shrubs. Grasses, sedges and deep-rooted herbs are stimulated by fire.

Response following harvest and herbicide:
A single herbicide application will control competition for two to three years. Regrowth of woody shrubs, graminoids and herbs may necessitate a second application.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature	625	45	0	0	3300	32
Mature	3550	53	2100	28	7200	48
Overmature	5050	62	750	14	1300	20
Bf						
Immature	9125	85	2750	60	8300	88
Mature	675	17	3625	45	12000	100
Overmature	5000	68	20875	88	12400	92

shaded sample size ≥ 5 unshaded sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

No information available.

Critical Comments

- often occurs in telluric situations on lower slopes where the nutrient status is enhanced by the lateral flow of oxygen and mineral-enriched water
- spruce and fir, especially white spruce, show exceptional growth in these telluric situations

Site Characteristics, Limitations and Hazard Potential

Characteristics										Limitations				Hazard Potential			
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
1				3	2			4				5	5	6	7	Harvesting
1				3	2			4				5	5	6		Renewal
1												5	5			Tending

Footnotes

1. Minimal disturbance of peat layer to avoid site damage.
2. Wet site restricts harvesting options.
3. Many coarse fragments may impede harvesting and renewal operations.
4. Edges of cut areas will experience some windthrow.
5. Normal operations will cause site damage on shallow peaty phase of this site type when not frozen. On mineral phase, normal operations may cause site damage when soils are moist, and will cause site damage when soils are wet. Use "best practices" to minimize site damage, or wait until conditions change.
6. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.
7. Moderate to low risk of nutrient loss using full tree clearcut logging on the peaty phase of this site type.

Opportunities

- site has moderate amount of advance growth
- wide range of silvicultural packages that will promote black spruce on this site. However, it is important not to "hold over" this site.

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	1 – 3
Jack pine	N/A	N/A
Aspen	N/A	N/A

Site Productivity = FRI Site Class

Degree of Effort		
1	=	Extensive
2	=	Basic
3	=	Intensive
4	=	Elite
N/A	=	Not Appropriate

Site Productivity		
H	=	1 – 2
M	=	2
L	=	2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method		Comments
Clearcut	R	Black spruce and balsam fir advance growth typically occur together on this site. Balsam fir does not naturally occur in the overstorey on this site type. Use CLAAG to protect black spruce advance growth when present.
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strips should be from 70 to 100 m wide. This technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Group seed tree. This technique may be prescribed to meet other management objectives.
- HARP	NR	HARP applies to peatland black spruce stands only.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		Harvest on frozen ground or use high flotation equipment during the frost-free season.
Full-tree	CR	See Logging Method comment.
Tree-length	CR	See Logging Method comment.
Cut-to-length/Shortwood	CR	See Logging Method comment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	This activity should only be done on frozen ground.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	R	
- Seed	R	
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	R	
- Planting	R	
- Scarification	CR	See Mechanical Site Preparation comment.
Tending Treatments		
Cleaning		
• Manual	CR	Cutting may stimulate stem sprouting and/or root suckering of competition.
• Mechanical	CR	See Manual Cleaning comment. Ground pressure of equipment should be under 10 psi.
• Chemical		
- Ground	CR	Ground pressure of equipment should be under 10 psi.
- Aerial	R	
Spacing	R	

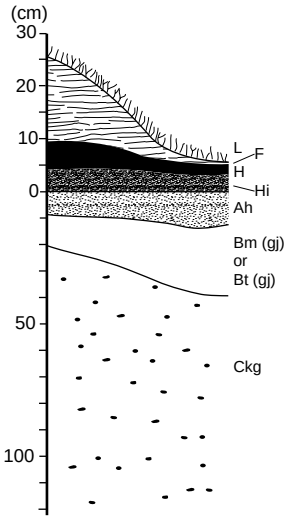
R = Recommended CR = Conditionally Recommended NR = Not Recommended

The establishment of jack pine or aspen is not an appropriate management objective for this site type.

Hardwood – Moist Soil

ST 10

Description: Hardwood stands on moist soils. Medium number of shrubs, herb rich, common speckled alder (n = 41).



Overstorey: Trembling aspen[9], Balsam poplar[4], Black spruce[2], White birch[1], Balsam fir[1], White spruce[1], Jack pine[1], Black ash[1], White elm[1].

Shrubs: Balsam fir, Poplar spp., Black spruce, White spruce; Dwarf raspberry, Speckled alder, Bristly wild rose, Wild red raspberry, Serviceberry spp., Bristly black currant, Twinflower, Swamp red currant, Skunk currant, Honeysuckle spp., Mountain ash spp., Red osier dogwood, Beaked hazel, Mountain maple, Squashberry.

Herbs: Fragrant bedstraw, Bunchberry, Kidney-leaved violet, Naked mitrewort, Wild lily-of-the-valley, Sarsaparilla, Blue bead lily, Spinulose shield fern, Starflower, Sedge spp., Bluebells, Sweet coltsfoot, Wood anemone, Large-leaved aster, Blue-joint grass, Woodland horsetail, Oak fern, Baneberry spp., Goldthread, Rattlesnake plantain, Rose twisted-stalk.

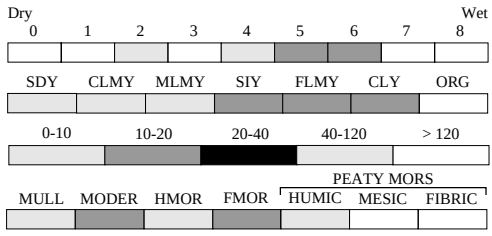
Mosses & Lichens: Schreber's moss, Plume moss, Electrified cat's tail moss.

Vegetation Types: V10[4] V9[2] V8[1] V13[1] (V11, V12, V14, V23)[2]

Ground Surface: Abundant deciduous litter with sparse feathermoss, low hummocks of sphagnum, and small water-filled depressions.

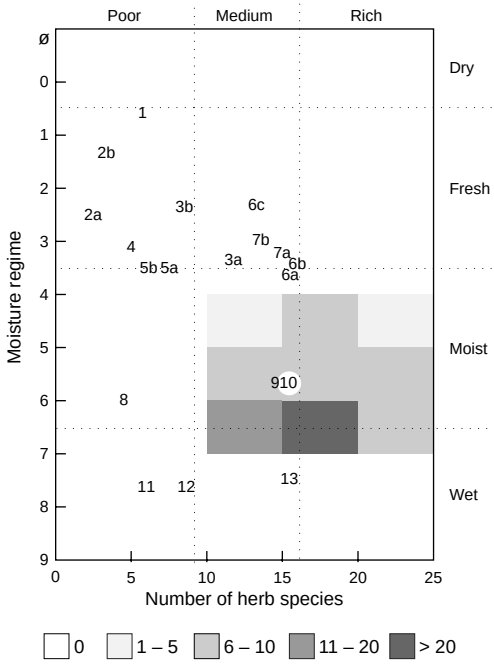
Soil Material: Lacustrine, glaciofluvial or morainal. Sparse coarse fragments, except on tills. On lacustrine plains, clay till, or silt pockets in glaciofluvial complexes.

Soil Types: S15[5] S16[2] S14[1] S3[1] (S9, S13)[1]

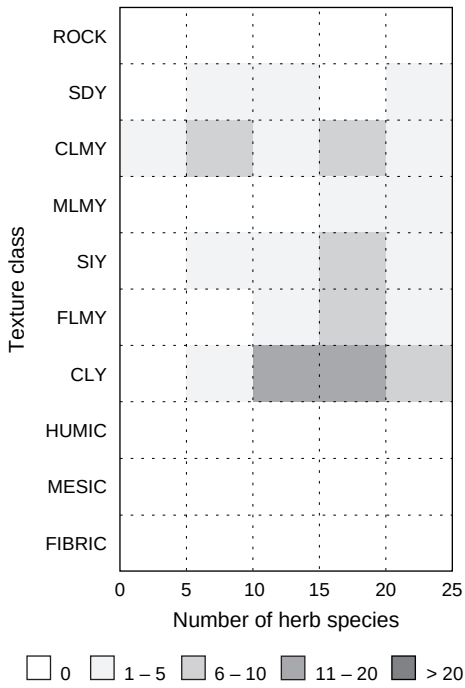


Comments: Often found on telluric, lower slope positions associated with nutrient-enriched seepage flow. On calcareous soils, with characteristic Hi/Ah humus horizons.

