Minnesota Forests and the Range of Natural Variation:

A 10 year update for the Northern Superior Upland and Drift and Lake Plains Ecological Sections of Northern Minnesota

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Background and Objectives

Understanding the composition and structure of Minnesota forests as they relate to the Range of Natural Variation (RNV) has been the focus of numerous forest management agencies, industry, and citizen planning efforts. (RNV) modeling is an approach to maintaining sustainable populations of plant and animal communities by emulating the types and amount of habitat that existed across a regional landscape under natural disturbance regimes. The underlying concept behind RNV is that, over relatively recent history prior to European settlement, the native communities of plants and animals adapted to particular ranges in the amounts of forest types and ages created by the dominant forest-regenerating disturbances of the presettlement forest. In the forests of northern Minnesota, the predominant large-scale forest disturbances were fire and wind (Frelich 2002).

The use of the RNV concept arose out of a need to develop defensible strategies for maintaining biological diversity and sustaining the viability of threatened and endangered species (Landres et al. 1999). Maintaining conditions within the RNV provides a landscape-scale management strategy for sustaining viability of diverse species with recognized habitat relationships, including those requiring an array of habitats (e.g. large mammals, numerous bird species), those that have specific habitat requirements (small mammals amphibians, reptiles), and those whose habitat relationships are poorly understood (Hunter et al. 1989, Swanson et al. 1994). Also, it provides a means to a comprehensive assessment that avoids the expense and time constraints associated with individual species modeling or population viability analyses.

By comparing current forest condition with the range of natural variation, forest managers can obtain information on how different vegetation growth stages are faring with respect to their abundance under natural disturbance regimes. This information can be used for many purposes, including development of silvicultural strategies and forest management plans that will move forest stands in the direction of the RNV.

In March 2004, the North Central Experiment Station of the US Forest Service released an update of the Forest Inventory and Analysis (FIA) data for Minnesota. This is approximately a 10 year update of the information on which the initial RNV analyses for Minnesota were based. The objective of the present study is to compare of the current status of forests with respect to the RNV with the initial RNV analyses conducted by Mark White and Terry Brown (2002). The intent is to document the degree to which different forest types have moved toward or away from the RNV in this time period. The following sections document the RNV modeling strategy and methods, data sources, results and conclusions from this analysis.

RNV Modeling

Several key ecological concepts form the basis of RNV models. Foremost is the concept of the “landscape ecosystem”, which refers to mappable, repeating combinations of soils, landform, climate and microclimate that support characteristic native plant communities. The science of identifying and classifying landscape ecosystems has been variously

called Ecological Land Classification (ELC) or Habitat Typing, and the end product referred to as an Ecological Classification System (ECS; Barnes et al 1982). Biophysically-based land classifications have a long history in European forestry (Cajander 1906, Barnes 1984), and a more recent history in the US (Barnes et al. 1982), but ecological classifications have been widely adopted for strategic and tactical forest planning by federal, state, county and private forest management agencies. Research has shown that ELCs can account for variation not only in forest composition, but also ecosystem functional processes, such as tree productivity (Host et al. 1988), forest succession (Host et al 1989) and nutrient cycling (Zak et al 1986). For this study, Landscape Ecosystems are defined in terms of the dominant late successional native plant community, e.g. Mesic Northern Hardwood Forest.

The fact that different forest successional pathways occur in different landscape positions has a direct bearing on range of variation concepts. Specifically, it is possible through field work and predictive modeling to identify the Native Plant Communities (NPCs) that comprise the plant assemblages characteristic of a particular landscape position. The MN Dept of Natural Resources, in fact, has recently published a detailed NPC classification for the Laurentian Forest region of Minnesota (MNDNR 2003). In RNV modeling, an NPC consists of a series of Vegetation Growth Stages (VGS), which are combinations of age classes and tree species that form characteristic successional stages within a landscape ecosystem. These stages include the dominant late successional community, as well as the early and mid-successional forest types that precede the late successional type under various disturbance regimes.

In the late 1990s, a group of ecologists from the University, the state and private industry assembled to explore and develop RNV models for forest lands of Minnesota. Model development involved identification of successional pathways for each of the native plant communities. This work focused on two ecological Sections that are extensive and important regions of forest production in the state: the Northern Superior Uplands and the Drift and Lake Plains. A critical component of the model was the quantification of disturbance frequencies for the dominant disturbance types; this work was conducted by Dr. Lee Frelich of the University of Minnesota, and is documented in two reports (Frelich 1999, 2000). The key element of identifying disturbance regimes is determination of fire and wind rotations, defined as the number of years that elapse between stand-replacing disturbance events. This was done with a combination of dendrochronological work as well as analysis of historic studies and data sources (Frelich 2002). The RNV models used here have been employed to varying degrees in planning endeavors by the MN DNR Subsection Teams, the USFS, and at least one of the Minnesota Forest Resources Council-sponsored Landscape Committees.

The disturbance rotations can be converted into return intervals – the frequency at which a particular point in the landscape is subjected to a stand-replacing disturbance, which in turn can be converted to an annual disturbance estimate. This latter calculation is the inverse of the rotation length. A 100 year fire rotation, for example, implies that 1/100 or 1% of that NPC will be subjected to fire each year. The combination of the successional models and disturbance frequencies allowed the development of RNV models, which

ultimately define the proportions of an ecological Section occurring in various VGSs under natural disturbance regimes (Appendix A). To construct the range of variation the model is run using the minimum and maximum estimates of disturbance rotations. This provides a pair of percentages that provide the range in the proportions of a VGS within a landscape ecosystem given the natural variation in disturbance frequencies.

The final step in RNV modeling is to translate the proportions into actual areas. This requires development of maps of native plant communities for the ecological sections. An NPC map for the Northern Superior Uplands was based on a spatial analysis of spatial data layers known to be important determinants or correlates of forest type distribution, including soils, elevation, landtype associations, climate, and numerous other factors (White and Host 2000). A similar effort for the Drift and Lake Plains was conducted by David Shadis, soil scientist and ECS coordinator for the Chippewa National Forest. These maps allow the proportions calculated in the RNV models to be translated to forest land areas.

This last step allows current forest condition to be compared against the RNV, and allows an assessment of how different forest management strategies move the forest toward or away from the RNV. This latter objective formed the basis of the Minnesota LCMR-funded SUSTAIN forest model, developed as a tool for RNV assessment, and, in part, a basis for the current analysis.

Current Condition/RNV comparisons

An initial comparison of current forest conditions to RNV models was conducted in the Drift and Lake Plains (DLP) section (Brown & White 2001). The analysis was based on the 1990 era Forest Inventory and Analysis (FIA) data set, augmented with a common forest inventory of DNR, County and Federal lands. These data were assembled by Chad Skally and Mark White, under funding from the MFRC Landscape Program. This was followed in 2002 by a similar analysis of the Northern Superior Uplands (NSU) section (Brown and White 2002). Fourteen NPCs were included in the analysis of these two Sections.

All 14 NPCs included in the RNV share a common pattern: with respect to the Range of Natural Variation, NPCs tend to be strongly overrepresented in the young to intermediate age classes (approximately 10 to ~100 years) and under represented in the older age classes. There is a good historical basis for this: the present day forests are the landscape response to the large-scale logging events and subsequent fires that occurred between 1880 and approximately 1920, in which many of the great pine forests and other late-successional and old growth forests of the lake states were harvested. This event and its effects on present-day forests are well-documented in Whitney (1987), Williams (1989), Frelich (2002), and numerous other sources.

The studies cited above were based on 1990 forest inventory coupled with the Minnesota common forest inventory. Since those reports were written, a more recent (2002) forest inventory was released. To determine the degree of change over this 10+ year period, the

two estimates of forest condition were compared against the RNV models, as described below.

Methods

The initial work on RNV and current composition was conducted with the "1990" USFS Forest Inventory and Analysis (FIA) data, which consisted of data collected between 1987 and 1990. Current composition used in Brown & White 2001 and 2002 was based on a synthesis of the 1990 FIA with more recent MN DNR Phase II inventories, and other National Forest and county-level data sets summarized at various levels of aggregation (hereafter referred to as the Skally-White or SW data set). Point and stand level inventory data were augmented with a Landsat TM classification developed at NRRI (Wolter et al. 1996).

Data acquisition

This project updates the current composition of northern Minnesota forests based on the 2003 Forest Inventory and Analysis data, released in March 2004. These data were collected between 1999 and 2003. Data were acquired at the NCES download site at http://www.ncrs2.fs.fed.us/4801/fiadb/fiadb17_dump/fiadb17_dump.htm; data were uploaded by the USFS on 4/7/2005 and were listed as MN_12_2003.

Assigning FIA plots to NPC and VGS classes

FIA plots were assigned to Native Plant Communities by overlaying the FIA point coverage onto the existing maps of Native Plant Communities. The NPC classification for the Northern Superior Uplands follows White and Host (2000), whereas the classification for the Drift and Lake Plains was based on the USFS classification created by Chippewa National Forest Soil Scientist David Shadis. Because the FIA data points are spatially perturbed or swapped, a GIS-based buffer analysis was used to assign points to NPCs – points were assigned based on the dominant NPC within a 0.8 km radius of the plot center; a subset of the data were evaluated to compare the compositional information to the NPC.

The STDAGE (Stand Age) field from the FIA PLOT file was linked to the TREE data file to classify plots into VGS classes. The assignment to VGS classes is not a straightforward process, however, because an 18 year old stand, for example, could potentially belong in two or three VGS that contain 18 year old trees, depending on where the stand is within the successional pathway. This issue is further compounded by the presence of human created or anthropogenic growth stages (e.g. stand types derived from clearcuts rather than natural disturbances).

To account for this, we created a series of anthropogenic vegetation growth stages that describe the response of a VGS to the dominant silvicultural treatments used in that NPC. These treatments can either return a VGS to an earlier successional type, or in the case of thinning and other intermediate harvest operations, accelerate a stand into a later successional stage. Each of the silvicultural operations has a return interval similar to those used for disturbance, providing a means to determine the proportion of the landscape in that particular treatment. These proportions, in turn, were used to assign

plots to natural and anthropogenic VGS classes on a pro-rata basis. This new set of successional models is presented in Appendix A.

Data summaries
Each FIA sample plot now consists of four fixed area subplots, systematically located in randomly selected 1 ac plots. The basal areas of individual species were summarized by calculating the basal area representation based on measured tree diameters (dbh) multiplied by the # trees/ac represented by that tree. These were summed by species at the subplot level, and averaged at the plot level to calculate plot-level mean basal area by species.

Plot level data were then summarized by VGS classes within NPCs. The dominant metrics for this study were mean basal area when present, tree density, species frequency (number of occurrences within plots within that VGS), and an importance value (IV) calculated as the product of species frequency and abundance.

Results

The NPCs range in area from 80,000 to over 1,000,000 ac in the NSU and 200,000 to just over 2,000,000 in the DLP. A total of 3954 FIA plots occurred in these two Sections, giving an average of 3728 ac represented by each FIA plot, well under the USFS target of 6000 ac/plot. The numbers of plots by NPC, however, were variable, and three communities which are relatively uncommon (White Cedar Swamp, Rich Swamp, and Jack pine-aspen-oak) were represented by less than 40 plots each. Most NPCs had over 100 plots with 676 and 886 plots in the DLP's extensive boreal hardwood/conifer and dry-mesic pine oak NPCs, respectively.

The number of plots within each VGS, however, was highly variable, and ranged from 0 to 247 (Table 1). In general, the later successional stages were poorly represented by FIA plot data, and the old-growth or multi-age classes typically had no representation in the FIA data set. The majority of plots were found in the 36-80 year age class. A comparison of the age distribution between the SW inventory and the 2003 FIA data set shows two significant differences. First, many fewer old trees were recorded in the latest FIA. The SW data set recorded more than twice as many trees 100 years of age, and significantly more between 100 and 150 years old (Figure 1). The recent FIA recorded no trees greater than 150 years old. While some of these difference may represent real changes in the forest, others may be attributable to a change in sampling methods, as discussed below. The second strong difference was a shift toward a greater proportion of the landscape in the younger age classes, particularly in stands between 30 and 70 years of age.

Species-level summaries are found in Appendices B through D. Appendix B presents average basal area when present (i.e. when the species occurred in a VGS, its basal area was used in calculating the mean for that VGS. Appendix C summarizes the frequency of occurrence – how often a particular species was found in plots on that VGS. The product of basal area when present and frequency provides an importance value (IV), an index of

species abundance (Appendix D). The comments below summarize the comparisons between the SW data set and the 2003 FIA data, which are found in Appendix E.

Drift and Lake Plains

Tamarack Swamp
VGS 2 and 3 (21-55 and 36-75) moved significantly higher compared with the SW estimate. No 2003 FIA plots were reported in the 76+ year class.

White Cedar Swamp
The White Cedar Swamp NPC represents only 1.4% of the DLP (117,723 ac), and only 34 plots occurred in this type. Twenty-three of these plots occurred in the two early successional growth stages (seedling sapling cedar-spruce (VGS 1) or tamarack (VGS 4) – both of these showed increases of over 10% from the SW data set.

Boreal Hardwood/Conifer
The Boreal Hardwood/Conifer system is a dominant NPC, occurring on 27% of the DLP, and, with the exception of the old-growth conifer growth stage, is well-represented in the 2003 FIA data set. Values for this type were very similar to those reported in the SW data set. In general, VGS 1, 2, and particularly 3 (pole, mature aspen-birch Conifer) were significantly above the RNV in the SW data set, and remained that way in the 2003 FIA data set, with the pole-mature class moving further above RNV. The conifer-dominated successional track (VGS 4, 5, and 6) were within RNV in the SW data set and remained that way. The two tracks converge in the mature-large conifer VGS class 7 (76-175 years); this class decreased below the RNV in the 2003 data set. Old-growth conifers (> 176 years were poorly represented in both forest inventories.

Mesic Northern Hardwood Forest
The Mesic Northern Hardwood type occurs on just over 3% (265,000 ac) of the DLP, and most growth stages were represented by 10 or fewer FIA plots. Most of the FIA plots (27 each) occurred in the two pole-size classes (VGS 3 and 9). These two classes were above RNV in the SW data set and moved further above RNV in the 2003 FIA data set.

Dry-Mesic Pine-Oak Forest
The Dry-Mesic Pine-Oak Forest is the largest NPC in the DLP, occupying 35% of the landscape, or about 2,852,218 ac. The multi-aged and old growth stages (VGS 5 sand 6) were poorly represented in the 2003 FIA data, the remainder were well-represented. Most stages were similar between the two forest inventories – the strongest change was evident in the growth stage with the laregest number of FIA plots (n=247). VGS 3 was significantly above RNV in the SW data set, and moved further above RNV in the 2003 FIA data set.

Dry-Mesic Pine Forest
The Dry-Mesic Pine Forest is the 3rd largest NPC, occurring on about 18% or 1,259,470 acres. The multi-aged red-white pine VGS was not represented by any FIA plots. The

trends in this type were similar to those of the Dry-Mesic Pine-oak forest – the pole-mature class had the largest number of plots ((106), was overrepresented in the SW data set and was further overrepresented in the 2003 FIA data set.

Dry Pine Forest
The Dry Pine Forest is less common than the previous two pine systems, occurring on just over 5% of the DLP, or 437,451 ac. As above, the pole-mature class had the largest number of plots (42), was overrepresented in the SW data set and was further overrepresented in the 2003 FIA data set.

Northern Superior Uplands

Mesic Red and White Pine
Mesic Red and White Pine occupies 561,710 ac or about 10% of the Northern Superior Uplands. Growth stages that were overrepresented in the early and mid-successional atages (VGS 3, 7,10,and 11) in the SW inventory showed little change in the 2003 FIA data set. VGS 3, the mature birch pine system (ages 51-80 years), remains strongly overrepresented, occupying approximately 42% of the NPC, compared with an RNV of 8-12%. The mature white pine (VGS 3) moved from within the RNV in the SW dataset to slightly below the minimum RNV in the 2003 FIA set. There are two multi-aged classes (VGSs 5, 6, >121 years) in this NPC, neither were represented in the 2003 FIA analysis.

Dry-mesic white and red pine
The Dry-mesic white and red pine NPC occupies 913,950 ac or about 16% of the NSU. Patterns were similar to those of the mesic red and white pine NPC: early and successional stages were over-repreresented in both data sets, with little difference between the two. An exception was the mature birch-pine VGS (Age 51-100), which was strongly overrepresented in SW, and moved further above RNV in the 2003 FIA set. This NPC contains 3 multiaged classes (> 121 years); none were represented in the 2003 FIA analysis.

Lowland Conifer
The Lowland Conifer NPC occupies about 1,035,535 ac or 18% of the NSU, and consists of four growth stages. With respect to RNV, the sapling-pole stage (41-80) years was strongly overrepresented in the SW inventory and become moreso in the 2003 FIA data set. The pole-mature age class, however, which was strongly overrepresented in the SW analysis showed significant movement toward the RNV. Representation of multi-aged black spruce was absent from the 2003 FIA inventory.

Rich Swamp
The Rich Swamp NPC occupies about 250,000 ac or 4% of the NSU. The pole-mature size class showed significant movement towards RNV; multi-aged rich swamps were absent from the 2003 inventory.

Mesic birch-aspen-spruce-fir
The Mesic birch-aspen-spruce-fir NPC occurs on 963,760 ac of the NSU or about 17%, and is a major focus of forest management activities. All stages except the multi-aged conifer type were well-represented in the data. Differences between the SW and FIA data sets were not strong, and most stages were within or close to RNV. The mature birch-conifer stage was an exception being overrepresented in the SW inventory and moving further from RNV in the 2003 FIA data set – this type now occupies about 40% of the NPC.

Jack pine-Black Spruce
The Jack Pine- Black Spruce NPC occupies just over 900,000 ac of the NSU. The NPC consists of two major successional lines, a pure jack pine system regenenerated by fire and a fir-spruce-cedar type formed after stand-replacing winds or clearcuts. The 2003 FIA inventory shows some growth stages moving towards RNV (VGS 2 and 5), some moving from under to overrepresentation (3 and 4), and some moving away from RNV (VGS 6).

Northern Hardwood Conifer
The Northern Hardwood Conifer NPC occupies 561,710 ac or about 10% of the NSU. There were few strong changes between the SW and 2003 FIA data sets; the 1-50 yr age class was overrepresented in the SW data set and became more overrepresented in the FIA data set. The 101-150 moved from being above RNV in SW to somewhat under RNV in the FIA data set. There was no representation of multi-aged stands in the 2003 FIA data set.

Discussion: caveats, interpretation, and recommendations

The 2003 Forest Inventory and Analysis dataset differs from the 1990 FIA inventory in several respects. The 1990 inventory was based on almost twice as many field plots: 12,118 collected in 1990 vs 6250 in 2003. The current target sampling intensity is one plot for every 6,000 acres of forest land. The plot design has also changed – beginning in 1995 the Forest Service changed to a fixed area sample. The FIA now measures trees occurring within four systematically located 24 ft radius (1/24 ac) subplots spread out over 1.5 acres. Plots may traverse forest stand, age, or land use boundaries. Plots in the four decades of FIA previous to this were based on 10 variable radius plots located within a forest stand of known area (Frayer and Furnival 1999). A key attribute of variable radius plot sampling is that it samples trees proportionally to their size – large diameter trees have a higher probability of being sampled than small diameter trees. Since small trees tend to be more abundant than large trees, this method avoids an artifact of fixed-area sampling, in which small trees are oversampled and large trees are undersampled. Fixed area plots are simpler to sample, but are less likely to record large trees, unless those trees happen to fall within the plot radius. Two other fields were dropped in the recent inventory – estimates of stand size and distance to water.

Many of the growth stages showed little change between the two inventories. This was expected, ten years is a relatively short interval in terms of forest change, and is a smaller interval than most of the vegetation growth stages. Also, some data included in the SW inventory from the common forest inventory was more recent than the 1990 FIA inventory.

While comparisons between these two data sets are subject to the caveats noted above, there are two patterns that recur across most of the upland plant communities analyzed here:

- Many of the pole-mature size classes that were above the maximum of the RNV in the SW inventory, moved further above the RNV in the 2003 FIA data set
- Few of the 2003 FIA plots were placed in old or multi-aged forest stands, and many of the forest communities had no representation of this type.

The current and future forests will continue to reflect the landscape response to the extensive harvests at the turn of the century for some time. Several present-day factors further contribute to changes in the composition and structure of Minnesota forests; among these are current effects imposed by modern forest management, land conversion to non-forest uses, environmental effects due to emerging insects and disease (e.g. sudden oak death, emerald ash borer, gypsy moth), changes in atmospheric trace gas composition, and climatic change. While these many factors make it difficult to predict future forest composition, several findings from this and previous studies can provide guidance to future forest management.

Key among these is that multi-aged, old growth, or presettlement era forest stands are very rare in the landscape. Frelich (2002) estimates that as of 1995 only 1.1% of presettlement primary forest still existed in the Lake States forests, with most of this concentrated in northern Minnesota's swamp conifer forests or within the BWCA Wilderness. The BWCAW has since experienced a significant straight-line wind event (July 4, 1999) that affected over 200,000 ha of the forest. Many of the representations of undisturbed forest now occur in protected areas such as National Parks, State Parks or Scientific and Natural Areas (SNAs), but these areas are still subject to natural and anthropogenic disturbance. An SNA established in an old-growth sugar maple forest in 2002 to protect an extensive patch of Canadian yew (*Taxus canadensis*), for example, has since experienced extensive deer browse which has decimated the yew population (Duluth News Tribune 5/7/06). It is clear that areas designed to protect existing remnants of multi-aged forests should:

- Span native plant communities – concentrating old growth in a few extensive types that are geographically concentrated does not preserve biodiversity at the landscape scale
- Be of adequate size and in an appropriate context – reserved areas should be large enough that they retain microclimatic characteristics of a forest interior. They should also be buffered – it is better to maintain transitional areas of similar forest type than to abut a 'hard' edge (e.g. forest/agriculture or forest/clearcut boundary)
- Be monitored and managed to retain multi-aged forest characteristics and processes

Also, retaining and advancing existing old and mature forests into multi-aged states is important for maintaining habitat types required to support biodiversity, particularly types that were once dominant elements of the landscape and are now exceedingly rare. There are numerous mechanisms to accomplish this: extended forest rotations, silvicultural techniques that accelerate forest succession (e.g. increased conifer components), and strategic plans designed to increase the acreages in late successional growth stages.

