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A comparison of non-spatial and spatial, empirical and resource-based competition indices for predicting the diameter growth of trees in maturing boreal mixedwood stands

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A comparison of non-spatial and spatial, empirical and resource-based competition indices for predicting the diameter growth of trees in maturing boreal mixedwood stands

SFM Project: Spatial and Non-spatial modeling of canopy tree dynamics in boreal forests

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Abstract

A series of individual tree non-spatial and spatial competition indices were used to estimate the diameter growth of subject trees in mixed species stands. The spatial indices included MIXLIGHT a forest light simulator, which mechanistically estimates the light resource to the top of the crown of the subject tree over the growing season. Tree data were from the Alberta permanent sample plot program, a set of 216 plots with mapped locations of trees with periodic diameter measurements going back as much as 40 years. Data were analysed within the four common ecosites that contained mixed forests. Competition indices were computed separately for each species of competitor. The indices for all competitor species were then combined to predict the growth of subject trees using multiple regression analysis. For the shade intolerant species (aspen, balsam poplar and lodgepole pine), the non-spatial indices were equal or better at predicting diameter growth than the spatially-explicit indices. For shade-tolerant white spruce, however, Heygi's spatially-explicit index was the best predictor. Seasonal light transmission ranked intermediate for predicting growth compared to the other indices. This may be due to the weak relationships between tree crown size and diameter needed to determine the geometry of light penetration. The strength of competitors can generally be ranked white spruce > pine > aspen >balsam poplar.

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Introduction

Intra- and interspecific interactions among trees in forest stands are important components of stand dynamics and predicting future growth. Many of these interactions are competitive, but amensalism, commensalism and mutualism occur in forests as well. Due to the predominance of competition, indices to quantify interaction and model tree or stand growth are characterized as competition indices, and attempt to incorporate information about a subject tree and its neighbours, or the stand as a whole, in a way that is thought to be representative of competition levels experienced (Burton 1993). However, the success of a competition index is usually not focused on how well it quantifies competition, but is more directly tested by how well it predicts future growth of a subject tree.

There are a wide variety of competition indices, but these can generally be categorized into non-spatial and spatial indices. The former generate information from the trees contained in a plot regardless of where they are located within it, while the latter require information on the spatial arrangement of trees. A helpful comparison is raster and vector categories in geographic information systems software, since the non-spatial indices contain area-based (raster) information, while the spatial indices contain coordinate-based (vector) information (Robinson and Ek 2000). Biging and Dobbertin (1992) suggested that spatial indices are more effective than non-spatial indices at prediction of tree growth, while others have found no difference (Lorimer 1983, Martin and Ek 1985). Since positional information is time-consuming to obtain, spatial indices should demonstrate incremental benefits over non-spatial indices to justify their greater costs.

Competition indices also vary in their degree of mechanistic information. Most indices are empirical, in the sense that they describe the outcome of plant interactions (growth or mortality) rather than the process (resource acquisition). Indices using size ratios (competitor size / focus tree size), particularly, tend to be results-based and circular in their reasoning (i.e. big trees grow fast), but some size ratio indices address the availability of above-ground resources (Biging and Dobbertin 1992). Influence zone indices attempt to quantify above and below ground competition by estimating overlap of crown and rooting zone (e.g. Holmes and Reed 1991). Growing space indices attempt to partition the ground area among the trees within the stand. If the critical resources are closely tied to ground space (nutrients, water), this approach approximates the competition mechanism. Effective empirical indices should be well correlated with availability of critical resources, so competition indices may be better viewed as lying on a continuum between empirical and process based approaches (Robinson and Ek 2000).

The recent increase in computer power has made it possible to develop competition indices which directly estimate availability of limiting resources. This "ultimate" competition index approach has shown merit in process-based forest growth modeling (Pacala et al. 1993, Bartelink 2000). Generally, the light (photosynthetically active radiation: PAR) resource has been modeled, although nutrient resource models have also been developed (Kimmins et al. 1990). Although a number of studies have compared empirical competition indices (Lorimer 1983, Martin and Ek 1984, Tomé and Burkhart 1989, Holmes and Reed 1991, Biging and Dobbertin 1992), no work has yet attempted to compare empirical indices with these process-based indices.

Most of the published competition indices have been developed and tested on single species stands. Studies which have applied competition indices to mixed species forests have generally treated all competing species similarly, other than allowing for different crown, stem and root allometry (Lorimer 1983, Homes and Reed 1991). Crown and root zone size alone may not fully characterize differences among species. Shade tolerant species, for example, have much higher crown foliage density than intolerant species, resulting in more light capture by crowns of similar size (Canham et al. 1994; Stadt and Lieffers 2000). Species-specific competition indices may offer a more direct method of dealing with species effects.

Site quality is also a useful variable in forest growth modeling. Site quality affects the growth rate of species and may alter the competitive interactions among species. Temperature, soil fertility, moisture regime and aspect are important determinants of site quality. While the past height growth rate of dominant trees (site index) has been typically used to quantify site quality, a more direct approach is to stratify the data by ecosites, which are designated based on climate, local topography, and indicator species.

The objectives of this paper were to use the large dataset of spatially mapped permanent sample plots (PSPs) maintained by the Alberta Land and Forest Service (1999) to compare a selection of competition indices for predicting the future growth of trees. Specifically we wanted to test: 1) the effectiveness of non-spatial, spatial and light resource indices as predictors of future tree growth, 2) examine differences in competitive ability among the dominant boreal forest species, and 3) determine if competitive ability and coefficients for competition indices are different across ecosites.

Methods

The Alberta Forest Service Permanent Sample Plot (PSP) program is a network of ~600 PSPs across the forested areas of the province. The earliest plots were established in 1960, and new plots have been added up to the present. The PSPs are not an entirely random sample of the forest, as they were often chosen for accessibility and to be subjectively representative of particular forest types. Remeasurement intervals varied from 3-11 years. Pre-1981 PSPs consist of four, square subplots, 202 to 2023 m^2 in size, separated by 20-60 m. Newer PSPs have a single square subplot, 1000-2000 m^2 in size. In this study, the smallest subplots used were 400 m^2, to allow a sufficient buffer around the central trees for calculating distance-dependent competition indices.

PSPs have been established in many ecosites; however, as numbers are low in some, we chose PSPs from the most frequent and commercially important four ecosites: boreal mixedwood (BM) d and e, and lower foothills (LF) e and f (Beckingham 1996, Beckingham et al. 1996). The BM ecoregion is characterized by typical maximum summer temperatures of 20 °C, mean annual temperatures of 1.5 °C and 389 mm of precipitation. The LF ecoregion is at higher elevation, has cooler summers and about 75 mm more precipitation than the BM area. The BMd ecosite is characterized by the presence of *Viburnum edule* and has a mesic moisture class and medium nutrient class. The BMe is characterized by *Cornus stolonifera* and is subhygric and rich. The LFe ecosite is characterized by *Viburnum edule* and is found on mesic, medium nutrient sites. The LFf ecosite is characterized by *Lonicera involucrata* and is generally subhygric and rich.

Tree data, collected by the forest service in each PSP subplot, included the tree species, a disease and damage assessment, stem diameter at breast height (DBH; 1.3 m), and stem location as distance and bearing from plot centre. Only trees with DBH$\geq$ 9.1 cm were identified and mapped. The top height and live crown length of one to three trees in many of the PSPs was also measured.

In this study, the four most abundant tree species, lodgepole pine (*Pinus contorta*, Pl), white spruce (*Picea glauca*, Sw), trembling aspen (*Populus tremuloides*, Aw), and balsam poplar (*Populus balsamifera*, Pb), were selected for analysis. Lodgepole pine rarely occurs in the BM ecosites, so analysis of this species was confined to LF sites. PSP subplots with a significant presence (defined as >5 m^2/ha basal area at breast height, BAHA) of species, other than the common species noted above, were excluded from the analysis. Where other species occurred at low abundance (<5 m^2/ha) they were assigned to the most ecologically similar competitor species, i.e. black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*) were treated as white spruce, and paper birch (*Betula papyrifera*) was treated as aspen. Growth increment data from these other species was not used in the analysis. Dead trees were ignored completely.

Annual diameter growth increments were calculated for undamaged ‘focus’ trees which occurred in the centre of the plot, a minimum of 8 m from the plot edge and within a 20 x 20 m square area surrounding plot centre. Annual growth was calculated as the change in DBH between remeasurements divided by the remeasurement interval. A number of PSP subplots had up to six remeasurements. Since the numerous subplots provided ample spatial replication, only the first remeasurement interval was used in the regression analysis to circumvent temporal dependencies in the data.

Once a data set of suitable focus trees was established, the competition indices were calculated. Six non-spatial and six spatial competition indices (Table 1), which had shown promise in previous studies, were calculated for each focal tree. Non-spatial indices were calculated for the central 20 × 20 m section of each subplot. To attempt to capture the asymmetric nature of competition for light in a non-spatial index, the sum of competitior diameter (SDBH) and basal area (BAHA) indices were also calculated separately using only the trees with greater height than the focus tree. Height was calculated based on DBH using the Alberta height vs. DBH equations (Huang et al. 1994). Spatial indices were calculated using an 8 m search radius of each focus tree. This size was a practical size given the size of the plots and approximately conforms to Lorimer's (1983) suggestion of using plots radii approximately 3.5 times the radius of the crowns of subject trees. Seasonal light transmission (photosynthetically active radiation as a percentage of above-canopy radiation, averaged from May to September) at the apex each focus tree was estimated using MIXLIGHT (Stadt and Lieffers 2000). Since they are distance dependent, most of the spatial indices are plot size and shape dependent, with the exception of MIXLIGHT, though MIXLIGHT is sensitive to edge effects.

MIXLIGHT is a stand and microsite level light simulator, which uses a ray-tracing technique to calculate light transmission through canopy gaps. Its spatial mode represents trees as regular geometric shapes (cylinders, cones, ellipsoids, paraboloids or combinations) and places leaf area randomly within each geometric crown. A seasonal simulation develops a normalized sky radiance distribution matrix by tracing the solar path across the sky for the entire growing season, and adding diffuse radiation. Rays are traced from the simulation point (the current focus tree apex) to the sky. Rays that intersect any crowns have their PAR transmission reduced by the leaf area properties within the crown. The rays are weighted by the radiance of the seasonal sky sector they originate in, and all rays are summed to give the average seasonal light transmission (%PAR) value.

Small plots may have significant edge effects for light calculations at high latitudes, due to the low solar elevation. This problem is more critical for calculating light availability to trees in understory positions, since the sun's rays have a longer path through the canopy. We surrounded each plot or subplot with eight translated copies of the plot to increase the size of the buffer and allow tracing of the low elevation rays through the geometric crowns.

The MIXLIGHT model required several variables that were not included in the original PSP data set. Tree height was calculated from the provincial height vs. DBH functions (Huang et al. 1994). Crown length and crown width were also estimated from DBH, using functions developed in this region (Stadt et al. 1999).

To determine the impacts of neighbours of different species, within each ecosite, competition indices were calculated separately for each species of competitor. These species indices were then used in a multiple regression model to predict future growth of the focus tree (Equation 1).

[1] $G_{k,m} = \beta_0 + \beta_{DBH}*DBH_k + \beta_{Aw}*CI_{Aw} + \beta_{Pb}*CI_{Pb} + \beta_{Pl}*CI_{Pl} + \beta_{Sw}*CI_{Sw} + \varepsilon_k$

Where $G_{k,m}$ is the annual diameter growth of focus tree *k* of species *m*, β_0 is the intercept, β_{DBH} is the coefficient for focus tree diameter (DBH_k) , β_{Aw}, β_{Pb}, β_{Pl}, and β_{Sw} are the coefficients for the competition indices (CI_{Aw}, CI_{Pb}, CI_{Pl}, and CI_{Sw} ; see Table 1 for formulae for each index) calculated separately for each competitor species, and ε_k is the error, which was assumed to be independent and normally distributed. With no neighbours, the expected growth of a tree would be $\beta_0 + \beta_1*DBH_k$. This approach was used to calculate index values for all of the non-spatial and most of the spatial competition indices. The seasonal %PAR resource index accounts for the species composition surrounding the focus tree as it calculates light attenuation through the crowns of the different species. For this index, separate species effects were not included (Equation 2).

[2] $G_{k,m} = \beta_0 + \beta_1*DBH_k + \beta_2*MIXL + \varepsilon_k$

Regression equations were created for each focal species (*m*) in each of the four ecosite types. Differences among ecosites were tested by looking for a reduction in the residual sum-of-squares from fitting equations 1 and 2 to separate ecosites vs. all ecosites (Zar 1999).

Both annual diameter growth and the natural logarithm of growth were initially tested as dependent variable for the models. Growth was selected as the dependent variable because normal probability, box plots and inspection of residuals indicated that assumptions of normality and homogeneity of variance and were violated using log-transformation.

Results

The density and basal area for the four species of interest (aspen, balsam poplar, lodgepole pine and white spruce) are summarized by species and ecosite in Table 2. Each species showed a wide range of variation within an ecosite. Balsam poplar generally had the lowest maximum density and basal area. The growth response range of all species was similar, but aspen and balsam poplar had the highest mean growth rates in the data set, followed by white spruce and lodgepole pine (Table 3). All regression models for predicting the annual diameter growth (in cm) of focal trees of the four common species were significant ($P<0.05$) with a root mean square error (RMSE) of 0.08-0.13, and the coefficient of determination (R^2) varying from 0.03 to 0.46 (Figure 1). Since the R^2 values show a greater range, and the same growth data was used to test all indices, R^2 was used to compare the effectiveness of the indices.

The spatial indices did not have consistently higher R^2 than the non-spatial indices, particularly for aspen, balsam poplar and lodgepole pine, where the non-spatial indices occasionally outperformed the spatial ones. The sum of the competitor diameters (SDBH) or basal area (BAHA) were usually similar or more effective than the other non-spatial indices for most species and ecosites. The spatial index with the highest R^2 varied considerably among focus species and ecosites, but Heygi's index consistently ranked high. Full regression statistics are provided for basal area and Heygi's indices (Table 4), and all regressions are presented in Appendix 1. The light resource index calculated by MIXLIGHT (the percentage of above-canopy seasonal PAR available at the tip of the crown) was variable in terms of its effectiveness.

It showed mid to lower R^2 values for white spruce, but ranked intermediate to best among the spatial indices for aspen, balsam poplar, and lodgepole pine.

The competitive ability of a species in terms of reducing the growth of the focus tree is indicated by the size of the regression coefficients for the species's competition index. White spruce had a strong effect as a competitor (Table 4); for most of the focus species and ecosites, the coefficient for the spruce competition index was the largest, consistently negative, and in only three cases were the coefficients not significant. Competition indices for pine had consistently negative regression coefficients, but these were relatively small in value. Aspen and poplar showed both negative and positive coefficients. Half the poplar coefficients and 25% of the aspen coefficients were not significant.