Moisture / Richness Grid

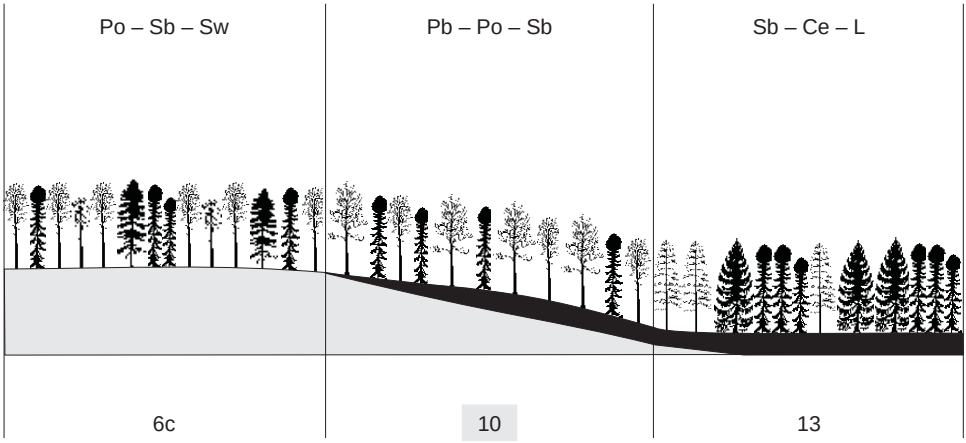


Texture / Richness Grid

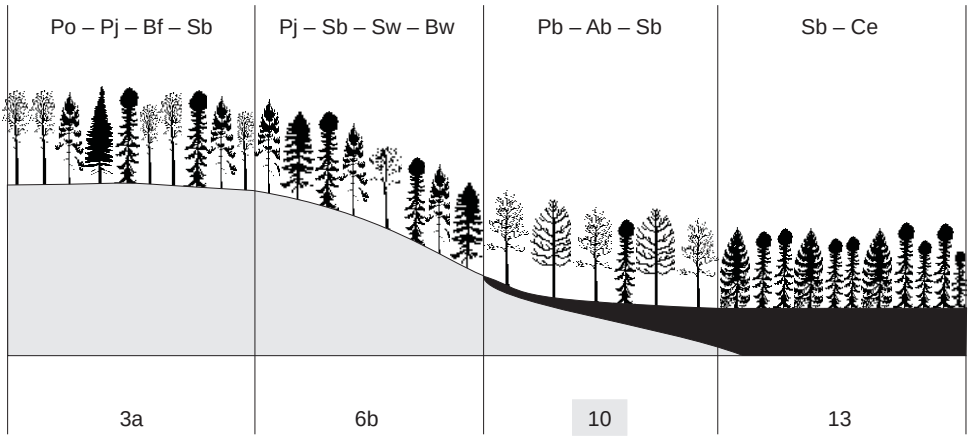


Typical Landscape Associations

Hardwood - Mixedwood Sequence on Sandy to Coarse Loamy Soil

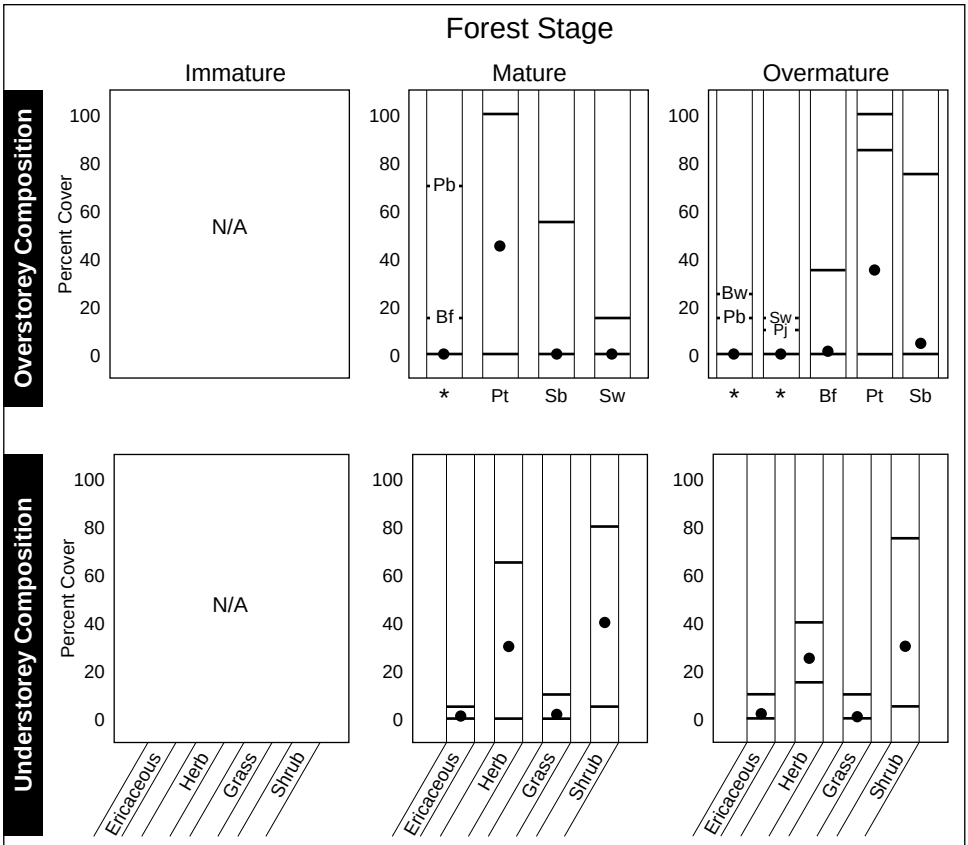


Mixedwood Sequence on Medium Loamy to Silty Soil



Occurs on imperfectly to poorly drained soils, on gently sloping areas adjacent to wetlands, lakes, rivers, and creeks, in small, bowl-like depressions and level areas within long slopes, on toe slope positions on moderate to steep slopes, on lower to toe slope positions on gentle slopes, and on slightly elevated hummocks within organic terrain. Stands consist of hardwood-dominated mixedwoods. Hardwood species (aspen, balsam poplar, black ash, and/or white birch) are usually dominant. White spruce, black spruce, and balsam fir are less frequent, often in patches. Often occurs on edges, in complex associations with ST9, in pockets where the conifer component is higher, with ST7a and 7b, on pockets of fresh soils and with ST13 on organic soils in drainageways. Rarely found as large contiguous areas, except in level, poorly drained terrain in the Clay Belt.

Site Structure and Composition



Advance Growth

Forest Stage

	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	N/A	N/A	125	15	950	18
Bf	N/A	N/A	1125	30	8300	84

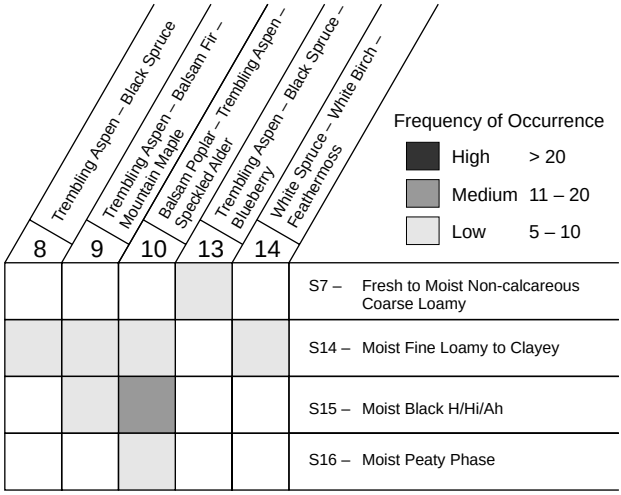
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	N/A	N/A	N/A	N/A	N/A	0	21	69	9	0	0	14	64	22	1

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	N/A	N/A	4	9	5	7

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

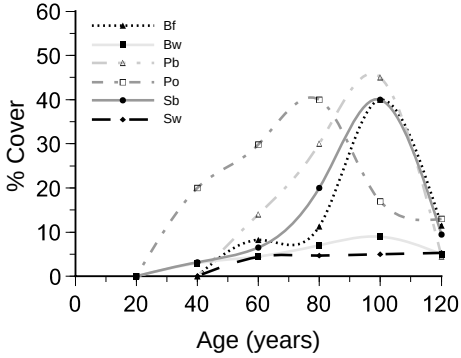


Selected Species Habitat Use

Species	Forest Stage: Pre-sapling		Immature		Overmature	Special Habitat Preferences
Woodland Caribou						
Moose (summer)	●	●				proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)						
Black Bear (fall foraging)						
Black Bear (cover)		○	○	○	○	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		●	○	○	●	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten						
Snowshoe Hare		●	○	○	●	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	●	●	○	○	○	large quantities of seed (especially maple) leaf litter
Great Gray Owl				●	●	large aspen and larch nest trees near open meadows, fens, bogs
Pileated Woodpecker				○	●	large (>45 cm) cavity trees, preferably aspen, carpenter ants
Spruce Grouse						
Ruffed Grouse		○	○	○	○	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker						
Boreal Chickadee				○	○	dead trees/stumps with soft heartwood for cavities
Least Flycatcher						
White Throated Sparrow	○	○			○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	●	●	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander	○	○	○	○	○	small breeding ponds, stumps and logs, deep litter

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural



Successional Relationships — Post-treatment

Response following harvest:
Harvesting promotes increased hardwood suckering from roots or stumps especially if cut during winter. Regeneration from seed occurs on areas of exposed mineral soil. The growth of woody shrubs (especially speckled alder, mountain maple, and serviceberries) is stimulated.

Response following harvest and mechanical site preparation:
Mechanical site preparation greatly increases hardwood sprouting, sprouting of woody shrubs (especially speckled alder), grasses, raspberries and herbaceous vegetation. The exposure of mineral soil provides a favourable seedbed for available seed.

Response following harvest and prescribed fire:
Following fire, most shrubs will quickly re-establish by suckering of their root systems. Within two years of burning, herbaceous growth and grasses can quickly dominate a site. Young thin-barked trees are easily killed by fire. Burned areas provide seedbeds for colonising plants.

Response following harvest and herbicide:
Depending on the application program, control of shrub species can be maintained. Typically, control will last approximately two to five years. Succession will be focussed on hardwood species such as aspen and balsam poplar and woody shrubs, especially alder and hazel. Graminoids and herbs may increase for a short time following reduction of the woody vegetation.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature						
Mature	15900	66	600	22	125	5
Overmature	1350	24	4650	24	50	5
Bf						
Immature						
Mature	8650	50	6250	76	625	15
Overmature	4950	70	21750	96	12375	55

sample size ≥ 5 sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

No information available.

Critical Comments

- occasional occurrences of white elm
- pure black ash stands on moist soils occur in this site type, typically on areas undergoing periodic flooding

Site Characteristics, Limitations and Hazard Potential

Characteristics									Limitations					Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
1					2			3			8	5	5	6	7	Harvesting
1					2		4	3			8	5	5	6		Renewal
1							4				8	5	5			Tending

Footnotes

1. Minimal disturbance of peat layer to avoid site damage.
2. Wet site restricts harvesting options.
3. Edges of cut areas will experience some windthrow.
4. Highly competitive site.
5. Normal operations will cause site damage on shallow peaty phase of this site type when not frozen. On mineral phase, normal operations may cause site damage when soils are moist, and will cause site damage when soils are wet. Use "best practices" to minimize site damage, or wait until conditions change.
6. Normal operations may cause erosion on slopes of 11 to 30%, and will cause erosion on slopes > 30%. Best practices can avoid or minimize erosion, but in many high risk cases, operations should not be conducted.
7. Moderate to low risk of nutrient loss using full tree clearcut logging on the peaty phase of this site type.
8. Potential for seasonal flooding.