The obvious source of future old-forests, of course, is the currently over-represented pole-mature growth stages, which uniformly occurred across most upland native plant communities. A strategy to reduce the inequities in RNV would be allow a subset of the mature stands to succeed to later successional stages, with attention to the stand size and proximity to other old forest patches. This management could involve silvicultural operations that remove aspen and birch without significantly opening the forest canopy, and prepare the site for increased conifer regeneration. To increase representation of older stages and still provide for a sustainable forest product flow, other stands of these overrepresented types should be harvested by traditional methods to restore young forest and provide for sustainable forest products. Again, harvest schedules should have a strong spatial component, and should enhance those attributes of young forest that provide for wildlife management – increased edge, increased age diversity, and interspersion of age classes at relatively fine spatial scales (i.e. small patch sizes).

RNV analysis is a tool for informing the development of forest management plans to maintain sustainable populations of plant and animal species. It provides a means of evaluating forest plan decisions in light of past and present forest conditions. The shift towards managing the forest as native plant communities rather than stands, and accounting for the size and spatial arrangement of forest patches in strategic plans is a major step towards sustainable forest management. While the present analysis does not show strong movement towards RNV, the recent trends toward increased forest certification by public and private forest managers, and the current concerns on changes in forest ownership patterns, and consequent efforts to identify and protect areas of high conservation value (e.g. MN DNR Forest Legacy Program *www.dnr.state.mn.us/forestlegacy*; MN Campaign for Conservation *www.campaignforconservation.org*, and others) represent positive steps that can ensure Minnesota forests are managed in a sustainable manner.

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Table 1. Count of FIA plots by NPC for two ecological Sections.

Section	NPC	Eco	Count
DLP	Tamarack Swamp	1	187
DLP	White Cedar Swamp	4	34
DLP	Boreal Hardwood/Conifer	7	676
DLP	Mesic Northern Hardwoods	9	78
DLP	Dry Mesic Pine/Oak	11	886
DLP	Dry Mesic Pine	12	454
DLP	Dry Pine	13	130
NSU	Mesic white pine-red pine	2	239
NSU	Dry mesic white pine-red pine	3	211
NSU	Lowland conifer	4	282
NSU	Rich swamp	5	25
NSU	Mesic aspen-birch-spruce-fir	6	349
NSU	Dry mesic jack pine-black spruce	7	290
NSU	Jack pine-aspen-oak	8	18
NSU	Sugar Maple	12	95
Total			3954

Table 2. Count of 2003 FIA plots by NPC and VGS for two ecological Sections.

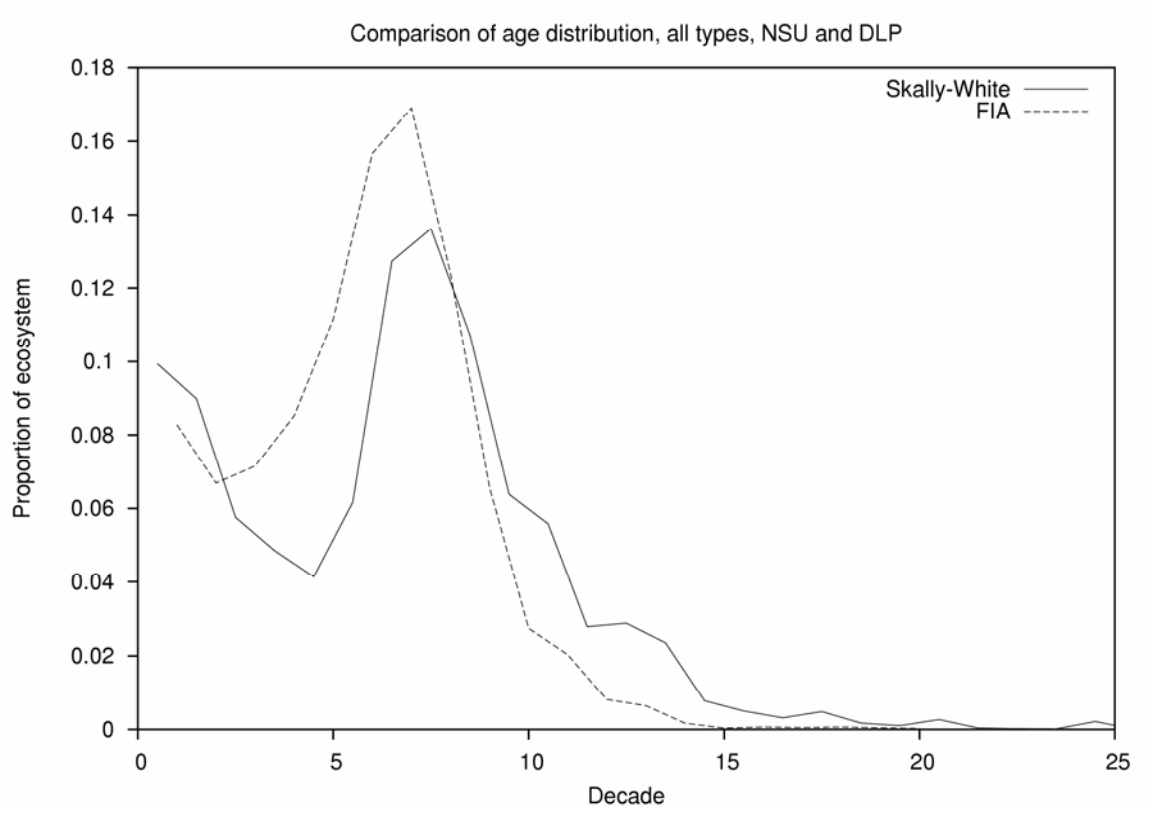
Section	NPC	Eco	VGS	Count
DLP	Tamarack Swamp	1	1	13
DLP	Tamarack Swamp	1	2	53
DLP	Tamarack Swamp	1	3	33
DLP	Tamarack Swamp	1	4	0
DLP	White Cedar Swamp	4	1	13
DLP	White Cedar Swamp	4	3	2
DLP	White Cedar Swamp	4	4	10
DLP	White Cedar Swamp	4	5	3
DLP	White Cedar Swamp	4	6	2
DLP	White Cedar Swamp	4	7	0
DLP	Boreal Hardwood/Conifer	7	1	52
DLP	Boreal Hardwood/Conifer	7	2	65
DLP	Boreal Hardwood/Conifer	7	3	219
DLP	Boreal Hardwood/Conifer	7	4	52
DLP	Boreal Hardwood/Conifer	7	5	65
DLP	Boreal Hardwood/Conifer	7	6	219
DLP	Boreal Hardwood/Conifer	7	7	77
DLP	Boreal Hardwood/Conifer	7	8	1
DLP	Mesic Northern Hardwoods	9	1	9
DLP	Mesic Northern Hardwoods	9	2	6
DLP	Mesic Northern Hardwoods	9	3	27
DLP	Mesic Northern Hardwoods	9	4	9
DLP	Mesic Northern Hardwoods	9	5	1
DLP	Mesic Northern Hardwoods	9	6	0
DLP	Mesic Northern Hardwoods	9	7	9
DLP	Mesic Northern Hardwoods	9	8	6
DLP	Mesic Northern Hardwoods	9	9	27
DLP	Mesic Northern Hardwoods	9	10	11
DLP	Mesic Northern Hardwoods	9	11	9
DLP	Dry Mesic Pine/Oak	11	1	70
DLP	Dry Mesic Pine/Oak	11	2	81
DLP	Dry Mesic Pine/Oak	11	3	247
DLP	Dry Mesic Pine/Oak	11	4	77
DLP	Dry Mesic Pine/Oak	11	5	2
DLP	Dry Mesic Pine/Oak	11	6	0
DLP	Dry Mesic Pine	12	1	33
DLP	Dry Mesic Pine	12	2	19
DLP	Dry Mesic Pine	12	3	106
DLP	Dry Mesic Pine	12	4	36
DLP	Dry Mesic Pine	12	5	0
DLP	Dry Pine	13	1	8
DLP	Dry Pine	13	2	13
DLP	Dry Pine	13	3	42

Table 2. Count of 2003 FIA plots by NPC and VGS for two ecological Sections.

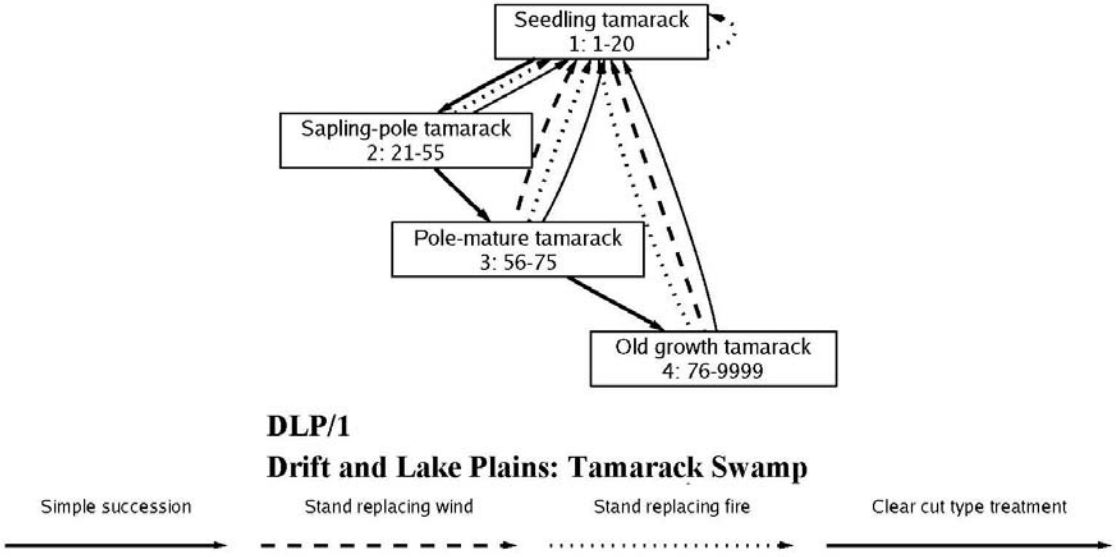
DLP	Dry Pine	13	4	8
DLP	Dry Pine	13	5	0
NSU	Mesic white pine-red pine	2	1	18
NSU	Mesic white pine-red pine	2	2	67
NSU	Mesic white pine-red pine	2	3	74
NSU	Mesic white pine-red pine	2	4	14
NSU	Mesic white pine-red pine	2	5	0
NSU	Mesic white pine-red pine	2	6	0
NSU	Mesic white pine-red pine	2	7	85
NSU	Mesic white pine-red pine	2	8	85
NSU	Mesic white pine-red pine	2	9	0
NSU	Mesic white pine-red pine	2	10	18
NSU	Mesic white pine-red pine	2	11	67
NSU	Dry mesic white pine-red pine	3	1	36
NSU	Dry mesic white pine-red pine	3	2	53
NSU	Dry mesic white pine-red pine	3	3	79
NSU	Dry mesic white pine-red pine	3	4	11
NSU	Dry mesic white pine-red pine	3	5	0
NSU	Dry mesic white pine-red pine	3	6	0
NSU	Dry mesic white pine-red pine	3	7	89
NSU	Dry mesic white pine-red pine	3	8	89
NSU	Dry mesic white pine-red pine	3	9	2
NSU	Dry mesic white pine-red pine	3	10	36
NSU	Dry mesic white pine-red pine	3	11	53
NSU	Lowland conifer	4	1	45
NSU	Lowland conifer	4	2	104
NSU	Lowland conifer	4	3	58
NSU	Lowland conifer	4	4	0
NSU	Rich swamp	5	1	2
NSU	Rich swamp	5	2	2
NSU	Rich swamp	5	3	12
NSU	Rich swamp	5	4	0
NSU	Mesic aspen-birch-spruce-fir	6	1	29
NSU	Mesic aspen-birch-spruce-fir	6	2	101
NSU	Mesic aspen-birch-spruce-fir	6	3	130
NSU	Mesic aspen-birch-spruce-fir	6	4	0
NSU	Mesic aspen-birch-spruce-fir	6	5	130
NSU	Mesic aspen-birch-spruce-fir	6	6	130
NSU	Mesic aspen-birch-spruce-fir	6	7	29
NSU	Mesic aspen-birch-spruce-fir	6	8	101
NSU	Dry mesic jack pine-black spruce	7	1	14
NSU	Dry mesic jack pine-black spruce	7	2	14
NSU	Dry mesic jack pine-black spruce	7	3	85
NSU	Dry mesic jack pine-black spruce	7	4	58
NSU	Dry mesic jack pine-black spruce	7	5	61
NSU	Dry mesic jack pine-black spruce	7	6	4

Table 2. Count of 2003 FIA plots by NPC and VGS for two ecological Sections.

NSU	Dry mesic jack pine-black spruce	7	7	0
NSU	Dry mesic jack pine-black spruce	7	8	49
NSU	Dry mesic jack pine-black spruce	7	9	64
NSU	Dry mesic jack pine-black spruce	7	10	94
NSU	Dry mesic jack pine-black spruce	7	11	14
NSU	Dry mesic jack pine-black spruce	7	12	99
NSU	Dry mesic jack pine-black spruce	7	13	123
NSU	Jack pine-aspen-oak	8	1	1
NSU	Jack pine-aspen-oak	8	4	12
NSU	Jack pine-aspen-oak	8	5	3
NSU	Jack pine-aspen-oak	8	7	1
NSU	Jack pine-aspen-oak	8	9	14
NSU	Northern Hardwood Conifer	12	1	37
NSU	Northern Hardwood Conifer	12	2	41
NSU	Northern Hardwood Conifer	12	3	3
NSU	Northern Hardwood Conifer	12	4	0
NSU	Northern Hardwood Conifer	12	5	0
NSU	Northern Hardwood Conifer	12	5	37
NSU	Northern Hardwood Conifer	12	6	41
NSU	Northern Hardwood Conifer	12	7	3

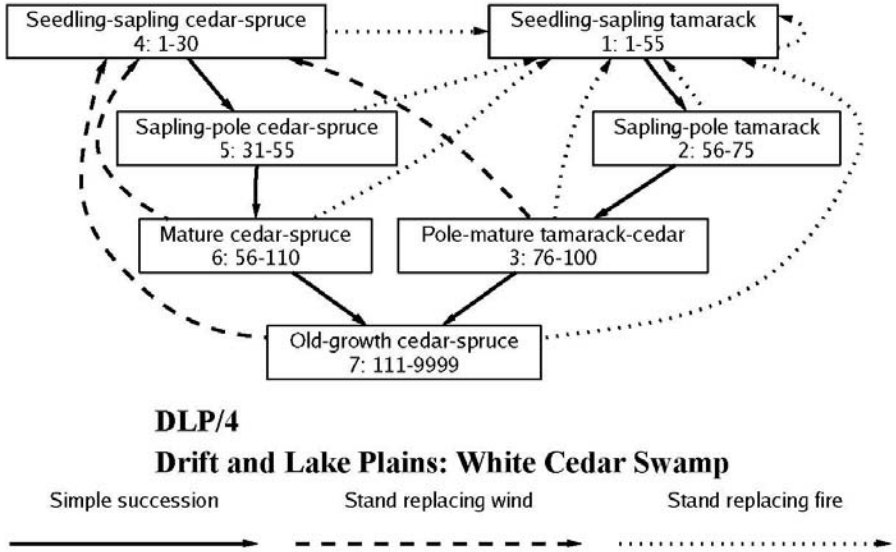

Comparison of age distribution, all types, NSU and DLP
Skally-White
FIA
Proportion of ecosystem
Decade
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
5
10
15
20
25

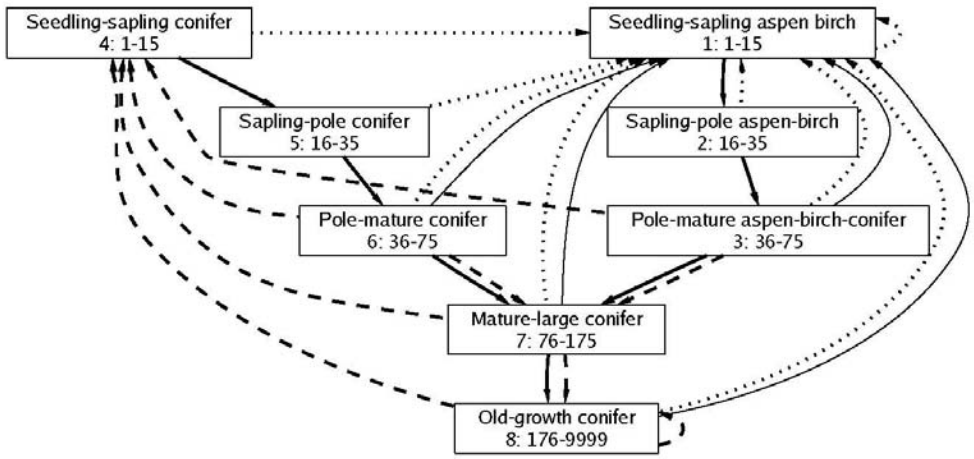
This appendix documents the successional pathways used in the RNV models; these are based on models presented in Brown and White 2001, 2002 and updated to include anthropogenic growth stages.



DLP/1

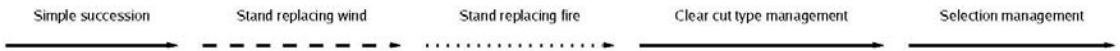
Drift and Lake Plains: Tamarack Swamp

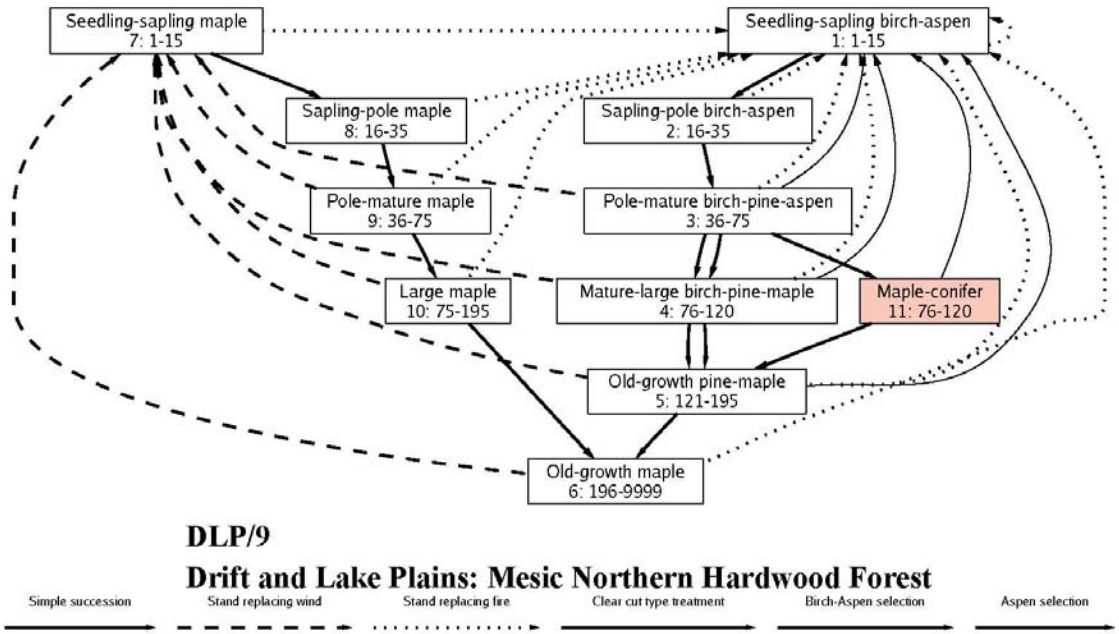

Seedling-sapling cedar-spruce
4: 1-30
Seedling-sapling tamarack
1: 1-55
Sapling-pole cedar-spruce
5: 31-55
Sapling-pole tamarack
2: 56-75
Mature cedar-spruce
6: 56-110
Pole-mature tamarack-cedar
3: 76-100
Old-growth cedar-spruce
7: 111-9999
DLP/4
Drift and Lake Plains: White Cedar Swamp
Simple succession
Stand replacing wind
Stand replacing fire

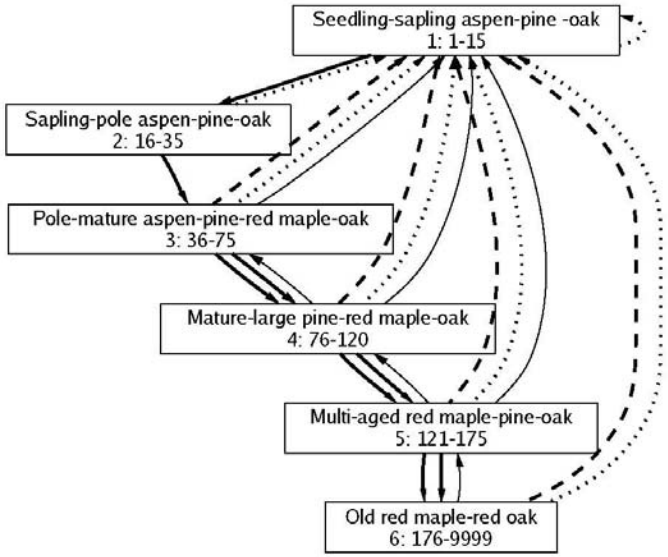


DLP/7

Drift and Lake Plains: Mesic Boreal Hardwood Forest

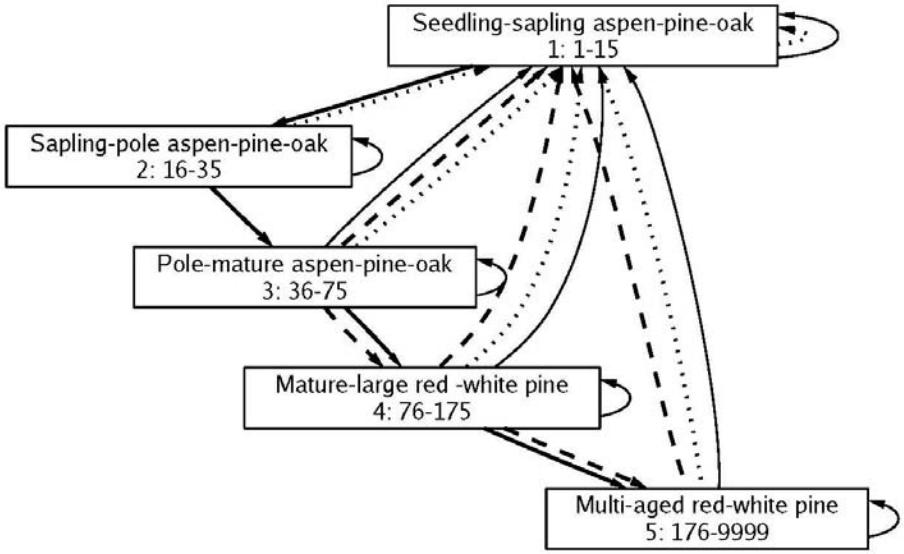



Seedling-sapling maple
7: 1-15
Seedling-sapling birch-aspen
1: 1-15
Sapling-pole maple
8: 16-35
Sapling-pole birch-aspen
2: 16-35
Pole-mature maple
9: 36-75
Pole-mature birch-pine-aspen
3: 36-75
Large maple
10: 75-195
Mature-large birch-pine-maple
4: 76-120
Maple-conifer
11: 76-120
Old-growth pine-maple
5: 121-195
Old-growth maple
6: 196-9999
DLP/9
Drift and Lake Plains: Mesic Northern Hardwood Forest
Simple succession
Stand replacing wind
Stand replacing fire
Clear cut type treatment
Birch-Aspen selection
Aspen selection