Discussion

Simple non-spatial indices such as a sum of the plot tree diameters (SDBH) or the basal area of trees (BAHA) larger than the focus tree, predicted individual tree annual diameter growth nearly as well as or better than more complex indices. This held true across the four ecosites tested and for predicting the growth of three of the four species examined. Only for predicting white spruce growth was there clear evidence that spatial indices perform better. Biging and Dobbertin (1992) found improvements in predicting diameter growth when spatial information was included in competition indices for single-species Douglas-fir (Pseudotsuga menziesii), ponderosa pine (*Pinus ponderosa*) or white fir (*Abies concolor*) stands. However, Lorimer (1983) also noted that simple non-spatial indices were nearly as good as spatial indices at predicting future growth of subject trees in even-aged hardwood stands. Likewise, Martin and Ek (1984) found no benefit in including any information other than basal area in a competition index for red pine (*Pinus resinosa*) plantations.

Given the data contained in our analysis of the PSP program, there appears to be little benefit for using spatial over non-spatial indices, at least for prediction of growth of aspen, balsam poplar and lodgepole pine. Non-spatial indices using ratios of competitor size to focus tree size (e.g. CFDBH, CFBA, AFDBH, AFBA, Table 1) were not consistently better across ecosites or for the various focus species than indices that simply assessed the density and size (SDBH, BAHA) of competitors larger than the focus tree. It appears that having the indices consider only trees larger than the focus tree is enough to capture the effects of size asymmetry on plant interactions. Further, spatial indices that also consider the ratio of competitor to focus tree size (Heygi, MaEk, Alem) did not consistently perform better than spatial indices that simply assess the density and distance of competitors from the focus tree (SDIS, SIDIS). In fact, the most complex empirical spatial index (Alem) was frequently much less effective than the simpler ones.

Considerable effort has been put into developing competition indices, particularly spatial indices, for forest growth modeling. Tomé and Burkhart. (1989), and Biging and Dobbertin (1992) for example, attempted to optimize the mathematical form of a spatial index for a particular forest. Since the species composition varies across different forests, it is not surprising that different indices are more effective for different forest regions. In mixed-species forests, the modeling challenge is greater, since trees interact differently with different neighbour species. Ecologically these differences relate to the neighbours' ability to sequester resources (through their crown size and form, their leaf density, and rooting structure) as well as interact noncompetitively through mycorrhizal connections or allelopathy. We attempted to deal with neighbours of mixed species, first by computing a separate empirical index for each species, then alternatively by using a light resource index, which accounts for neighbour crown shape, size, density and position. Both techniques were effective, although there were generally better fits for the empirical models.

A possible reason for the poor fit with the spatial indices for the three shade intolerant species may relate to the fact that most of the subject trees for the intolerant species tended to occupy dominant positions in the canopy in mixed species stands. Trees in dominant positions probably have fewer differences in light availability compared to trees in lower positions and competition for below ground resources are more likely to influence growth. Thus the overall stocking of neighbouring trees over a wider area (i.e. the extent of the root systems) may be as important that the nearby position of neighbors. Further, the R^2 values for the regression models of the intolerant species were mostly quite low. In contrast, the multiple regressions of the competition indices showed a tendency for the spatially-explicit indices to predict growth of the focus tree better than the non spatial indices, meeting our intuitive expectation regarding superiority of spatially-explicit models. As many of the focus trees in the spruce data set were sub-canopy trees, the size and proximity of neighbours probably would have much more effect on their growth than on the growth of the intolerant aspen, poplar and pine. Overall, however, for inventory data of fire-origin, natural and untended stands such as that available in the Alberta PSP data bank, spatial indices may not be appreciably better than simple non-spatial indices. For modeling forest dynamics under management systems involving more complex dynamics, such as underplanting, thinning, shelterwoods, strip cutting or group selection, (Lieffers et al. 1996) more complex spatial models may be more effective.

The light resource index (MIXL) is a more direct estimator of the availability of an important resource that could affect the growth of a subject tree. It has more theoretical appeal than the competition indices and does not depend upon mathematical constructs such as ratios between variable and relatively arbitrary search radii around subject trees. MIXLIGHT has been shown to be capable of estimating light reasonably well at specific three dimensional points in the understory (Pinno et al 2001). MIXLIGHT, however, was only similar or less effective at predicting individual tree growth than the better empirical, non-spatial or spatial indices (e.g. BAHA, Heygi). In fact, for white spruce focus trees, the light index was often the least effective predictor of growth. This was somewhat surprising, given the clear response of understory white spruce, and other species, to light transmission levels through the canopy (Lieffers and Stadt 1994, Wright et al. 1999). There were several difficulties in the application of the MIXLIGHT model to this data set. As height was not measured for most of the trees within these PSPs, the values for tree height were estimated from the relationship between DBH and height from other data (Huang et al. 1994). Secondly, the prediction of crown width and length from diameter of competitors was subject to a lower level of precision (Stadt et al. 1999). In a sensitivity analysis of driving variables in MIXLIGHT, crown width and length were deemed most important to the accuracy of the model (Stadt and Lieffers 2000). These sources of error affected the precisions of the light values that were ultimately calculated. Indeed, the reason Biging and Dobbertin (1992) found significant improvements from using spatial indices may have been due to the more detailed and carefully measured information on crown dimensions available in their data set. A third reason for reduced prediction ability of MIXLIGHT relative to the competition indices is other indices had information on the competitive rank of the subject tree explicitly in their formulation in the ratio of size of subject tree relative to that of competitor tree or implicitly by including only trees as competitors that were taller than the subject tree. Thus, larger focus trees are deemed to have superior competitive ability (as estimated by growth) than smaller trees. While this may fit with the theory of one sided competition (Weiner and Thomas 1986), these indices do not isolate competitive relations from the many other factors that may affect growth of trees, e.g. micosite or genetic differences. For these reasons, we still believe that the light index should be considered an effective part of growth prediction models, particularly those relying on modeling processes.

Overall, in these analyses, the prediction of growth of subject trees was somewhat less precise than previous studies (Lorimer 1983; Tomé and Burkhart 1989; Martin and Ek 1984). There are several possible contributing factors for these apparently relatively weak correlation coefficients. In other studies growth was predicted in single species stands instead of mixed species stands. Interactions among competitors in mixed species systems is more complex than single species stands (Connell 1990). Applying these indices to several competitor species, and across multiple ecosites provides a rigorous test of the overall utility of the indices for predicting the outcome of competition, but is likely to result in lower overall precision of estimates because of failure to estimate interactions among competitors. Secondly, most of the previous studies have used log-transformed growth of focus trees. Using log growth as a dependent variable in our study also resulted in higher R^2 values than if growth were the dependent variable. With growth as the dependent variable in our analyses, there was closer adherence to the assumption of normal and heteroscedastic residuals for least-squares regression, but lower R^2 values.

The apparent higher accuracy of the white spruce growth response compared to the other species (Figure 1) is largely due to the greater size range of surviving white spruce. As a species tolerant to medium shade, white spruce will persist under competitive conditions which would kill the other, intolerant, species. The decrease in the range of growth response for the intolerant species was probably exacerbated by long intervals between measurement periods. As intolerant species are more likely to succumb to periods of slow growth than tolerant species(Messier et al 1999), , the slow growing tree from the intolerant population would more likely be eliminated before the next measurement time. Additionally, the surviving intolerant species tended to be found in the mid to upper canopy where the light resource was less spatially variable. This may be why a non-spatial index which indicates the overall site occupancy, such as basal area, is more effective than spatial indices for these species.

In terms of the ability to alter the growth of focus trees, white spruce was, not surprisingly, the most competitive species. White spruce have relatively narrow but long crowns which carry dense leaf and wood area, while aspen, poplar and lodgepole pine crowns have less depth and much lower leaf and wood area density (Canham et al. 1999, Stadt and Lieffers 2000). Constabel (1991) noted that individual white spruce crowns transmit 2-10 times less light than aspen of similar DBH. Thus, the abundance and size of the spruce crowns in the canopy, as viewed from the focus tree, greatly influences the light resource, and likely the thermal regime as well (Groot and Carlson 1996). The intolerant species (aspen, poplar, and lodgepole pine) were neutral, slightly negative or occasionally positive in terms of their effect on the growth of conspecific trees or trees of other species (Table 2). This “mixed bag” of responses can be partially attributed to cross-correlation among the species-specific competition indices in the data from these natural forests. Spruce tends to replace other species when it occurs in the canopy, so when spruce are abundant other species are scarce, light resources are low, and growth is poor. When there are few spruce, other species are abundant, light resources are higher, and growth is better. A similar pattern was observed in a previous study (Lieffers and Stadt 1994). Surprisingly, when balsam poplar was a neighbouring species for focal white spruce there were neutral or positive relationships with spruce growth in most of the ecosites examined (Table 2). While it is unlikely that the balsam poplar are actually causing an apparent increase in tree growth, the apparent lack of competition may be related to several factors. 1) Balsam poplar has the lowest leaf area density of any boreal forest species (Stadt and Lieffers 2000). Its presence in a position may prevent a more serious competitor from occupying it. 2) There may be facilitation interactions between balsam poplar and white spruce, such as Simard et al. (1997) noted for the mycorrhizal connection between white birch and Douglas-fir. 3) The leaf litter of balsam poplar may stimulate nutrient cycling which may benefit the spruce (Kelty and Cameron 1995).

The relationships generated in these analyses could be added to the SORTIE model (Canham et al. 1994; Canham et al. 1999) to predict growth in mixedwood stands using spatial knowledge of the species, and size of individual neighbours. The non-spatial models could also be applied to the Mixedwood Growth and yield Model (MGM) (Titus 2002) to predict growth of individual subject trees. As there is usually a linkage between growth of a tree and its mortality (Kobe and Coates 1997), these competitive relations will also be linked to prediction of mortality.

References

Alberta Land and Forest Services. 2000**.** Land and Forest Services Permanent Sample Plot Field Procedures Manual. Forest Management Division, Resource Analysis Center.

Alemdag, I.S. 1978. Evaluation of some competition indices for the prediction of diameter increment in planted white spruce. Can For Serv. Forest Manage Inst, Inf Rep FMR-X-108. 39 p.

Bartelink, H.H. 2000. Effects of stand composition and thinning in mixed-species forests: a modeling approach applied to Douglas-fir and beech. Tree Physiology 20: 399-406.

Beckingham, J.D. and J.H. Archibald. 1996. Field guide to ecosites of northern Alberta. Canadian Forest Service, Northwest Region, Northern Forestry Centre, Edmonton, Alberta.

Beckingham, J.D., I.G.W. Corns, and J.H. Archibald. 1996. Field guide to ecosites of west-central Alberta. Canadian Forest Service, Northwest Region, Northern Forestry Centre, Edmonton, Alberta.

Biging, G.S., M. Dobbertin.1992. A comparison of distance-dependent competition measures for height and basal area growth of individual conifer trees. Forest Sci. 38(4): 695-720.

Burton, P.J. 1993. Some limitations inherent to static indices of plant competition. Can. J. For. Res. 23: 2141-2151.

Canham, C.D., Finzi, A.C., Pacala, S.W. and Burbank, D.H., 1994. Causes and consequences of resource heterogeneity in forests: interspecific variation in light transmission by canopy trees. Can. J. For. Res. 24, 337-349.

Canham, C.D., K.D. Coates, P. Bartemucci and S. Quaglia. 1999. Measurement and modeling of spatially explicit variation in light transmission through interior cedar-hemlock forests of British Columbia. Canadian Journal of Forest Research 29: 1775-1783.

Connell, J.H., Apparent versus "Real" Competition in Plants. P. 9-26. in Perspectives on Plant Competition. Grace, J.B. and D. Tilman (eds.). Academic Press, San Diego CA.

Constabel. A.C., 1995. Light Transmission Through Boreal Mixedwood Stands. MSc Thesis, University of Alberta.

Cornell, J.A., and R.D. Berger. 1987. Factors that influence the value of the coefficient of determination in simple linear and nonlinear regression models. Phytopathology 77: 63-70.

Groot, A. and D.W. Carlson. 1996. Influence of shelter on night temperatures, frost damage and bud break of white spruce seedlings. Can. J. For. Res. 26: 1531-1538

Hegyi, F. 1974. A simulation model for managing jack pine stands. P. 74-90 in Growth models for tree and stand simulation, Fries, J. (ed.). Royal Coll. Of For., Stockholm, Sweden.

Holmes, M.J. and D.D. Reed. 1991. Competition indices for mixed species northern hardwoods. Forest Sci. November 1991:1338-1349.

Huang, S., S.J. Titus, T.W. Lakusta, R.J. Held. 1994. Ecologically-based individual tree height-diameter models for major Alberta tree species. Alberta Environmental Protection Land and Forest Services Forest Management Division, Edmonton, Alberta, 27pp.

Klinka, K., Q. Wang, G.J. Kayahara and R.E. Carter. 1992. Light-growth response relationships in Pacific silver fir (*Abies amabilis*) and subalpine fir (*Abies lasiocarpa*). Canadian Journal of Botany 70: 1919-1930.

Kimmins, J.P., C. Caza, C. Messier, J. Karakatsoulis, K.A. Scoullar, M.J. Apps. 1990. FORCYTE and FORECAST: ecosystem-level management models with which to examine the yield, economic, energy and wildlife implication of vegetation management as a component of rotation-length silvicultural systems. FRDA Report, Canadian Forestry Service 109: 107-108.

Kelty, M. and Cameron, I.R. 1995. Plot designs for the analysis of species interactions in mixed stands. Commonwealth Forestry Review 74:322-332.

Kobe, R.K. and K.D. Coates. 1997. Models of sapling mortality as a function of growth to characterize interspecific variation in shade tolerance of eight trees species of northwestern British Columbia. Can. J. For. Res. 27: 2227-236.

Lieffers, V.J., R.B. Macmillan, D. MacPherson, K. Branter and J.D. Stewart. 1996. Semi-natural and intensive silvicultural systems for the boreal mixedwood forest. For. Chron. 72: 286-292.

Lieffers, V.J. and Stadt, K.J., 1994. Growth of understory *Picea glauca*, *Calamagrostis canadensis*, and *Epilobium angustifolium* in relation to overstory light transmission. Can. J. For. Res. 24, 1193-1198.

Lorimer, C.G. 1983. Tests of age-independent competition indices for individual trees in natural hardwood stands. Forest Ecology and Management, 6: 343-360.

Martin G.L. and A. Ek. 1984. A comparison of competition measures and growth models for predicting plantation red pine diameter and height growth. Forest Sci.30(3):731-743.

Messier, C., R. Doucet, J-C. Ruel, Y. Claveau, C. Kelly, and M.J. Lechowicz. 1999. Functional ecology of advance regeration in relation to light in boreal forests. Candian Journal of Forest Research 29: 812-823.