Opportunities

- site has medium amount of advance growth
- wide range of silvicultural packages that will promote black spruce on this site. However, it is important not to “hold over” this site
- this site is ideally managed as a hardwood or mixedwood. Conversion to a conifer overstorey is unlikely to succeed and is not recommended
- good site for the establishment of white spruce

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	2 – 4
Jack pine	N/A	N/A
Aspen	M	1

Site Productivity = FRI Site Class

Degree of Effort		
1	=	Extensive
2	=	Basic
3	=	Intensive
4	=	Elite
N/A	=	Not Appropriate

Site Productivity		
H	=	1 – 2
M	=	2
L	=	2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method		Comments
Clearcut	R	Advance growth mostly balsam fir.
• Harvest Method - Conventional	R	
- Strip/Block	CR	This harvest method may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	This harvest method may be prescribed to meet other management objectives. Group seed tree only.
- HARP	NR	HARP applies to peatland black spruce stands only.
Shelterwood	NR	High probability of windthrow.
Selection	NR	Promotes shift in species composition to balsam fir and/or white cedar.
Logging Method		Harvest on frozen ground or use high flotation equipment during the frost-free season.
Full-tree	CR	See Logging Method comment.
Tree-length	CR	See Logging Method comment.
Cut-to-length/Shortwood	CR	See Logging Method comment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments	Comments	
Site Preparation		
• Mechanical	CR	Recommended activity for frozen ground only.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Has minimal amounts of black spruce advance growth.
- Seed	NR	Competitive site. Potential for natural seeding is very low due to low density of black spruce in the original stand
-Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	NR	See Natural Seed comment.
- Planting	R	
- Scarification	NR	Highly competitive site.
Tending Treatments		
Cleaning		
• Manual	CR	Cutting may stimulate stem sprouting and/or root suckering of competing species.
• Mechanical	CR	Ground pressure of equipment should be less than 10 psi. Can also damage seedlings. See Manual Cleaning comment.
• Chemical		
- Ground	CR	Ground pressure of equipment should be less than 10 psi.
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

The establishment of jack pine is not an appropriate management objective for this site type.

Silvicultural Interpretations for the Establishment of Aspen

Silvicultural System • Harvest Method		Comments
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strips should be at least 20 m wide to warm the soil and stimulate suckering. This technique may be prescribed to meet other management objectives.
- Patch	CR	Openings 0.4 ha in size are the minimum acceptable to stimulate aspen suckering. This technique may be prescribed to meet other management objectives.
- Seed-tree	NR	Leaving live aspen will reduce suckering.
- HARP	NR	Biologically inappropriate.
Shelterwood	NR	This is a shade intolerant species which is generally not suited to this silvicultural system.
Selection	NR	See Shelterwood comment.
Logging Method		Harvest on frozen ground or use high flotation equipment during the frost-free season.
Full-tree	CR	See Logging Method comment.
Tree-length	CR	See Logging Method comment.
Cut-to-length/Shortwood	CR	See Logging Method comment.

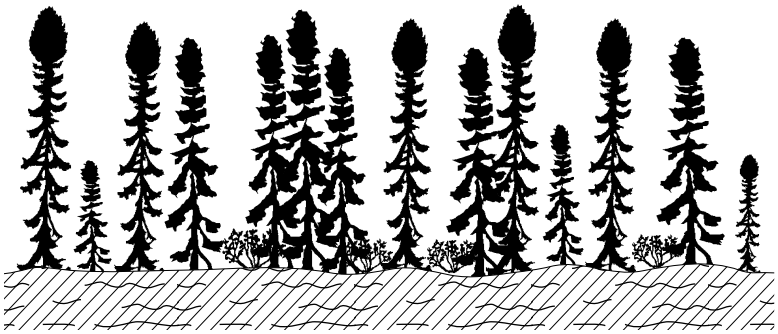
R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Aspen (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	NR	See Scarification (Section II, Book I).
• Chemical	R	Chemical site preparation may be used on sites where the residual overstorey will negatively affect root suckering. 2,4-D is recommended since it will remove the overstorey without damaging the root systems.
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	NR	Aspen does not regenerate under a closed canopy.
- Seed	NR	Reproduction by seed is not an important factor for regeneration of aspen.
- Vegetative (coppice)	R	
• Blended	NR	Insufficient data and/or field experience exist to recommend this technique on this site type.
• Artificial		
- Seeding	NR	See Blended comment.
- Planting	NR	See Blended comment.
- Scarification	CR	Recommended for frozen ground only.
Tending Treatments		
Cleaning		The literature dealing with pure aspen stands gives the impression that a hands off approach may be the most appropriate form of cleaning for this species.
• Manual	NR	
• Mechanical	NR	
• Chemical		
- Ground	NR	
- Aerial	NR	
Spacing	R	Site quality and timing is critical for the success of this treatment.

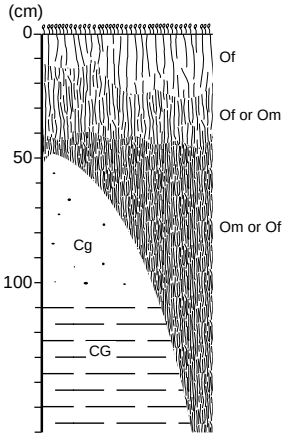
R = Recommended CR = Conditionally Recommended NR = Not Recommended

Black Spruce – Labrador-tea



ST 11

Description: Black spruce stands, on moderately decomposed organic soils with thick surface fibric horizons. Medium number of ericaceous shrubs, herb poor, with abundant Labrador-tea and sphagnum, and sparse feathermoss (n = 32).



Overstorey: Black spruce[10].

Shrubs: Black spruce, Balsam fir; Labrador-tea, Creeping snowberry, Velvetleaf blueberry, Early low blueberry, Small cranberry, Leatherleaf, Pale laurel, Sheep laurel, Twinflower.

Herbs: Sedge spp., Three-leaved smilacina, Bunchberry, Goldthread, Northern comandra, Woodland horsetail.

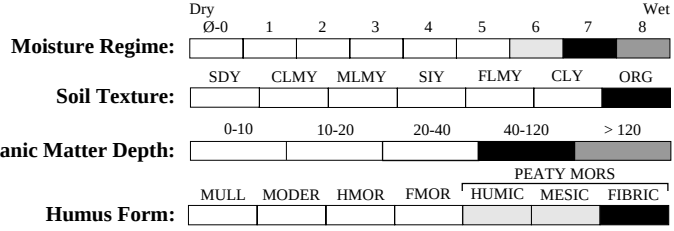
Mosses & Lichens: Schreber's moss, *Sphagnum nemoreum*, Broom moss, *Sphagnum girgensohnii*, Reindeer lichen, Plume moss, *Sphagnum fuscum*, *Sphagnum magellanicum*, Stair-step moss, Liverworts, *Sphagnum angustifolium.*

Vegetation Types: V25[4] V24[3] V22[2] V21[1]

Ground Surface: Abundant moderate hummocks of sphagnum and feathermoss with sparse, small water-filled depressions.

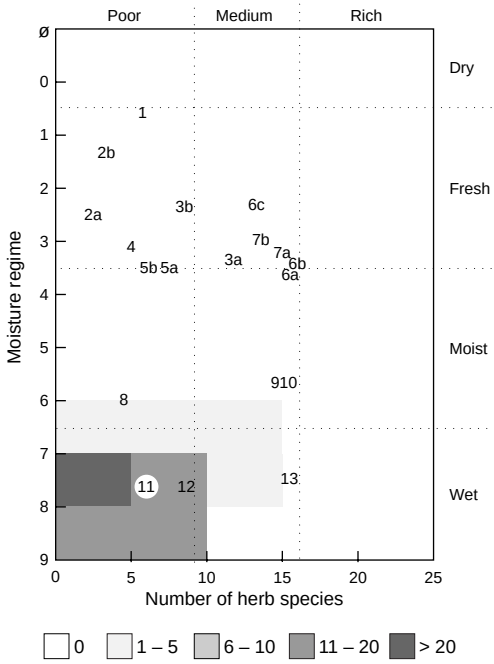
Soil Material: Organic soil.

Soil Types: S17[7] S19[2] S18[1]

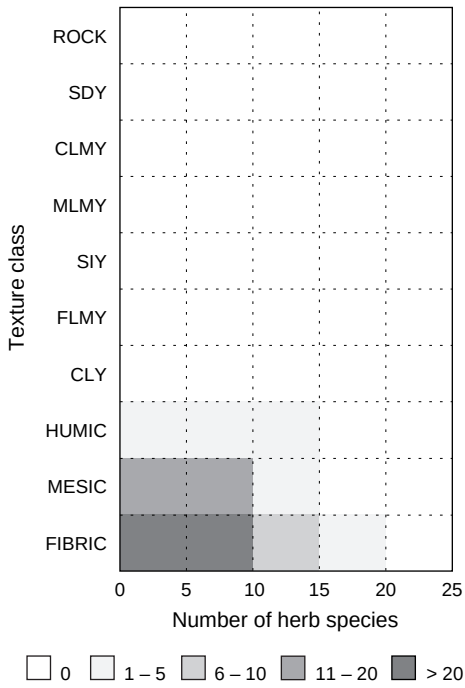


Comments: Deep fibric to mesic organic materials on flat terrain. Often dense, slow-growing, all-aged stands with abundant black spruce shrubs.