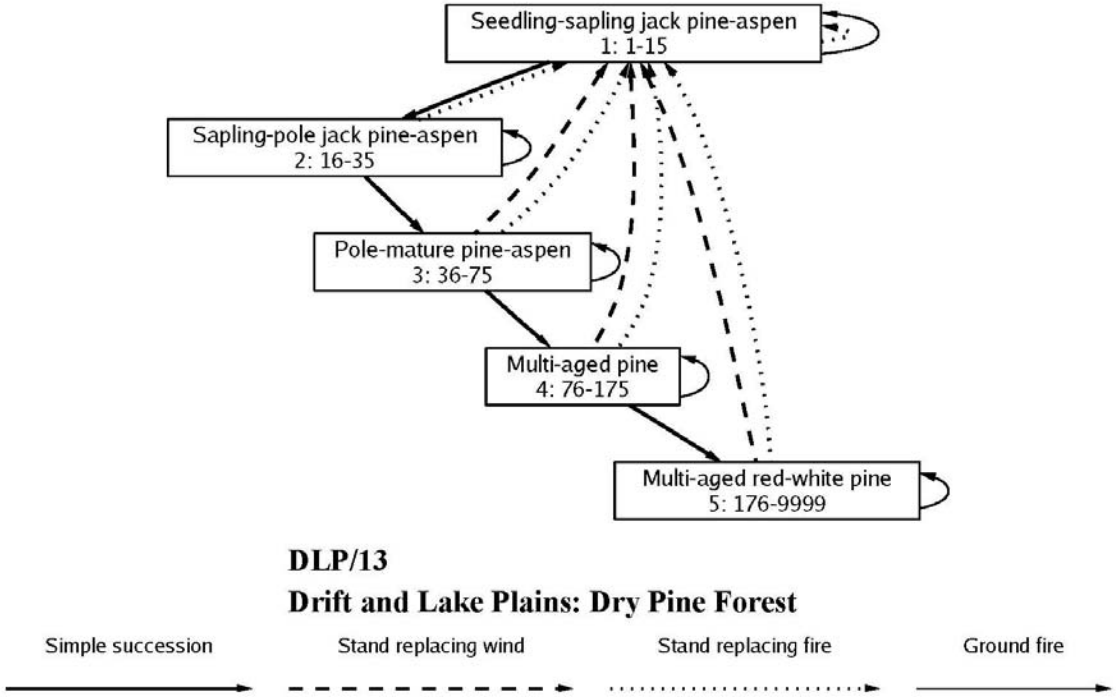
DLP/11

Drift and Lake Plains: Dry-Mesic Pine-Oak Forest



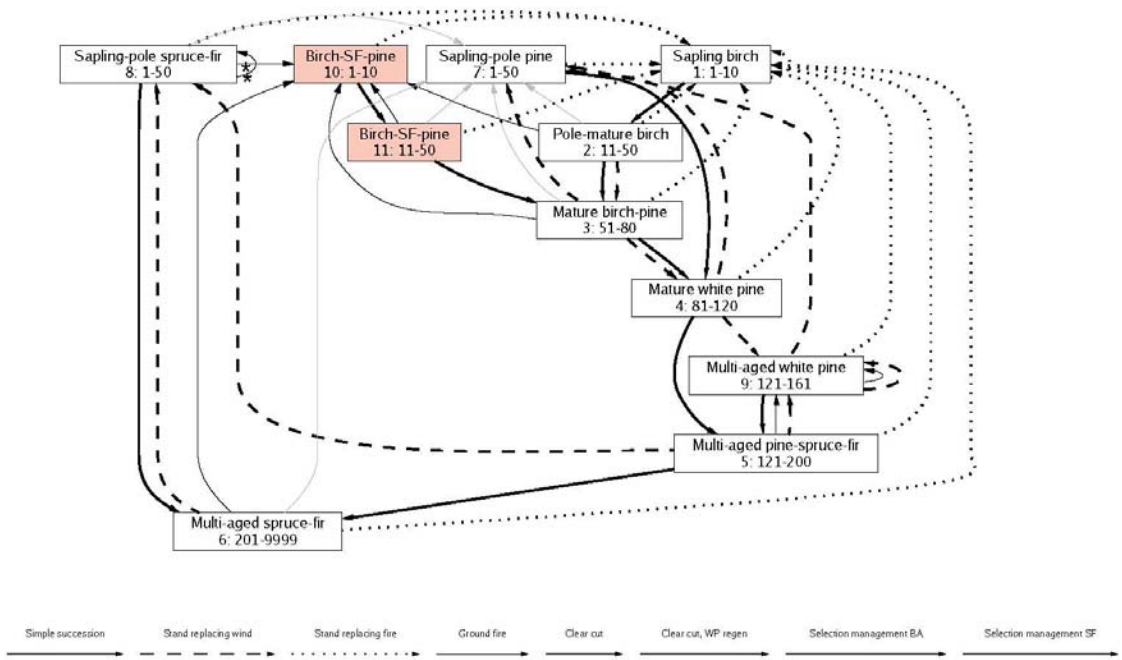
DLP/12

Drift and Lake Plains: Dry-Mesic Pine Forest



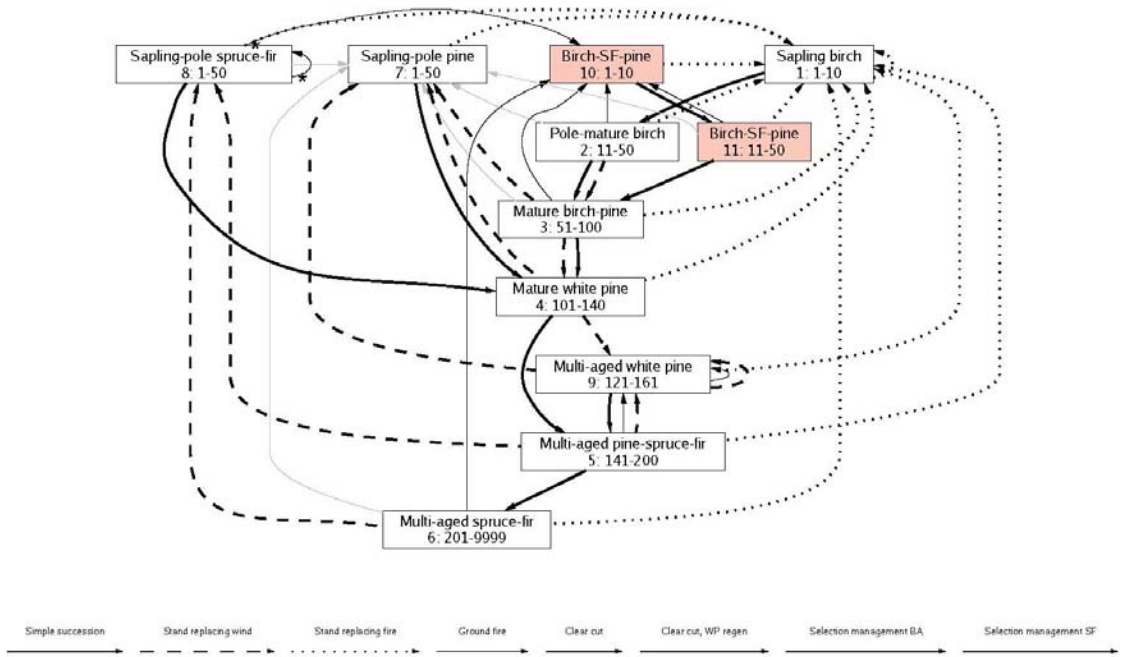
DLP/13

Drift and Lake Plains: Dry Pine Forest



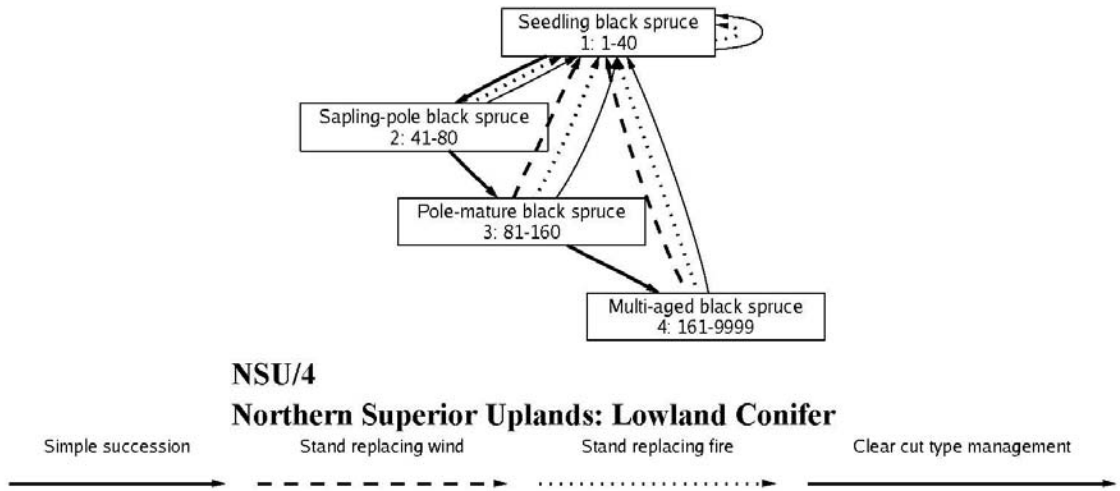
NSU/2

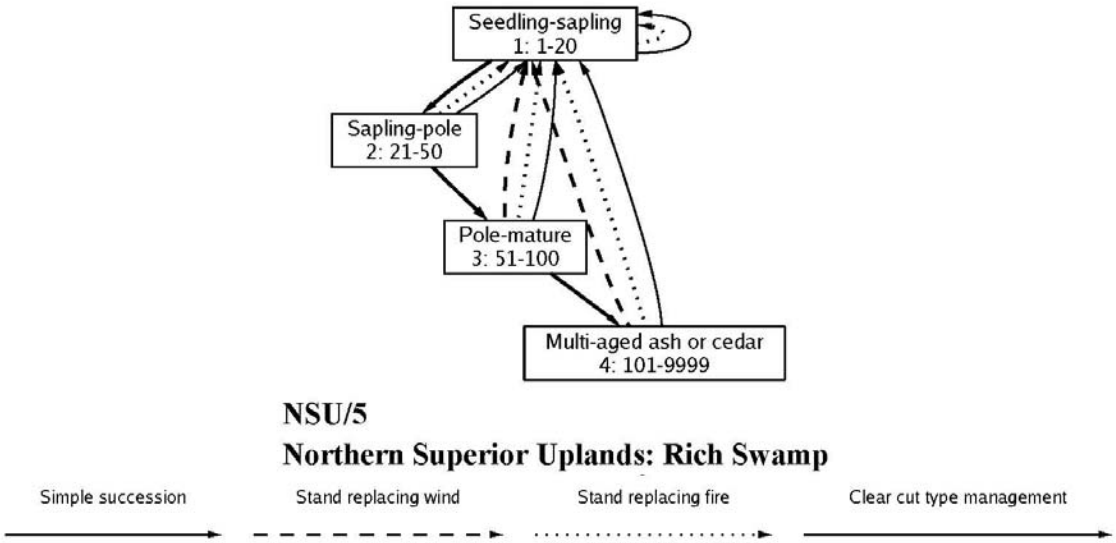
Northern Superior Uplands: Mesic White and Red Pine



NSU/3

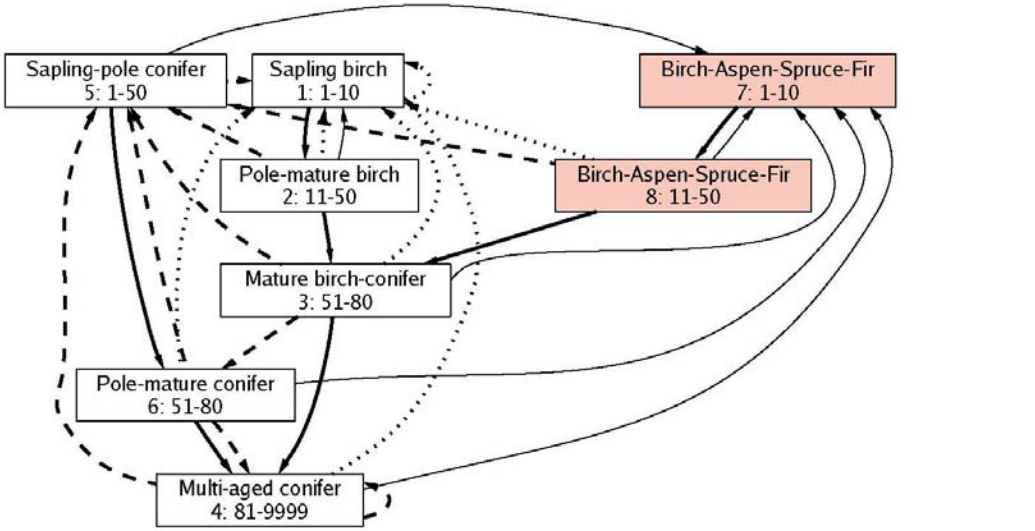
Northern Superior Uplands: Dry-Mesic White and Red Pine


Seedling black spruce
1: 1-40
Sapling-pole black spruce
2: 41-80
Pole-mature black spruce
3: 81-160
Multi-aged black spruce
4: 161-9999
NSU/4
Northern Superior Uplands: Lowland Conifer
Simple succession
Stand replacing wind
Stand replacing fire
Clear cut type management



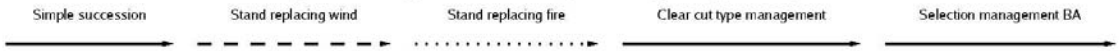
NSU/5

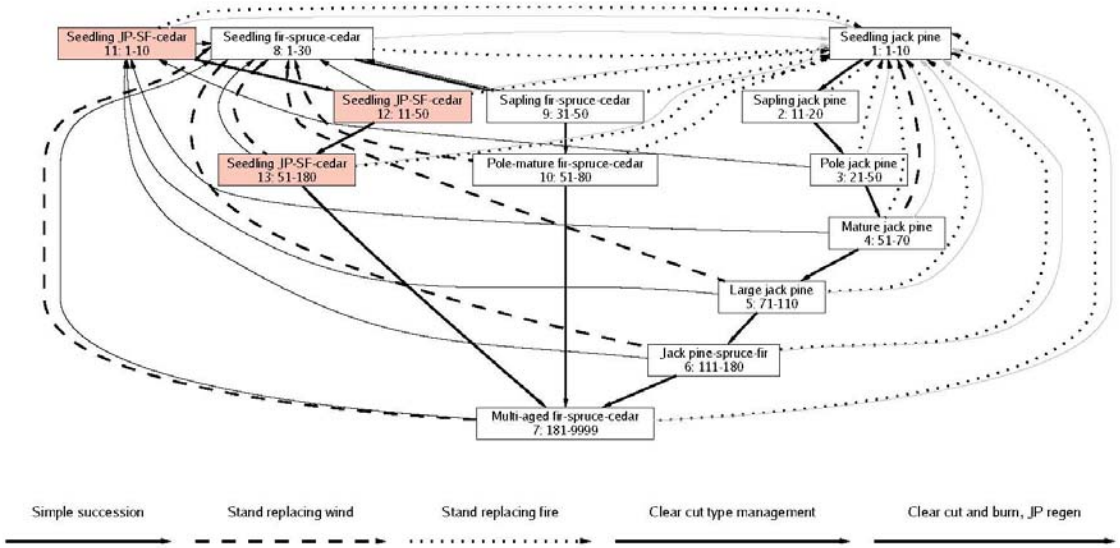
Northern Superior Uplands: Rich Swamp



NSU/6

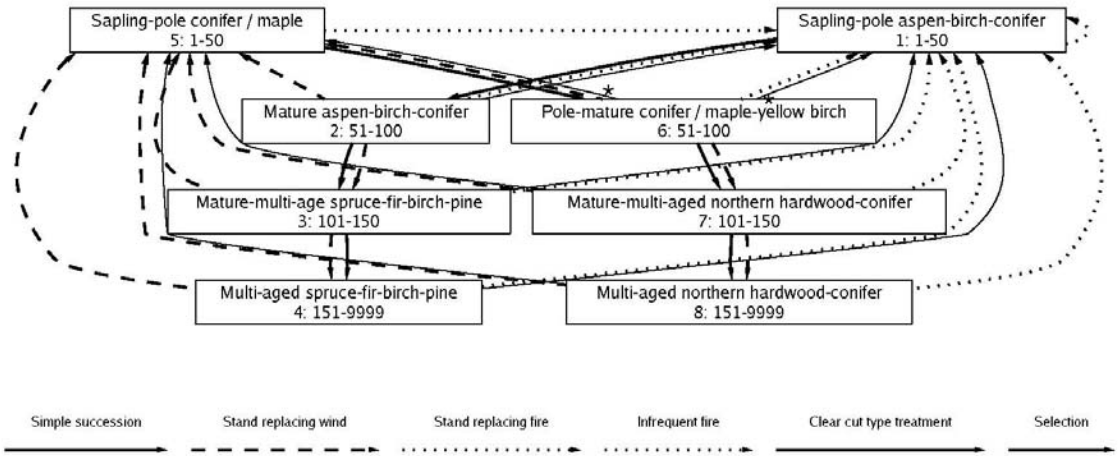
Northern Superior Uplands: Mesic Birch-Aspen-Spruce-Fir





NSU/7

Northern Superior Uplands: Jack Pine-Black Spruce



NSU/12

Northern Superior Uplands: Northern Hardwood Conifer

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Boreal Hardwood/Conifer	American basswood	4.41	7.69	5.50	4.41	7.69	5.50	6.06						
		American elm	1.00	0.46	1.33	1.00	0.46	1.33	2.04						
		American hornbeam,musclewood	4.30	0.64	0.20	4.30	0.64	0.20							
		American mountain-ash			1.71			1.71							
		balsam fir	2.78	3.22	4.61	2.78	3.22	4.61	3.59						
		balsam poplar	2.50	3.85	3.87	2.50	3.85	3.87	2.80						
		bigtooth aspen	3.82	4.58	4.36	3.82	4.58	4.36	2.71						
		black ash	2.34	1.83	5.49	2.34	1.83	5.49	8.86						
		black spruce	3.42	3.94	6.90	3.42	3.94	6.90	10.22	18.99					
		boxelder			2.04			2.04							
		bur oak	1.08	1.28	2.60	1.08	1.28	2.60	8.27						
		cherry and plum spp.			0.35			0.35							
		chokecherry		0.12	0.19		0.12	0.19							
		eastern hophornbeam	0.29	1.68	1.69	0.29	1.68	1.69	1.52						
		eastern white pine	4.84	2.91	3.33	4.84	2.91	3.33	2.72						
		green ash	1.23	0.36	2.15	1.23	0.36	2.15	1.71						
		jack pine	3.27	4.49	4.96	3.27	4.49	4.96	22.19						
		larch (introduced)							1.24						
		mountain maple		0.44	0.57		0.44	0.57	0.60						
		northern pin oak			1.95			1.95							
		northern red oak	1.14	3.23	4.30	1.14	3.23	4.30	7.34						
		northern white-cedar		16.57	6.77		16.57	6.77	10.24						
		other, unknown		0.20			0.20		0.54						
		paper birch	1.48	1.88	2.86	1.48	1.88	2.86	4.47						
		peachleaf willow		0.38	0.69		0.38	0.69							
		pin cherry		0.43			0.43								
		quaking aspen	6.27	10.87	9.39	6.27	10.87	9.39	5.25						
		red maple	1.91	2.14	3.69	1.91	2.14	3.69	2.06						
		red pine	3.00	12.69	11.53	3.00	12.69	11.53	8.77						
		rock elm			2.59			2.59							
		serviceberry			0.15			0.15							
		silver maple							2.15						
		slippery elm			0.41			0.41							
		sugar maple	1.31	2.32	3.28	1.31	2.32	3.28	7.03						
		tamarack (native)	4.64	2.09	2.89	4.64	2.09	2.89	4.29						
		white oak							2.91						
		white spruce	2.28	2.06	1.22	2.28	2.06	1.22	2.68						
		willow	1.17	0.80	0.95	1.17	0.80	0.95	0.31						
		yellow birch			1.54			1.54	2.24						

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Dry Mesic Pine	American basswood	4.51	4.10	4.38	4.06									
		American elm	0.72	2.88	1.63	1.40									
		American hornbeam,musclewood	0.98		0.61	0.25									
		balsam fir	1.63	1.57	3.72	3.87									
		balsam poplar	0.91	0.75	3.11	3.98									
		bigtooth aspen	3.91	6.24	8.12	0.53									
		black ash	3.53	1.28	2.24	6.96									
		black cherry	0.55	1.08	0.68										
		black oak			1.07										
		black spruce			2.24	0.31									
		boxelder		2.45	1.06	0.69									
		bur oak	2.29	2.53	3.54	6.75									
		cherry and plum spp.			0.66										
		chokecherry		0.23	0.15	0.17									
		eastern hophornbeam	1.29	2.44	1.69	1.10									
		eastern white pine	5.42	0.92	4.52	1.89									
		green ash	2.65	0.65	1.29	2.21									
		jack pine	3.17	0.32	3.67	18.98									
		northern pin oak			2.78	2.60									
		northern red oak	2.19	3.93	3.95	6.47									
		northern white-cedar				24.01									
		paper birch	2.01	1.41	3.37	2.91									
		peachleaf willow		0.26	0.42										
		pin cherry	0.19		0.49										
		quaking aspen	4.45	10.38	8.14	5.36									
		red maple	2.25	0.72	2.67	1.98									
		red pine	2.45	7.43	5.06	9.35									
		serviceberry			0.10	0.12									
		silver maple	2.46												
		sugar maple	3.53	2.69	3.24	7.06									
		tamarack (native)	1.78	2.69	7.27	18.57									
		white oak	2.30		3.40										
		white spruce	0.41	1.98	2.20	3.39									
		willow		0.24											
		yellow birch				1.55									