Pacala, S.W., C.D. Canham and J.A. Silander. 1993. Forest models defined by field measurements: I. The design of a northeastern forest simulator. Can. J. For. Res. 23: 1980-1988.

Pinno, B.D., V.J. Lieffers and K.J.Stadt. 2001. Measuring and modeling the crown and light transmission characteristics of juvenile aspen. Can. J. For. Res. 31:1930-1939.

Robinson, A. P. and Ek, A.R. 2000. The consequences of hierarchy for modeling in forest ecosystems. Can. J. For. Res. 30: 1837-1846.

SAS version 8.1. SAS Institute, Cary, N.C.

Simard, S.W. Perry, D.A. , Jones, M.D., Myrold, D.D., Durall, D.M. and Molina,R. 1997. Net transfer of carbon between trees species with shared ectomycorrhizal fungi. Nature 388: 579-582.

Stadt, K.J., V.J. Lieffers, J. Stewart. 1999. Crown characteristics of boreal conifers and application of the light model MIXLIGHT. Report submitted to Manning Diversified Trust Fund. 28pp.

Stadt, K.J. and V.J. Lieffers. 2000. MIXLIGHT: A flexible light transmission model for mixed-species forest stands. Agricultural and Forest Meteorology 102:235-252.

Titus, S.W. 2002. Description of Mixedwood Management Growth Model. http://www.rr.ualberta.ca/research/mgm/The%20Model/Description.htm

Tomé, M., H.E. Burkhart. 1989. Distance-dependent competition measures for predicting growth of individual trees. Forest Sci. 35(3):816-831.

Weiner, J. and Thomas S.C. 1986. Size variation in plant monocultures. Oikos 47:211-222.

Wright. E.F., K.D. Coates, C.D. Canham, and P. Bartemucci. 1998. Species variability in growth response to light across a climatic in northwestern British Columbia. Can. J. For. Res. 28: 871-886.

Zar, J. 1999. Biostatistical Analysis, 4th ed. Upper Saddle River, N.J.: Prentice Hall.

Table 1. Non-spatial and spatial competition indices used in this study.

Type	Index	Abbreviation	Formula[1, 2]
Non-spatial	Sum of competitor diameters	SDBH	$\sum_{j=1}^{n_i} DBH_{ij}$
	Basal area of competitors	BAHA	$\dfrac{\sum_{j=1}^{n_i}\left[\left(DBH_{ij}/200\right)^2\right]}{plot\ area}$
	Competitor to focus tree diameter	CFDBH	$\dfrac{\sum_{j=1}^{n_i} DBH_{ij}}{DBH_k}$
	Competitor to focus tree basal area[3]	CFBA	$\dfrac{\sum_{j=1}^{n_i} DBH_j^2}{DBH_k^2}$
	Average to focus tree diameter	AFDBH	$\dfrac{\frac{1}{n_i}\sum_{j=1}^{n_i} DBH_{ij}}{DBH_k}$
	Average to focus tree basal area[3]	AFBA	$\dfrac{\frac{1}{n_i}\sum_{j=1}^{n_i} DBH_{ij}^2}{DBH_k^2}$
Spatial	Sum of competitor distances[4]	SDIS	$\sum_{j=1}^{n_i} D_{ij}$
	Sum of inverse competitor distances[4]	SIDIS	$\sum_{j=1}^{n_i} \dfrac{1}{D_{ij}}$
	Heygi (1974)[4]	Heygi	$\sum_{j=1}^{n_i} \dfrac{DBH_{ij}}{DBH_k\left(D_{ij}+1\right)}$
	Martin-Ek (1984)[4]	MaEk	$\sum_{j=1}^{n_i}\left(\dfrac{DBH_{ij}}{DBH_k}\exp\left[\dfrac{16\times D_{ij}}{DBH_{ij}+DBH_k}\right]\right)$
	Alemdag (1978)[4]	Alem	$\sum_{j=1}^{n_i}\left(\pi\left[\dfrac{DBH_k\times D_{ij}}{DBH_k+DBH_{ij}}\right]^2\left[\dfrac{DBH_{ij}/D_{ij}}{\sum_{j=1}^{n_i} DBH_{ij}/D_{ij}}\right]\right)$
	MIXLIGHT (seasonal light transmission to tree apex)	MIXL	See text

[1]DBH is stem diameter at 1.3 m with units in cm, n_i is the number of trees of species i in the plot or subplot, j is the competitor tree, and k is the focus tree
[2]Focus tree not included as a competitor in calculations
[3]For these size ratios, basal area and DBH^2 give the same result
[4]Calculated using 8 m radius plot, centred on focus tree

Table 2. Density and basal area range by species and ecosite for subplots in the Alberta Forest Service PSP data set.

		Density (stems/ha)		Basal area (m^2/ha)	
Ecosite	Species	Min	Max	Min	Max
BMd	Aspen	10.0	2530.0	0.5	38.6
	Balsam poplar	9.9	1142.3	0.0	23.8
	White spruce	4.9	7234.6	0.0	44.4
BMe	Aspen	19.9	1720.0	1.2	15.7
	Balsam poplar	44.5	710.0	2.3	26.0
	White spruce	169.3	1270.0	2.5	37.0
LFe	Aspen	9.9	1775.8	0.4	39.5
	Balsam poplar	9.5	1248.5	0.1	18.9
	Lodgepole pine	9.9	2272.7	0.4	41.5
	White spruce	4.9	3424.0	0.0	58.1
LFf	Aspen	4.9	790.9	0.0	27.0
	Balsam poplar	4.9	1532.4	0.0	10.7
	Lodgepole pine	4.9	4246.9	0.5	40.7
	White spruce	4.9	1557.5	0.0	46.3

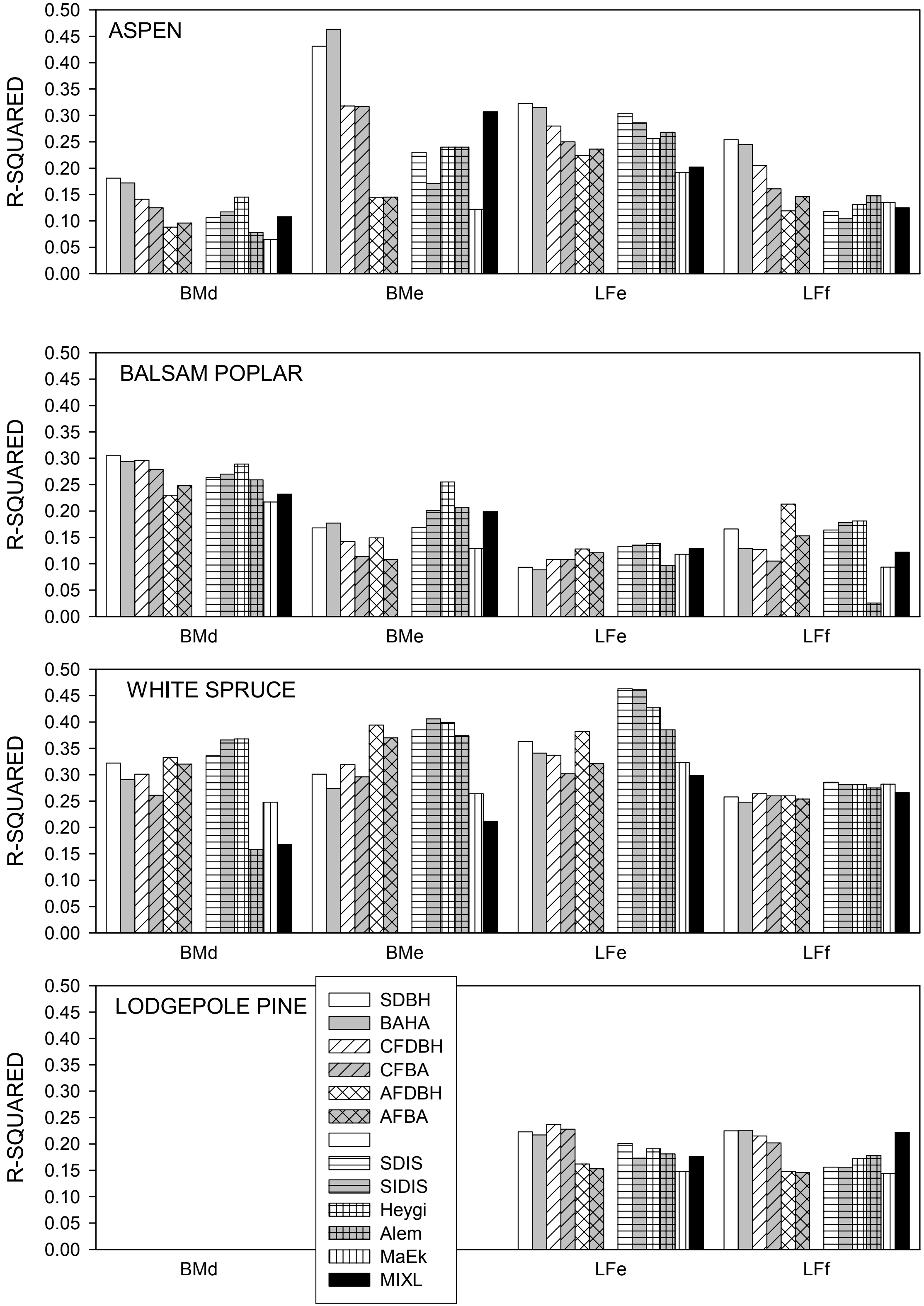
Table 3. Annual diameter growth data by species and ecosite for the Alberta Forest Service PSP data used in this study.

Ecosite	**Species**	**Number of focus trees**	**Min**	**Max**	**Mean**	**Standard deviation**
BMd	Aspen	1090	-0.18	0.80	0.18	0.12
	Balsam poplar	217	-0.18	0.80	0.19	0.15
	White spruce	667	-0.17	0.79	0.17	0.13
BMe	Aspen	101	-0.12	0.80	0.26	0.16
	Balsam poplar	107	-0.08	0.75	0.20	0.13
	White spruce	117	-0.18	0.78	0.16	0.15
LFe	Aspen	679	-0.18	0.70	0.15	0.12
	Balsam poplar	245	-0.13	0.78	0.19	0.13
	Lodgepole pine	641	-0.18	0.69	0.12	0.10
	White spruce	428	-0.20	0.80	0.18	0.15
LFf	Aspen	264	-0.17	0.74	0.20	0.14
	Balsam poplar	222	-0.16	0.76	0.23	0.15
	Lodgepole pine	2000	-0.20	0.69	0.13	0.09
	White spruce	387	-0.20	0.80	0.17	0.15

Table 2. Regression coefficients and statistics for one nonspatial (basal area) and one spatial (Heygi's) competition index. Dependent value is annual diameter increment.

Ecosite	Focal Species	Competition Index	Intercept[1]	DBH[1]	Aspen[1]	Balsam poplar[1]	White spruce[1]	Lodgepole pine[1]	R^2	RMSE	Regression *F* statistic
BMd	Aspen	BASA	0.20955	+0.00262	-0.00521	-0.00036 ns	-0.00560	-	0.17	0.108	56.1
	Aspen	Heygi	0.24155	+0.00108 ns	-0.00877	-0.01290	-0.02730	-	0.15	0.109	49.2
	Balsam poplar	BASA	0.20050	+0.00499	-0.00756	-0.00318 ns	-0.00746	-	0.29	0.117	22.1
	Balsam poplar	Heygi	0.16294	+0.00441	-0.01180	-0.00957	-0.04020	-	0.29	0.116	22.7
	White spruce	BASA	0.17587	+0.00333	+0.00309	+0.00886	-0.00551	-	0.29	0.103	68.0
	White spruce	Heygi	0.19969	+0.00239	+0.01300	+0.00960 ns	-0.01990	-	0.37	0.097	98.4
BMe	Aspen	BASA	0.41512	-0.00240	-0.01370	-0.01010	-0.00383	-	0.46	0.098	20.7
	Aspen	Heygi	0.40165	-0.00338 ns	-0.01240	-0.02210	-0.02690	-	0.24	0.117	7.7
	Balsam poplar	BASA	0.21069	+0.00241 ns	-0.00170 ns	-0.00128 ns	-0.00610	-	0.18	0.116	5.5
	Balsam poplar	Heygi	0.30778	-0.00002 ns	-0.01230 ns	-0.02630	-0.02800	-	0.26	0.110	8.7
	White spruce	BASA	0.03470 ns	+0.00500	+0.01070	+0.00071 ns	-0.00065 ns	-	0.27	0.103	10.6
	White spruce	Heygi	0.22220	+0.00115 ns	+0.00497 ns	-0.00499 ns	-0.02400	-	0.40	0.095	18.9
LFe	Aspen	BASA	0.14881	+0.00440	-0.00283	-0.00972	-0.00673	-0.00370	0.32	0.084	62.0
	Aspen	Heygi	0.05680	+0.00580	-0.00135 ns	+0.07680	-0.01310	-0.00380 ns	0.26	0.088	46.4
	Balsam poplar	BASA	0.11728	+0.00504	+0.00021 ns	+0.00052 ns	-0.00519 ns	-0.00098 ns	0.09	0.103	4.6
	Balsam poplar	Heygi	0.17217	+0.00337	-0.01560	-0.00370 ns	-0.02840 ns	-0.00937 ns	0.14	0.100	7.6
	Lodgepole pine	BASA	0.19112	+0.00149 ns	-0.00425	-0.00394	-0.00931	-0.00329	0.22	0.087	35.2
	Lodgepole pine	Heygi	0.13089	+0.00332	-0.01740	-0.01500	-0.06740	-0.00635	0.19	0.088	30.2
	White spruce	BASA	0.19659	+0.00400	-0.00250	+0.00559 ns	-0.00499	-0.00083 ns	0.34	0.115	44.3
	White spruce	Heygi	0.21639	+0.00313	-0.00986	+0.02450	-0.02010	-0.00439 ns	0.43	0.110	62.9
LFf	Aspen	BASA	0.26586	+0.00233	-0.00579	-0.00534 ns	-0.01010	-0.00265 ns	0.25	0.119	17.6
	Aspen	Heygi	0.19572	+0.00346	-0.00492 ns	-0.00901 ns	-0.04610	-0.00557 ns	0.13	0.128	7.8
	Balsam poplar	BASA	0.37396	-0.00025 ns	-0.00672	-0.00491	-0.00823	-0.00504	0.13	0.133	6.4
	Balsam poplar	Heygi	0.33580	+0.00010 ns	-0.03510	-0.01100	-0.05590	-0.04600	0.18	0.129	9.6
	Lodgepole pine	BASA	0.16269	+0.00257	+0.00036 ns	-0.00393 ns	-0.00642	-0.00361	0.23	0.082	116.0
	Lodgepole pine	Heygi	0.10100	+0.00415	-0.01950	-0.08040	-0.02320	-0.00584	0.17	0.084	82.6
	White spruce	BASA	0.12700	+0.00433	-0.00304	+0.00118 ns	-0.00275	-0.00007 ns	0.25	0.107	25.1
	White spruce	Heygi	0.10700	+0.00475	-0.01720	+0.00091 ns	-0.00849	+0.00212 ns	0.28	0.105	29.9

ns denotes not significant (P>0.05) under the null hypothesis that this coefficient equals zero.