Moisture / Richness Grid

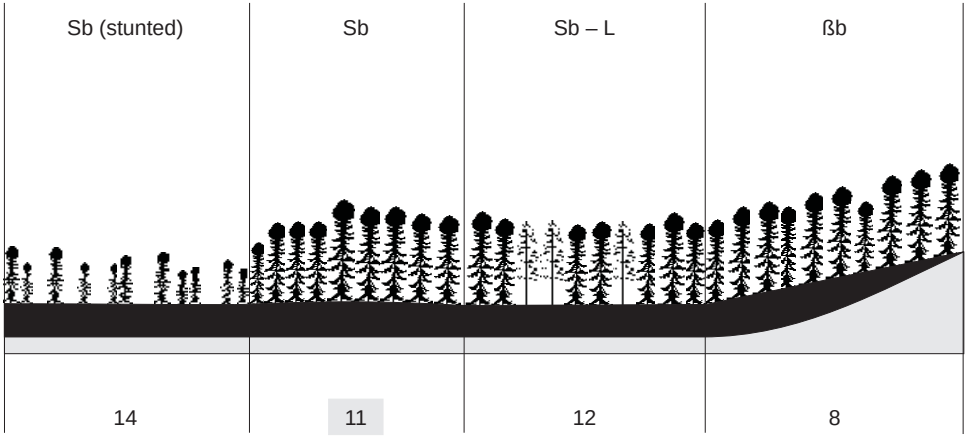


Texture / Richness Grid



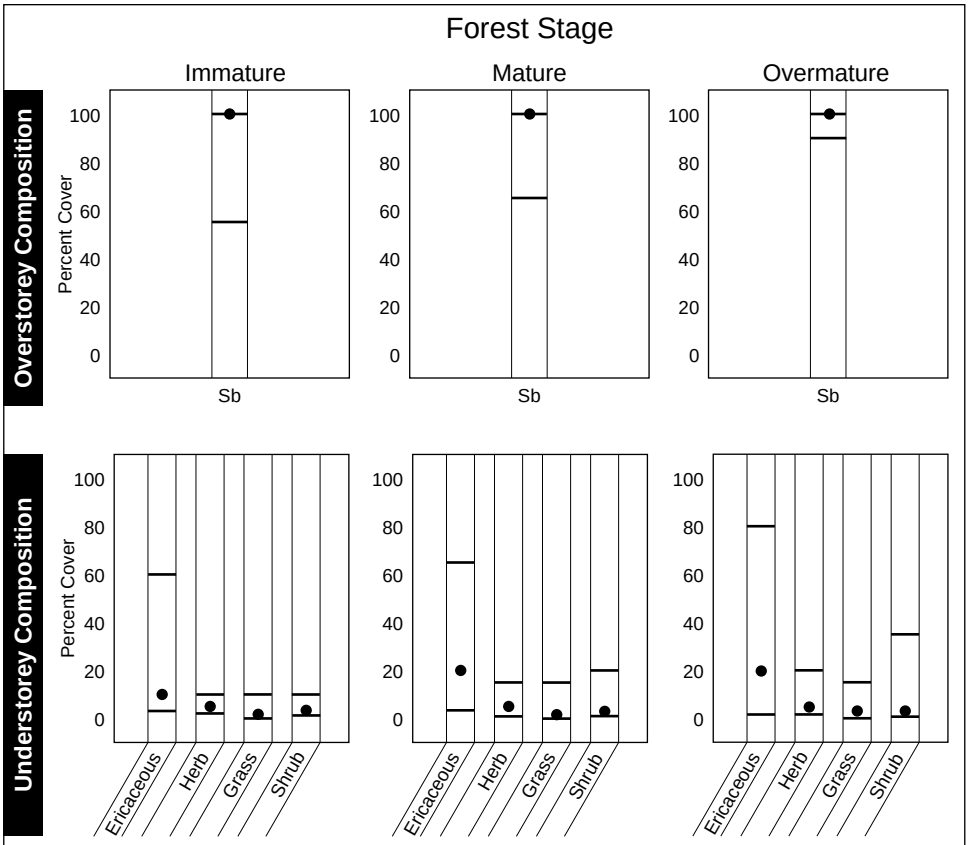
Typical Landscape Associations

Black Spruce Sequence on Organic Soil



Occurs on organic soils with little lateral water flow, often in extensive, flat, broadly oval or circular-shaped low-lying areas; less often on level terrain adjacent to rivers, creeks, streams, and lakes. Also occurs in localized depressions within upland slopes or bedrock plateaus, or in pockets, fissures or crevices in bedrock-controlled terrain. Pure stands of black spruce are typical. Stand productivity is usually medium to low. Sometimes occurs in complex associations with ST12, on variable organic terrain. Within these complexes, ST12 occurs in drainage corridors, while ST11 occurs in level areas or depressions. Often located adjacent to poorer wetlands (ST14, bogs and fens). ST8 or 9 often occurs between ST11 and the adjacent mineral soil uplands.

Site Structure and Composition



Advance Growth

Forest Stage

	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	18550	94	11300	72	20450	91
Bf	100	2	400	8	1500	14

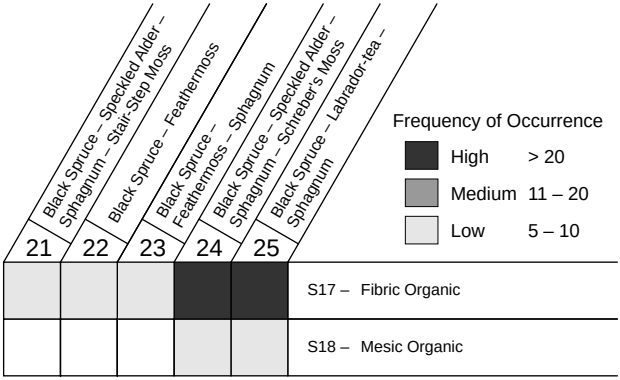
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	50	38	2	9	1	60	33	1	4	1	49	46	1	3	1

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	1	4	2	4	2	2

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

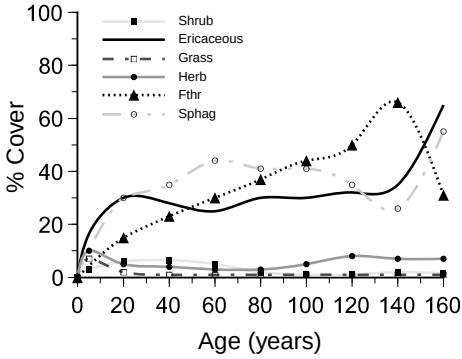


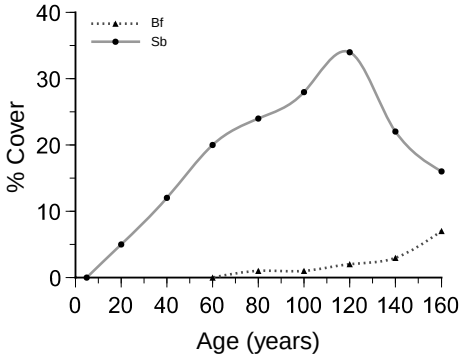
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Immature	Overmature	Special Habitat Preferences
Woodland Caribou				
Moose (summer)				
Moose (winter)		○	○	dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)	○			blueberries, raspberries, beaked hazel
Black Bear (cover)	○	○	○	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx	○	○	○	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten		○	○	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare	○	○	○	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel			○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse				
Great Gray Owl			○	large aspen and larch nest trees near open meadows, fens, bogs
Pileated Woodpecker				
Spruce Grouse		○	○	young jack pine forest with small open areas for display
Ruffed Grouse	○	○	○	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker				
Boreal Chickadee			○	dead trees/stumps with soft heartwood for cavities
Least Flycatcher			○	tall aspen cavity trees, open mid-canopy layer for foraging
White Throated Sparrow	○		○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler				
Blue-spotted Salamander	○	○	○	small breeding ponds, stumps and logs, deep litter

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
Because this site type has low vegetation diversity and is generally dominated by ericaceous shrubs, there are few changes in composition and abundance after disturbance. There may be some increased growth of ericaceous shrubs due to the increased availability of sunlight.

Response following harvest and mechanical site preparation:
Ericaceous shrubs will increase due to stimulation of sprouting and root suckering. The growth and vigor of sedges is stimulated by cutting of rhizomes.

Response following harvest and prescribed fire:
Following light fires, ericaceous shrubs sprout from rhizomes and vegetative parts. Grasses and sedges are stimulated and will tend to increase.

Response following harvest and herbicide:
This site typically does not require herbicide application. When it is required, variable responses are achieved from different herbicides, but competition generally decreases in abundance for at least three years.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature	18550	94				
Mature	11850	72	3650	36		
Overmature	20450	91				
Bf						
Immature	100	2				
Mature	200	8	3700	52		
Overmature	1500	14				

sample size ≥ 5 sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

No information available.

Critical Comments

- weak lateral water flow
- typically a uniform forest floor with hummocks of sphagnum and feathermosses
- few or no open water pools
- black spruce stands often have a high stem density
- many stands are all-aged due to their origin by layering and seeding

Site Characteristics, Limitations and Hazard Potential

Characteristics									Limitations						Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
1					2			3				4	4		5	Harvesting
1					2			3				4	4			Renewal
1												4	4			Tending

Footnotes

1. Minimal disturbance to peat layer is important for avoiding site damage.
2. Wet site restricts harvesting options.
3. Edges of cut areas will experience some windthrow.
4. Fibric organic soils are the most frequent soil type for this site type. Normal operations will cause site damage on all moist or wet organic soils and on dry mesic or humic organic soils. However, risk of site damage is only moderate on dry fibric organic soils. "Best practices" may minimize damage, but, in many cases operations should not be conducted until conditions change.
5. Moderate to low risk of nutrient loss using full tree clearcut logging on this site type.

Opportunities

- excellent opportunity for black spruce seeding
- site has high amount of advance growth
- wide range of silvicultural packages that will promote black spruce on this site
- can “hold over” for a period of time (non-competitive)

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	M	1 – 3
Jack pine	N/A	N/A
Aspen	N/A	N/A

Site Productivity = FRI Site Class

Degree of Effort		
1	=	Extensive
2	=	Basic
3	=	Intensive
4	=	Elite
N/A	=	Not Appropriate

Site Productivity		
H	=	1 – 2
M	=	2
L	=	2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System •Harvest Method	Comments	
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strips should be from 70 to 100 m wide. This technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Group seed tree. This technique may be prescribed to meet other management objectives.
- HARP	CR	HARP may be used for overmature black spruce stands. Must identify lower diameter limit and maintain a semi-contiguous crown cover.
Shelterwood	NR	High probability of windthrow.
Selection	NR	
Logging Method		Harvest on frozen ground or use high flotation equipment during the frost-free season.
Full-tree	CR	See Logging Method comment.
Tree-length	CR	See Logging Method comment.
Cut-to-length/Shortwood	CR	See Logging Method comment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

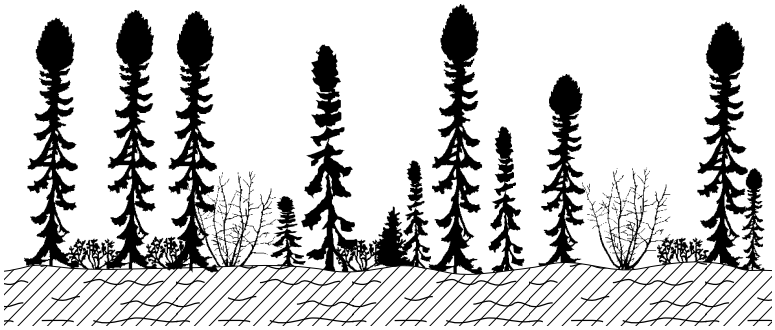
Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	This activity should only be done on frozen ground.
• Chemical	R	
• Prescribed Burn	R	
Regeneration		
• Natural		
- Advance Growth	R	
- Seed	R	
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	R	
- Planting	R	
- Scarification	CR	See Mechanical Site Preparation comment.
Tending Treatments		
Cleaning		
• Manual	R	
• Mechanical	CR	Site sensitive to rutting. Ground pressure of equipment should be less than 10 psi. Can also damage seedlings.
• Chemical		
- Ground	CR	Ground pressure of equipment should be under 10 psi.
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

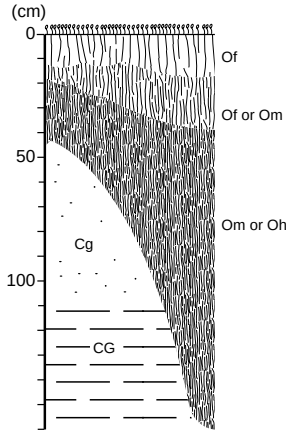
The establishment of jack pine or aspen is not an appropriate management objective for this site type.