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Dry Mesic Pine/Oak	American basswood	3.79	1.76	4.38	4.89									
		American elm	1.24	0.72	1.38	1.52	0.27								
		American hornbeam,musclewood	1.11		2.82	2.71									
		balsam fir	2.50	4.04	3.64	5.61	7.71								
		balsam poplar	2.03	4.30	2.31	2.44									
		bigtooth aspen	1.57	3.54	8.13	6.26									
		black ash	2.46	2.16	3.52	6.73	4.50								
		black cherry	0.10	0.31	0.61	0.26									
		black spruce	0.86	2.96	4.99	5.05	0.59								
		boxelder	1.13	0.97	0.99	0.34									
		bur oak	2.39	1.25	2.51	3.99	2.04								
		butternut			1.85										
		cherry and plum spp.			0.47										
		chestnut oak	2.57												
		chokecherry	0.54	0.20	0.46	0.52									
		eastern hophornbeam		2.88	1.46	1.14	3.62								
		eastern white pine	4.77	2.16	3.83	5.36									
		green ash	1.34	1.93	2.20	2.13									
		jack pine	1.35	6.31	7.39	4.32									
		mountain maple		0.52	0.26	0.32									
		northern pin oak		2.21	2.54	2.90									
		northern red oak	2.48	1.36	4.86	8.29	0.40								
		northern white-cedar	1.72	5.82	8.45	15.98	40.74								
		other, unknown	0.89		1.37										
		paper birch	2.04	2.13	3.77	4.07	2.32								
		peachleaf willow			0.35										
		pin cherry			1.24										
		quaking aspen	6.19	11.52	7.21	6.06	2.58								
		red maple	1.61	1.48	2.09	2.27	1.10								
		red pine	3.61	11.36	7.15	9.97									
		serviceberry	0.12												
		silver maple		0.73	1.75	17.93									
		sugar maple	1.36	1.35	4.16	4.98									
		tamarack (native)	5.37	0.69	5.57	10.37									
		white oak			1.86	1.57									
		white spruce	0.68	2.11	1.90	2.33									
		willow		1.39	0.41										
		yellow birch	2.21	0.25	0.63	1.87									

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Dry Pine	American basswood			6.81	11.71									
		American elm	1.01	0.26	2.35	0.80									
		American hornbeam,musclewood	1.01		0.42	0.23									
		balsam fir			5.88	2.43									
		balsam poplar	0.56	1.12	1.34										
		bigtooth aspen	0.30	1.94	4.34	2.23									
		black ash		0.10	4.17										
		black cherry	0.17		0.23	0.23									
		black spruce		1.18	2.58	5.14									
		boxelder	0.27		1.15										
		bur oak	1.55	3.88	2.66	5.59									
		chokecherry		0.12	0.40										
		eastern hophornbeam	0.76		0.23	1.65									
		eastern white pine		1.97	5.25										
		green ash	0.50		0.77										
		jack pine		3.23	12.43	9.56									
		northern pin oak		4.45		1.06									
		northern red oak	0.38	2.08	3.06	0.28									
		other, unknown			1.90										
		paper birch	1.47	1.27	2.82	3.01									
		peachleaf willow	1.32		0.92										
		pin cherry		0.15											
		quaking aspen	8.99	8.10	7.15	4.57									
		red maple	1.42	2.00	3.81	0.97									
		red pine	7.37	12.88	6.39	8.98									
		rock elm	0.50												
		Siberian elm		0.62											
		sugar maple	0.35		1.06	4.01									
		tamarack (native)		0.66	3.56	8.99									
		white spruce	21.90	0.82	1.90	0.77									
		willow		0.26											

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Mesic Northern Hardwood	American basswood	2.61		7.61	17.94			2.61		7.61	15.35	17.94		
		American elm			1.20	2.48					1.20	2.48	2.48		
		American hornbeam,musclewood			2.12						2.12				
		balsam fir	1.40	3.60	3.15	2.47	0.25		1.40	3.60	3.15	2.16	2.47		
		balsam poplar		2.30	1.14	2.67				2.30	1.14	2.67	2.67		
		bigtooth aspen	0.60		4.05	4.46			0.60		4.05	4.46	4.46		
		black ash		0.17	3.03	4.33				0.17	3.03	4.33	4.33		
		black cherry			1.88						1.88				
		black spruce	0.93		2.66	2.71			0.93		2.66	2.71	2.71		
		boxelder			0.22						0.22				
		bur oak		0.12	2.88	2.47				0.12	2.88	1.53	2.47		
		chokecherry		0.25	0.45	1.97				0.25	0.45	1.97	1.97		
		eastern hophornbeam	0.41		0.77	0.17			0.41		0.77	0.17	0.17		
		eastern white pine			4.12	15.43					4.12	15.43	15.43		
		green ash	0.86	0.75	2.61				0.86	0.75	2.61				
		jack pine	9.66						9.66						
		mountain maple			0.28						0.28				
		northern red oak	1.68		7.17	6.47			1.68		7.17	4.96	6.47		
		northern white-cedar		1.29	8.08	8.65	45.45			1.29	8.08	17.85	8.65		
		paper birch	2.86	0.86	4.86	5.72			2.86	0.86	4.86	5.41	5.72		
		quaking aspen	5.95	12.01	7.13	2.42			5.95	12.01	7.13	5.88	2.42		
		red maple	2.96		2.96	1.40			2.96		2.96	1.87	1.40		
		red pine	5.31	25.84		15.40			5.31	25.84		15.40	15.40		
		sugar maple	1.06		5.92	12.67			1.06		5.92	10.33	12.67		
		tamarack (native)	0.76		3.07	3.14			0.76		3.07	3.14	3.14		
		white oak			4.48						4.48				
		white spruce		1.54	1.92	1.11				1.54	1.92	1.11	1.11		
		willow		0.89		1.57				0.89		1.57	1.57		
		yellow birch	1.46		2.56	0.52			1.46		2.56	0.52	0.52		

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Tamarack Swamp	American basswood			0.58										
		American elm	0.39	0.48	2.59										
		balsam fir	3.07	4.93	4.28										
		balsam poplar	2.94	9.21	6.16										
		bigtooth aspen		0.49											
		black ash	2.11	6.45	7.65										
		black cherry		0.22											
		black spruce	0.23	5.42	6.28										
		bur oak	1.24	0.69	5.56										
		chokecherry		0.29											
		eastern white pine		3.32											
		green ash	4.26		0.97										
		jack pine		5.00											
		larch (introduced)			0.26										
		northern red oak		0.73											
		northern white-cedar	2.24	4.16	5.04										
		paper birch	10.35	3.52	1.30										
		quaking aspen	6.52	8.89	2.54										
		red maple	2.98	3.54	4.86										
		red pine		3.15											
		Siberian elm	0.90												
		silver maple			36.96										
		tamarack (native)	1.18	4.38	8.48										
		white spruce	0.29	3.13											
		willow		0.15											
		yellow birch			3.20										
	White Cedar Swamp	American basswood			5.17			5.17							
		American elm	2.72		1.58		2.72	1.58							
		balsam fir	2.11		4.84	1.13	7.04	4.84							
		balsam poplar	4.90		6.03	1.45	25.54	6.03							
		black ash	0.62		2.21	0.39	0.96	2.21							
		black spruce	6.29		1.44	7.09	5.49	1.44							
		bur oak	0.20			0.20									
		green ash	1.18				1.18								
		northern white-cedar	3.78		27.27	3.78		27.27							
		other, unknown	0.10			0.10									
		paper birch	1.76		3.34	1.78	1.64	3.34							
		quaking aspen	7.49		24.33	8.44	5.28	24.33							
		red maple	0.38			0.51	0.10								
		tamarack (native)	5.24		0.32	4.63	5.85	0.32							

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Dry mesic jack pine-black	American basswood			0.17						0.17			0.17	
		American mountain-ash			0.23	0.23					0.23	0.23		0.23	0.23
		balsam fir	2.50	2.23	3.16	3.53	3.28	2.04		2.58	3.28	3.73	2.50	3.05	3.36
		balsam poplar	2.64	0.12	0.64	7.92	0.56			1.38	0.64	5.51	2.64	0.47	4.24
		bigtooth aspen		1.54	1.13	2.58	2.35			1.01	1.23	2.20		1.18	2.48
		black ash	1.66	0.93	1.25	2.03	7.67	2.51		1.29	1.25	5.90	1.66	1.14	5.46
		black cherry				0.15						0.15			0.15
		black spruce	1.34	2.52	4.74	4.98	4.69	0.47		2.89	4.86	4.41	1.34	4.50	4.75
		bur oak		0.30		0.41				0.30		0.41		0.30	0.41
		chokecherry			0.29		0.10			0.15	0.49	0.10		0.29	0.10
		eastern white pine	7.09	1.07	2.25	2.46	6.48	13.21		2.02	2.58	3.74	7.09	2.05	5.29
		green ash				3.66	0.34					2.00			2.00
		jack pine	2.72	6.99	5.14	4.73	6.29	13.07		5.71	4.60	4.92	2.72	5.32	5.63
		larch (introduced)			0.79						0.79			0.79	
		mountain maple	0.25		0.26	1.01	0.41			0.24	0.26	0.75	0.25	0.26	0.75
		northern red oak			2.14	1.79	1.45			0.15	2.80	1.01		2.14	1.52
		northern white-cedar		0.90	2.43	4.10	7.66			0.90	2.43	5.03		1.92	6.24
		other, unknown		0.81						0.81				0.81	
		paper birch	1.50	1.80	3.55	4.77	3.91	4.32		1.71	4.00	4.68	1.50	3.35	4.31
		peachleaf willow				0.92	0.79					0.92			0.86
		pin cherry			0.19	0.10				0.12	0.22	0.10		0.19	0.10
		quaking aspen	3.19	5.38	6.32	7.43	6.80	3.89		5.41	6.08	7.32	3.19	6.19	7.05
		red maple	4.77	3.82	3.84	1.83	2.72	0.79		3.11	4.38	2.36	4.77	3.84	2.29
		red pine	2.15	0.21	8.35	8.68	5.17	4.24		9.07	6.52	7.67	2.15	7.90	6.45
		silver maple				1.18						1.18			1.18
		sugar maple		1.02		0.67	2.64			1.02		0.63		1.02	1.33
		tamarack (native)	1.31	0.39	2.22	2.43	4.51			1.27	2.36	2.43	1.31	2.05	3.32
		white spruce	6.70	0.44	1.71	1.81	1.44	1.53		2.61	2.05	1.75	6.70	1.45	1.67
		yellow birch					5.20					5.20			5.20

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Dry mesic white pine-red p	American basswood		1.29					1.29	1.29			1.29		
		American elm		0.54	1.07				0.54	0.54			0.54		
		American mountain-ash		0.12					0.12	0.12			0.12		
		balsam fir	1.78	2.52	3.90	3.98			2.29	2.29	0.95	1.78	2.52		
		balsam poplar	1.09	2.03	4.65	2.46			1.63	1.63		1.09	2.03		
		bigtooth aspen	3.95	5.44	4.63	9.20			4.55	4.55		3.95	5.44		
		black ash	1.39	2.15	5.31	5.07			1.77	1.77	5.15	1.39	2.15		
		black spruce	1.57	2.60	3.37	9.32			2.09	2.09	30.80	1.57	2.60		
		black willow		0.23					0.23	0.23			0.23		
		bur oak	1.40						1.40	1.40		1.40			
		chokecherry		0.35	0.26				0.35	0.35			0.35		
		eastern white pine	3.48	2.47	4.32	3.51			2.80	2.80	0.50	3.48	2.47		
		green ash		0.73	8.32				0.73	0.73			0.73		
		jack pine	1.31	6.61	6.91	3.91			5.02	5.02		1.31	6.61		
		mountain maple	0.23	0.24	0.49	1.94			0.23	0.23		0.23	0.24		
		northern pin oak	0.12		0.18				0.12	0.12		0.12			
		northern red oak	1.56	0.33	1.46				1.25	1.25		1.56	0.33		
		northern white-cedar	8.32	3.60	4.90	18.43			5.49	5.49		8.32	3.60		
		other, unknown			0.33										
		paper birch	2.17	2.59	4.09	3.57			2.43	2.43	1.05	2.17	2.59		
		peachleaf willow	0.86	0.40					0.55	0.55		0.86	0.40		
		pin cherry		0.12	0.31				0.12	0.12			0.12		
		quaking aspen	3.94	9.23	9.45	4.02			7.17	7.17		3.94	9.23		
		red maple	3.61	2.78	3.89	3.11			3.07	3.07		3.61	2.78		
		red pine	1.26	10.04	7.38	4.78			7.53	7.53		1.26	10.04		
		serviceberry			0.12										
		silver maple		0.15					0.15	0.15			0.15		
		sugar maple	2.05		0.86				2.05	2.05		2.05			
		tamarack (native)	2.03	1.11	1.27	0.38			1.80	1.80	0.38	2.03	1.11		
		white spruce	1.05	1.67	1.50	1.84			1.56	1.56		1.05	1.67		
		willow			0.30										
		yellow birch		1.79		0.83			1.79	1.79			1.79		

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Jack pine-aspen-oak	American basswood					1.07								
		balsam fir	3.48			2.30	6.17		3.48		2.63				
		bigtooth aspen	5.34			11.67	4.66		5.34		9.34				
		black ash				3.03					3.03				
		black spruce	4.49			3.75			4.49		3.75				
		eastern white pine				3.85	3.58				4.36				
		jack pine				4.56					4.56				
		mountain maple					0.35								
		northern red oak	0.78			1.37	0.76		0.78		1.31				
		paper birch	2.85			2.12	2.05		2.85		2.20				
		quaking aspen	10.21			10.16	11.62		10.21		9.47				
		red maple				2.90	1.76				2.71				
		red pine				3.75	1.84				2.79				
		sugar maple				0.28					0.28				
		white spruce	0.22			1.30	3.02		0.22		1.30				
	Lowland conifer	American basswood		2.63											
		balsam fir	3.24	2.99	3.72										
		balsam poplar	2.38	2.42	5.63										
		black ash	1.27	8.14	8.01										
		black spruce	4.17	10.29	10.96										
		black willow	5.52												
		chokecherry			0.25										
		eastern redcedar		0.38											
		eastern white pine		2.02	2.68										
		green ash	0.20	0.18											
		jack pine	0.85	2.99	7.74										
		mountain maple	0.15	0.47	1.48										
		northern white-cedar	6.09	8.66	14.46										
		paper birch	1.99	3.73	2.82										
		peachleaf willow		0.50											
		pin cherry	0.17	0.15	0.24										
		quaking aspen	3.38	5.01	6.14										
		red maple	4.38	3.66	0.18										
		red pine	2.84	0.22	2.30										
		sugar maple	0.52	2.14	0.10										
		tamarack (native)	2.70	4.18	3.62										
		white spruce	1.21	2.26	4.19										
		willow		0.92											
		yellow birch		5.07	5.69										

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Mesic aspen-birch-spruce-	American basswood		2.42	1.84		2.42	1.84		2.42					
		American elm		0.41	0.97		0.41	0.97		0.41					
		American mountain-ash	0.30	1.37	0.97		1.22	0.97	0.30	1.37					
		balsam fir	1.98	4.20	4.11		3.84	4.11	1.98	4.20					
		balsam poplar	0.66	3.71	4.15		3.47	4.15	0.66	3.71					
		bigtooth aspen		3.45	3.04		3.45	3.04		3.45					
		black ash	1.93	2.69	4.41		2.49	4.41	1.93	2.69					
		black cherry		0.12			0.12			0.12					
		black spruce	1.47	2.99	3.63		2.71	3.63	1.47	2.99					
		black willow		2.61			2.61			2.61					
		boxelder		0.41			0.41			0.41					
		bur oak		0.15	0.21		0.15	0.21		0.15					
		chokecherry	2.07	0.55	0.20		0.80	0.20	2.07	0.55					
		eastern white pine	0.40	0.20	2.09		0.30	2.09	0.40	0.20					
		green ash		1.81	0.64		1.81	0.64		1.81					
		jack pine	0.31	7.54	3.52		6.81	3.52	0.31	7.54					
		mountain maple	0.65	0.50	1.31		0.51	1.31	0.65	0.50					
		northern red oak		0.23	0.76		0.23	0.76		0.23					
		northern white-cedar	3.95	4.85	7.29		4.63	7.29	3.95	4.85					
		paper birch	1.88	3.32	8.66		3.07	8.66	1.88	3.32					
		peachleaf willow	0.65	1.15	0.33		1.06	0.33	0.65	1.15					
		pin cherry		0.43	1.40		0.43	1.40		0.43					
		plains cottonwood			0.46			0.46							
		quaking aspen	5.25	8.23	11.64		7.59	11.64	5.25	8.23					
		red maple	2.62	2.85	3.30		2.82	3.30	2.62	2.85					
		red pine	3.71	12.58	5.96		10.61	5.96	3.71	12.58					
		serviceberry		1.10	0.17		1.10	0.17		1.10					
		sugar maple	3.41	4.31	8.29		4.15	8.29	3.41	4.31					
		tamarack (native)	0.73	1.59	2.86		1.42	2.86	0.73	1.59					
		white spruce	0.76	4.26	1.76		3.61	1.76	0.76	4.26					
		willow	3.69	0.97	0.23		1.65	0.23	3.69	0.97					
		yellow birch		2.38	3.08		2.38	3.08		2.38					

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Mesic white pine-red pine	American basswood	19.12	1.63	3.95				5.13	5.13		19.12	1.63		
		American elm		0.69	0.72				0.69	0.69			0.69		
		American mountain-ash	0.24		0.17				0.24	0.24		0.24			
		balsam fir	3.82	4.55	5.33	4.16			4.45	4.45		3.82	4.55		
		balsam poplar	1.01	2.75	2.46				2.31	2.31		1.01	2.75		
		bigtooth aspen	0.30	2.16	1.68				1.23	1.23		0.30	2.16		
		black ash	1.75	1.99	3.19	7.56			1.96	1.96		1.75	1.99		
		black spruce	1.62	4.41	3.73	1.73			4.04	4.04		1.62	4.41		
		bur oak			1.40										
		chokecherry		5.47					5.47	5.47			5.47		
		eastern cottonwood			1.85										
		eastern hophornbeam	3.29	0.26	0.12				1.77	1.77		3.29	0.26		
		eastern white pine		5.46	4.61	14.28			5.46	5.46			5.46		
		green ash	0.58	0.59	1.29				0.59	0.59		0.58	0.59		
		jack pine		3.37	4.81	4.45			3.37	3.37			3.37		
		mountain maple	0.12	0.55	1.07	0.29			0.51	0.51		0.12	0.55		
		northern red oak		4.48	3.30	0.96			4.48	4.48			4.48		
		northern white-cedar		2.25	9.57	26.47			2.25	2.25			2.25		
		paper birch	4.32	3.49	5.52	6.47			3.68	3.68		4.32	3.49		
		peachleaf willow	1.07	1.64					1.45	1.45		1.07	1.64		
		pin cherry		2.18		0.15			2.18	2.18			2.18		
		quaking aspen	3.54	7.97	7.61	3.02			7.21	7.21		3.54	7.97		
		red maple	2.18	3.84	2.77	2.37			3.39	3.39		2.18	3.84		
		red pine	5.52	9.98	10.27	8.83			9.43	9.43		5.52	9.98		
		rock elm		0.30					0.30	0.30			0.30		
		sugar maple	1.43	5.67	9.75	0.41			4.16	4.16		1.43	5.67		
		tamarack (native)	1.39	0.77	1.15				0.93	0.93		1.39	0.77		
		white spruce	1.73	3.37	3.14	0.80			3.29	3.29		1.73	3.37		
		yellow birch	1.92	0.67	3.70	0.50			1.09	1.09		1.92	0.67		

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Rich swamp	balsam fir	5.40	0.81	2.84										
		balsam poplar	1.75		2.25										
		black ash	8.01	3.94	5.46										
		black spruce		2.11	6.08										
		eastern white pine	6.97		2.44										
		mountain maple	0.12												
		northern white-cedar	6.28		14.20										
		paper birch	2.46	1.71	2.09										
		quaking aspen	8.75		4.08										
		red pine	13.30												
		tamarack (native)		1.02	3.11										
		white spruce	2.20		2.43										
		willow			0.33										

Mean Basal Area (when present) by NPC, VGS, and tree species.

Average of avgba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Sugar Maple	American basswood	1.99	4.86			1.99	4.86							
		American elm		0.53				0.53							
		American mountain-ash	0.45	0.66			0.45	0.66							
		balsam fir	4.09	3.70	3.28		4.09	3.70	3.28						
		balsam poplar	1.11	7.14			1.11	7.14							
		bigtooth aspen	2.77	2.66			2.77	2.66							
		black ash	2.39	1.96	13.16		2.39	1.96	13.16						
		black cherry		0.20				0.20							
		black spruce	0.55	2.72			0.55	2.72							
		eastern cottonwood	0.10				0.10								
		eastern hophornbeam	0.89	0.77			0.89	0.77							
		eastern white pine		3.79				3.79							
		green ash	0.40				0.40								
		jack pine	0.35				0.35								
		mountain maple	0.63	1.50			0.63	1.50							
		northern red oak		6.05				6.05							
		northern white-cedar	10.22	9.27	13.38		10.22	9.27	13.38						
		other, unknown			0.84				0.84						
		paper birch	4.66	7.16	18.81		4.66	7.16	18.81						
		peachleaf willow	0.89				0.89								
		pin cherry	0.75	1.24			0.75	1.24							
		quaking aspen	8.74	6.16			8.74	6.16							
		red maple	2.43	2.60	0.40		2.43	2.60	0.40						
		red pine	17.53				17.53								
		serviceberry	0.26	0.75			0.26	0.75							
		sugar maple	5.12	11.76	0.74		5.12	11.76	0.74						
		tamarack (native)			25.20				25.20						
		white spruce	3.07	2.16	6.41		3.07	2.16	6.41						
		willow	0.57				0.57								
		yellow birch	3.56	3.42			3.56	3.42							

Species frequency (proportional) by NPC, VGS, and tree species.