ASPEN
BALSAM POPLAR
WHITE SPRUCE
LODGEPOLE PINE
R-SQUARED
0.00
0.05
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0.40
0.45
0.50
BMd
BMe
LFe
LFf
SDBH
BAHA
CFDBH
CFBA
AFDBH
AFBA
SDIS
SIDIS
Heygi
Alem
MaEk
MIXL

Figure 1 Correlation coefficient of multiple regression models (see Eq 1.) for four different focal species surrounded by mixtures of competitor species. The caption code shows the six non spatial and six spatial competition indices tested (see Table 1), in the various versions of Eq. 1.

Appendix 1. List of regression coefficients and statistics by focus species and ecosite for all models tested.

ECOSITE	SPECIES	*DATUM*	*CI*	Intercept	DBH	ASPEN	POPLAR	SPRUCE	PINE	Light	R^2	RMSE	F-Value
BMd	ASPEN	**COEFF**	**DIAM**	0.2628	1.00E-04	-2.11E-04	-1.68E-04	-3.42E-04	-	-	0.18	0.107	59.80
BMd	ASPEN	SE	**DIAM**	1.44E-02	5.90E-04	1.88E-05	7.07E-05	3.83E-05	-	-			
BMd	ASPEN	SIG	**DIAM**	<0.0001	0.865	<0.0001	0.0174	<0.0001	-	-			<0.0001
BMd	ASPEN	**COEFF**	**BASA**	0.20955	0.00262	-0.00521	-0.00036	-0.00560	-	-	0.17	0.108	56.1
BMd	ASPEN	SE	**BASA**	1.18E-02	5.12E-04	4.85E-04	1.65E-03	7.13E-04	-	-			
BMd	ASPEN	SIG	**BASA**	<0.0001	<0.0001	<0.0001	0.827	<0.0001	-	-			<0.0001
BMd	ASPEN	**COEFF**	**CFDI**	0.25577	-6.58E-04	-1.97E-03	-2.01E-03	-3.32E-03	-	-	0.14	0.110	44.30
BMd	ASPEN	SE	**CFDI**	1.53E-02	6.59E-04	2.08E-04	8.41E-04	5.35E-04	-	-			
BMd	ASPEN	SIG	**CFDI**	<0.0001	3.18E-01	<0.0001	1.72E-02	<0.0001	-	-			<0.0001
BMd	ASPEN	**COEFF**	**CFBA**	0.23508	-1.17E-04	-1.28E-03	-5.48E-04	-7.39E-04	-	-	0.13	0.111	38.40
BMd	ASPEN	SE	**CFBA**	1.45E-02	6.43E-04	1.38E-04	4.83E-04	2.31E-04	-	-			
BMd	ASPEN	SIG	**CFBA**	<0.0001	8.56E-01	<0.0001	2.57E-01	1.40E-03	-	-			<0.0001
BMd	ASPEN	**COEFF**	**AFDI**	0.15151	3.31E-03	-1.57E-06	-1.18E-05	-1.99E-05	-	-	0.09	0.113	26.10
BMd	ASPEN	SE	**AFDI**	1.49E-02	6.32E-04	9.69E-07	8.51E-06	2.97E-06	-	-			
BMd	ASPEN	SIG	**AFDI**	<0.0001	<0.0001	1.04E-01	1.65E-01	<0.0001	-	-			<0.0001
BMd	ASPEN	**COEFF**	**AFBA**	0.19163	1.74E-03	-1.22E-05	-3.40E-05	-5.42E-05	-	-	0.10	0.113	28.70
BMd	ASPEN	SE	**AFBA**	1.52E-02	6.54E-04	2.54E-06	2.01E-05	7.74E-06	-	-			
BMd	ASPEN	SIG	**AFBA**	<0.0001	8.00E-03	<0.0001	9.06E-02	<0.0001	-	-			<0.0001
BMd	ASPEN	**COEFF**	**DIST**	1.16E-01	4.85E-03	7.80E-05	-2.25E-04	-8.11E-04	-	-	1.06E-01	1.12E-01	3.44E+01
BMd	ASPEN	SE	**DIST**	1.60E-02	5.84E-04	6.74E-05	2.00E-04	1.14E-04	-	-			
BMd	ASPEN	SIG	**DIST**	<0.0001	<0.0001	0.2472	0.2603	<0.0001	-	-			<0.0001
BMd	ASPEN	**COEFF**	**INDS**	0.14602	4.20E-03	-1.66E-03	-7.83E-03	-2.25E-02	-	-	1.17E-01	1.11E-01	3.85E+01
BMd	ASPEN	SE	**INDS**	1.49E-02	5.62E-04	1.26E-03	4.00E-03	2.51E-03	-	-			
BMd	ASPEN	SIG	**INDS**	<0.0001	<0.0001	1.88E-01	5.06E-02	<0.0001	-	-			<0.0001
BMd	ASPEN	**COEFF**	**Heygi**	0.24155	0.00108	-0.00877	-0.01290	-0.02730	-	-	0.15	0.109	49.2
BMd	ASPEN	SE	**Heygi**	1.70E-02	6.29E-04	1.25E-03	3.51E-03	2.53E-03	-	-			
BMd	ASPEN	SIG	**Heygi**	<0.0001	0.086	<0.0001	0.000	<0.0001	-	-			<0.0001
BMd	ASPEN	**COEFF**	**Ma-Ek**	1.35E-01	3.55E-03	2.46E-06	-4.24E-05	-3.29E-05	-	-	6.49E-02	1.14E-01	2.01E+01
BMd	ASPEN	SE	**Ma-Ek**	1.40E-02	6.53E-04	2.65E-06	1.21E-05	1.38E-05	-	-			
BMd	ASPEN	SIG	**Ma-Ek**	<0.0001	<0.0001	3.55E-01	5.00E-04	1.72E-02	-	-			<0.0001
BMd	ASPEN	**COEFF**	**Alemdag**	9.79E-02	3.31E-03	2.32E-03	3.08E-04	-5.89E-04	-	-	7.80E-03	1.14E-01	2.44E+01
BMd	ASPEN	SE	**Alemdag**	1.03E-02	5.24E-04	4.54E-04	2.04E-04	2.44E-04	-	-			
BMd	ASPEN	SIG	**Alemdag**	<0.0001	<0.0001	<0.0001	1.32E-01	1.58E-02	-	-			<0.0001
BMd	ASPEN	**COEFF**	**Mixlight**	-1.28E-03	2.32E-03	-	-	-	-	1.72E-03	0.1079	0.1116	7.02E+01
BMd	ASPEN	SE	**Mixlight**	1.69E-02	5.22E-04	-	-	-	-	2.01E-04			
BMd	ASPEN	SIG	**Mixlight**	9.40E-01	<0.0001	-	-	-	-	<0.0001			<0.0001
BMd	BALSAM POPLAR	**COEFF**	**DIAM**	0.23994	2.65E-03	-2.59E-04	-2.02E-04	-4.17E-04	-	-	3.05E-01	1.16E-01	2.33E+01
BMd	BALSAM POPLAR	SE	**DIAM**	4.57E-02	1.58E-03	5.28E-05	7.36E-05	9.05E-05	-	-			
BMd	BALSAM POPLAR	SIG	**DIAM**	<0.0001	0.094	<0.0001	0.0067	<0.0001	-	-			<0.0001
BMd	BALSAM POPLAR	**COEFF**	**BASA**	0.20050	0.00499	-0.00756	-0.00318	-0.00746	-	-	0.29	0.117	22.1
BMd	BALSAM POPLAR	SE	**BASA**	4.45E-02	1.37E-03	1.72E-03	1.62E-03	1.63E-03	-	-			
BMd	BALSAM POPLAR	SIG	**BASA**	<0.0001	0.000	<0.0001	0.051	<0.0001	-	-			<0.0001
BMd	BALSAM POPLAR	**COEFF**	**CFDI**	0.24298	1.51E-03	-2.50E-03	-2.80E-03	-6.50E-03	-	-	2.96E-01	1.17E-01	2.22E+01

ECOSITE	SPECIES	*DATUM*	*CI*	Intercept	DBH	ASPEN	POPLAR	SPRUCE	PINE	Light	R^2	RMSE	F-Value
BMd	BALSAM POPLAR	SE	**CFDI**	4.42E-02	1.68E-03	5.63E-04	8.69E-04	1.53E-03	-	-			
BMd	BALSAM POPLAR	SIG	**CFDI**	<0.0001	3.69E-01	<0.0001	1.40E-03	<0.0001	-	-			<0.0001
BMd	BALSAM POPLAR	**COEFF**	**CFBA**	0.23964	1.32E-03	-1.77E-03	-1.40E-03	-2.73E-03	-	-	2.79E-01	1.18E-01	2.05E+01
BMd	BALSAM POPLAR	SE	**CFBA**	4.57E-02	1.77E-03	4.19E-04	4.53E-04	7.55E-04	-	-			
BMd	BALSAM POPLAR	SIG	**CFBA**	<0.0001	4.56E-01	<0.0001	2.30E-03	4.00E-04	-	-			<0.0001
BMd	BALSAM POPLAR	**COEFF**	**AFDI**	0.13088	5.50E-03	-8.62E-06	-2.22E-05	-3.61E-05	-	-	2.30E-01	1.22E-01	1.59E+01
BMd	BALSAM POPLAR	SE	**AFDI**	3.90E-02	1.48E-03	3.53E-06	1.17E-05	1.10E-05	-	-			
BMd	BALSAM POPLAR	SIG	**AFDI**	0.0009	3.00E-04	1.56E-02	5.85E-02	1.20E-03	-	-			<0.0001
BMd	BALSAM POPLAR	**COEFF**	**AFBA**	0.17062	3.87E-03	-3.08E-05	-5.81E-05	-1.05E-04	-	-	2.48E-01	1.20E-01	1.75E+01
BMd	BALSAM POPLAR	SE	**AFBA**	4.17E-02	1.62E-03	9.62E-06	2.20E-05	2.90E-05	-	-			
BMd	BALSAM POPLAR	SIG	**AFBA**	<0.0001	1.75E-02	1.60E-03	8.80E-03	4.00E-04	-	-			<0.0001
BMd	BALSAM POPLAR	**COEFF**	**DIST**	0.14005	5.80E-03	-4.82E-04	-6.80E-04	-1.60E-03	-	-	2.63E-01	1.18E-01	1.99E+01
BMd	BALSAM POPLAR	SE	**DIST**	3.28E-02	1.26E-03	1.75E-04	2.69E-04	4.17E-04	-	-			
BMd	BALSAM POPLAR	SIG	**DIST**	<0.0001	<0.0001	6.30E-03	1.22E-02	2.00E-04	-	-			<0.0001
BMd	BALSAM POPLAR	**COEFF**	**INDS**	0.12356	6.13E-03	-9.30E-03	-7.76E-03	-4.16E-02	-	-	2.70E-01	1.17E-01	2.06E+01
BMd	BALSAM POPLAR	SE	**INDS**	3.12E-02	1.25E-03	3.98E-03	3.01E-03	9.42E-03	-	-			
BMd	BALSAM POPLAR	SIG	**INDS**	0.0001	<0.0001	2.02E-02	1.06E-02	<0.0001	-	-			<0.0001
BMd	BALSAM POPLAR	**COEFF**	**Heygi**	0.16294	0.00441	-0.01180	-0.00957	-0.04020	-	-	0.29	0.116	22.7
BMd	BALSAM POPLAR	SE	**Heygi**	3.44E-02	1.34E-03	3.77E-03	2.74E-03	8.97E-03	-	-			
BMd	BALSAM POPLAR	SIG	**Heygi**	<0.0001	0.001	0.002	0.001	<0.0001	-	-			<0.0001
BMd	BALSAM POPLAR	**COEFF**	**Ma-Ek**	1.03E-01	5.70E-03	-1.02E-05	-5.15E-05	-5.65E-05	-	-	2.17E-01	1.21E-01	1.54E+01
BMd	BALSAM POPLAR	SE	**Ma-Ek**	3.12E-02	1.37E-03	9.49E-06	2.82E-05	5.14E-05	-	-			
BMd	BALSAM POPLAR	SIG	**Ma-Ek**	1.10E-03	<0.0001	0.2863	0.0684	0.2728	-	-			<0.0001
BMd	BALSAM POPLAR	**COEFF**	**Alemdag**	6.57E-02	8.34E-03	-2.29E-03	7.60E-04	-1.98E-03	-	-	2.59E-01	1.18E-01	1.95E+01
BMd	BALSAM POPLAR	SE	**Alemdag**	2.36E-02	1.18E-03	6.95E-04	7.67E-04	6.62E-04	-	-			
BMd	BALSAM POPLAR	SIG	**Alemdag**	5.90E-03	<0.0001	1.10E-03	3.23E-01	3.10E-03	-	-			<0.0001
BMd	BALSAM POPLAR	**COEFF**	**Mixlight**	-7.13E-02	5.92E-03	-	-	-	-	1.86E-03	0.232	0.11957	33.97
BMd	BALSAM POPLAR	SE	**Mixlight**	3.58E-02	1.24E-03	-	-	-	-	4.62E-04			
BMd	BALSAM POPLAR	SIG	**Mixlight**	4.75E-02	<0.0001	-	-	-	-	<0.0001			<0.0001
BMd	WHITE SPRUCE	**COEFF**	**DIAM**	0.19473	2.33E-03	1.48E-04	1.43E-04	-2.51E-04	-	-	3.22E-01	1.00E-01	7.84E+01
BMd	WHITE SPRUCE	SE	**DIAM**	2.78E-02	8.95E-04	3.91E-05	1.33E-04	2.60E-05	-	-			
BMd	WHITE SPRUCE	SIG	**DIAM**	<0.0001	9.50E-03	2.00E-04	2.82E-01	<0.0001	-	-			<0.0001
BMd	WHITE SPRUCE	**COEFF**	**BASA**	0.17587	0.00333	0.00309	0.00886	-0.00551	-	-	0.29	0.103	68.0
BMd	WHITE SPRUCE	SE	**BASA**	2.49E-02	7.72E-04	8.73E-04	3.57E-03	6.05E-04	-	-			
BMd	WHITE SPRUCE	SIG	**BASA**	<0.0001	<0.0001	0.000	0.013	<0.0001	-	-			<0.0001
BMd	WHITE SPRUCE	**COEFF**	**CFDI**	0.1452	3.38E-03	2.52E-03	8.48E-04	-2.40E-03	-	-	3.01E-01	1.02E-01	7.13E+01
BMd	WHITE SPRUCE	SE	**CFDI**	2.47E-02	8.90E-04	4.59E-04	1.67E-03	2.68E-04	-	-			
BMd	WHITE SPRUCE	SIG	**CFDI**	<0.0001	2.00E-04	<0.0001	6.11E-01	<0.0001	-	-			<0.0001
BMd	WHITE SPRUCE	**COEFF**	**CFBA**	0.12976	3.79E-03	1.27E-03	1.91E-03	-1.17E-03	-	-	2.61E-01	1.05E-01	5.84E+01
BMd	WHITE SPRUCE	SE	**CFBA**	2.20E-02	8.35E-04	2.51E-04	1.13E-03	1.39E-04	-	-			
BMd	WHITE SPRUCE	SIG	**CFBA**	<0.0001	<0.0001	<0.0001	9.04E-02	<0.0001	-	-			<0.0001
BMd	WHITE SPRUCE	**COEFF**	**AFDI**	0.13789	4.05E-03	2.50E-05	6.99E-06	-1.51E-05	-	-	3.33E-01	9.96E-02	8.24E+01
BMd	WHITE SPRUCE	SE	**AFDI**	1.65E-02	6.23E-04	3.80E-06	4.93E-05	1.58E-06	-	-			