Black Spruce – Speckled Alder



ST 12

Description: Black spruce and speckled alder on wet, moderately decomposed organic soils with thick surface fibric horizons. Medium number of shrubs and herbs (n = 30).



Overstorey: Black spruce[10], Larch[1].

Shrubs: Black spruce, Balsam fir; Speckled alder; Labrador-tea, Creeping snowberry, Small cranberry, Twinflower, Dwarf raspberry, Velvetleaf blueberry, Early low blueberry, Northern honeysuckle, Leatherleaf.

Herbs: Sedge spp., Bunchberry, Three-leaved smilacina, Goldthread, Naked mitrewort, Woodland horsetail, Wood anemone, Northern comandra.

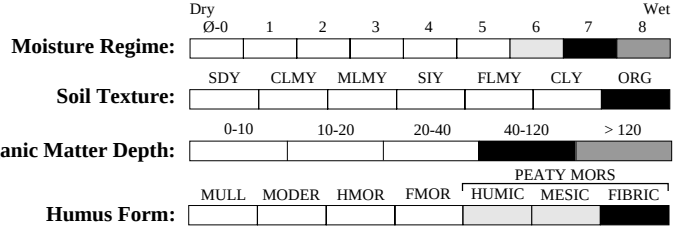
Mosses & Lichens: *Sphagnum girgensohnii*, Schreber's moss, *Sphagnum magellanicum, Sphagnum nemoreum,* Stair-step moss, Plume moss, Broom moss, other *Sphagnum* spp., Reindeer lichen.

Vegetation Types: V21[5] V24[3] V20[1] V19[1]

Ground Surface: Abundant, moderate hummocks of sphagnum and feathermoss, with sparse patches of litter. Small water-filled depressions common on sites with strong groundwater flow, sparse on sites with weak flow.

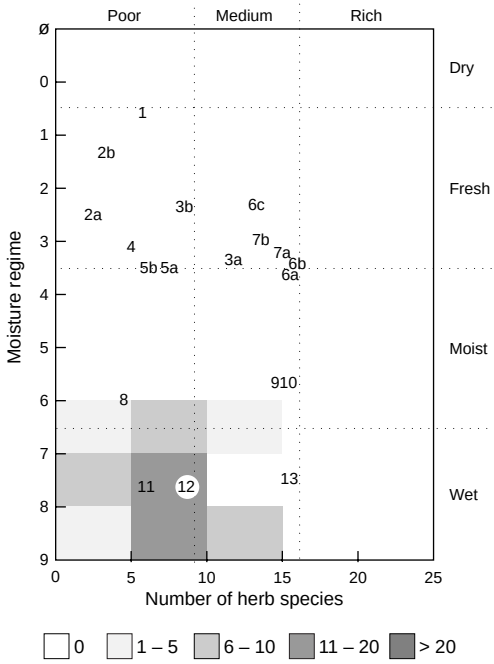
Soil Material: Organic soil.

Soil Types: S17[6] S18[2] S19[2]

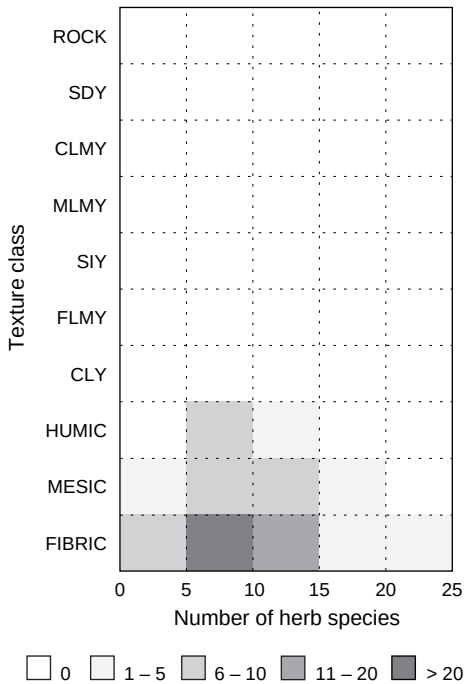


Comments: Moderately deep mesic organic materials, usually associated with weak seepage flow. Balsam fir or white cedar trees may be present. Tree canopy usually uneven with many openings. Black spruce shrubs common.