Sum of freq			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Boreal Hardwood/Conifer	American basswood	0.10	0.06	0.19	0.10	0.06	0.19	0.18						
		American elm	0.21	0.12	0.21	0.21	0.12	0.21	0.10						
		American hornbeam,musclewood	0.02	0.02	0.00	0.02	0.02	0.00							
		American mountain-ash			0.00			0.00							
		balsam fir	0.27	0.45	0.50	0.27	0.45	0.50	0.51						
		balsam poplar	0.29	0.32	0.21	0.29	0.32	0.21	0.19						
		bigtooth aspen	0.08	0.06	0.05	0.08	0.06	0.05	0.03						
		black ash	0.35	0.38	0.33	0.35	0.38	0.33	0.44						
		black spruce	0.10	0.17	0.32	0.10	0.17	0.32	0.35	1.00					
		boxelder			0.01			0.01							
		bur oak	0.17	0.17	0.13	0.17	0.17	0.13	0.09						
		cherry and plum spp.			0.00			0.00							
		chokecherry		0.02	0.03		0.02	0.03							
		eastern hophornbeam	0.02	0.08	0.05	0.02	0.08	0.05	0.09						
		eastern white pine	0.08	0.03	0.06	0.08	0.03	0.06	0.05						
		green ash	0.12	0.06	0.11	0.12	0.06	0.11	0.05						
		jack pine	0.02	0.06	0.03	0.02	0.06	0.03	0.01						
		larch (introduced)							0.01						
		mountain maple		0.03	0.05		0.03	0.05	0.03						
		northern pin oak			0.00			0.00							
		northern red oak	0.04	0.03	0.07	0.04	0.03	0.07	0.06						
		northern white-cedar		0.03	0.11		0.03	0.11	0.34						
		other, unknown		0.02			0.02		0.01						
		paper birch	0.46	0.48	0.58	0.46	0.48	0.58	0.47						
		peachleaf willow		0.05	0.02		0.05	0.02							
		pin cherry		0.03			0.03								
		quaking aspen	0.65	0.82	0.64	0.65	0.82	0.64	0.30						
		red maple	0.17	0.18	0.36	0.17	0.18	0.36	0.19						
		red pine	0.10	0.08	0.06	0.10	0.08	0.06	0.05						
		rock elm			0.00			0.00							
		serviceberry			0.00			0.00							
		silver maple							0.01						
		slippery elm			0.00			0.00							
		sugar maple	0.13	0.12	0.22	0.13	0.12	0.22	0.17						
		tamarack (native)	0.12	0.22	0.26	0.12	0.22	0.26	0.34						
		white oak							0.01						
		white spruce	0.08	0.11	0.08	0.08	0.11	0.08	0.06						
		willow	0.04	0.03	0.01	0.04	0.03	0.01	0.01						
		yellow birch			0.03			0.03	0.01						

Species frequency (proportional) by NPC, VGS, and tree species.

Sum of freq			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Dry Mesic Pine	American basswood	0.18	0.26	0.39	0.39									
		American elm	0.27	0.26	0.34	0.44									
		American hornbeam,musclewood	0.03		0.06	0.08									
		balsam fir	0.09	0.05	0.19	0.22									
		balsam poplar	0.21	0.21	0.16	0.11									
		bigtooth aspen	0.06	0.21	0.10	0.03									
		black ash	0.12	0.16	0.24	0.19									
		black cherry	0.06	0.05	0.11										
		black oak			0.01										
		black spruce			0.06	0.06									
		boxelder		0.05	0.05	0.06									
		bur oak	0.33	0.53	0.53	0.56									
		cherry and plum spp.			0.02										
		chokecherry		0.05	0.03	0.03									
		eastern hophornbeam	0.06	0.05	0.21	0.19									
		eastern white pine	0.03	0.05	0.11	0.03									
		green ash	0.21	0.37	0.20	0.25									
		jack pine	0.03	0.05	0.15	0.03									
		northern pin oak			0.01	0.03									
		northern red oak	0.24	0.26	0.37	0.39									
		northern white-cedar				0.11									
		paper birch	0.39	0.47	0.58	0.53									
		peachleaf willow		0.05	0.02										
		pin cherry	0.06		0.03										
		quaking aspen	0.82	0.89	0.78	0.56									
		red maple	0.15	0.42	0.33	0.33									
		red pine	0.09	0.26	0.10	0.06									
		serviceberry			0.01	0.03									
		silver maple	0.03												
		sugar maple	0.15	0.16	0.27	0.33									
		tamarack (native)	0.03	0.11	0.11	0.06									
		white oak	0.03		0.03										
		white spruce	0.12	0.11	0.17	0.08									
		willow		0.05											
		yellow birch				0.03									

Species frequency (proportional) by NPC, VGS, and tree species.

Sum of freq			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Dry Mesic Pine/Oak	American basswood	0.10	0.07	0.21	0.34									
		American elm	0.09	0.07	0.09	0.23	0.50								
		American hornbeam,musclewood	0.01		0.01	0.03									
		balsam fir	0.17	0.17	0.29	0.29	0.50								
		balsam poplar	0.13	0.14	0.07	0.09									
		bigtooth aspen	0.16	0.12	0.15	0.16									
		black ash	0.13	0.17	0.24	0.40	1.00								
		black cherry	0.01	0.04	0.02	0.03									
		black spruce	0.04	0.07	0.11	0.09	0.50								
		boxelder	0.01	0.01	0.02	0.01									
		bur oak	0.34	0.27	0.42	0.35	0.50								
		butternut			0.01										
		cherry and plum spp.			0.00										
		chestnut oak	0.01												
		chokecherry	0.01	0.04	0.01	0.04									
		eastern hophornbeam		0.04	0.11	0.14	0.50								
		eastern white pine	0.03	0.05	0.13	0.13									
		green ash	0.06	0.06	0.13	0.25									
		jack pine	0.21	0.33	0.28	0.08									
		mountain maple		0.04	0.02	0.01									
		northern pin oak		0.02	0.03	0.04									
		northern red oak	0.29	0.19	0.38	0.31	0.50								
		northern white-cedar	0.03	0.02	0.05	0.13	0.50								
		other, unknown	0.03		0.01										
		paper birch	0.36	0.43	0.62	0.53	0.50								
		peachleaf willow			0.00										
		pin cherry			0.01										
		quaking aspen	0.74	0.78	0.68	0.45	0.50								
		red maple	0.24	0.22	0.34	0.32	0.50								
		red pine	0.24	0.27	0.20	0.16									
		serviceberry	0.01												
		silver maple		0.01	0.02	0.04									
		sugar maple	0.14	0.07	0.22	0.26									
		tamarack (native)	0.06	0.10	0.14	0.18									
		white oak			0.02	0.05									
		white spruce	0.03	0.04	0.11	0.12									
		willow		0.02	0.00										
		yellow birch	0.03	0.01	0.02	0.05									

Species frequency (proportional) by NPC, VGS, and tree species.

Sum of freq			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Dry Pine	American basswood			0.07	0.13									
		American elm	0.25	0.08	0.14	0.13									
		American hornbeam,musclewood	0.13		0.02	0.13									
		balsam fir			0.19	0.25									
		balsam poplar	0.25	0.08	0.17										
		bigtooth aspen	0.13	0.08	0.19	0.25									
		black ash		0.08	0.19										
		black cherry	0.13		0.02	0.13									
		black spruce		0.08	0.10	0.25									
		boxelder	0.13		0.02										
		bur oak	0.63	0.31	0.45	0.75									
		chokecherry		0.08	0.05										
		eastern hophornbeam	0.13		0.05	0.13									
		eastern white pine		0.08	0.05										
		green ash	0.50		0.05										
		jack pine		0.54	0.40	0.50									
		northern pin oak		0.08		0.13									
		northern red oak	0.25	0.15	0.24	0.13									
		other, unknown			0.02										
		paper birch	0.38	0.23	0.50	0.50									
		peachleaf willow	0.13		0.02										
		pin cherry		0.08											
		quaking aspen	0.63	0.85	0.69	0.75									
		red maple	0.13	0.15	0.14	0.13									
		red pine	0.25	0.62	0.29	0.50									
		rock elm	0.13												
		Siberian elm		0.08											
		sugar maple	0.13		0.02	0.13									
		tamarack (native)		0.08	0.07	0.13									
		white spruce	0.13	0.23	0.02	0.13									
		willow		0.08											

Species frequency (proportional) by NPC, VGS, and tree species.

Sum of freq			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Mesic Northern Hardwood	American basswood	0.11		0.67	0.33			0.11		0.67	0.36	0.33		
		American elm			0.19	0.33					0.19	0.27	0.33		
		American hornbeam,musclewood			0.04						0.04				
		balsam fir	0.33	0.50	0.30	0.67	1.00		0.33	0.50	0.30	0.64	0.67		
		balsam poplar		0.50	0.11	0.22				0.50	0.11	0.18	0.22		
		bigtooth aspen	0.22		0.11	0.22			0.22		0.11	0.18	0.22		
		black ash		0.17	0.41	0.33				0.17	0.41	0.27	0.33		
		black cherry			0.04						0.04				
		black spruce	0.11		0.07	0.22			0.11		0.07	0.18	0.22		
		boxelder			0.04						0.04				
		bur oak		0.17	0.07	0.11				0.17	0.07	0.18	0.11		
		chokecherry		0.17	0.04	0.11				0.17	0.04	0.09	0.11		
		eastern hophornbeam	0.11		0.15	0.11			0.11		0.15	0.09	0.11		
		eastern white pine			0.04	0.22					0.04	0.18	0.22		
		green ash	0.11	0.33	0.22				0.11	0.33	0.22				
		jack pine	0.11						0.11						
		mountain maple			0.11						0.11				
		northern red oak	0.22		0.33	0.33			0.22		0.33	0.36	0.33		
		northern white-cedar		0.33	0.04	0.33	1.00			0.33	0.04	0.36	0.33		
		paper birch	0.67	0.50	0.81	0.67			0.67	0.50	0.81	0.64	0.67		
		quaking aspen	0.67	1.00	0.63	0.44			0.67	1.00	0.63	0.45	0.44		
		red maple	0.44		0.56	0.44			0.44		0.56	0.45	0.44		
		red pine	0.11	0.17		0.11			0.11	0.17		0.09	0.11		
		sugar maple	0.33		0.67	0.44			0.33		0.67	0.45	0.44		
		tamarack (native)	0.11		0.11	0.22			0.11		0.11	0.18	0.22		
		white oak			0.04						0.04				
		white spruce		0.33	0.07	0.11				0.33	0.07	0.09	0.11		
		willow		0.17		0.11				0.17		0.09	0.11		
		yellow birch	0.11		0.15	0.11			0.11		0.15	0.09	0.11		

Species frequency (proportional) by NPC, VGS, and tree species.

Sum of freq			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Tamarack Swamp	American basswood			0.09										
		American elm	0.23	0.06	0.06										
		balsam fir	0.31	0.21	0.21										
		balsam poplar	0.15	0.08	0.03										
		bigtooth aspen		0.02											
		black ash	0.46	0.09	0.21										
		black cherry		0.04											
		black spruce	0.08	0.53	0.73										
		bur oak	0.15	0.04	0.06										
		chokecherry		0.02											
		eastern white pine		0.02											
		green ash	0.08		0.09										
		jack pine		0.06											
		larch (introduced)			0.03										
		northern red oak		0.02											
		northern white-cedar	0.08	0.09	0.24										
		paper birch	0.08	0.15	0.15										
		quaking aspen	0.69	0.32	0.12										
		red maple	0.31	0.13	0.12										
		red pine		0.02											
		Siberian elm	0.08												
		silver maple			0.03										
		tamarack (native)	0.31	0.57	0.55										
		white spruce	0.08	0.09											
		willow		0.02											
		yellow birch			0.03										
	White Cedar Swamp	American basswood			0.50			0.50							
		American elm	0.08		0.50		0.33	0.50							
		balsam fir	0.46		0.50	0.50	0.33	0.50							
		balsam poplar	0.54		0.50	0.60	0.33	0.50							
		black ash	0.38		0.50	0.30	0.67	0.50							
		black spruce	0.15		0.50	0.10	0.33	0.50							
		bur oak	0.08			0.10									
		green ash	0.08				0.33								
		northern white-cedar	0.15		0.50	0.20		0.50							
		other, unknown	0.08			0.10									
		paper birch	0.46		0.50	0.50	0.33	0.50							
		quaking aspen	0.77		0.50	0.70	1.00	0.50							
		red maple	0.23			0.20	0.33								
		tamarack (native)	0.15		0.50	0.10	0.33	0.50							

Species frequency (proportional) by NPC, VGS, and tree species.

Sum of freq			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Dry mesic jack pine-black	American basswood			0.01						0.02			0.01	
		American mountain-ash			0.01	0.02					0.02	0.01		0.01	0.01
		balsam fir	0.36	0.57	0.67	0.74	0.74	0.75		0.55	0.67	0.74	0.36	0.66	0.74
		balsam poplar	0.07	0.07	0.02	0.03	0.03			0.04	0.03	0.03	0.07	0.03	0.03
		bigtooth aspen		0.07	0.08	0.10	0.08			0.04	0.09	0.10		0.08	0.09
		black ash	0.07	0.07	0.02	0.05	0.10	0.25		0.04	0.03	0.06	0.07	0.03	0.08
		black cherry				0.02						0.01			0.01
		black spruce	0.36	0.50	0.69	0.79	0.57	0.50		0.43	0.78	0.73	0.36	0.67	0.67
		bur oak		0.07		0.02				0.02		0.01		0.01	0.01
		chokecherry			0.06		0.03			0.06	0.03	0.01		0.05	0.02
		eastern white pine	0.07	0.21	0.18	0.22	0.18	0.75		0.18	0.16	0.18	0.07	0.18	0.22
		green ash				0.02	0.02					0.02			0.02
		jack pine	0.43	0.36	0.56	0.52	0.48	0.25		0.49	0.55	0.51	0.43	0.54	0.49
		larch (introduced)			0.01						0.02			0.01	
		mountain maple	0.07		0.09	0.14	0.10			0.06	0.09	0.15	0.07	0.08	0.11
		northern red oak			0.05	0.03	0.13			0.02	0.05	0.06		0.04	0.08
		northern white-cedar		0.07	0.02	0.03	0.05			0.02	0.03	0.04		0.03	0.04
		other, unknown		0.07						0.02				0.01	
		paper birch	0.64	0.64	0.81	0.81	0.90	1.00		0.65	0.86	0.84	0.64	0.79	0.86
		peachleaf willow				0.02	0.02					0.01			0.02
		pin cherry			0.04	0.02				0.02	0.03	0.01		0.03	0.01
		quaking aspen	0.86	0.79	0.76	0.79	0.74	0.50		0.82	0.75	0.80	0.86	0.77	0.76
		red maple	0.14	0.36	0.24	0.33	0.44	0.50		0.20	0.27	0.37	0.14	0.25	0.39
		red pine	0.07	0.07	0.20	0.12	0.11	0.75		0.16	0.17	0.09	0.07	0.18	0.14
		silver maple				0.02						0.01			0.01
		sugar maple		0.14		0.07	0.03			0.04		0.05		0.02	0.05
		tamarack (native)	0.21	0.07	0.12	0.07	0.05			0.12	0.13	0.04	0.21	0.11	0.06
		white spruce	0.21	0.21	0.14	0.31	0.16	0.50		0.18	0.14	0.26	0.21	0.15	0.24
		yellow birch					0.02					0.01			0.01

Species frequency (proportional) by NPC, VGS, and tree species.

Sum of freq			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Dry mesic white pine-red p	American basswood		0.02					0.01	0.01			0.02		
		American elm		0.02	0.04				0.01	0.01			0.02		
		American mountain-ash		0.02					0.01	0.01			0.02		
		balsam fir	0.47	0.68	0.87	0.73			0.60	0.60	0.50	0.47	0.68		
		balsam poplar	0.08	0.08	0.08	0.27			0.08	0.08		0.08	0.08		
		bigtooth aspen	0.08	0.04	0.19	0.09			0.06	0.06		0.08	0.04		
		black ash	0.17	0.11	0.16	0.55			0.13	0.13	0.50	0.17	0.11		
		black spruce	0.33	0.23	0.39	0.36			0.27	0.27	0.50	0.33	0.23		
		black willow		0.02					0.01	0.01			0.02		
		bur oak	0.03						0.01	0.01		0.03			
		chokecherry		0.02	0.01				0.01	0.01			0.02		
		eastern white pine	0.17	0.23	0.27	0.45			0.20	0.20	0.50	0.17	0.23		
		green ash		0.02	0.01				0.01	0.01			0.02		
		jack pine	0.17	0.26	0.22	0.18			0.22	0.22		0.17	0.26		
		mountain maple	0.03	0.08	0.19	0.27			0.06	0.06		0.03	0.08		
		northern pin oak	0.03		0.03				0.01	0.01		0.03			
		northern red oak	0.08	0.02	0.05				0.04	0.04		0.08	0.02		
		northern white-cedar	0.06	0.06	0.05	0.36			0.06	0.06		0.06	0.06		
		other, unknown			0.01										
		paper birch	0.53	0.62	0.86	0.64			0.58	0.58	0.50	0.53	0.62		
		peachleaf willow	0.03	0.04					0.03	0.03		0.03	0.04		
		pin cherry		0.02	0.01				0.01	0.01			0.02		
		quaking aspen	0.78	0.83	0.87	0.55			0.81	0.81		0.78	0.83		
		red maple	0.39	0.51	0.58	0.27			0.46	0.46		0.39	0.51		
		red pine	0.11	0.19	0.22	0.27			0.16	0.16		0.11	0.19		
		serviceberry			0.01										
		silver maple		0.02					0.01	0.01			0.02		
		sugar maple	0.06		0.09				0.02	0.02		0.06			
		tamarack (native)	0.08	0.02	0.03	0.09			0.04	0.04	0.50	0.08	0.02		
		white spruce	0.11	0.34	0.33	0.36			0.25	0.25		0.11	0.34		
		willow			0.01										
		yellow birch		0.02		0.09			0.01	0.01			0.02		

Species frequency (proportional) by NPC, VGS, and tree species.

Sum of freq			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Jack pine-aspen-oak	American basswood					0.33								
		balsam fir	1.00			0.92	0.67		1.00		0.86				
		bigtooth aspen	1.00			0.17	0.33		1.00		0.21				
		black ash				0.08					0.07				
		black spruce	1.00			0.67			1.00		0.57				
		eastern white pine				0.33	0.67				0.36				
		jack pine				0.50					0.43				
		mountain maple					0.33								
		northern red oak	1.00			0.25	0.67		1.00		0.29				
		paper birch	1.00			0.92	1.00		1.00		0.93				
		quaking aspen	1.00			1.00	1.00		1.00		1.00				
		red maple				0.83	0.67				0.86				
		red pine				0.08	0.33				0.14				
		sugar maple				0.17					0.14				
		white spruce	1.00			0.33	0.33		1.00		0.29				
	Lowland conifer	American basswood		0.01											
		balsam fir	0.67	0.59	0.48										
		balsam poplar	0.02	0.08	0.05										
		black ash	0.11	0.18	0.19										
		black spruce	0.67	0.77	0.76										
		black willow	0.02												
		chokecherry			0.02										
		eastern redcedar		0.01											
		eastern white pine		0.04	0.05										
		green ash	0.02	0.02											
		jack pine	0.20	0.14	0.07										
		mountain maple	0.02	0.04	0.10										
		northern white-cedar	0.13	0.22	0.26										
		paper birch	0.47	0.44	0.36										
		peachleaf willow		0.09											
		pin cherry	0.02	0.01	0.02										
		quaking aspen	0.47	0.37	0.16										
		red maple	0.09	0.09	0.05										
		red pine	0.07	0.01	0.02										
		sugar maple	0.04	0.06	0.02										
		tamarack (native)	0.38	0.43	0.28										
		white spruce	0.09	0.12	0.09										
		willow		0.01											
		yellow birch		0.01	0.02										

Species frequency (proportional) by NPC, VGS, and tree species.

Sum of freq			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Mesic aspen-birch-spruce	American basswood		0.03	0.02		0.02	0.02		0.03					
		American elm		0.02	0.02		0.02	0.02		0.02					
		American mountain-ash	0.03	0.06	0.02		0.05	0.02	0.03	0.06					
		balsam fir	0.45	0.66	0.79		0.62	0.79	0.45	0.66					
		balsam poplar	0.07	0.24	0.14		0.20	0.14	0.07	0.24					
		bigtooth aspen		0.01	0.04		0.01	0.04		0.01					
		black ash	0.21	0.17	0.25		0.18	0.25	0.21	0.17					
		black cherry		0.01			0.01			0.01					
		black spruce	0.21	0.26	0.28		0.25	0.28	0.21	0.26					
		black willow		0.02			0.02			0.02					
		boxelder		0.02			0.02			0.02					
		bur oak		0.01	0.01		0.01	0.01		0.01					
		chokecherry	0.03	0.05	0.01		0.05	0.01	0.03	0.05					
		eastern white pine	0.03	0.01	0.07		0.02	0.07	0.03	0.01					
		green ash		0.01	0.01		0.01	0.01		0.01					
		jack pine	0.03	0.09	0.08		0.08	0.08	0.03	0.09					
		mountain maple	0.03	0.19	0.33		0.15	0.33	0.03	0.19					
		northern red oak		0.01	0.01		0.01	0.01		0.01					
		northern white-cedar	0.14	0.12	0.20		0.12	0.20	0.14	0.12					
		paper birch	0.52	0.71	0.76		0.67	0.76	0.52	0.71					
		peachleaf willow	0.07	0.09	0.01		0.08	0.01	0.07	0.09					
		pin cherry		0.05	0.05		0.04	0.05		0.05					
		plains cottonwood			0.01			0.01							
		quaking aspen	0.69	0.72	0.71		0.72	0.71	0.69	0.72					
		red maple	0.10	0.19	0.26		0.17	0.26	0.10	0.19					
		red pine	0.07	0.07	0.02		0.07	0.02	0.07	0.07					
		serviceberry		0.01	0.01		0.01	0.01		0.01					
		sugar maple	0.07	0.09	0.17		0.08	0.17	0.07	0.09					
		tamarack (native)	0.07	0.08	0.05		0.08	0.05	0.07	0.08					
		white spruce	0.28	0.35	0.39		0.33	0.39	0.28	0.35					
		willow	0.03	0.03	0.01		0.03	0.01	0.03	0.03					
		yellow birch		0.03	0.15		0.02	0.15		0.03					

Species frequency (proportional) by NPC, VGS, and tree species.