ECOSITE	SPECIES	*DATUM*	*CI*	Intercept	DBH	ASPEN	POPLAR	SPRUCE	PINE	Light	R^2	RMSE	F-Value
BMd	WHITE SPRUCE	SIG	**AFDI**	<0.0001	<0.0001	<0.0001	0.8872	<0.0001	-	-			<0.0001
BMd	WHITE SPRUCE	**COEFF**	**AFBA**	0.13183	3.94E-03	7.27E-05	-6.26E-05	-3.13E-05	-	-	3.20E-01	1.01E-01	7.78E+01
BMd	WHITE SPRUCE	SE	**AFBA**	1.82E-02	6.99E-04	1.10E-05	1.21E-04	3.60E-06	-	-			
BMd	WHITE SPRUCE	SIG	**AFBA**	<0.0001	<0.0001	<0.0001	6.04E-01	<0.0001	-	-			<0.0001
BMd	WHITE SPRUCE	**COEFF**	**DIST**	0.12813	4.97E-03	9.84E-04	2.58E-04	-7.94E-04	-	-	3.36E-01	9.97E-02	8.57E+01
BMd	WHITE SPRUCE	SE	DIST	1.70E-02	5.62E-04	1.47E-04	4.80E-04	7.80E-05	-	-			
BMd	WHITE SPRUCE	SIG	DIST	<0.0001	<0.0001	<0.0001	5.91E-01	<0.0001	-	-			<0.0001
BMd	WHITE SPRUCE	**COEFF**	**INDS**	0.14685	4.43E-03	2.21E-02	9.54E-03	-1.99E-02	-	-	3.66E-01	9.74E-02	9.78E+01
BMd	WHITE SPRUCE	SE	INDS	1.71E-02	5.69E-04	3.07E-03	1.01E-02	1.73E-03	-	-			
BMd	WHITE SPRUCE	SIG	INDS	<0.0001	<0.0001	<0.0001	3.45E-01	<0.0001	-	-			<0.0001
BMd	WHITE SPRUCE	**COEFF**	**Heygi**	0.19969	0.00239	0.01300	0.00960	-0.01990	-	-	0.37	0.097	98.4
BMd	WHITE SPRUCE	SE	Heygi	2.12E-02	7.15E-04	2.44E-03	8.95E-03	1.65E-03	-	-			
BMd	WHITE SPRUCE	SIG	Heygi	<0.0001	0.001	<0.0001	0.284	<0.0001	-	-			<0.0001
BMd	WHITE SPRUCE	**COEFF**	**Ma-Ek**	0.08709	5.35E-03	5.80E-05	5.34E-05	-3.72E-05	-	-	2.48E-01	1.06E-01	5.57E+01
BMd	WHITE SPRUCE	SE	**Ma-Ek**	1.55E-02	6.49E-04	8.34E-06	3.58E-05	6.50E-06	-	-			
BMd	WHITE SPRUCE	SIG	**Ma-Ek**	<0.0001	<0.0001	<0.0001	1.36E-01	<0.0001	-	-			<0.0001
BMd	WHITE SPRUCE	**COEFF**	**Alemdag**	5.95E-02	4.42E-03	1.85E-04	-2.42E-04	1.97E-03	-	-	1.58E-01	1.12E-01	3.17E+01
BMd	WHITE SPRUCE	SE	**Alemdag**	1.22E-02	7.24E-04	2.92E-04	4.52E-04	5.38E-04	-	-			
BMd	WHITE SPRUCE	SIG	**Alemdag**	<0.0001	<0.0001	0.527	0.5928	0.0003	-	-			<0.0001
BMd	WHITE SPRUCE	**COEFF**	**Mixlight**	5.56E-02	3.42E-03	-	-	-	-	8.98E-04	0.1681	0.11146	68.62
BMd	WHITE SPRUCE	SE	**Mixlight**	1.21E-02	7.70E-04	-	-	-	-	1.89E-04			
BMd	WHITE SPRUCE	SIG	**Mixlight**	<0.0001	<0.0001	-	-	-	-	<0.0001			<0.0001
BMe	ASPEN	**COEFF**	**DIAM**	0.48351	-5.88E-03	-4.38E-04	-6.78E-04	-2.50E-04	-	-	4.31E-01	1.01E-01	1.82E+01
BMe	ASPEN	SE	**DIAM**	4.09E-02	1.44E-03	7.09E-05	2.38E-04	5.64E-05	-	-			
BMe	ASPEN	SIG	**DIAM**	<0.0001	<0.0001	<0.0001	5.30E-03	<0.0001	-	-			<0.0001
BMe	ASPEN	**COEFF**	**BASA**	0.41512	-0.00240	-0.01370	-1.01000	-0.00383	-	-	0.46	0.981	20.7
BMe	ASPEN	SE	**BASA**	3.13E-02	1.16E-03	2.03E-03	4.85E-03	1.15E-03	-	-			
BMe	ASPEN	SIG	**BASA**	<0.0001	0.041	<0.0001	0.041	0.001	-	-			<0.0001
BMe	ASPEN	**COEFF**	**CFDI**	0.42954	-5.21E-03	-3.64E-03	-4.91E-03	-3.22E-03	-	-	3.18E-01	1.11E-01	1.12E+01
BMe	ASPEN	SE	**CFDI**	4.31E-02	1.62E-03	7.79E-04	3.05E-03	7.82E-04	-	-			
BMe	ASPEN	SIG	**CFDI**	<0.0001	1.80E-03	<0.0001	1.11E-01	<0.0001	-	-			<0.0001
BMe	ASPEN	**COEFF**	**CFBA**	0.40393	-4.52E-03	-2.79E-03	-1.10E-03	-1.17E-03	-	-	3.17E-01	1.11E-01	1.12E+01
BMe	ASPEN	SE	**CFBA**	3.82E-02	1.50E-03	5.72E-04	1.63E-03	4.03E-04	-	-			
BMe	ASPEN	SIG	**CFBA**	<0.0001	3.40E-03	<0.0001	5.00E-01	4.70E-03	-	-			<0.0001
BMe	ASPEN	**COEFF**	**AFDI**	0.15378	2.49E-03	7.21E-06	6.70E-05	-2.73E-05	-	-	1.45E-01	1.24E-01	4.06E+00
BMe	ASPEN	SE	**AFDI**	9.44E-02	2.60E-03	9.16E-06	5.21E-05	1.60E-05	-	-			
BMe	ASPEN	SIG	**AFDI**	0.1066	3.39E-01	4.33E-01	2.02E-01	9.15E-02	-	-			0.0044
BMe	ASPEN	**COEFF**	**AFBA**	0.38126	-3.48E-03	-4.32E-05	-1.34E-04	-8.26E-05	-	-	1.44E-01	1.24E-01	4.04E+00
BMe	ASPEN	SE	**AFBA**	6.91E-02	2.23E-03	1.95E-05	8.13E-05	2.08E-05	-	-			
BMe	ASPEN	SIG	**AFBA**	<0.0001	1.22E-01	2.94E-02	9.79E-02	1.00E-04	-	-			0.0045
BMe	ASPEN	**COEFF**	**DIST**	8.53E-02	4.06E-03	5.38E-04	2.06E-03	-1.15E-03	-	-	2.30E-01	1.18E-01	7.23E+00
BMe	ASPEN	SE	**DIST**	7.14E-02	1.95E-03	2.92E-04	9.32E-04	3.76E-04	-	-			
BMe	ASPEN	SIG	**DIST**	2.35E-01	3.96E-02	6.84E-02	2.97E-02	2.80E-03	-	-			<0.0001

ECOSITE	SPECIES	*DATUM*	*CI*	Intercept	DBH	ASPEN	POPLAR	SPRUCE	PINE	Light	R^2	RMSE	F-Value
BMe	ASPEN	**COEFF**	**INDS**	3.01E-01	-2.89E-04	-3.77E-03	-1.98E-02	-3.39E+00	-	-	1.71E-01	1.22E-01	5.00E+00
BMe	ASPEN	SE	**INDS**	5.95E-02	1.73E-03	4.94E-03	1.45E-02	7.97E-03	-	-			
BMe	ASPEN	SIG	**INDS**	<0.0001	8.68E-01	4.47E-01	1.75E-01	<0.0001	-	-			0.001
BMe	ASPEN	**COEFF**	**Heygi**	0.40165	-0.00338	-0.01240	-0.02210	-0.02690	-	-	0.24	0.117	7.7
BMe	ASPEN	SE	**Heygi**	5.38E-02	1.74E-03	4.48E-03	8.09E-03	5.29E-03	-	-			
BMe	ASPEN	SIG	**Heygi**	<0.0001	0.055	0.007	0.007	<0.0001	-	-			<0.0001
BMe	ASPEN	**COEFF**	**Ma-Ek**	0.20519	1.48E-03	-3.26E-06	5.47E-05	-1.49E-04	-	-	1.22E-01	1.26E-01	3.36E+00
BMe	ASPEN	SE	**Ma-Ek**	5.13E-02	1.95E-03	1.37E-05	3.16E-05	5.41E-05	-	-			
BMe	ASPEN	SIG	**Ma-Ek**	1.00E-04	4.49E-01	8.13E-01	8.67E-02	6.90E-03	-	-			0.0128
BMe	ASPEN	**COEFF**	**Alemdag**	0.13201	-3.50E-05	1.95E-03	3.86E-03	-4.13E-03	-	-	2.40E-01	1.17E-01	7.68E+00
BMe	ASPEN	SE	**Alemdag**	3.22E-02	1.36E-03	1.03E-03	8.51E-04	1.16E-03	-	-			
BMe	ASPEN	SIG	**Alemdag**	<0.0001	9.80E-01	0.0617	<0.0001	0.0006	-	-			<0.0001
BMe	ASPEN	**COEFF**	**Mixlight**	2.06E-02	-8.93E-04	-	-	-	-	2.66E-03	0.3068	0.11077	21.91
BMe	ASPEN	SE	**Mixlight**	3.86E-02	1.22E-03	-	-	-	-	4.04E-04			
BMe	ASPEN	SIG	**Mixlight**	0.596	0.4658	-	-	-	-	<0.0001			<0.0001
BMe	BALSAM POPLAR	**COEFF**	**DIAM**	0.22112	1.75E-03	-6.38E-05	-7.26E-05	-2.93E-04	-	-	1.68E-01	1.17E-01	5.13E+00
BMe	BALSAM POPLAR	SE	**DIAM**	6.48E-02	1.69E-03	1.05E-04	1.21E-04	8.19E-05	-	-			
BMe	BALSAM POPLAR	SIG	**DIAM**	0.0009	3.04E-01	5.46E-01	5.51E-01	5.00E-04	-	-			0.0008
BMe	BALSAM POPLAR	**COEFF**	**BASA**	0.21069	0.00241	-0.00170	-0.00128	-0.00610	-	-	0.18	0.116	5.5
BMe	BALSAM POPLAR	SE	**BASA**	4.77E-02	1.32E-03	1.82E-03	1.88E-03	1.60E-03	-	-			
BMe	BALSAM POPLAR	SIG	**BASA**	<0.0001	0.071	0.353	0.496	0.000	-	-			0.001
BMe	BALSAM POPLAR	**COEFF**	**CFDI**	2.45E-01	6.86E-04	-8.90E-04	-1.88E-03	-4.06E-03	-	-	1.42E-01	1.18E-01	4.20E+00
BMe	BALSAM POPLAR	SE	**CFDI**	7.81E-02	2.29E-03	1.43E-03	2.41E-03	1.29E-03	-	-			
BMe	BALSAM POPLAR	SIG	**CFDI**	2.30E-03	7.66E-01	5.34E-01	4.37E-01	2.20E-03	-	-			0.0034
BMe	BALSAM POPLAR	**COEFF**	**CFBA**	2.30E-01	9.44E-04	-7.45E-04	-6.19E-04	-1.69E-03	-	-	1.14E-01	1.20E-01	3.28E+00
BMe	BALSAM POPLAR	SE	**CFBA**	6.61E-02	2.08E-03	9.23E-04	1.29E-03	6.46E-04	-	-			
BMe	BALSAM POPLAR	SIG	**CFBA**	8.00E-04	6.51E-01	4.21E-01	6.31E-01	1.05E-02	-	-			0.0142
BMe	BALSAM POPLAR	**COEFF**	**AFDI**	7.27E-02	4.69E-03	1.37E-05	7.24E-05	-1.40E-05	-	-	1.49E-01	1.18E-01	4.46E+00
BMe	BALSAM POPLAR	SE	**AFDI**	6.01E-02	1.69E-03	1.03E-05	3.72E-05	1.02E-05	-	-			
BMe	BALSAM POPLAR	SIG	**AFDI**	2.29E-01	6.70E-03	1.87E-01	5.44E-02	1.73E-01	-	-			0.0023
BMe	BALSAM POPLAR	**COEFF**	**AFBA**	1.18E-01	4.01E-03	2.47E-05	7.11E-05	-3.54E-05	-	-	1.08E-01	1.21E-01	3.10E+00
BMe	BALSAM POPLAR	SE	**AFBA**	6.54E-02	1.97E-03	3.17E-05	7.92E-05	2.32E-05	-	-			
BMe	BALSAM POPLAR	SIG	**AFBA**	7.46E-02	4.42E-02	4.38E-01	3.71E-01	1.30E-01	-	-			0.0188
BMe	BALSAM POPLAR	**COEFF**	**DIST**	0.14872	3.25E-03	1.31E-04	4.29E-04	-1.23E-03	-	-	1.69E-01	1.16E-01	5.20E+00
BMe	BALSAM POPLAR	SE	**DIST**	5.37E-02	1.51E-03	3.41E-04	7.03E-04	3.54E-04	-	-			
BMe	BALSAM POPLAR	SIG	**DIST**	0.0067	3.39E-02	7.01E-01	5.43E-01	8.00E-04	-	-			0.0007
BMe	BALSAM POPLAR	**COEFF**	**INDS**	0.23076	2.24E-03	-5.74E-03	-1.85E-02	-3.02E-02	-	-	2.01E-01	1.14E-01	6.42E+00
BMe	BALSAM POPLAR	SE	**INDS**	4.22E-02	1.37E-03	7.15E-03	8.20E-03	7.90E-03	-	-			
BMe	BALSAM POPLAR	SIG	**INDS**	<0.0001	1.04E-01	4.24E-01	2.66E-02	2.00E-04	-	-			0.0001
BMe	BALSAM POPLAR	**COEFF**	**Heygi**	0.30778	-0.00002	-0.01230	-0.02630	-0.02800	-	-	0.26	0.110	8.7
BMe	BALSAM POPLAR	SE	**Heygi**	4.69E-02	1.45E-03	7.07E-03	7.01E-03	7.32E-03	-	-			
BMe	BALSAM POPLAR	SIG	**Heygi**	<0.0001	0.987	0.086	0.000	0.000	-	-			<0.0001
BMe	BALSAM POPLAR	**COEFF**	**Ma-Ek**	0.17576	2.53E-03	3.26E-05	-6.38E-05	-1.67E-04	-	-	1.29E-01	1.19E-01	3.79E+00