Moisture / Richness Grid

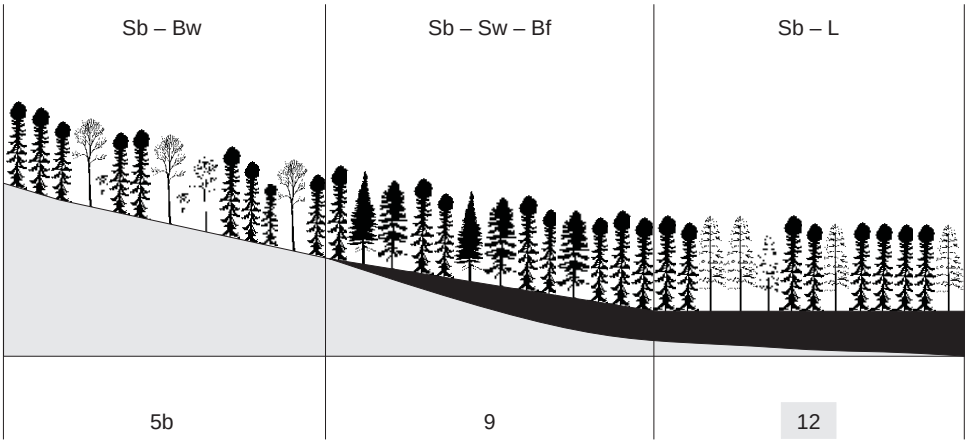


Texture / Richness Grid

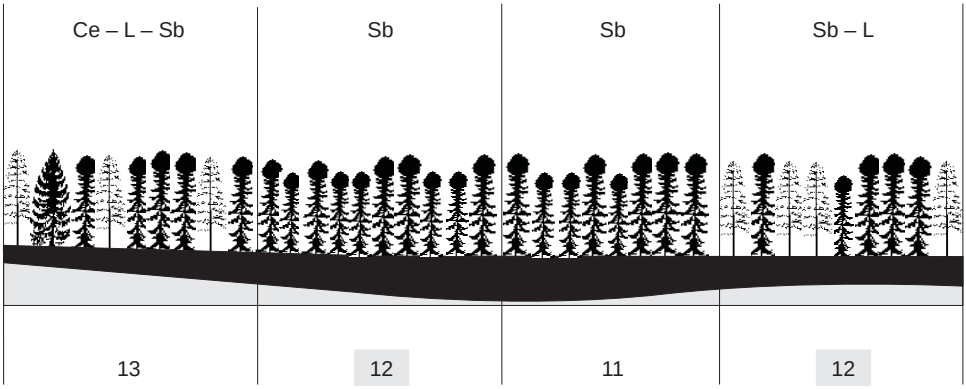


Typical Landscape Associations

Conifer Sequence on Medium Loamy to Silty Soil

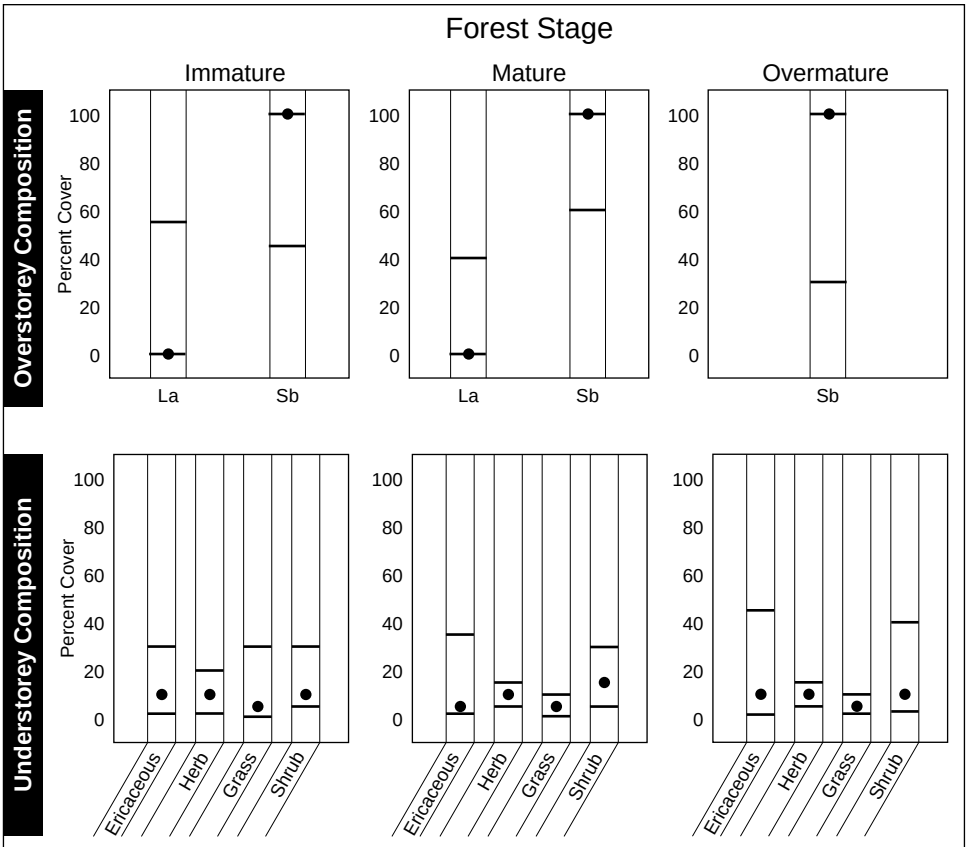


Conifer Sequence on Organic Soil



Occurs on organic soils within extensive wetland areas and is associated with moderate lateral water flow. Occurs as a narrow band (lagg) surrounding treed or untreed bogs and fens, adjacent to linear drainage features (usually small intermittent creeks or seepageways), adjacent to conifer-dominated uplands on areas of generally low relief, or adjacent to richer wetlands in terrain with greater slopes. Occurs as pure black spruce or black spruce-larch stands. Scattered white cedar can also be present. Stands are usually medium in productivity. Often occurs in complex associations with ST13, on variable organic terrain with strong to medium water flow (e.g. adjacent to uplands), or with ST11 on organic terrain with medium to weak water flow, in situations further away from the uplands. A gradient often occurs from ST11 to 12 to 13 as one moves towards the slopes bordering upland areas or towards a drainage feature. ST8 or 9 often occurs between ST12 and adjacent uplands.

Site Structure and Composition



Advance Growth

Forest Stage

	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	8200	80	11200	72	11500	71
Bf	50	3	800	20	1350	6

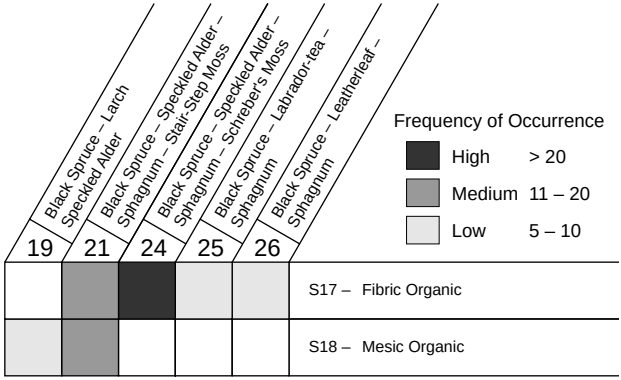
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	60	30	4	5	1	55	36	1	7	1	42	50	1	6	1

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	1	4	2	5	2	4

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

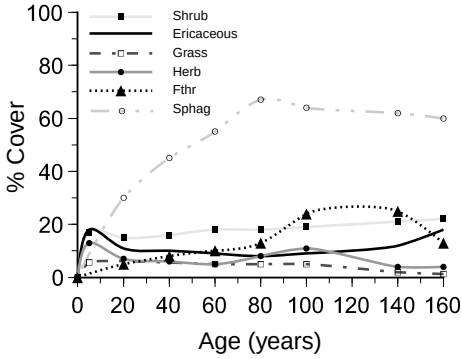


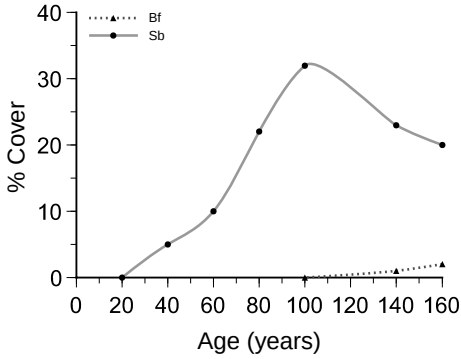
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling	Immature	Overmature	Special Habitat Preferences
Woodland Caribou				
Moose (summer)				
Moose (winter)		○	○	dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)				
Black Bear (cover)	○	○	○	dense understories, scattered supercanopy trees provide escape site for cubs
Lynx	○	○	○	availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten		○	○	large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare	○	○	○	dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel			○	large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse				
Great Gray Owl			○	large aspen and larch nest trees near open meadows, fens, bogs
Pileated Woodpecker				
Spruce Grouse		○	○	young jack pine forest with small open areas for display
Ruffed Grouse	○	○	○	dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker				
Boreal Chickadee			●	dead trees/stumps with soft heartwood for cavities
Least Flycatcher			○	tall aspen cavity trees, open mid-canopy layer for foraging
White Throated Sparrow	○		○	abundant slash and low herbaceous vegetation
Bay-breasted Warbler		○	○	understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander	○	○	○	small breeding ponds, stumps and logs, deep litter

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
The growth of speckled alder is stimulated by greater availability of light. Grasses, sedges and ericaceous shrubs increase in vigor and abundance, and ericaceous shrubs can also increase fruit yields.

Response following harvest and mechanical site preparation:
Site preparation stimulates sprouting shrubs (especially speckled alder and willows), grasses and sedges.

Response following harvest and prescribed fire:
Deeply rooted shrubs (e.g. speckled alder, Labrador-tea) increase in abundance following fire.

Response following harvest and herbicide:
One or two applications of 2,4-D at three to five year intervals may be required to control speckled alder.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature	10200	80	250	45		
Mature	11200	72	7675	66		
Overmature	11500	71	6325	50		
Bf						
Immature	0	0	125	5		
Mature	800	12	950	26		
Overmature	1350	04	1375	28		

sample size ≥ 5 sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

No information available.

Critical Comments

- moderate lateral flow of oxygen and nutrient-enhanced water
- forest floor moderately broken by open water pools and drainage channels
- stands usually more patchy than ST11, with a moderate number of canopy openings arranged in linear or net-like patterns
- occasional occurrence of white cedar, typically as a small proportion of the total canopy composition
- sometimes found as pure larch stands

Site Characteristics, Limitations and Hazard Potential

Characteristics									Limitations							Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities		
1					2			3				4	4		5	Harvesting		
1					2			3				4	4			Renewal		
1												4	4			Tending		

Footnotes

1. Minimal disturbance of peat layer to avoid site damage.
2. Wet site restricts harvesting options.
3. Edges of cut areas will experience some windthrow.
4. Normal operations will cause site damage on all moist or wet organic soils and on dry mesic or humic organic soils. However, risk of site damage is only moderate on dry fibric organic soils. Best practices may minimize damage, but in many cases operations should not be conducted until conditions change.
5. Moderate to low risk of nutrient loss using full tree clearcut logging on this site type. Soils associated with this site can be nutrient poor. However, telluric water flow provides a steady nutrient input to offset any nutrient loss from logging.

Opportunities

- excellent opportunity for black spruce seeding
- site has high amount of advance growth
- wide range of silvicultural packages that will promote black spruce on this site

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	M	1 – 3
Jack pine	N/A	N/A
Aspen	N/A	N/A

Site Productivity = FRI Site Class

Degree of Effort		
1	=	Extensive
2	=	Basic
3	=	Intensive
4	=	Elite
N/A	=	Not Appropriate

Site Productivity		
H	=	1 – 2
M	=	2
L	=	2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method	Comments	
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strips should be from 70 to 100 m wide. This technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Group seed tree. This technique may be prescribed to meet other management objectives.
- HARP	CR	HARP may be used for overmature black spruce stands. Must identify lower diameter limit and maintain a semi-contiguous crown cover.
Shelterwood	NR	High probability of windthrow.
Selection	NR	
Logging Method		Harvest on frozen ground or use high flotation equipment during the frost-free season on dry fibric soils only.
Full-tree	CR	See Logging Method comment.
Tree-length	CR	See Logging Method comment.
Cut-to-length/Shortwood	CR	See Logging Method comment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

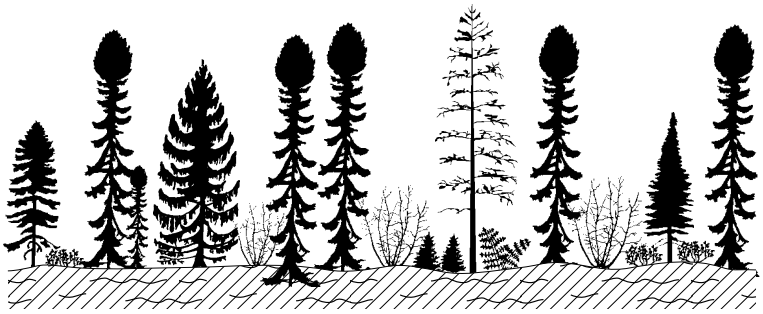
Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	This activity should only be done on frozen ground.
• Chemical	R	
• Prescribed Burn	NR	Promotes grass growth on moist, nutrient rich sites.
Regeneration		
• Natural		
- Advance Growth	R	
- Seed	R	
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	R	
- Planting	R	
- Scarification	CR	See Mechanical Site Preparation comment.
Tending Treatments		
Cleaning		
• Manual	CR	Cutting may stimulate stem sprouting and/or root suckering of competition.
• Mechanical	CR	See Manual Cleaning comment. Ground pressure of equipment should be under 10 psi.
• Chemical		
- Ground	CR	Ground pressure of equipment should be under 10 psi.
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

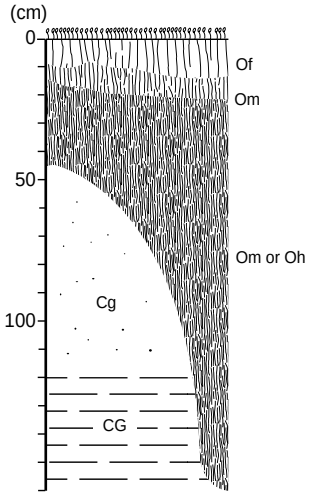
The establishment of jack pine or aspen is not an appropriate management objective for this site type.

Conifer – Speckled Alder



ST 13

Description: Black spruce, cedar and larch stands with speckled alder on wet, well-decomposed organic soils with thin surface fibric horizons. Shrub, herb and moss rich (n = 37).



Overstorey: Black spruce[9], Larch[2], White cedar[2], White spruce[1], Balsam fir[1].