Sum of freq			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Mesic white pine-red pine	American basswood	0.06	0.06	0.08				0.06	0.06		0.06	0.06		
		American elm		0.03	0.03				0.02	0.02			0.03		
		American mountain-ash	0.06		0.03				0.01	0.01		0.06			
		balsam fir	0.39	0.69	0.82	0.79			0.62	0.62		0.39	0.69		
		balsam poplar	0.22	0.18	0.16				0.19	0.19		0.22	0.18		
		bigtooth aspen	0.11	0.03	0.04				0.05	0.05		0.11	0.03		
		black ash	0.06	0.12	0.31	0.21			0.11	0.11		0.06	0.12		
		black spruce	0.11	0.19	0.24	0.29			0.18	0.18		0.11	0.19		
		bur oak			0.04										
		chokecherry		0.01					0.01	0.01			0.01		
		eastern cottonwood			0.01										
		eastern hophornbeam	0.06	0.01	0.01				0.02	0.02		0.06	0.01		
		eastern white pine		0.07	0.09	0.50			0.06	0.06			0.07		
		green ash	0.06	0.06	0.05				0.06	0.06		0.06	0.06		
		jack pine		0.12	0.08	0.21			0.09	0.09			0.12		
		mountain maple	0.06	0.15	0.26	0.14			0.13	0.13		0.06	0.15		
		northern red oak		0.01	0.03	0.07			0.01	0.01			0.01		
		northern white-cedar		0.10	0.15	0.36			0.08	0.08			0.10		
		paper birch	0.72	0.66	0.77	0.86			0.67	0.67		0.72	0.66		
		peachleaf willow	0.06	0.03					0.04	0.04		0.06	0.03		
		pin cherry		0.01		0.07			0.01	0.01			0.01		
		quaking aspen	0.67	0.87	0.76	0.43			0.82	0.82		0.67	0.87		
		red maple	0.33	0.24	0.45	0.29			0.26	0.26		0.33	0.24		
		red pine	0.06	0.10	0.07	0.21			0.09	0.09		0.06	0.10		
		rock elm		0.01					0.01	0.01			0.01		
		sugar maple	0.28	0.13	0.26	0.14			0.16	0.16		0.28	0.13		
		tamarack (native)	0.06	0.04	0.05				0.05	0.05		0.06	0.04		
		white spruce	0.06	0.27	0.36	0.29			0.22	0.22		0.06	0.27		
		yellow birch	0.06	0.03	0.11	0.07			0.04	0.04		0.06	0.03		

Species frequency (proportional) by NPC, VGS, and tree species.

Sum of freq			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Rich swamp	balsam fir	1.00	0.50	0.92										
		balsam poplar	0.50		0.25										
		black ash	0.50	0.50	0.42										
		black spruce		1.00	0.67										
		eastern white pine	0.50		0.08										
		mountain maple	0.50												
		northern white-cedar	0.50		0.33										
		paper birch	1.00	0.50	0.58										
		quaking aspen	0.50		0.42										
		red pine	0.50												
		tamarack (native)		0.50	0.25										
		white spruce	1.00		0.17										
		willow			0.08										
	Sugar Maple	American basswood	0.08	0.17			0.08	0.17							
		American elm		0.02				0.02							
		American mountain-ash	0.03	0.05			0.03	0.05							
		balsam fir	0.54	0.66	0.33		0.54	0.66	0.33						
		balsam poplar	0.19	0.12			0.19	0.12							
		bigtooth aspen	0.03	0.02			0.03	0.02							
		black ash	0.27	0.22	0.67		0.27	0.22	0.67						
		black cherry		0.02				0.02							
		black spruce	0.11	0.12			0.11	0.12							
		eastern cottonwood	0.03				0.03								
		eastern hophornbeam	0.05	0.07			0.05	0.07							
		eastern white pine		0.02				0.02							
		green ash	0.08				0.08								
		jack pine	0.03				0.03								
		mountain maple	0.38	0.29			0.38	0.29							
		northern red oak		0.12				0.12							
		northern white-cedar	0.16	0.29	0.67		0.16	0.29	0.67						
		other, unknown			0.33				0.33						
		paper birch	0.78	0.78	0.33		0.78	0.78	0.33						
		peachleaf willow	0.05				0.05								
		pin cherry	0.11	0.07			0.11	0.07							
		quaking aspen	0.78	0.41			0.78	0.41							
		red maple	0.41	0.39	0.33		0.41	0.39	0.33						
		red pine	0.05				0.05								
		serviceberry	0.03	0.02			0.03	0.02							
		sugar maple	0.38	0.76	0.33		0.38	0.76	0.33						
		tamarack (native)			0.33				0.33						
		white spruce	0.19	0.37	0.33		0.19	0.37	0.33						
		willow	0.03				0.03								
		yellow birch	0.16	0.27			0.16	0.27							

Species importance value by NPC and VGS

Average of iv_totba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Boreal Hardwood/Conifer	American basswood	0.42	0.47	1.05	0.42	0.47	1.05	1.10						
		American elm	0.21	0.06	0.28	0.21	0.06	0.28	0.21						
		American hornbeam,musclewood	0.08	0.01	0.00	0.08	0.01	0.00							
		American mountain-ash			0.01			0.01							
		balsam fir	0.75	1.44	2.31	0.75	1.44	2.31	1.82						
		balsam poplar	0.72	1.24	0.81	0.72	1.24	0.81	0.55						
		bigtooth aspen	0.29	0.28	0.24	0.29	0.28	0.24	0.07						
		black ash	0.81	0.71	1.81	0.81	0.71	1.81	3.91						
		black spruce	0.33	0.67	2.17	0.33	0.67	2.17	3.58	18.99					
		boxelder			0.03			0.03							
		bur oak	0.19	0.22	0.34	0.19	0.22	0.34	0.75						
		cherry and plum spp.			0.00			0.00							
		chokecherry		0.00	0.01		0.00	0.01							
		eastern hophornbeam	0.01	0.13	0.09	0.01	0.13	0.09	0.14						
		eastern white pine	0.37	0.09	0.21	0.37	0.09	0.21	0.14						
		green ash	0.14	0.02	0.24	0.14	0.02	0.24	0.09						
		jack pine	0.06	0.28	0.14	0.06	0.28	0.14	0.29						
		larch (introduced)							0.02						
		mountain maple		0.01	0.03		0.01	0.03	0.02						
		northern pin oak			0.01			0.01							
		northern red oak	0.04	0.10	0.29	0.04	0.10	0.29	0.48						
		northern white-cedar		0.51	0.74		0.51	0.74	3.46						
		other, unknown		0.00			0.00		0.01						
		paper birch	0.68	0.89	1.64	0.68	0.89	1.64	2.09						
		peachleaf willow		0.02	0.01		0.02	0.01							
		pin cherry		0.01			0.01								
		quaking aspen	4.10	8.86	6.00	4.10	8.86	6.00	1.57						
		red maple	0.33	0.40	1.33	0.33	0.40	1.33	0.40						
		red pine	0.29	0.98	0.68	0.29	0.98	0.68	0.46						
		rock elm			0.01			0.01							
		serviceberry			0.00			0.00							
		silver maple							0.03						
		slippery elm			0.00			0.00							
		sugar maple	0.18	0.29	0.72	0.18	0.29	0.72	1.19						
		tamarack (native)	0.54	0.45	0.74	0.54	0.45	0.74	1.45						
		white oak							0.04						
		white spruce	0.18	0.22	0.09	0.18	0.22	0.09	0.17						
		willow	0.05	0.02	0.01	0.05	0.02	0.01	0.00						
		yellow birch			0.05			0.05	0.03						

Species importance value by NPC and VGS

Average of iv_totba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Dry Mesic Pine	American basswood	0.82	1.08	1.69	1.58									
		American elm	0.20	0.76	0.55	0.62									
		American hornbeam,musclewood	0.03		0.03	0.02									
		balsam fir	0.15	0.08	0.70	0.86									
		balsam poplar	0.19	0.16	0.50	0.44									
		bigtooth aspen	0.24	1.31	0.84	0.01									
		black ash	0.43	0.20	0.53	1.35									
		black cherry	0.03	0.06	0.08										
		black oak			0.01										
		black spruce			0.13	0.02									
		boxelder		0.13	0.05	0.04									
		bur oak	0.76	1.33	1.87	3.75									
		cherry and plum spp.			0.01										
		chokecherry		0.01	0.00	0.00									
		eastern hophornbeam	0.08	0.13	0.35	0.21									
		eastern white pine	0.16	0.05	0.51	0.05									
		green ash	0.56	0.24	0.26	0.55									
		jack pine	0.10	0.02	0.55	0.53									
		northern pin oak			0.03	0.07									
		northern red oak	0.53	1.03	1.45	2.52									
		northern white-cedar				2.67									
		paper birch	0.79	0.67	1.97	1.54									
		peachleaf willow		0.01	0.01										
		pin cherry	0.01		0.01										
		quaking aspen	3.64	9.29	6.38	2.98									
		red maple	0.34	0.31	0.88	0.66									
		red pine	0.22	1.95	0.53	0.52									
		serviceberry			0.00	0.00									
		silver maple	0.07												
		sugar maple	0.54	0.42	0.89	2.35									
		tamarack (native)	0.05	0.28	0.82	1.03									
		white oak	0.07		0.10										
		white spruce	0.05	0.21	0.37	0.28									
		willow		0.01											
		yellow birch				0.04									

Species importance value by NPC and VGS

Average of iv_totba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Dry Mesic Pine/Oak	American basswood	0.38	0.13	0.94	1.65									
		American elm	0.11	0.05	0.12	0.36	0.13								
		American hornbeam,musclewood	0.02		0.03	0.07									
		balsam fir	0.43	0.70	1.05	1.60	3.86								
		balsam poplar	0.26	0.58	0.17	0.22									
		bigtooth aspen	0.25	0.44	1.22	0.98									
		black ash	0.32	0.37	0.85	2.71	4.50								
		black cherry	0.00	0.01	0.01	0.01									
		black spruce	0.04	0.22	0.57	0.46	0.30								
		boxelder	0.02	0.01	0.02	0.00									
		bur oak	0.82	0.34	1.06	1.40	1.02								
		butternut			0.01										
		cherry and plum spp.			0.00										
		chestnut oak	0.04												
		chokecherry	0.01	0.01	0.01	0.02									
		eastern hophornbeam		0.11	0.17	0.16	1.81								
		eastern white pine	0.14	0.11	0.48	0.70									
		green ash	0.08	0.12	0.29	0.53									
		jack pine	0.29	2.10	2.06	0.34									
		mountain maple		0.02	0.00	0.00									
		northern pin oak		0.05	0.08	0.11									
		northern red oak	0.71	0.25	1.83	2.58	0.20								
		northern white-cedar	0.05	0.14	0.41	2.08	20.37								
		other, unknown	0.03		0.01										
		paper birch	0.73	0.92	2.35	2.17	1.16								
		peachleaf willow			0.00										
		pin cherry			0.02										
		quaking aspen	4.60	8.96	4.87	2.75	1.29								
		red maple	0.39	0.33	0.72	0.74	0.55								
		red pine	0.88	3.08	1.45	1.55									
		serviceberry	0.00												
		silver maple		0.01	0.03	0.70									
		sugar maple	0.19	0.10	0.91	1.29									
		tamarack (native)	0.31	0.07	0.77	1.88									
		white oak			0.05	0.08									
		white spruce	0.02	0.08	0.21	0.27									
		willow		0.03	0.00										
		yellow birch	0.06	0.00	0.01	0.10									

Species importance value by NPC and VGS

Average of iv_totba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Dry Pine	American basswood			0.49	1.46									
		American elm	0.25	0.02	0.34	0.10									
		American hornbeam,musclewood	0.13		0.01	0.03									
		balsam fir			1.12	0.61									
		balsam poplar	0.14	0.09	0.22										
		bigtooth aspen	0.04	0.15	0.83	0.56									
		black ash		0.01	0.79										
		black cherry	0.02		0.01	0.03									
		black spruce		0.09	0.25	1.29									
		boxelder	0.03		0.03										
		bur oak	0.97	1.19	1.20	4.19									
		chokecherry		0.01	0.02										
		eastern hophornbeam	0.10		0.01	0.21									
		eastern white pine		0.15	0.25										
		green ash	0.25		0.04										
		jack pine		1.74	5.03	4.78									
		northern pin oak		0.34		0.13									
		northern red oak	0.10	0.32	0.73	0.03									
		other, unknown			0.05										
		paper birch	0.55	0.29	1.41	1.51									
		peachleaf willow	0.17		0.02										
		pin cherry		0.01											
		quaking aspen	5.62	6.86	4.93	3.43									
		red maple	0.18	0.31	0.54	0.12									
		red pine	1.84	7.93	1.82	4.49									
		rock elm	0.06												
		Siberian elm		0.05											
		sugar maple	0.04		0.03	0.50									
		tamarack (native)		0.05	0.25	1.12									
		white spruce	2.74	0.19	0.05	0.10									
		willow		0.02											

Species importance value by NPC and VGS

Average of iv_totba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Mesic Northern Hardwood	American basswood	0.29		5.07	5.98			0.29		5.07	5.58	5.98		
		American elm			0.22	0.83					0.22	0.68	0.83		
		American hornbeam,musclewood			0.08						0.08				
		balsam fir	0.47	1.80	0.93	1.65	0.25		0.47	1.80	0.93	1.37	1.65		
		balsam poplar		1.15	0.13	0.59				1.15	0.13	0.49	0.59		
		bigtooth aspen	0.13		0.45	0.99			0.13		0.45	0.81	0.99		
		black ash		0.03	1.23	1.44				0.03	1.23	1.18	1.44		
		black cherry			0.07						0.07				
		black spruce	0.10		0.20	0.60			0.10		0.20	0.49	0.60		
		boxelder			0.01						0.01				
		bur oak		0.02	0.21	0.27				0.02	0.21	0.28	0.27		
		chokecherry		0.04	0.02	0.22				0.04	0.02	0.18	0.22		
		eastern hophornbeam	0.05		0.11	0.02			0.05		0.11	0.02	0.02		
		eastern white pine			0.15	3.43					0.15	2.81	3.43		
		green ash	0.10	0.25	0.58				0.10	0.25	0.58				
		jack pine	1.07						1.07						
		mountain maple			0.03						0.03				
		northern red oak	0.37		2.39	2.16			0.37		2.39	1.80	2.16		
		northern white-cedar		0.43	0.30	2.88	45.45			0.43	0.30	6.49	2.88		
		paper birch	1.91	0.43	3.96	3.81			1.91	0.43	3.96	3.45	3.81		
		quaking aspen	3.96	12.01	4.49	1.07			3.96	12.01	4.49	2.67	1.07		
		red maple	1.31		1.64	0.62			1.31		1.64	0.85	0.62		
		red pine	0.59	4.31		1.71			0.59	4.31		1.40	1.71		
		sugar maple	0.35		3.95	5.63			0.35		3.95	4.69	5.63		
		tamarack (native)	0.08		0.34	0.70			0.08		0.34	0.57	0.70		
		white oak			0.17						0.17				
		white spruce		0.51	0.14	0.12				0.51	0.14	0.10	0.12		
		willow		0.15		0.17				0.15		0.14	0.17		
		yellow birch	0.16		0.38	0.06			0.16		0.38	0.05	0.06		

Species importance value by NPC and VGS

Average of iv_totba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
DLP	Tamarack Swamp	American basswood			0.05										
		American elm	0.09	0.03	0.16										
		balsam fir	0.95	1.02	0.91										
		balsam poplar	0.45	0.69	0.19										
		bigtooth aspen		0.01											
		black ash	0.97	0.61	1.62										
		black cherry		0.01											
		black spruce	0.02	2.86	4.57										
		bur oak	0.19	0.03	0.34										
		chokecherry		0.01											
		eastern white pine		0.06											
		green ash	0.33		0.09										
		jack pine		0.28											
		larch (introduced)			0.01										
		northern red oak		0.01											
		northern white-cedar	0.17	0.39	1.22										
		paper birch	0.80	0.53	0.20										
		quaking aspen	4.52	2.85	0.31										
		red maple	0.92	0.47	0.59										
		red pine		0.06											
		Siberian elm	0.07												
		silver maple			1.12										
		tamarack (native)	0.36	2.48	4.63										
		white spruce	0.02	0.29											
		willow		0.00											
		yellow birch			0.10										
	White Cedar Swamp	American basswood			2.59			2.59							
		American elm	0.21		0.79		0.91	0.79							
		balsam fir	0.97		2.42	0.56	2.35	2.42							
		balsam poplar	2.64		3.02	0.87	8.51	3.02							
		black ash	0.24		1.11	0.12	0.64	1.11							
		black spruce	0.97		0.72	0.71	1.83	0.72							
		bur oak	0.02			0.02									
		green ash	0.09				0.39								
		northern white-cedar	0.58		13.64	0.76		13.64							
		other, unknown	0.01			0.01									
		paper birch	0.81		1.67	0.89	0.55	1.67							
		quaking aspen	5.76		12.16	5.91	5.28	12.16							
		red maple	0.09			0.10	0.03								
		tamarack (native)	0.81		0.16	0.46	1.95	0.16							

Species importance value by NPC and VGS

Average of iv_totba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Dry mesic jack pine-black	American basswood			0.00						0.00			0.00	
		American mountain-ash			0.00	0.00					0.00	0.00		0.00	0.00
		balsam fir	0.89	1.27	2.12	2.62	2.42	1.53		1.42	2.20	2.78	0.89	2.00	2.49
		balsam poplar	0.19	0.01	0.02	0.27	0.02			0.06	0.02	0.18	0.19	0.01	0.14
		bigtooth aspen		0.11	0.09	0.27	0.19			0.04	0.12	0.21		0.10	0.22
		black ash	0.12	0.07	0.03	0.10	0.75	0.63		0.05	0.04	0.38	0.12	0.03	0.44
		black cherry				0.00						0.00			0.00
		black spruce	0.48	1.26	3.29	3.95	2.69	0.23		1.24	3.80	3.24	0.48	3.00	3.21
		bur oak		0.02		0.01				0.01		0.00		0.00	0.00
		chokecherry			0.02		0.00			0.01	0.02	0.00		0.01	0.00
		eastern white pine	0.51	0.23	0.40	0.55	1.17	9.91		0.37	0.40	0.68	0.51	0.37	1.16
		green ash				0.06	0.01					0.04			0.03
		jack pine	1.16	2.50	2.91	2.45	2.99	3.27		2.80	2.52	2.51	1.16	2.85	2.74
		larch (introduced)			0.01						0.01			0.01	
		mountain maple	0.02		0.02	0.14	0.04			0.01	0.02	0.11	0.02	0.02	0.09
		northern red oak			0.10	0.06	0.19			0.00	0.13	0.06		0.09	0.12
		northern white-cedar		0.06	0.06	0.14	0.38			0.02	0.08	0.21		0.06	0.25
		other, unknown		0.06						0.02				0.01	
		paper birch	0.97	1.16	2.88	3.87	3.53	4.32		1.11	3.44	3.93	0.97	2.64	3.71
		peachleaf willow				0.02	0.01					0.01			0.01
		pin cherry			0.01	0.00				0.00	0.01	0.00		0.01	0.00
		quaking aspen	2.74	4.23	4.83	5.90	5.02	1.94		4.42	4.56	5.84	2.74	4.75	5.33
		red maple	0.68	1.37	0.90	0.60	1.21	0.40		0.63	1.16	0.88	0.68	0.97	0.89
		red pine	0.15	0.01	1.67	1.05	0.59	3.18		1.48	1.12	0.65	0.15	1.44	0.89
		silver maple				0.02						0.01			0.01
		sugar maple		0.15		0.05	0.09			0.04		0.03		0.02	0.06
		tamarack (native)	0.28	0.03	0.26	0.17	0.22			0.16	0.30	0.10	0.28	0.23	0.19
		white spruce	1.44	0.09	0.24	0.56	0.24	0.76		0.48	0.29	0.45	1.44	0.22	0.41
		yellow birch					0.09					0.06			0.04

Species importance value by NPC and VGS

Average of iv_totba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Dry mesic white pine-red p	American basswood		0.02					0.01	0.01			0.02		
		American elm		0.01	0.04				0.01	0.01			0.01		
		American mountain-ash		0.00					0.00	0.00			0.00		
		balsam fir	0.84	1.71	3.41	2.90			1.36	1.36	0.47	0.84	1.71		
		balsam poplar	0.09	0.15	0.35	0.67			0.13	0.13		0.09	0.15		
		bigtooth aspen	0.33	0.21	0.88	0.84			0.26	0.26		0.33	0.21		
		black ash	0.23	0.24	0.87	2.76			0.24	0.24	2.58	0.23	0.24		
		black spruce	0.52	0.59	1.32	3.39			0.56	0.56	15.40	0.52	0.59		
		black willow		0.00					0.00	0.00			0.00		
		bur oak	0.04						0.02	0.02		0.04			
		chokecherry		0.01	0.00				0.00	0.00			0.01		
		eastern white pine	0.58	0.56	1.15	1.60			0.57	0.57	0.25	0.58	0.56		
		green ash		0.01	0.11				0.01	0.01			0.01		
		jack pine	0.22	1.75	1.49	0.71			1.13	1.13		0.22	1.75		
		mountain maple	0.01	0.02	0.09	0.53			0.01	0.01		0.01	0.02		
		northern pin oak	0.00		0.00				0.00	0.00		0.00			
		northern red oak	0.13	0.01	0.07				0.06	0.06		0.13	0.01		
		northern white-cedar	0.46	0.20	0.25	6.70			0.31	0.31		0.46	0.20		
		other, unknown			0.00										
		paper birch	1.15	1.61	3.52	2.27			1.42	1.42	0.52	1.15	1.61		
		peachleaf willow	0.02	0.02					0.02	0.02		0.02	0.02		
		pin cherry		0.00	0.00				0.00	0.00			0.00		
		quaking aspen	3.06	7.66	8.26	2.19			5.80	5.80		3.06	7.66		
		red maple	1.40	1.42	2.26	0.85			1.41	1.41		1.40	1.42		
		red pine	0.14	1.89	1.59	1.30			1.18	1.18		0.14	1.89		
		serviceberry			0.00										
		silver maple		0.00					0.00	0.00			0.00		
		sugar maple	0.11		0.08				0.05	0.05		0.11			
		tamarack (native)	0.17	0.02	0.03	0.03			0.08	0.08	0.19	0.17	0.02		
		white spruce	0.12	0.57	0.49	0.67			0.39	0.39		0.12	0.57		
		willow			0.00										
		yellow birch		0.03		0.08			0.02	0.02			0.03		