ECOSITE	SPECIES	*DATUM*	*CI*	Intercept	DBH	ASPEN	POPLAR	SPRUCE	PINE	Light	R^2	RMSE	F-Value
BMe	BALSAM POPLAR	SE	**Ma-Ek**	4.67E-02	1.67E-03	2.34E-05	5.27E-05	8.03E-05	-	-			
BMe	BALSAM POPLAR	SIG	**Ma-Ek**	0.0003	1.34E-01	1.66E-01	2.29E-01	4.04E-02	-	-			0.0065
BMe	BALSAM POPLAR	**COEFF**	**Alemdag**	0.12948	2.71E-03	9.16E-04	2.38E-03	-4.58E-03	-	-	2.07E-01	1.14E-01	6.66E+00
BMe	BALSAM POPLAR	SE	**Alemdag**	3.47E-02	1.27E-03	7.70E-04	8.26E-04	1.23E-03	-	-			
BMe	BALSAM POPLAR	SIG	**Alemdag**	0.0003	3.47E-02	2.37E-01	4.90E-03	3.00E-04	-	-			<0.0001
BMe	BALSAM POPLAR	**COEFF**	**Mixlight**	-4.97E-02	1.04E-03	-	-	-	-	2.85E-03	0.1989	0.11323	12.91
BMe	BALSAM POPLAR	SE	**Mixlight**	5.58E-02	1.33E-03	-	-	-	-	6.59E-04			
BMe	BALSAM POPLAR	SIG	**Mixlight**	3.75E-01	4.36E-01	-	-	-	-	<0.0001			<0.0001
BMe	WHITE SPRUCE	**COEFF**	**DIAM**	0.14228	2.82E-03	2.92E-04	-3.74E-05	-1.84E-04	-	-	3.01E-01	1.02E-01	1.21E+01
BMe	WHITE SPRUCE	SE	**DIAM**	4.55E-02	1.21E-03	1.34E-04	2.11E-04	5.32E-05	-	-			
BMe	WHITE SPRUCE	SIG	**DIAM**	0.0023	2.12E-02	3.16E-02	8.60E-01	8.00E-04	-	-			<0.0001
BMe	WHITE SPRUCE	**COEFF**	**BASA**	0.03470	0.00500	0.01070	0.00071	-0.00065	-	-	0.27	0.103	10.6
BMe	WHITE SPRUCE	SE	**BASA**	5.68E-02	1.33E-03	3.19E-03	4.29E-03	1.35E-03	-	-			
BMe	WHITE SPRUCE	SIG	**BASA**	0.542	0.000	0.001	0.868	0.634	-	-			<0.0001
BMe	WHITE SPRUCE	**COEFF**	**CFDI**	0.13959	2.52E-03	4.61E-03	7.91E-04	-2.68E-03	-	-	3.19E-01	1.00E-01	1.31E+01
BMe	WHITE SPRUCE	SE	**CFDI**	4.05E-02	1.18E-03	1.97E-03	2.26E-03	6.84E-04	-	-			
BMe	WHITE SPRUCE	SIG	**CFDI**	0.0008	3.51E-02	2.07E-02	7.27E-01	2.00E-04	-	-			<0.0001
BMe	WHITE SPRUCE	**COEFF**	**CFBA**	8.96E-02	3.61E-03	4.03E-03	3.22E-04	-8.82E-04	-	-	2.96E-01	1.02E-01	1.18E+01
BMe	WHITE SPRUCE	SE	**CFBA**	3.81E-02	1.17E-03	1.18E-03	9.75E-04	3.46E-04	-	-			
BMe	WHITE SPRUCE	SIG	**CFBA**	2.05E-02	2.60E-03	9.00E-04	7.42E-01	1.22E-02	-	-			<0.0001
BMe	WHITE SPRUCE	**COEFF**	**AFDI**	0.15857	2.53E-03	-1.81E-05	3.90E-05	-2.49E-05	-	-	3.94E-01	9.45E-02	1.82E+01
BMe	WHITE SPRUCE	SE	**AFDI**	2.99E-02	8.92E-04	4.33E-05	7.88E-05	4.38E-06	-	-			
BMe	WHITE SPRUCE	SIG	**AFDI**	<0.0001	0.0054	0.6759	0.6212	<0.0001	-	-			<0.0001
BMe	WHITE SPRUCE	**COEFF**	**AFBA**	0.1742	1.72E-03	1.73E-05	4.93E-05	-5.29E-05	-	-	3.70E-01	9.64E-02	1.64E+01
BMe	WHITE SPRUCE	SE	**AFBA**	3.59E-02	1.06E-03	1.02E-04	1.38E-04	9.68E-06	-	-			
BMe	WHITE SPRUCE	SIG	**AFBA**	<0.0001	1.07E-01	8.66E-01	7.21E-01	<0.0001	-	-			<0.0001
BMe	WHITE SPRUCE	**COEFF**	**DIST**	0.16805	3.13E-03	-2.22E-04	9.64E-04	-1.31E-03	-	-	3.85E-01	9.58E-02	1.79E+01
BMe	WHITE SPRUCE	SE	**DIST**	2.92E-02	8.19E-04	3.80E-04	6.76E-04	2.36E-04	-	-			
BMe	WHITE SPRUCE	SIG	**DIST**	<0.0001	2.00E-04	5.60E-01	1.57E-01	<0.0001	-	-			<0.0001
BMe	WHITE SPRUCE	**COEFF**	**INDS**	0.17951	2.91E-03	1.49E-03	1.36E-02	-2.92E-02	-	-	4.06E-01	9.42E-02	1.95E+01
BMe	WHITE SPRUCE	SE	**INDS**	3.03E-02	8.24E-04	6.74E-03	1.71E-02	4.82E-03	-	-			
BMe	WHITE SPRUCE	SIG	**INDS**	<0.0001	0.0006	0.8255	0.4271	<0.0001	-	-			<0.0001
BMe	WHITE SPRUCE	**COEFF**	**Heygi**	0.22220	0.00115	0.00497	-0.00499	-0.02400	-	-	0.40	0.095	18.9
BMe	WHITE SPRUCE	SE	**Heygi**	3.84E-02	1.02E-03	7.01E-03	1.23E-02	4.00E-03	-	-			
BMe	WHITE SPRUCE	SIG	**Heygi**	<0.0001	0.265	0.480	0.686	<0.0001	-	-			<0.0001
BMe	WHITE SPRUCE	**COEFF**	**Ma-Ek**	9.88E-02	3.29E-03	2.85E-05	4.69E-05	-7.63E-05	-	-	2.64E-01	1.05E-01	1.02E+01
BMe	WHITE SPRUCE	SE	**Ma-Ek**	3.07E-02	1.01E-03	7.82E-04	9.91E-05	2.50E-05	-	-			
BMe	WHITE SPRUCE	SIG	**Ma-Ek**	1.70E-03	1.60E-03	8.76E-01	6.37E-01	2.90E-03	-	-			<0.0001
BMe	WHITE SPRUCE	**COEFF**	**Alemdag**	1.92E-02	3.94E-03	-2.29E-03	-1.49E-03	4.50E-03	-	-	3.74E-01	9.67E-01	1.70E+01
BMe	WHITE SPRUCE	SE	**Alemdag**	2.11E-02	9.27E-04	7.03E-04	5.08E-04	1.01E-03	-	-			
BMe	WHITE SPRUCE	SIG	**Alemdag**	3.65E-01	<0.0001	1.50E-03	4.20E-03	<0.0001	-	-			<0.0001
BMe	WHITE SPRUCE	**COEFF**	**Mixlight**	4.11E-02	3.79E-03	-	-	-	-	4.14E-04	0.2121	0.10752	15.61
BMe	WHITE SPRUCE	SE	**Mixlight**										

ECOSITE	SPECIES	*DATUM*	*CI*	Intercept	DBH	ASPEN	POPLAR	SPRUCE	PINE	Light	R^2	RMSE	F-Value
BMe	WHITE SPRUCE	SIG	**Mixlight**	6.62E-02	1.30E-03	-	-	-	-	0.2329			<0.0001
LFe	ASPEN	**COEFF**	**DIAM**	0.2082	2.03E-03	-1.62E-04	-5.68E-04	-4.22E-04	-2.55E-04	-	3.23E-01	8.34E-02	6.44E+01
LFe	ASPEN	SE	**DIAM**	2.27E-02	7.90E-04	2.47E-05	1.11E-04	3.57E-05	4.48E-05	-			
LFe	ASPEN	SIG	**DIAM**	<0.0001	0.0104	<0.0001	<0.0001	<0.0001	<0.0001	-			<0.0001
LFe	ASPEN	**COEFF**	**BASA**	0.14881	0.00440	-0.00283	-0.00972	-0.00673	-0.00370	-	0.32	0.084	62.0
LFe	ASPEN	SE	**BASA**	1.96E-02	6.81E-04	5.46E-04	2.46E-03	5.81E-04	8.65E-04	-			
LFe	ASPEN	SIG	**BASA**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-			<0.0001
LFe	ASPEN	**COEFF**	**CFDI**	0.20224	1.25E-03	-1.95E-03	-5.56E-03	-5.67E-03	-3.02E-03	-	2.80E-01	8.60E-01	5.24E+01
LFe	ASPEN	SE	**CFDI**	2.35E-02	8.73E-04	3.38E-04	1.42E-03	6.03E-04	6.25E-04	-			
LFe	ASPEN	SIG	**CFDI**	<0.0001	1.53E-01	<0.0001	1.00E-04	<0.0001	<0.0001	-			<0.0001
LFe	ASPEN	**COEFF**	**CFBA**	0.16859	2.14E-03	-1.08E-03	-1.73E-03	-2.53E-03	-1.24E-03	-	2.50E-01	8.78E-01	4.49E+01
LFe	ASPEN	SE	**CFBA**	2.23E-02	8.58E-04	2.26E-04	7.88E-04	3.26E-04	3.39E-04	-			
LFe	ASPEN	SIG	**CFBA**	<0.0001	1.28E-02	<0.0001	2.89E-02	<0.0001	3.00E-04	-			<0.0001
LFe	ASPEN	**COEFF**	**AFDI**	5.94E-02	5.67E-03	-3.71E-06	7.18E-05	-1.59E-05	-1.94E-06	-	2.36E-01	8.86E-02	4.16E+01
LFe	ASPEN	SE	**AFDI**	1.97E-02	7.19E-04	1.99E-06	1.44E-05	4.33E-06	4.88E-06	-			
LFe	ASPEN	SIG	**AFDI**	2.60E-03	<0.0001	6.27E-02	<0.0001	3.00E-04	6.92E-01	-			<0.0001
LFe	ASPEN	**COEFF**	**AFBA**	1.07E-01	4.23E-03	-2.14E-05	7.88E-05	-5.18E-05	-2.01E-05	-	2.24E-01	8.93E-01	3.90E+01
LFe	ASPEN	SE	**AFBA**	2.18E-02	8.14E-04	5.23E-06	3.90E-05	1.03E-05	9.22E-06	-			
LFe	ASPEN	SIG	**AFBA**	<0.0001	<0.0001	<0.0001	4.35E-02	<0.0001	2.93E-02	-			<0.0001
LFe	ASPEN	**COEFF**	**DIST**	3.30E-02	6.00E-03	5.51E-05	2.76E-03	-4.74E-04	2.97E-04	-	3.04E-01	8.47E-02	5.87E+01
LFe	ASPEN	SE	**DIST**	1.91E-02	6.38E-04	9.15E-05	3.00E-04	1.27E-04	1.83E-04	-			
LFe	ASPEN	SIG	**DIST**	0.0835	<0.0001	0.5477	<0.0001	0.0002	0.105	-			<0.0001
LFe	ASPEN	**COEFF**	**INDS**	2.69E-02	6.18E-03	2.26E-03	7.58E-02	-9.42E-03	4.93E-03	-	2.86E-01	8.57E-02	5.40E+01
LFe	ASPEN	SE	**INDS**	1.68E-02	6.04E-04	1.52E-03	9.37E-03	2.69E-03	4.37E-03	-			
LFe	ASPEN	SIG	**INDS**	1.10E-01	<0.0001	1.38E-01	<0.0001	5.00E-04	2.59E-01	-			<0.0001
LFe	ASPEN	**COEFF**	**Heygi**	0.05680	0.00580	-0.00135	0.07680	-0.01310	-0.00380	-	0.26	0.088	46.4
LFe	ASPEN	SE	**Heygi**	2.08E-02	7.17E-04	1.51E-03	1.20E-02	2.80E-03	3.77E-03	-			
LFe	ASPEN	SIG	**Heygi**	0.007	<0.0001	0.371	<0.0001	<0.0001	0.314	-			<0.0001
LFe	ASPEN	**COEFF**	**Ma-Ek**	5.10E-02	6.03E-03	-1.38E-05	2.48E-04	-8.50E-05	-2.06E-05	-	1.92E-01	9.12E-02	3.20E+01
LFe	ASPEN	SE	**Ma-Ek**	1.81E-02	7.49E-04	9.39E-06	8.45E-05	2.66E-05	4.06E-05	-			
LFe	ASPEN	SIG	**Ma-Ek**	4.90E-03	<0.0001	0.1421	0.0035	0.0015	0.6121	-			<0.0001
LFe	ASPEN	**COEFF**	**Alemdag**	4.17E-02	6.40E-03	-6.44E-04	1.29E-03	-1.14E-03	6.10E-04	-	2.68E-01	8.68E-02	4.93E+01
LFe	ASPEN	SE	**Alemdag**	1.23E-02	5.99E-04	4.07E-04	2.01E-04	2.72E-04	3.13E-04	-			
LFe	ASPEN	SIG	**Alemdag**	7.00E-04	<0.0001	1.14E-01	<0.0001	<0.0001	5.12E-02	-			<0.0001
LFe	ASPEN	**COEFF**	**Mixlight**	-2.08E-02	5.03E-03	-	-	-	-	1.03E-03	0.2022	0.09041	8.57E+01
LFe	ASPEN	SE	**Mixlight**	1.54E-02	6.59E-04	-	-	-	-	1.92E-04			
LFe	ASPEN	SIG	**Mixlight**	1.76E-01	<0.0001	-	-	-	-	<0.0001			<0.0001
LFe	BALSAM POPLAR	**COEFF**	**DIAM**	0.12501	4.93E-03	-2.58E-05	4.33E-05	-3.58E-04	-8.35E-05	-	9.32E-02	1.03E-01	4.91E+00
LFe	BALSAM POPLAR	SE	**DIAM**	3.66E-02	1.35E-03	4.73E-05	7.74E-05	2.08E-04	7.45E-05	-			
LFe	BALSAM POPLAR	SIG	**DIAM**	0.0007	3.00E-04	5.86E-01	5.76E-01	8.60E-02	2.63E-01	-			0.0003
LFe	BALSAM POPLAR	**COEFF**	**BASA**	0.11728	0.00504	0.00021	0.00052	-0.00519	-0.00098	-	0.09	0.103	4.6
LFe	BALSAM POPLAR	SE	**BASA**	3.41E-02	1.26E-03	1.02E-03	1.78E-03	3.10E-03	1.68E-03	-			
LFe	BALSAM POPLAR	SIG	**BASA**	0.001	<0.0001	0.841	0.769	0.095	0.559	-			0.001