Shrubs: Balsam fir, Black spruce, Speckled alder; Dwarf raspberry, Creeping snowberry, Twinflower, Labrador-tea, Northern honeysuckle, Red osier dogwood, Mountain ash spp., Bristly black currant, Bristly wild rose, Swamp red currant, Velvetleaf blueberry, Serviceberry spp., Canada honeysuckle, Wild red raspberry, Squashberry.

Herbs: Sedges, Bunchberry, Kidney-leaved violet, Goldthread, Naked mitrewort, Fragrant bedstraw, Starflower, Wild lily-of-the-valley, Wood anemone, Three-leaved smilacina, Oak fern, Sarsaparilla, Blue-joint grass, Woodland horsetail, Blue bead lily, Sweet coltsfoot, Ciliolate aster.

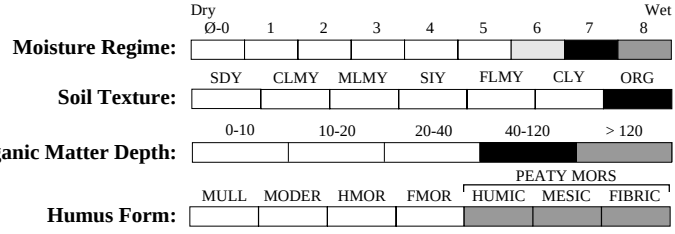
Mosses & Lichens: Schreber's moss, Stair-step moss, *Sphagnum girgensohnii*, *Sphagnum nemoreum*, Electrified cat's tail moss, Plume moss, Broom moss, *Mnium* spp., Sickle moss, Ribbed bog moss.

Vegetation Types: V19[2] V21[2] V6[2] V20[2] V7[1] V22[1]

Ground Surface: High hummocks of sphagnum and feathermoss with sparse patches of litter and abundant small water-filled depressions.

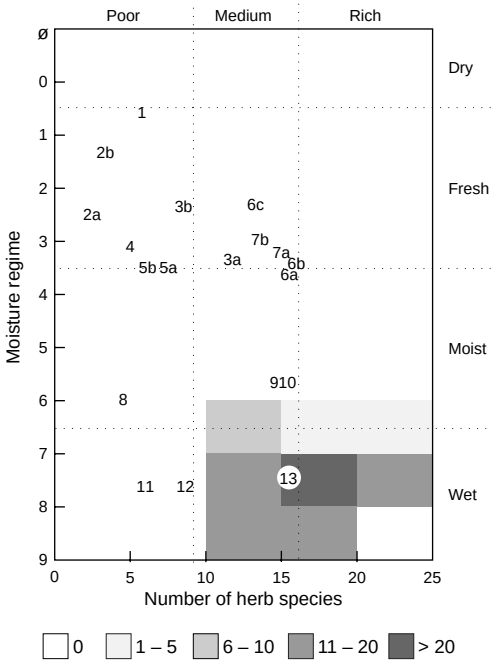
Soil Material: Organic soil.

Soil Types: S19[5] S18[3] S17[2]

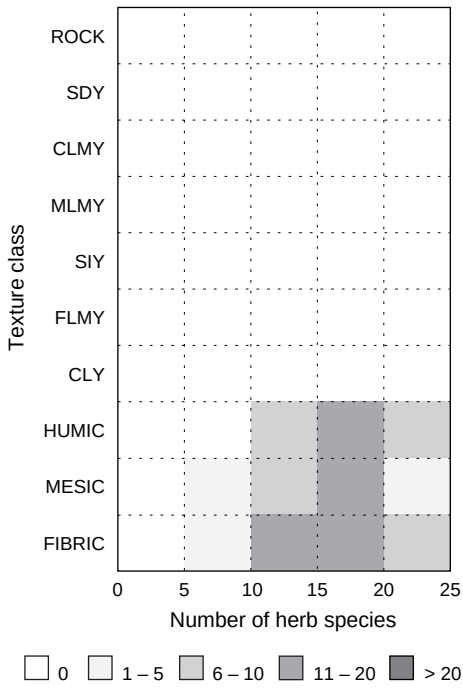


Comments: Found on toe slopes, bottoms of valleys, and adjacent to waterways, with strong seepage flow. Sparse black ash and white birch trees. Tree canopy uneven with many openings.

Moisture / Richness Grid

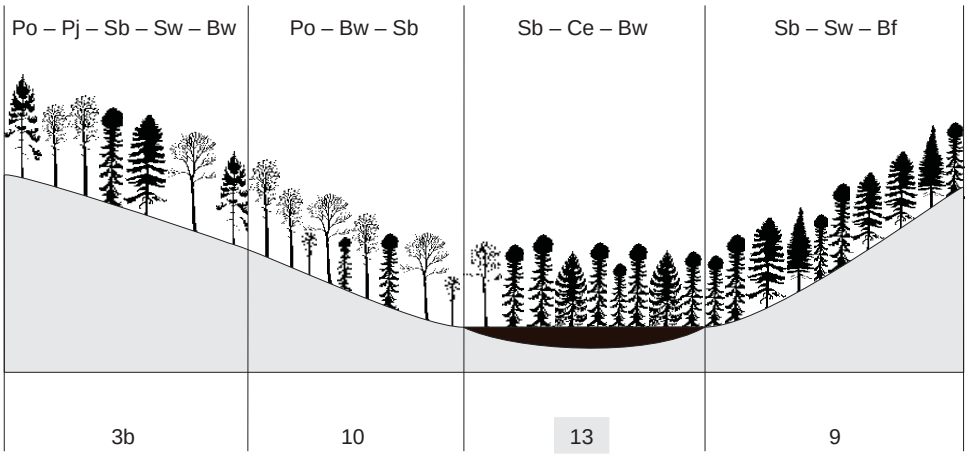


Texture / Richness Grid

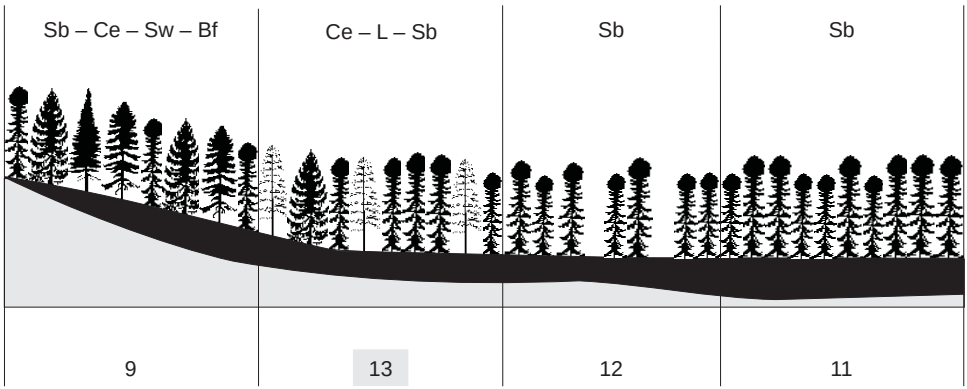


Typical Landscape Associations

Mixedwood Sequence on Coarse Loamy to Silty Soil

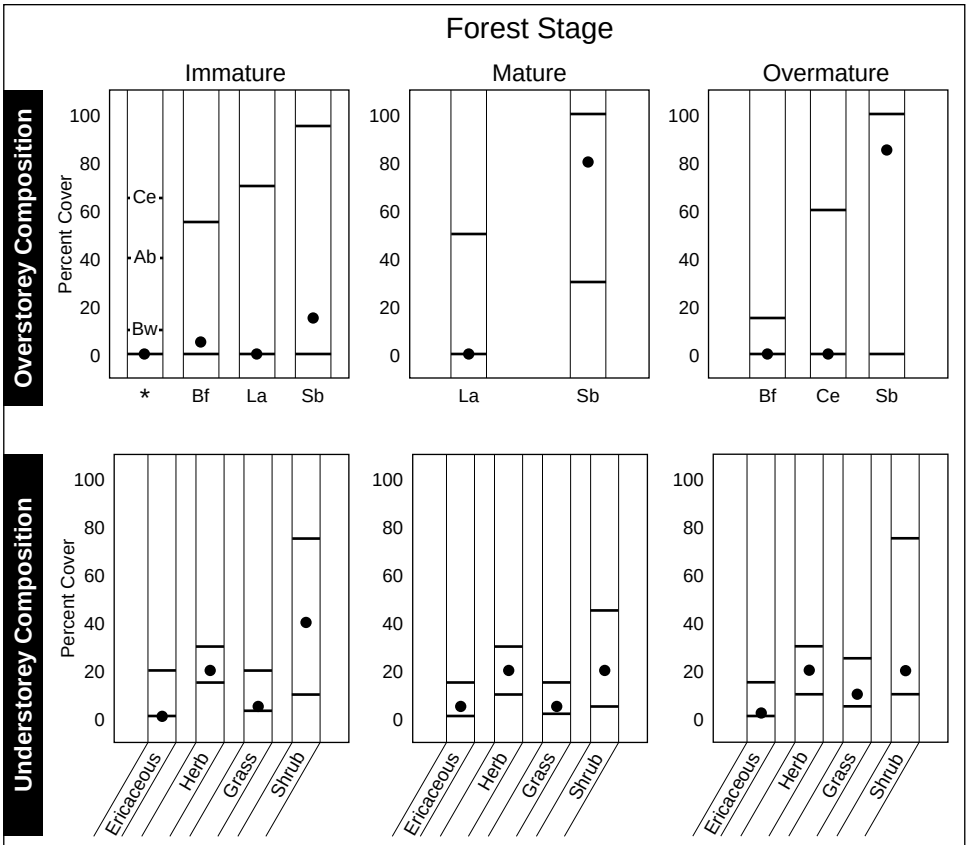


Conifer Sequence on Organic Soil



Occurs on wet organic soils with strong groundwater flow, often adjacent to streams and creeks or directly adjacent to upland areas where water flow is strong, or in linear, low lying valleys between upland areas. Stands are dominated by black spruce, larch, or white cedar. Within these stands, small pockets of white birch, balsam fir, white spruce, balsam poplar, or black ash may occur. Stands are usually of medium to high productivity. Stocking is variable and the tree canopy is often patchy and broken. Often occurs in complex associations with ST12, on variable organic terrain with strong to medium water flow (e.g. adjacent to uplands). Narrow bands of ST9 and 10, which occur on lower slopes, often lie between ST13 and the adjacent upland forests.