Species importance value by NPC and VGS

Average of iv_totba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Jack pine-aspen-oak	American basswood					0.36								
		balsam fir	3.48			2.11	4.11		3.48		2.25				
		bigtooth aspen	5.34			1.95	1.55		5.34		2.00				
		black ash				0.25					0.22				
		black spruce	4.49			2.50			4.49		2.14				
		eastern white pine				1.28	2.38				1.56				
		jack pine				2.28					1.96				
		mountain maple					0.12								
		northern red oak	0.78			0.34	0.51		0.78		0.38				
		paper birch	2.85			1.94	2.05		2.85		2.04				
		quaking aspen	10.21			10.16	11.62		10.21		9.47				
		red maple				2.42	1.17				2.32				
		red pine				0.31	0.61				0.40				
		sugar maple				0.05					0.04				
		white spruce	0.22			0.43	1.01		0.22		0.37				
	Lowland conifer	American basswood		0.03											
		balsam fir	2.16	1.76	1.80										
		balsam poplar	0.05	0.19	0.29										
		black ash	0.14	1.49	1.52										
		black spruce	2.78	7.92	8.31										
		black willow	0.12												
		chokecherry			0.00										
		eastern redcedar		0.00											
		eastern white pine		0.08	0.14										
		green ash	0.00	0.00											
		jack pine	0.17	0.43	0.53										
		mountain maple	0.00	0.02	0.15										
		northern white-cedar	0.81	1.92	3.74										
		paper birch	0.93	1.65	1.02										
		peachleaf willow		0.04											
		pin cherry	0.00	0.00	0.00										
		quaking aspen	1.58	1.83	0.95										
		red maple	0.39	0.32	0.01										
		red pine	0.19	0.00	0.04										
		sugar maple	0.02	0.12	0.00										
		tamarack (native)	1.02	1.81	1.00										
		white spruce	0.11	0.26	0.36										
		willow		0.01											
		yellow birch		0.05	0.10										

Species importance value by NPC and VGS

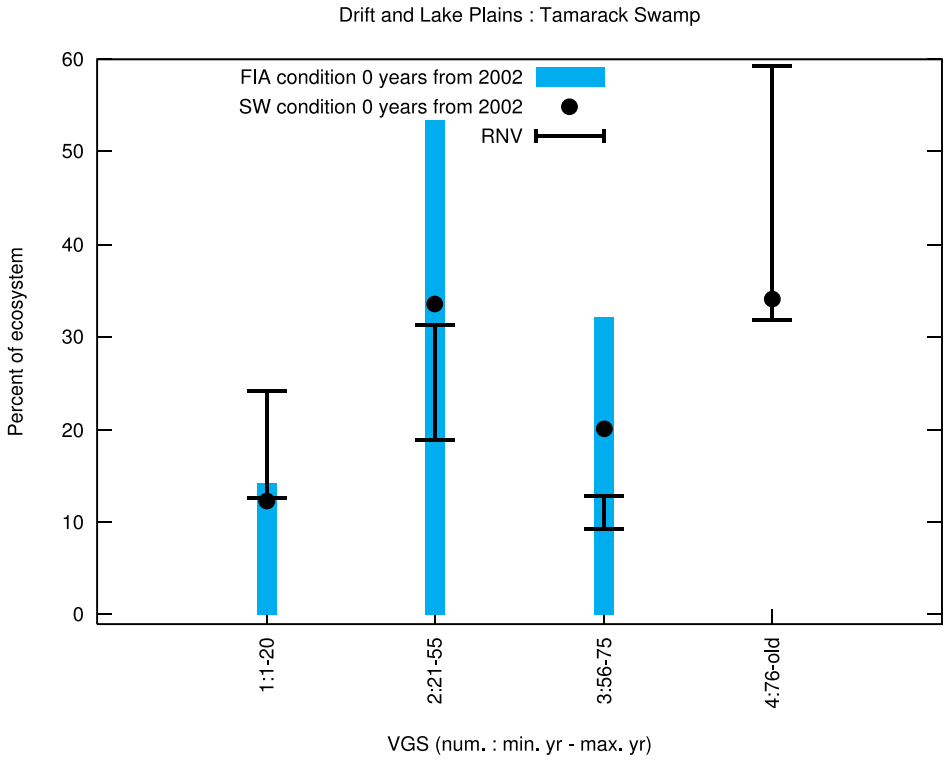
Average of iv_totba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Mesic aspen-birch-spruce	American basswood		0.07	0.04		0.06	0.04		0.07					
		American elm		0.01	0.02		0.01	0.02		0.01					
		American mountain-ash	0.01	0.08	0.01		0.07	0.01	0.01	0.08					
		balsam fir	0.89	2.78	3.26		2.36	3.26	0.89	2.78					
		balsam poplar	0.05	0.88	0.57		0.69	0.57	0.05	0.88					
		bigtooth aspen		0.03	0.12		0.03	0.12		0.03					
		black ash	0.40	0.45	1.09		0.44	1.09	0.40	0.45					
		black cherry		0.00			0.00			0.00					
		black spruce	0.30	0.77	1.03		0.67	1.03	0.30	0.77					
		black willow		0.05			0.04			0.05					
		boxelder		0.01			0.01			0.01					
		bur oak		0.00	0.00		0.00	0.00		0.00					
		chokecherry	0.07	0.03	0.00		0.04	0.00	0.07	0.03					
		eastern white pine	0.01	0.00	0.14		0.00	0.14	0.01	0.00					
		green ash		0.02	0.00		0.01	0.00		0.02					
		jack pine	0.01	0.67	0.30		0.52	0.30	0.01	0.67					
		mountain maple	0.02	0.09	0.43		0.08	0.43	0.02	0.09					
		northern red oak		0.00	0.01		0.00	0.01		0.00					
		northern white-cedar	0.55	0.58	1.46		0.57	1.46	0.55	0.58					
		paper birch	0.97	2.37	6.59		2.06	6.59	0.97	2.37					
		peachleaf willow	0.04	0.10	0.00		0.09	0.00	0.04	0.10					
		pin cherry		0.02	0.06		0.02	0.06		0.02					
		plains cottonwood			0.00			0.00							
		quaking aspen	3.62	5.95	8.24		5.43	8.24	3.62	5.95					
		red maple	0.27	0.54	0.86		0.48	0.86	0.27	0.54					
		red pine	0.26	0.87	0.14		0.73	0.14	0.26	0.87					
		serviceberry		0.01	0.00		0.01	0.00		0.01					
		sugar maple	0.24	0.38	1.40		0.35	1.40	0.24	0.38					
		tamarack (native)	0.05	0.13	0.13		0.11	0.13	0.05	0.13					
		white spruce	0.21	1.48	0.69		1.19	0.69	0.21	1.48					
		willow	0.13	0.03	0.00		0.05	0.00	0.13	0.03					
		yellow birch		0.07	0.45		0.05	0.45		0.07					

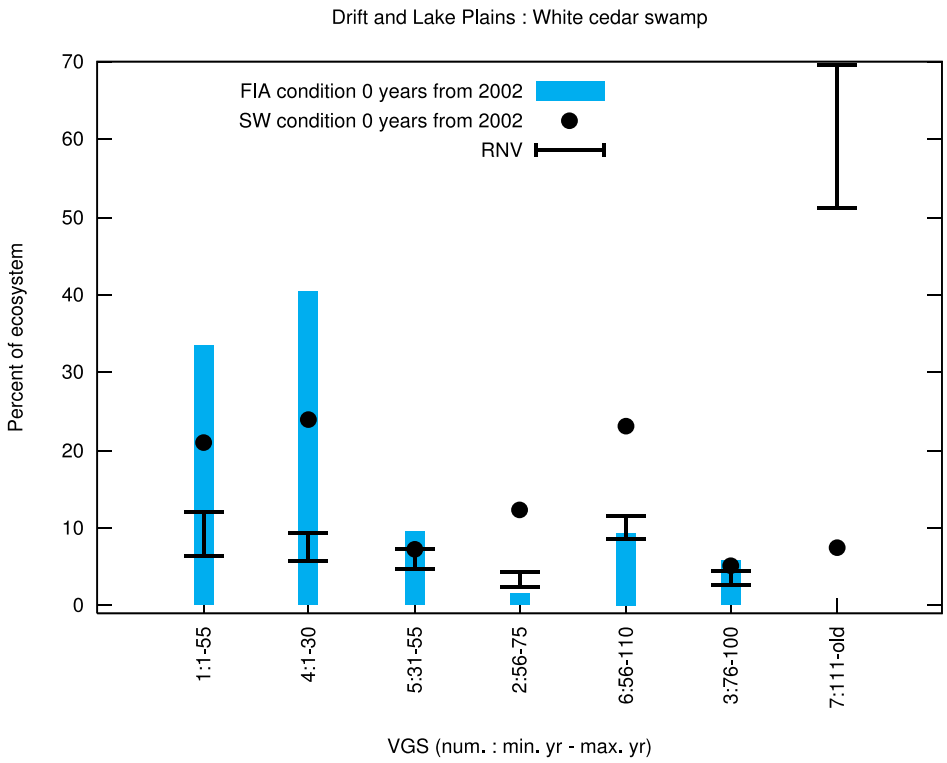
Species importance value by NPC and VGS

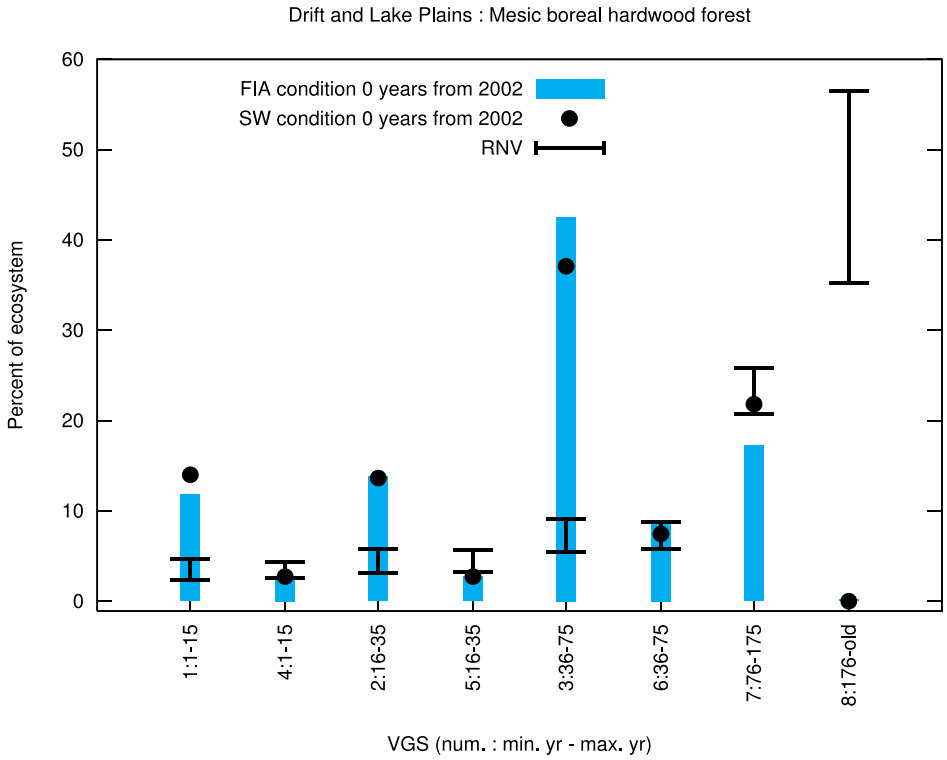
Average of iv_totba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Mesic white pine-red pine	American basswood	1.06	0.10	0.32				0.30	0.30		1.06	0.10		
		American elm		0.02	0.02				0.02	0.02			0.02		
		American mountain-ash	0.01		0.00				0.00	0.00		0.01			
		balsam fir	1.49	3.12	4.39	3.26			2.77	2.77		1.49	3.12		
		balsam poplar	0.22	0.49	0.40				0.44	0.44		0.22	0.49		
		bigtooth aspen	0.03	0.06	0.07				0.06	0.06		0.03	0.06		
		black ash	0.10	0.24	0.99	1.62			0.21	0.21		0.10	0.24		
		black spruce	0.18	0.86	0.91	0.50			0.71	0.71		0.18	0.86		
		bur oak			0.06										
		chokecherry		0.08					0.06	0.06			0.08		
		eastern cottonwood			0.02										
		eastern hophornbeam	0.18	0.00	0.00				0.04	0.04		0.18	0.00		
		eastern white pine		0.41	0.44	7.14			0.32	0.32			0.41		
		green ash	0.03	0.04	0.07				0.03	0.03		0.03	0.04		
		jack pine		0.40	0.39	0.95			0.32	0.32			0.40		
		mountain maple	0.01	0.08	0.28	0.04			0.07	0.07		0.01	0.08		
		northern red oak		0.07	0.09	0.07			0.05	0.05			0.07		
		northern white-cedar		0.23	1.42	9.45			0.19	0.19			0.23		
		paper birch	3.12	2.30	4.25	5.55			2.47	2.47		3.12	2.30		
		peachleaf willow	0.06	0.05					0.05	0.05		0.06	0.05		
		pin cherry		0.03		0.01			0.03	0.03			0.03		
		quaking aspen	2.36	6.90	5.76	1.30			5.94	5.94		2.36	6.90		
		red maple	0.73	0.92	1.24	0.68			0.88	0.88		0.73	0.92		
		red pine	0.31	1.04	0.69	1.89			0.89	0.89		0.31	1.04		
		rock elm		0.00					0.00	0.00			0.00		
		sugar maple	0.40	0.76	2.50	0.06			0.68	0.68		0.40	0.76		
		tamarack (native)	0.08	0.03	0.06				0.04	0.04		0.08	0.03		
		white spruce	0.10	0.91	1.15	0.23			0.73	0.73		0.10	0.91		
		yellow birch	0.11	0.02	0.40	0.04			0.04	0.04		0.11	0.02		

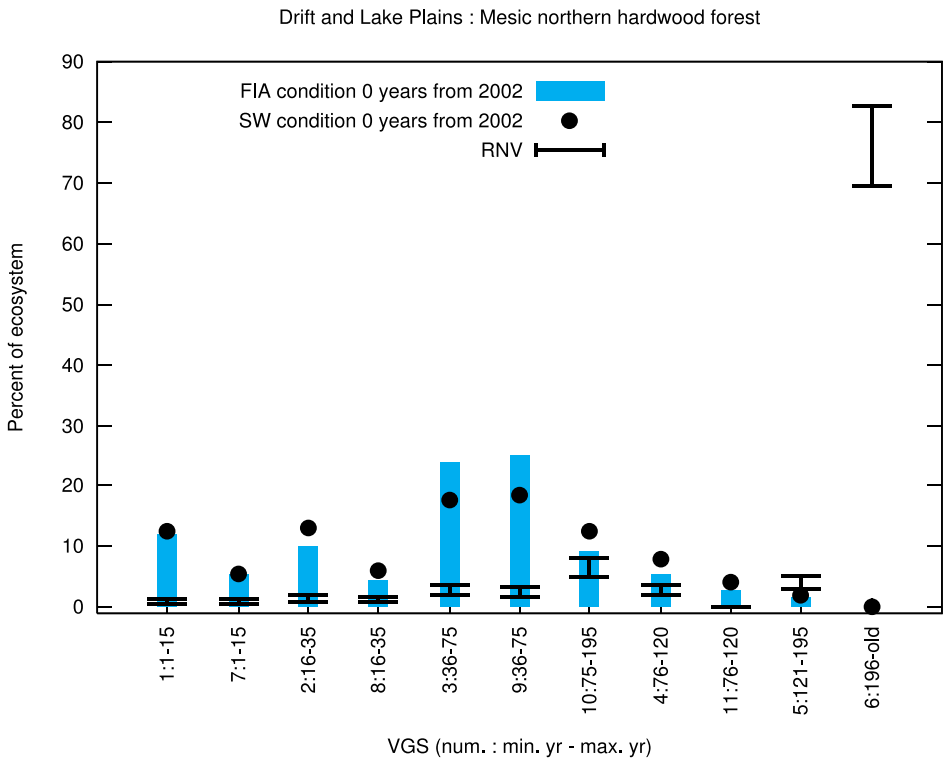
Species importance value by NPC and VGS

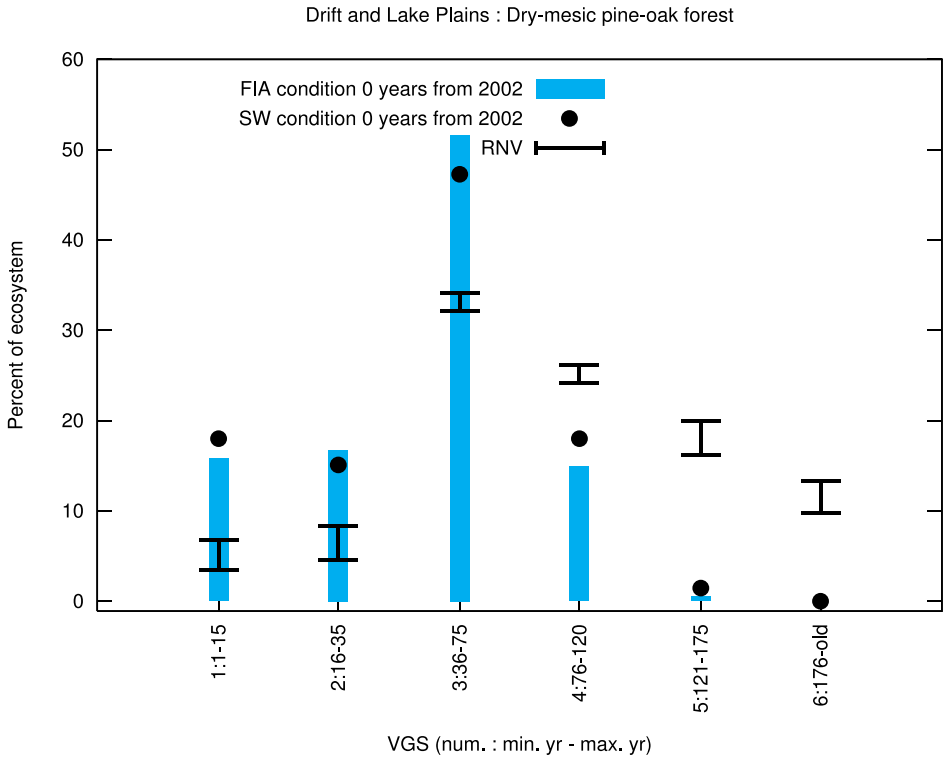
Average of iv_totba			vgs												
sec	npc	common_name	1	2	3	4	5	6	7	8	9	10	11	12	13
NSU	Rich swamp	balsam fir	5.40	0.41	2.61										
		balsam poplar	0.88		0.56										
		black ash	4.00	1.97	2.28										
		black spruce		2.11	4.05										
		eastern white pine	3.49		0.20										
		mountain maple	0.06												
		northern white-cedar	3.14		4.73										
		paper birch	2.46	0.86	1.22										
		quaking aspen	4.37		1.70										
		red pine	6.65												
		tamarack (native)		0.51	0.78										
		white spruce	2.20		0.40										
		willow			0.03										
	Sugar Maple	American basswood	0.16	0.83			0.16	0.83							
		American elm		0.01				0.01							
		American mountain-ash	0.01	0.03			0.01	0.03							
		balsam fir	2.21	2.43	1.09		2.21	2.43	1.09						
		balsam poplar	0.21	0.87			0.21	0.87							
		bigtooth aspen	0.07	0.06			0.07	0.06							
		black ash	0.65	0.43	8.77		0.65	0.43	8.77						
		black cherry		0.00				0.00							
		black spruce	0.06	0.33			0.06	0.33							
		eastern cottonwood	0.00				0.00								
		eastern hophornbeam	0.05	0.06			0.05	0.06							
		eastern white pine		0.09				0.09							
		green ash	0.03				0.03								
		jack pine	0.01				0.01								
		mountain maple	0.24	0.44			0.24	0.44							
		northern red oak		0.74				0.74							
		northern white-cedar	1.66	2.71	8.92		1.66	2.71	8.92						
		other, unknown			0.28				0.28						
		paper birch	3.65	5.58	6.27		3.65	5.58	6.27						
		peachleaf willow	0.05				0.05								
		pin cherry	0.08	0.09			0.08	0.09							
		quaking aspen	6.85	2.56			6.85	2.56							
		red maple	0.98	1.02	0.13		0.98	1.02	0.13						
		red pine	0.95				0.95								
		serviceberry	0.01	0.02			0.01	0.02							
		sugar maple	1.94	8.90	0.25		1.94	8.90	0.25						
		tamarack (native)			8.40				8.40						
		white spruce	0.58	0.79	2.14		0.58	0.79	2.14						
		willow	0.02				0.02								
		yellow birch	0.58	0.92			0.58	0.92							

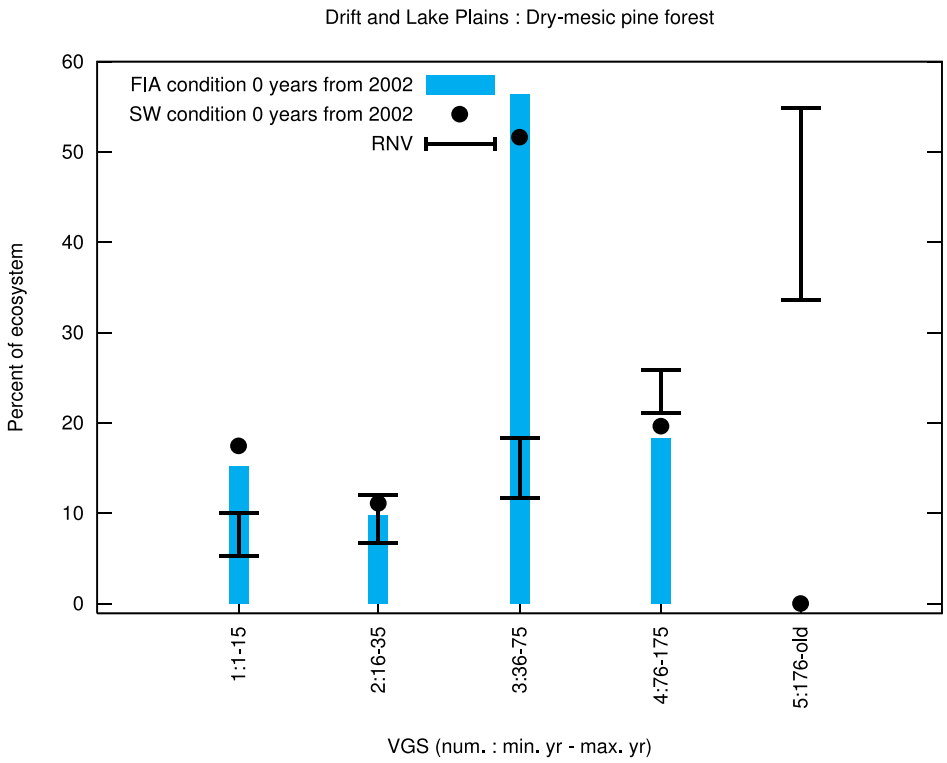

Drift and Lake Plains : Tamarack Swamp
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
10
20
30
40
50
60
1:1-20
2:21-55
3:56-75
4:76-old
VGS (num. : min. yr - max. yr)