ECOSITE	SPECIES	*DATUM*	*CI*	Intercept	DBH	ASPEN	POPLAR	SPRUCE	PINE	Light	R^2	RMSE	F-Value
LFe	BALSAM POPLAR	**COEFF**	**CFDI**	0.13911	4.31E-03	-4.05E-04	5.26E-04	-7.10E-03	-1.84E-03	-	1.08E-01	1.02E-01	5.77E+00
LFe	BALSAM POPLAR	SE	**CFDI**	4.02E-02	1.56E-03	6.69E-04	1.04E-03	3.25E-03	1.13E-03	-			
LFe	BALSAM POPLAR	SIG	**CFDI**	0.0006	6.30E-03	5.45E-01	6.15E-01	3.02E-02	1.03E-01	-			<0.0001
LFe	BALSAM POPLAR	**COEFF**	**CFBA**	0.13511	4.30E-03	3.86E-05	2.05E-04	-3.12E-03	-1.17E-03	-	1.08E-01	1.02E-01	5.77E+00
LFe	BALSAM POPLAR	SE	**CFBA**	3.89E-02	1.59E-03	3.87E-04	6.34E-04	1.39E-03	7.31E-04	-			
LFe	BALSAM POPLAR	SIG	**CFBA**	0.0006	7.20E-03	9.21E-01	7.47E-01	2.53E-02	1.09E-01	-			<0.0001
LFe	BALSAM POPLAR	**COEFF**	**AFDI**	0.1084	5.07E-03	-1.23E-05	2.08E-05	-4.87E-05	-3.43E-06	-	1.28E-01	1.01E-01	6.99E+00
LFe	BALSAM POPLAR	SE	**AFDI**	3.26E-02	1.26E-03	6.10E-06	1.16E-05	5.69E-05	1.16E-05	-			
LFe	BALSAM POPLAR	SIG	**AFDI**	0.001	<0.0001	0.0445	0.0749	0.392	0.7681	-			<0.0001
LFe	BALSAM POPLAR	**COEFF**	**AFBA**	0.1294	4.47E-03	-2.59E-05	2.38E-05	-1.07E-04	-3.06E-05	-	1.21E-01	1.01E-01	6.59E+00
LFe	BALSAM POPLAR	SE	**AFBA**	3.47E-02	1.41E-03	1.26E-05	2.21E-05	1.02E-04	2.66E-05	-			
LFe	BALSAM POPLAR	SIG	**AFBA**	0.0002	1.80E-03	4.05E-02	2.83E-01	2.97E-01	2.51E-01	-			<0.0001
LFe	BALSAM POPLAR	**COEFF**	**DIST**	0.14722	4.20E-03	-9.49E-04	4.45E-05	-9.49E-04	-2.92E-04	-	1.33E-01	1.00E-01	7.32E+00
LFe	BALSAM POPLAR	SE	**DIST**	2.76E-02	1.09E-03	2.71E-04	3.09E-04	7.06E-04	3.19E-04	-			
LFe	BALSAM POPLAR	SIG	**DIST**	<0.0001	2.00E-04	5.00E-04	8.86E-01	1.80E-01	3.61E-01	-			<0.0001
LFe	BALSAM POPLAR	**COEFF**	**INDS**	0.15813	4.14E-03	-2.69E-02	-4.26E-03	-3.68E-02	-5.13E-03	-	1.35E-01	1.00E-01	7.43E+00
LFe	BALSAM POPLAR	SE	**INDS**	2.39E-02	1.08E-03	7.41E-03	3.66E-03	2.32E-02	7.05E-03	-			
LFe	BALSAM POPLAR	SIG	**INDS**	<0.0001	2.00E-04	3.00E-04	2.47E-01	1.13E-01	4.67E-01	-			<0.0001
LFe	BALSAM POPLAR	**COEFF**	**Heygi**	0.17217	0.00337	-0.01560	-0.00370	-0.02840	-0.00937	-	0.14	0.100	7.6
LFe	BALSAM POPLAR	SE	**Heygi**	2.68E-02	1.13E-03	4.53E-03	3.23E-03	1.66E-02	6.44E-03	-			
LFe	BALSAM POPLAR	SIG	**Heygi**	<0.0001	0.003	0.001	0.253	0.089	0.147	-			<0.0001
LFe	BALSAM POPLAR	**COEFF**	**Ma-Ek**	1.24E-01	4.61E-03	-4.58E-05	3.45E-05	-6.08E-05	-1.60E-04	-	1.18E-01	1.01E-01	6.41E+00
LFe	BALSAM POPLAR	SE	**Ma-Ek**	3.23E-02	1.40E-03	2.29E-05	4.01E-05	4.09E-05	9.14E-05	-			
LFe	BALSAM POPLAR	SIG	**Ma-Ek**	1.00E-04	1.10E-03	0.0473	0.3905	0.1384	0.082	-			<0.0001
LFe	BALSAM POPLAR	**COEFF**	**Alemdag**	1.20E-01	4.16E-03	-7.58E-04	1.20E-03	-5.38E-04	1.76E-04	-	9.70E-02	1.02E-01	5.14E+00
LFe	BALSAM POPLAR	SE	**Alemdag**	2.23E-02	1.32E-03	4.83E-04	6.97E-04	9.05E-04	5.87E-04	-			
LFe	BALSAM POPLAR	SIG	**Alemdag**	<0.0001	1.90E-03	1.18E-01	8.56E-02	5.53E-01	7.64E-01	-			0.0002
LFe	BALSAM POPLAR	**COEFF**	**Mixlight**	2.87E-02	2.21E-03	-	-	-	-	1.69E-03	0.129	0.09991	17.92
LFe	BALSAM POPLAR	SE	**Mixlight**	3.13E-02	1.22E-03	-	-	-	-	4.28E-04			
LFe	BALSAM POPLAR	SIG	**Mixlight**	3.60E-01	7.02E-02	-	-	-	-	0.0001			<0.0001
LFe	LODGEPOLE PINE	**COEFF**	**DIAM**	0.20515	7.64E-04	-2.11E-04	-2.50E-04	-6.29E-04	-1.31E-04	-	2.23E-01	8.62E-02	3.64E+01
LFe	LODGEPOLE PINE	SE	**DIAM**	3.00E-02	1.05E-03	4.31E-05	6.73E-05	6.26E-05	2.51E-05	-			
LFe	LODGEPOLE PINE	SIG	**DIAM**	<0.0001	4.66E-01	<0.0001	2.00E-04	<0.0001	<0.0001	-			<0.0001
LFe	LODGEPOLE PINE	**COEFF**	**BASA**	0.19112	0.00149	-0.00425	-0.00394	-0.00931	-0.00329	-	0.22	0.087	35.2
LFe	LODGEPOLE PINE	SE	**BASA**	2.88E-02	9.90E-04	9.83E-04	1.35E-03	9.86E-04	6.14E-04	-			
LFe	LODGEPOLE PINE	SIG	**BASA**	<0.0001	0.133	<0.0001	0.004	<0.0001	<0.0001	-			<0.0001
LFe	LODGEPOLE PINE	**COEFF**	**CFDI**	0.23874	-1.01E-03	-3.72E-03	-4.56E-03	-1.40E-02	-1.95E-03	-	2.37E-01	8.54E-02	3.94E+01
LFe	LODGEPOLE PINE	SE	**CFDI**	2.73E-02	1.01E-03	6.70E-04	9.88E-04	1.40E-03	3.04E-04	-			
LFe	LODGEPOLE PINE	SIG	**CFDI**	<0.0001	0.317	<0.0001	<0.0001	<0.0001	<0.0001	-			<0.0001
LFe	LODGEPOLE PINE	**COEFF**	**CFBA**	0.2194	-6.95E-04	-2.07E-03	-2.23E-03	-9.09E-03	-1.14E-03	-	2.28E-01	8.60E-02	3.74E+01
LFe	LODGEPOLE PINE	SE	**CFBA**	2.38E-02	9.18E-04	4.51E-04	5.46E-04	9.99E-04	1.74E-04	-			
LFe	LODGEPOLE PINE	SIG	**CFBA**	<0.0001	4.49E-01	<0.0001	<0.0001	<0.0001	<0.0001	-			<0.0001
LFe	LODGEPOLE PINE	**COEFF**	**AFDI**	1.77E-03	6.76E-03	-1.09E-05	-4.31E-06	-9.62E-05	7.34E-06	-	1.62E-01	8.95E-02	2.45E+01

ECOSITE	SPECIES	*DATUM*	*CI*	Intercept	DBH	ASPEN	POPLAR	SPRUCE	PINE	Light	R^2	RMSE	F-Value
LFe	LODGEPOLE PINE	SE	**AFDI**	2.24E-02	7.94E-04	8.55E-06	2.52E-05	1.47E-05	2.17E-06	-			
LFe	LODGEPOLE PINE	SIG	**AFDI**	9.37E-01	<0.0001	2.04E-01	8.64E-01	<0.0001	7.00E-04	-			<0.0001
LFe	LODGEPOLE PINE	**COEFF**	**AFBA**	9.21E-02	3.90E-03	-6.80E-05	-1.08E-04	-3.43E-04	-4.45E-06	-	1.53E-01	9.00E-02	2.30E+01
LFe	LODGEPOLE PINE	SE	**AFBA**	2.31E-02	8.62E-04	2.16E-05	4.74E-05	4.52E-05	4.89E-06	-			
LFe	LODGEPOLE PINE	SIG	**AFBA**	<0.0001	<0.0001	1.80E-03	2.29E-02	<0.0001	3.63E-01	-			<0.0001
LFe	LODGEPOLE PINE	**COEFF**	**DIST**	-4.09E-02	7.66E-03	-7.44E-05	6.58E-04	-1.88E-03	5.33E-04	-	2.01E-01	8.75E-02	3.22E+01
LFe	LODGEPOLE PINE	SE	**DIST**	2.09E-02	6.94E-04	2.21E-04	4.33E-04	2.75E-04	9.87E-05	-			
LFe	LODGEPOLE PINE	SIG	**DIST**	0.0505	<0.0001	0.7362	0.1284	<0.0001	<0.0001	-			<0.0001
LFe	LODGEPOLE PINE	**COEFF**	**INDS**	-6.51E-03	7.01E-03	-5.30E-03	6.42E-03	-4.20E-02	6.96E-03	-	1.73E-01	8.90E-02	2.68E+01
LFe	LODGEPOLE PINE	SE	**INDS**	2.23E-02	7.32E-04	4.98E-03	9.50E-03	5.73E-03	2.31E-03	-			
LFe	LODGEPOLE PINE	SIG	**INDS**	7.70E-01	<0.0001	0.2876	0.4994	<0.0001	0.0027	-			<0.0001
LFe	LODGEPOLE PINE	**COEFF**	**Heygi**	0.13089	0.00332	-0.01740	-0.01500	-0.06740	-0.00635	-	0.19	0.088	30.2
LFe	LODGEPOLE PINE	SE	**Heygi**	2.91E-02	9.57E-04	4.57E-03	7.34E-03	7.02E-03	2.36E-03	-			
LFe	LODGEPOLE PINE	SIG	**Heygi**	<0.0001	0.001	0.000	0.041	<0.0001	0.007	-			<0.0001
LFe	LODGEPOLE PINE	**COEFF**	**Ma-Ek**	1.00E-01	3.40E-03	-1.71E-04	-2.04E-04	-1.04E-03	-1.48E-05	-	1.48E-01	9.04E-02	2.22E+01
LFe	LODGEPOLE PINE	SE	**Ma-Ek**	2.12E-02	8.26E-04	5.88E-05	1.19E-04	1.42E-04	1.45E-05	-			
LFe	LODGEPOLE PINE	SIG	**Ma-Ek**	<0.0001	<0.0001	3.70E-03	8.58E-02	<0.0001	3.08E-01	-			<0.0001
LFe	LODGEPOLE PINE	**COEFF**	**Alemdag**	2.47E-02	5.49E-03	-4.58E-04	1.15E-04	-2.68E-03	1.78E-03	-	1.81E-01	8.86E-02	2.83E+01
LFe	LODGEPOLE PINE	SE	**Alemdag**	1.34E-02	7.44E-04	2.46E-04	3.04E-04	3.37E-04	4.55E-04	-			
LFe	LODGEPOLE PINE	SIG	**Alemdag**	6.65E-02	<0.0001	6.29E-02	7.04E-01	<0.0001	1.00E-04	-			<0.0001
LFe	LODGEPOLE PINE	**COEFF**	**Mixlight**	1.18E-02	-4.80E-04	-	-	-	-	1.85E-03	0.176	8.86E-02	6.87E+01
LFe	LODGEPOLE PINE	SE	**Mixlight**	1.38E-02	7.75E-04	-	-	-	-	2.02E-04			
LFe	LODGEPOLE PINE	SIG	**Mixlight**	3.95E-01	5.36E-01	-	-	-	-	<0.0001			<0.0001
LFe	WHITE SPRUCE	**COEFF**	**DIAM**	0.21562	3.13E-03	-8.92E-05	2.90E-04	-2.76E-04	-3.86E-05	-	3.63E-01	1.13E-01	4.88E+01
LFe	WHITE SPRUCE	SE	**DIAM**	3.12E-02	9.09E-04	5.12E-05	1.60E-04	3.72E-05	4.12E-05	-			
LFe	WHITE SPRUCE	SIG	**DIAM**	<0.0001	6.00E-04	8.24E-02	7.05E-02	<0.0001	3.50E-01	-			<0.0001
LFe	WHITE SPRUCE	**COEFF**	**BASA**	0.19659	0.00400	-0.00250	0.00559	-0.00499	-0.00083	-	0.34	0.115	44.3
LFe	WHITE SPRUCE	SE	**BASA**	3.32E-02	9.06E-04	1.27E-03	3.16E-03	7.90E-04	9.26E-04	-			
LFe	WHITE SPRUCE	SIG	**BASA**	<0.0001	<0.0001	0.049	0.078	<0.0001	0.373	-			<0.0001
LFe	WHITE SPRUCE	**COEFF**	**CFDI**	0.17193	3.81E-03	3.87E-04	3.78E-03	-3.30E-03	-1.27E-04	-	3.37E-01	1.16E-01	4.34E+01
LFe	WHITE SPRUCE	SE	**CFDI**	2.86E-02	9.12E-04	6.69E-04	1.88E-03	5.04E-04	5.50E-04	-			
LFe	WHITE SPRUCE	SIG	**CFDI**	<0.0001	<0.0001	5.63E-01	4.51E-02	<0.0001	8.18E-01	-			<0.0001
LFe	WHITE SPRUCE	**COEFF**	**CFBA**	0.13068	4.88E-03	6.06E-04	1.63E-03	-1.35E-03	-7.56E-05	-	3.02E-01	1.19E-01	3.70E+01
LFe	WHITE SPRUCE	SE	**CFBA**	2.72E-02	9.01E-04	3.85E-04	8.13E-04	2.75E-04	2.97E-04	-			
LFe	WHITE SPRUCE	SIG	**CFBA**	<0.0001	<0.0001	1.16E-01	4.50E-02	<0.0001	7.99E-01	-			<0.0001
LFe	WHITE SPRUCE	**COEFF**	**AFDI**	0.20248	3.36E-03	-6.52E-06	7.38E-05	-4.21E-05	-5.66E-06	-	3.82E-01	1.12E-01	5.29E+01
LFe	WHITE SPRUCE	SE	**AFDI**	2.33E-02	7.31E-04	5.58E-06	4.36E-05	4.70E-06	7.77E-06	-			
LFe	WHITE SPRUCE	SIG	**AFDI**	<0.0001	<0.0001	0.2431	0.0915	<0.0001	0.4666	-			<0.0001
LFe	WHITE SPRUCE	**COEFF**	**AFBA**	0.16328	4.01E-03	1.72E-06	9.88E-05	-5.68E-05	-1.29E-05	-	3.21E-01	1.17E-01	4.04E+01
LFe	WHITE SPRUCE	SE	**AFBA**	2.50E-02	8.25E-04	9.78E-06	6.08E-05	9.09E-06	1.43E-05	-			
LFe	WHITE SPRUCE	SIG	**AFBA**	<0.0001	<0.0001	8.60E-01	1.05E-01	<0.0001	3.66E-01	-			<0.0001
LFe	WHITE SPRUCE	**COEFF**	**DIST**	0.18509	4.80E-03	-8.2594	2.34E-03	-1.29E-03	2.63E-04	-	4.63E-01	1.06E-01	7.28E+01
LFe	WHITE SPRUCE	SE	**DIST**	2.07E-02	6.02E-04	2.15E-04	7.97E-04	1.42E-04	2.80E-04	-			