Site Structure and Composition



Advance Growth

	Forest Stage					
	Immature		Mature		Overmature	
	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Sb	2475	45	3300	43	7750	68
Bf	3125	43	1375	20	50	6

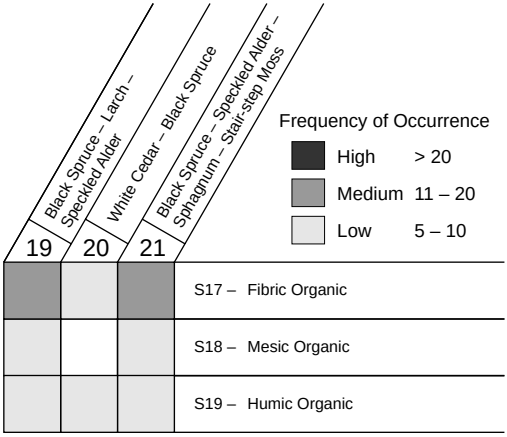
Seedbed

	Immature					Mature					Overmature				
	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen	Sphag	Fthr	Bdlf	Con	Lichen
	56	8	13	23	0	45	44	3	8	0	38	50	3	8	1

Coarse Woody Debris

	Immature		Mature		Overmature	
	Logs	Debris	Logs	Debris	Logs	Debris
	3	6	3	5	3	9

Vegetation and Soil Type Relationships
(number of plots with defined combinations)

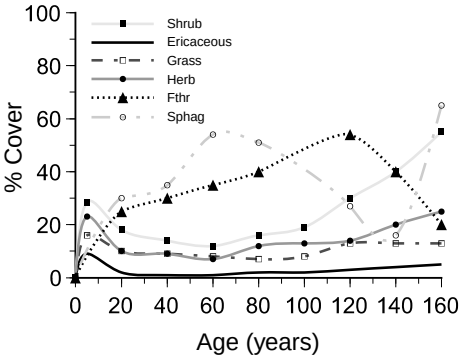


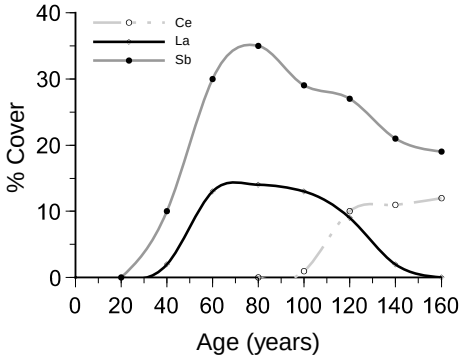
Selected Species Habitat Use

Species	Forest Stage: Pre-sapling		Immature		Overmature		Special Habitat Preferences
Woodland Caribou							
Moose (summer)	○	○					proximity to aquatic feeding areas, mineral licks, thermal cover
Moose (winter)			○	○	○		dense patches of conifer near abundant hardwood and shrubs
Black Bear (fall foraging)							
Black Bear (cover)		○	○	○	○		dense understories, scattered supercanopy trees provide escape site for cubs
Lynx		●	○	○	●		availability of snowshoe hare - large logs, stumps, mature conifer near denning sites
Marten			○	●	●		large maternal den trees, large logs and debris provide access to prey and den sites
Snowshoe Hare		●	○	○	●		dense hardwood and conifer thickets greater than 1 m tall and less than 2.5 m
Northern Flying Squirrel				○	○		large cavity trees, often abandoned pileated cavities, underground fungi
Deer Mouse	○	○	○	○	○		large quantities of seed (especially maple) leaf litter
Great Gray Owl				●	●		large aspen and larch nest trees near open meadows, fens, bogs
Pileated Woodpecker							
Spruce Grouse			○	○	○		young jack pine forest with small open areas for display
Ruffed Grouse		○	○	○	○		dense young stands, large logs for drumming and nest concealment
Black-backed Woodpecker							
Boreal Chickadee				●	●		dead trees/stumps with soft heartwood for cavities
Least Flycatcher				●	●		tall aspen cavity trees, open mid-canopy layer for foraging
White Throated Sparrow	○	○			○		abundant slash and low herbaceous vegetation
Bay-breasted Warbler			○	○	○		understorey spruce/fir stems for nesting, spruce budworm
Blue-spotted Salamander	○	○	○	○	○		small breeding ponds, stumps and logs, deep litter

○ Used Habitat ● Preferred Habitat

Successional Relationships — Natural





Successional Relationships — Post-treatment

Response following harvest:
Increased light availability greatly stimulates the growth of woody shrubs, ericaceous shrubs, graminoids and herbs, especially if the underlying, well-humified organic layers are exposed.

Response following harvest and mechanical site preparation:
Mechanical site preparation greatly stimulates sprouting shrubs (especially speckled alder and willow), raspberry, graminoids, sedges and herbs.

Response following harvest and prescribed fire:
Most shrubs increase in abundance following a burn. Reproduction is both vegetative and from seed and is often vigorous (e.g. speckled alder). Ericaceous shrubs sprout from rhizomes.

Response following harvest and herbicide:
One or two herbicide applications at two to five year intervals may be required to control woody shrubs, graminoids and herbs.

Site Productivity

Site class by species

Site Class	Species		
	Sb	Pj	Po
1			
2			
3			

0 | 1 – 20 | 21 – 40 | 41 – 60 | > 60

Advance Growth Density

Species / Forest Stage	Overstorey Type					
	Spruce		Mixed Conifer		Hardwood	
Sb	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)	Density (stems/ha)	Stocking (%)
Immature	3375	45	1750	25		
Mature	4100	50	4800	44	800	12
Overmature	7750	68	6850	44		
Bf						
Immature	5100	48	2500	40		
Mature	4600	76	1250	22	8200	68
Overmature	4300	60		92		

shaded sample size ≥ 5 unshaded sample size < 5

Natural Ingress Probability and Density (ten years post-disturbance)

No information available.

Critical Comments

- strong lateral flow of oxygen and nutrient-enhanced water
- typically, forest floor strongly broken by open water pools and drainage channels
- stands vary from productive and uniform (typically adjacent to upland sites), to very patchy, with trees in clumps, and many canopy openings arranged in linear or net-like patterns
- moss layer includes many species, reflecting the richness of this site type, usually the percent cover of sphagnum is lower than in ST11 and 12
- “upland” tree species (balsam fir, white spruce, white birch, balsam poplar, black ash) often occur as a small proportion of the canopy, due to the enhanced nutrient status of this site type
- preferred by more wildlife species compared to other black spruce lowland sites

Site Characteristics, Limitations and Hazard Potential

Characteristics									Limitations							Hazard Potential		
Peat Layer	LFH Layer	Soil Texture	Depth to Bedrock	Stoniness	Moisture Regime	Terrain	Competition	Windthrow	Frost Heaving	Drought/Desiccation	Seasonal Flooding	Compaction	Rutting	Soil Erosion	Biomass & Nutrient Removal	Silvicultural Activities
1					2			3				4	4		5	Harvesting
1					2			3				4	4			Renewal
1												4	4			Tending

Footnotes

1. Minimal disturbance of peat layer to avoid site damage.
2. Wet site restricts harvesting options; potential for elevated water table following harvest.
3. Edges of cut areas will experience some windthrow.
4. Normal operations will cause site damage on all moist or wet organic soils and on dry mesic or humic organic soils. However, risk of site damage is only moderate on dry fibric organic soils. Best practices may minimize damage, but, in many cases operations should not be conducted until conditions change.
5. Moderate to low risk of nutrient loss using full tree clearcut logging on this site type. Soils associated with this site can be nutrient poor. However, telluric water flow provides a steady nutrient input to offset any nutrient loss from logging.

Opportunities

- site has medium amount of advance growth

Silvicultural Intensity Considerations

Species Objective	Site Productivity	Degree of Effort to Reach Free-to-grow
Black spruce	H	1 – 3
Jack pine	N/A	N/A
Aspen	N/A	N/A

Site Productivity = FRI Site Class

Degree of Effort

1 = Extensive
2 = Basic
3 = Intensive
4 = Elite
N/A = Not Appropriate

Site Productivity

H = 1 – 2
M = 2
L = 2 – 3

Silvicultural Interpretations for the Establishment of Black Spruce

Silvicultural System • Harvest Method	Comments	
Clearcut	R	
• Harvest Method - Conventional	R	
- Strip/Block	CR	Strips should be from 70 to 100 m wide. This technique may be prescribed to meet other management objectives.
- Patch	R	
- Seed-tree	CR	Group seed tree. This technique may be prescribed to meet other management objectives.
- HARP	CR	HARP may be used for overmature black spruce stands. Must identify lower diameter limit and maintain a semi-contiguous crown cover.
Shelterwood	NR	High probability of windthrow.
Selecton	NR	
Logging Method		Harvest on frozen ground.
Full-tree	CR	Winter logging will reduce nutrient loss. See Logging Method comment.
Tree-length	CR	See Logging Method comment.
Cut-to-length/Shortwood	CR	See Logging Method comment.

R = Recommended CR = Conditionally Recommended NR = Not Recommended

Silvicultural Interpretations for the Establishment of Black Spruce (con't)

Renewal Treatments		Comments
Site Preparation		
• Mechanical	CR	This activity should only be done on frozen ground. Mechanical site preparation on these sites promotes heavy competition.
• Chemical	R	
• Prescribed Burn	NR	Promotes grass growth on moist, nutrient rich sites.
Regeneration		
• Natural		
- Advance Growth	R	
- Seed	R	
- Vegetative (coppice)	NR	This species does not regenerate by coppice.
• Blended	R	
• Artificial		
- Seeding	R	
- Planting	R	
- Scarification	CR	See Mechanical Site Preparation comment.
Tending Treatments		
Cleaning		
• Manual	CR	Cutting may stimulate stem sprouting and/or root suckering of competition.
• Mechanical	CR	See Manual Cleaning comment. Ground pressure of equipment should be under 10 psi.
• Chemical		
- Ground	CR	Ground pressure of equipment should be under 10 psi.
- Aerial	R	
Spacing	R	

R = Recommended CR = Conditionally Recommended NR = Not Recommended

The establishment of jack pine or aspen is not an appropriate management objective for this site type.