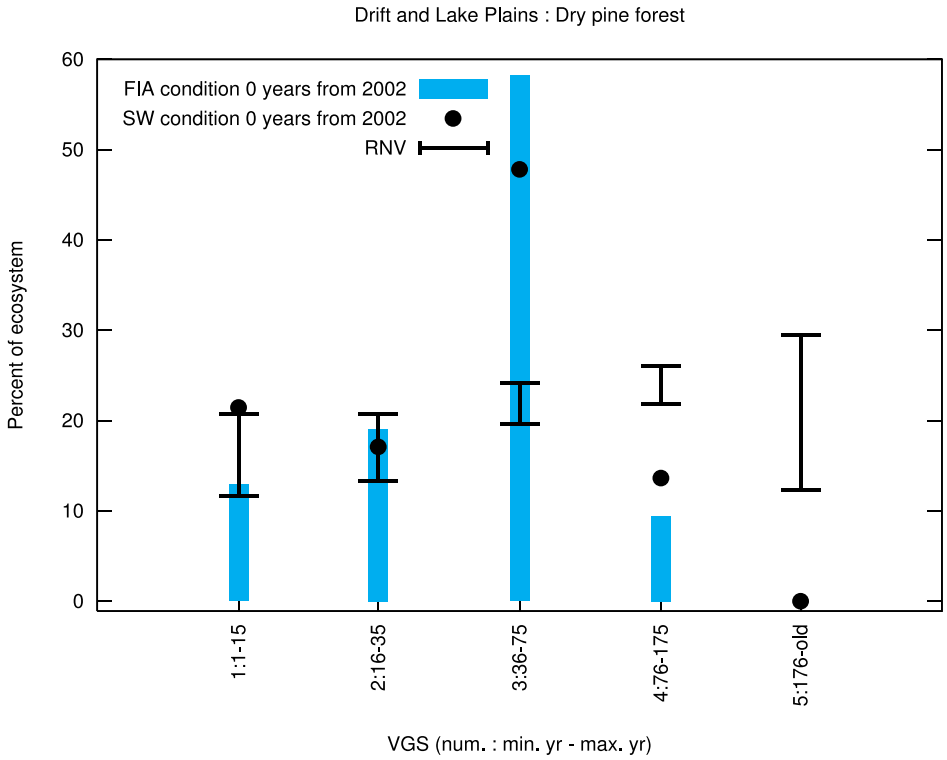

Drift and Lake Plains : White cedar swamp
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
10
20
30
40
50
60
70
1:1-55
4:1-30
5:31-55
2:56-75
6:56-110
3:76-100
7:111-old
VGS (num. : min. yr - max. yr)

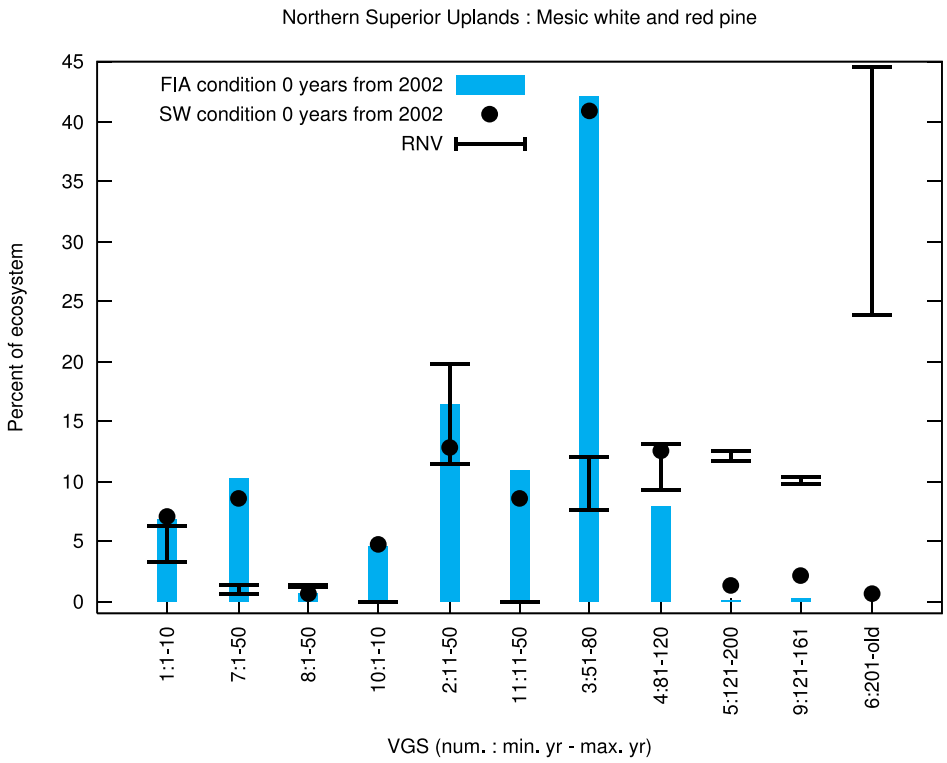

Drift and Lake Plains : Mesic boreal hardwood forest
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
10
20
30
40
50
60
1:1-15
4:1-15
2:16-35
5:16-35
3:36-75
6:36-75
7:76-175
8:176-old
VGS (num. : min. yr - max. yr)

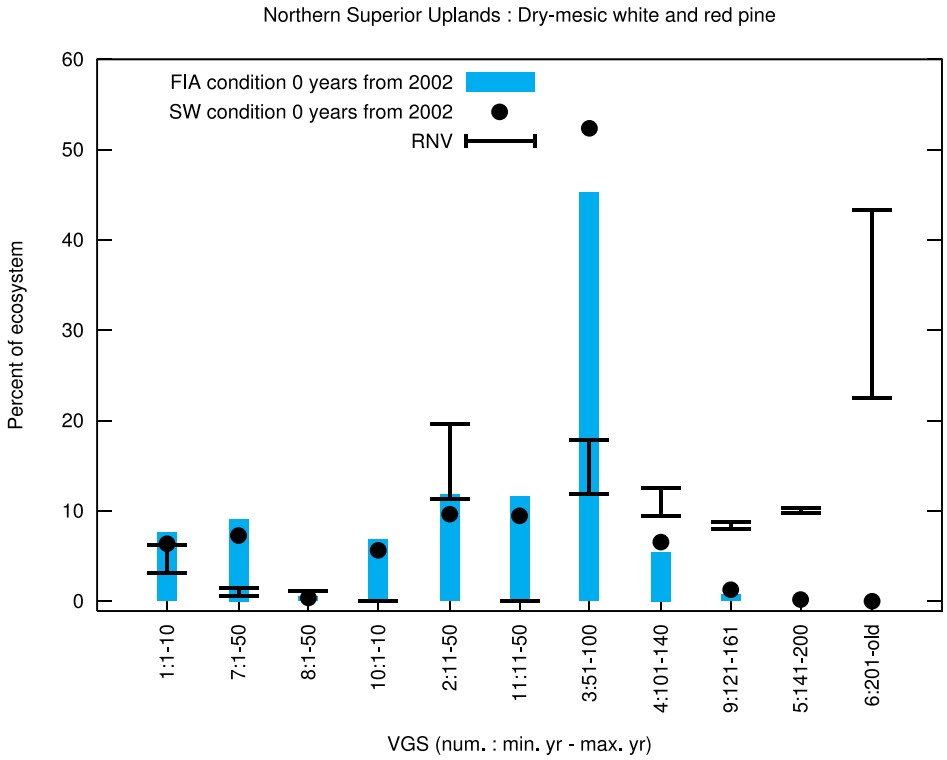

Drift and Lake Plains : Mesic northern hardwood forest
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
10
20
30
40
50
60
70
80
90
1:1-15
7:1-15
2:16-35
8:16-35
3:36-75
9:36-75
10:75-195
4:76-120
11:76-120
5:121-195
6:196-old
VGS (num. : min. yr - max. yr)

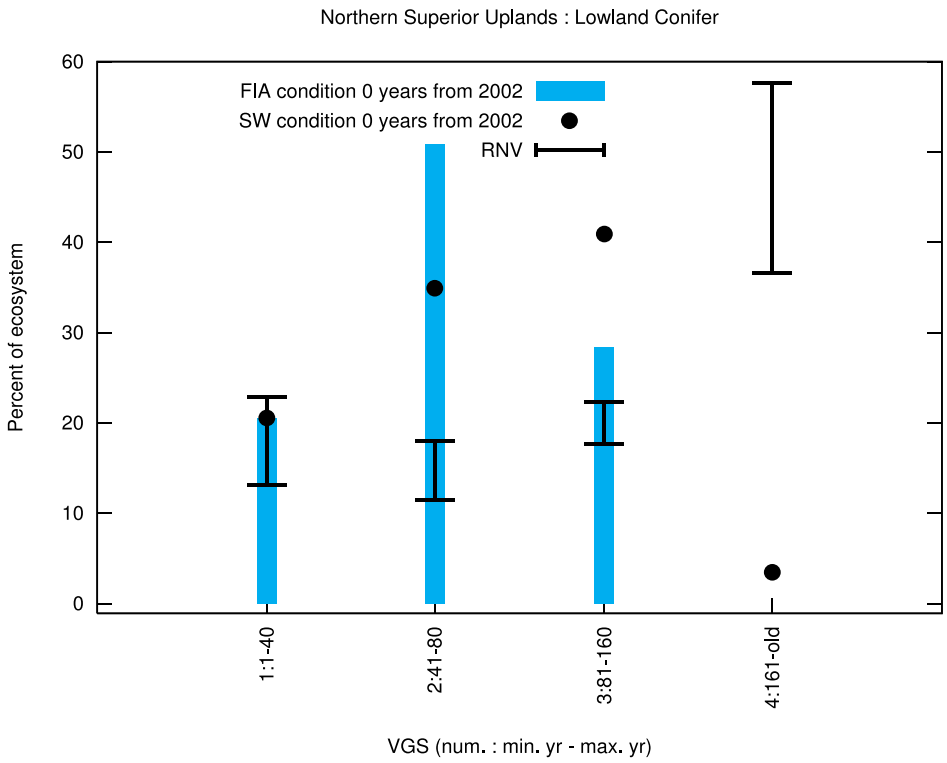

Drift and Lake Plains : Dry-mesic pine-oak forest
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
10
20
30
40
50
60
1:1-15
2:16-35
3:36-75
4:76-120
5:121-175
6:176-old
VGS (num. : min. yr - max. yr)

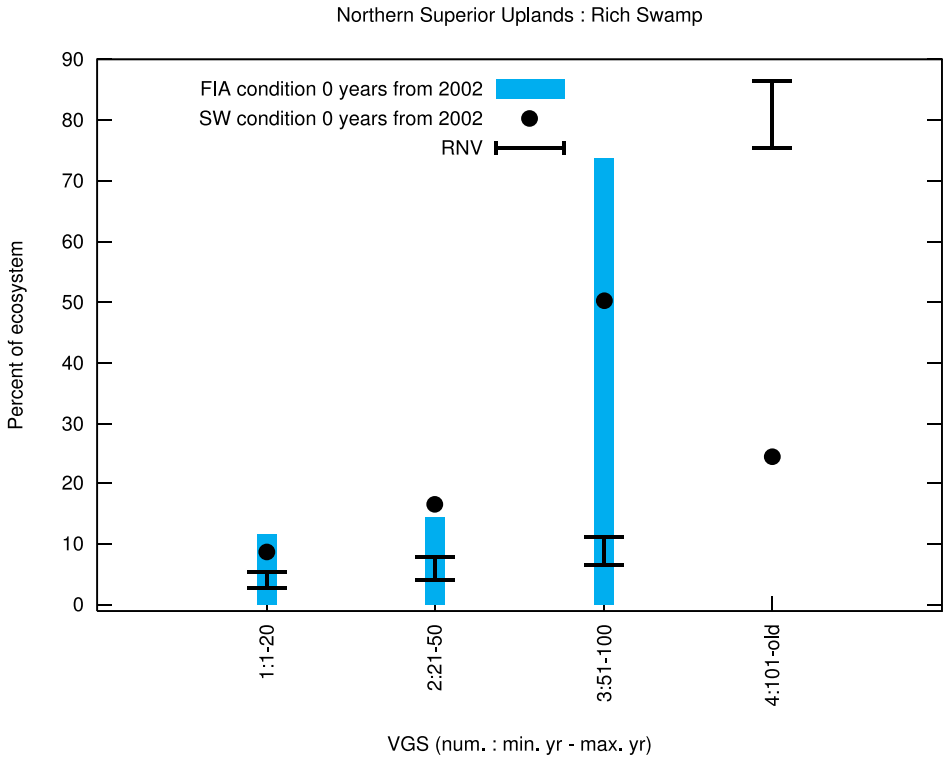

Drift and Lake Plains : Dry-mesic pine forest
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
10
20
30
40
50
60
1:1-15
2:16-35
3:36-75
4:76-175
5:176-old
VGS (num. : min. yr - max. yr)

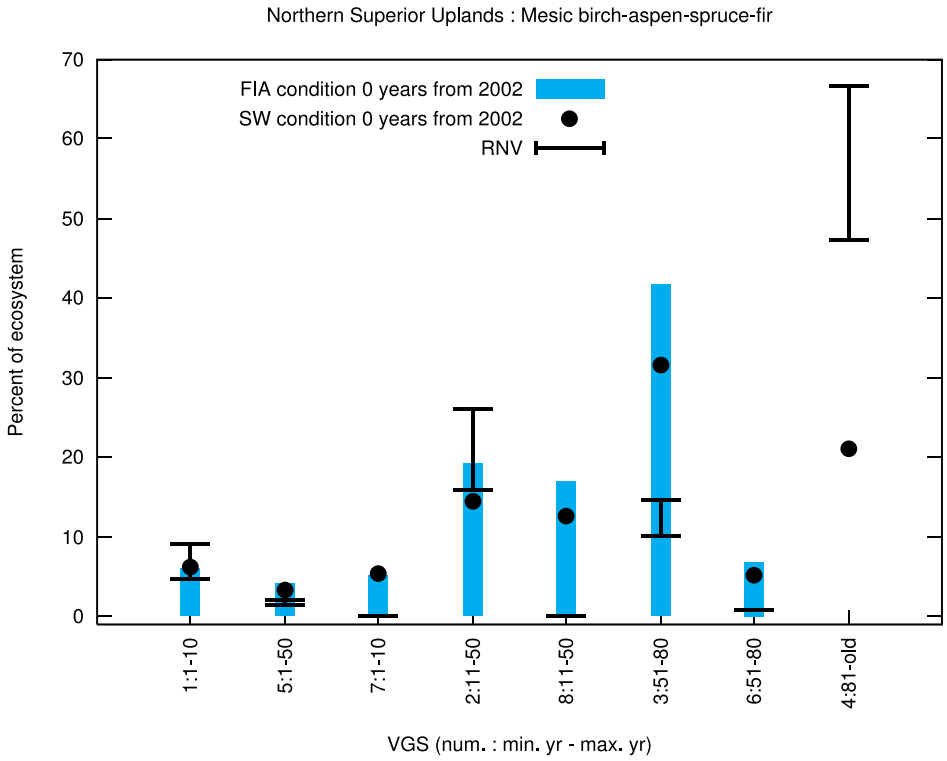

Drift and Lake Plains : Dry pine forest
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
10
20
30
40
50
60
1:1-15
2:16-35
3:36-75
4:76-175
5:176-old
VGS (num. : min. yr - max. yr)

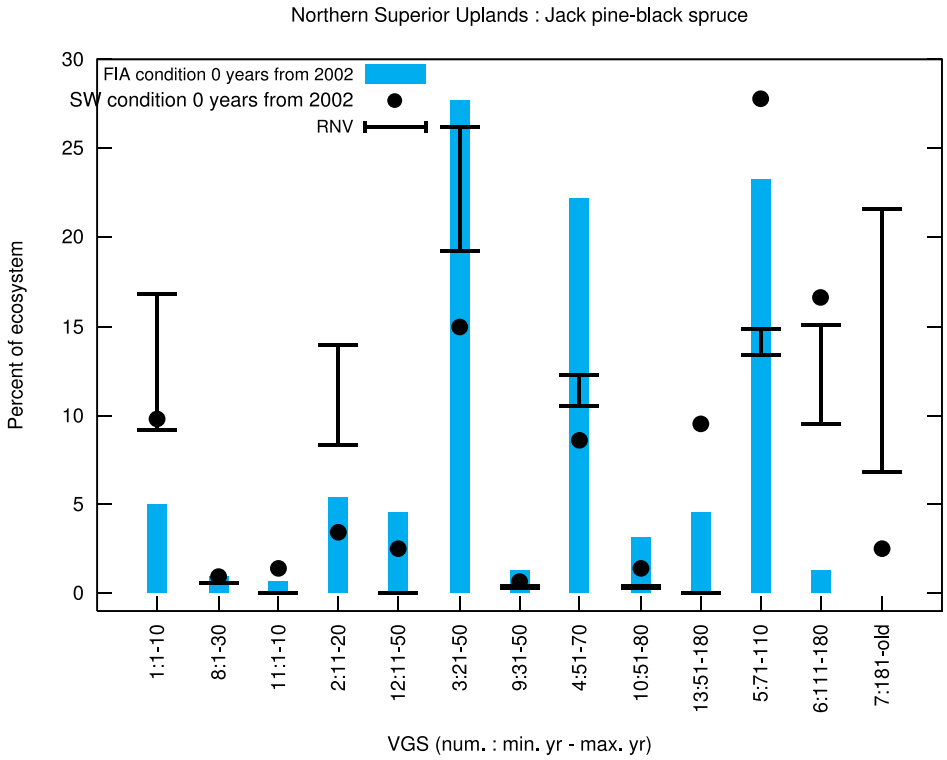

Northern Superior Uplands : Mesic white and red pine
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
5
10
15
20
25
30
35
40
45
1:1-10
7:1-50
8:1-50
10:1-10
2:11-50
11:11-50
3:51-80
4:81-120
5:121-200
9:121-161
6:201-old
VGS (num. : min. yr - max. yr)

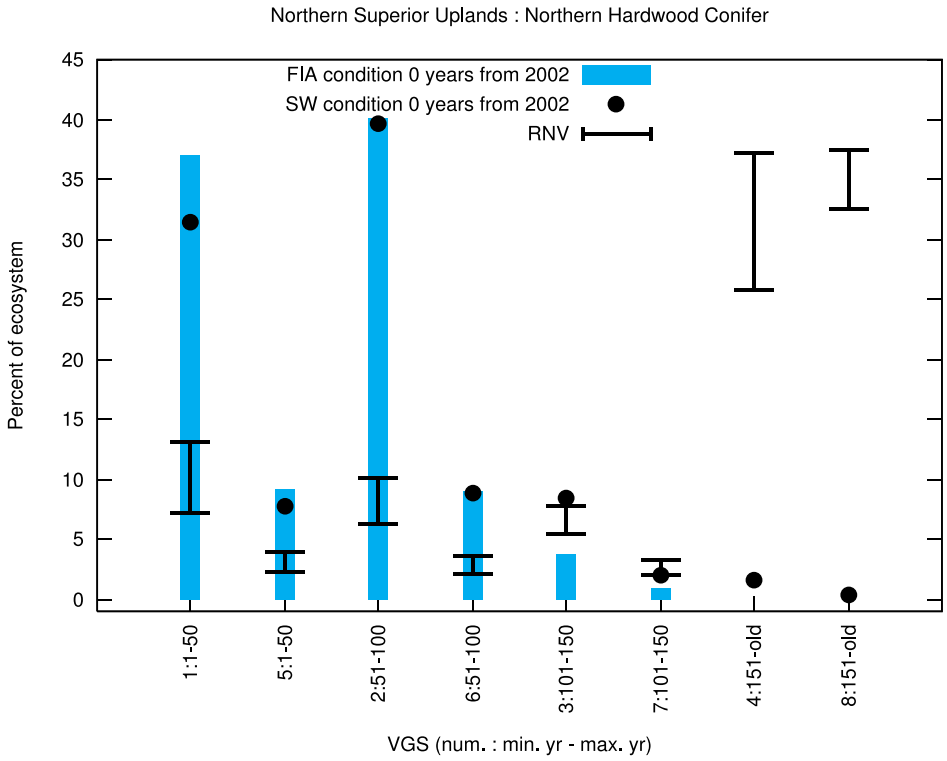

Northern Superior Uplands : Dry-mesic white and red pine
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
10
20
30
40
50
60
1:1-10
7:1-50
8:1-50
10:1-10
2:11-50
11:11-50
3:51-100
4:101-140
9:121-161
5:141-200
6:201-old
VGS (num. : min. yr - max. yr)


Northern Superior Uplands : Lowland Conifer
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
10
20
30
40
50
60
1:1-40
2:41-80
3:81-160
4:161-old
VGS (num. : min. yr - max. yr)


Northern Superior Uplands : Rich Swamp
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
10
20
30
40
50
60
70
80
90
1:1-20
2:21-50
3:51-100
4:101-old
VGS (num. : min. yr - max. yr)


Northern Superior Uplands : Mesic birch-aspen-spruce-fir
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
10
20
30
40
50
60
70
1:1-10
5:1-50
7:1-10
2:11-50
8:11-50
3:51-80
6:51-80
4:81-old
VGS (num. : min. yr - max. yr)


Northern Superior Uplands : Jack pine-black spruce
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
5
10
15
20
25
30
1:1-10
8:1-30
11:1-10
2:11-20
12:11-50
3:21-50
9:31-50
4:51-70
10:51-80
13:51-180
5:71-110
6:111-180
7:181-old
VGS (num. : min. yr - max. yr)


Northern Superior Uplands : Northern Hardwood Conifer
FIA condition 0 years from 2002
SW condition 0 years from 2002
RNV
Percent of ecosystem
0
5
10
15
20
25
30
35
40
45
1:1-50
5:1-50
2:51-100
6:51-100
3:101-150
7:101-150
4:151-old
8:151-old
VGS (num. : min. yr - max. yr)