ECOSITE	SPECIES	*DATUM*	*CI*	Intercept	DBH	ASPEN	POPLAR	SPRUCE	PINE	Light	R^2	RMSE	F-Value
LFe	WHITE SPRUCE	SIG	**DIST**	<0.0001	<0.0001	0.0001	0.0035	<0.0001	0.3483	-			<0.0001
LFe	WHITE SPRUCE	**COEFF**	**INDS**	0.18713	4.59E-03	-1.81E-02	3.74E-02	-2.22E-02	-1.89E-03	-	4.61E-01	1.06E-01	7.23E+01
LFe	WHITE SPRUCE	SE	**INDS**	2.01E-02	6.07E-04	4.39E-03	1.62E-02	2.32E-03	6.11E-03	-			
LFe	WHITE SPRUCE	SIG	**INDS**	<0.0001	<0.0001	<0.0001	2.13E-02	<0.0001	7.58E-01	-			<0.0001
LFe	WHITE SPRUCE	**COEFF**	**Heygi**	0.21639	0.00313	-0.00986	0.02450	-0.02010	-0.00439	-	0.43	0.110	62.9
LFe	WHITE SPRUCE	SE	**Heygi**	2.48E-02	7.50E-04	3.62E-03	1.21E-02	2.16E-03	4.29E-03	-			
LFe	WHITE SPRUCE	SIG	**Heygi**	<0.0001	<0.0001	0.007	0.043	<0.0001	0.307	-			<0.0001
LFe	WHITE SPRUCE	**COEFF**	**Ma-Ek**	6.90E-02	6.65E-03	-2.38E-06	1.17E-03	-5.45E-05	8.25E-05	-	3.23E-01	1.19E-01	4.03E+01
LFe	WHITE SPRUCE	SE	**Ma-Ek**	2.00E-02	7.25E-04	2.64E-05	2.74E-04	1.42E-05	6.82E-05	-			
LFe	WHITE SPRUCE	SIG	**Ma-Ek**	6.00E-04	<0.0001	9.28E-01	<0.0001	1.00E-04	2.27E-01	-			<0.0001
LFe	WHITE SPRUCE	**COEFF**	**Alemdag**	4.11E-02	6.95E-03	-2.16E-03	1.28E-03	1.18E-03	2.73E-03	-	3.85E-01	1.14E-01	5.28E+01
LFe	WHITE SPRUCE	SE	**Alemdag**	1.39E-02	7.05E-04	4.28E-04	5.41E-04	5.17E-04	5.67E-04	-			
LFe	WHITE SPRUCE	SIG	**Alemdag**	3.20E-03	<0.0001	<0.0001	1.86E-02	2.25E-02	<0.0001	-			<0.0001
LFe	WHITE SPRUCE	**COEFF**	**Mixlight**	3.41E-02	4.39E-03	-	-	-	-	1.21E-03	0.299	0.12096	90.64
LFe	WHITE SPRUCE	SE	**Mixlight**	1.46E-02	9.40E-04	-	-	-	-	2.71E-04			
LFe	WHITE SPRUCE	SIG	**Mixlight**	1.96E-02	<0.001	-	-	-	-	<0.0001			<0.0001
LFf	ASPEN	**COEFF**	**DIAM**	0.33542	2.32E-04	-4.50E-04	-3.06E-04	-6.71E-04	-2.47E-04	-	2.45E-01	1.20E-01	1.68E+01
LFf	ASPEN	SE	**DIAM**	4.50E-02	1.27E-03	8.68E-05	2.28E-04	1.16E-04	8.32E-05	-			
LFf	ASPEN	SIG	**DIAM**	<0.0001	8.55E-01	<0.0001	1.80E-01	<0.0001	3.20E-03	-			<0.0001
LFf	ASPEN	**COEFF**	**BASA**	0.26586	0.00233	-0.00579	-0.00534	-0.01010	-0.00265	-	0.25	0.119	17.6
LFf	ASPEN	SE	**BASA**	4.06E-02	1.17E-03	1.24E-03	4.00E-03	1.75E-03	1.47E-03	-			
LFf	ASPEN	SIG	**BASA**	<0.0001	0.048	<0.0001	0.183	<0.0001	0.073	-			<0.0001
LFf	ASPEN	**COEFF**	**CFDI**	0.36352	-1.29E-03	-9.43E-03	-1.83E-03	-1.22E-02	-4.74E-03	-	2.05E-01	1.23E-01	1.33E+01
LFf	ASPEN	SE	**CFDI**	4.89E-02	1.40E-03	1.95E-03	3.08E-03	2.51E-03	1.42E-03	-			
LFf	ASPEN	SIG	**CFDI**	<0.0001	3.56E-01	<0.0001	5.54E-01	<0.0001	1.00E-03	-			<0.0001
LFf	ASPEN	**COEFF**	**CFBA**	0.32001	-5.04E-04	-4.72E-03	-1.58E-04	-5.81E-03	-2.42E-03	-	1.61E-01	1.26E-01	9.90E+00
LFf	ASPEN	SE	**CFBA**	4.88E-02	1.43E-03	1.21E-03	1.60E-03	1.53E-03	9.02E-04	-			
LFf	ASPEN	SIG	**CFBA**	<0.0001	7.25E-01	1.00E-04	9.22E-01	2.00E-04	7.80E-03	-			<0.0001
LFf	ASPEN	**COEFF**	**AFDI**	0.16977	4.04E-03	-4.95E-05	4.14E-06	-5.82E-05	-1.13E-06	-	1.19E-01	1.29E-01	6.93E+00
LFf	ASPEN	SE	**AFDI**	4.33E-02	1.22E-03	2.99E-05	3.55E-05	1.72E-05	5.47E-06	-			
LFf	ASPEN	SIG	**AFDI**	0.0001	1.10E-03	9.89E-02	9.07E-01	8.00E-04	8.37E-01	-			<0.0001
LFf	ASPEN	**COEFF**	**AFBA**	0.24495	1.94E-03	-1.90E-04	-3.82E-05	-2.45E-04	-2.32E-05	-	1.46E-01	1.27E-01	8.85E+00
LFf	ASPEN	SE	**AFBA**	4.54E-02	1.31E-03	6.96E-05	8.04E-05	5.74E-05	1.37E-05	-			
LFf	ASPEN	SIG	**AFBA**	<0.0001	1.39E-01	6.80E-03	6.35E-01	<0.0001	9.02E-02	-			<0.0001
LFf	ASPEN	**COEFF**	**DIST**	1.12E-01	5.33E-03	-4.41E-04	9.75E-04	-9.73E-04	5.20E-04	-	1.18E-01	1.29E-01	6.88E+00
LFf	ASPEN	SE	**DIST**	4.37E-02	1.15E-03	4.52E-04	6.77E-04	3.88E-04	3.68E-04	-			
LFf	ASPEN	SIG	**DIST**	1.06E-02	<0.0001	0.3295	0.1512	0.0129	0.1588	-			<0.0001
LFf	ASPEN	**COEFF**	**INDS**	1.16E-01	5.23E-03	-8.71E-04	1.14E-02	-2.24E-02	5.62E-03	-	1.05E-01	1.30E-01	6.04E+00
LFf	ASPEN	SE	**INDS**	3.99E-02	1.15E-03	4.58E-03	1.63E-02	7.71E-03	6.73E-03	-			
LFf	ASPEN	SIG	**INDS**	3.80E-03	<0.0001	8.49E-01	4.86E-01	4.00E-03	4.05E-01	-			<0.0001
LFf	ASPEN	**COEFF**	**Heygi**	0.19572	0.00346	-0.00492	-0.00901	-0.04610	-0.00557	-	0.13	0.128	7.8
LFf	ASPEN	SE	**Heygi**	4.54E-02	1.26E-03	3.73E-03	1.94E-02	1.05E-02	6.67E-03	-			
LFf	ASPEN	SIG	**Heygi**	<0.0001	0.007	0.189	0.643	<0.0001	0.405	-			<0.0001

ECOSITE	SPECIES	*DATUM*	*CI*	Intercept	DBH	ASPEN	POPLAR	SPRUCE	PINE	Light	R^2	RMSE	F-Value
LFf	ASPEN	**COEFF**	**Ma-Ek**	0.23409	2.03E-03	-6.55E-04	4.65E-05	-1.07E-03	-1.05E-04	-	1.35E-01	1.28E-01	8.05E+00
LFf	ASPEN	SE	**Ma-Ek**	4.65E-02	1.36E-03	2.35E-04	7.58E-05	2.90E-04	1.14E-04	-			
LFf	ASPEN	SIG	**Ma-Ek**	<0.0001	1.37E-01	5.70E-03	5.40E-01	3.00E-04	3.57E-01	-			<0.0001
LFf	ASPEN	**COEFF**	**Alemdag**	9.60E-02	5.80E-03	-4.88E-04	1.32E-03	-1.79E-03	4.84E-04	-	1.48E-01	1.27E-01	8.92E+00
LFf	ASPEN	SE	**Alemdag**	3.07E-02	1.18E-03	6.15E-04	4.43E-04	5.59E-04	6.26E-04	-			
LFf	ASPEN	SIG	**Alemdag**	0.0019	<0.0001	0.4281	0.0031	0.0015	0.4398	-			<0.0001
LFf	ASPEN	**COEFF**	**Mixlight**	1.81E-02	2.13E-03	-	-	-	-	1.97E-03	0.125	0.12811	18.64
LFf	ASPEN	SE	**Mixlight**	3.98E-02	1.13E-03	-	-	-	-	4.62E-04			
LFf	ASPEN	SIG	**Mixlight**	6.49E-01	6.07E-02	-	-	-	-	<0.0001			<0.0001
LFf	BALSAM POPLAR	**COEFF**	**DIAM**	0.42804	-1.85E-03	-3.82E-04	-3.85E-04	-5.04E-04	-3.84E-04	-	1.66E-01	1.30E-01	8.62E+00
LFf	BALSAM POPLAR	SE	**DIAM**	4.86E-02	1.43E-03	8.97E-05	1.21E-04	1.14E-04	1.21E-04	-			
LFf	BALSAM POPLAR	SIG	**DIAM**	<0.0001	1.96E-01	<0.0001	1.70E-03	<0.0001	1.70E-03	-			<0.0001
LFf	BALSAM POPLAR	**COEFF**	**BASA**	0.37396	-0.00025	-0.00672	-0.00491	-0.00823	-0.00504	-	0.13	0.133	6.4
LFf	BALSAM POPLAR	SE	**BASA**	5.01E-02	1.39E-03	1.82E-03	2.47E-03	2.04E-03	2.24E-03	-			
LFf	BALSAM POPLAR	SIG	**BASA**	<0.0001	0.860	0.000	0.048	<0.0001	0.026	-			<0.0001
LFf	BALSAM POPLAR	**COEFF**	**CFDI**	0.35941	-1.22E-03	-3.84E-03	-1.70E-03	-1.17E-02	-4.24E-03	-	1.27E-01	1.33E-01	6.29E+00
LFf	BALSAM POPLAR	SE	**CFDI**	5.10E-02	1.65E-03	1.24E-03	1.48E-03	2.62E-03	2.18E-03	-			
LFf	BALSAM POPLAR	SIG	**CFDI**	<0.0001	4.60E-01	2.20E-03	2.52E-01	<0.0001	5.29E-02	-			<0.0001
LFf	BALSAM POPLAR	**COEFF**	**CFBA**	0.24057	1.94E-03	-8.60E-04	8.83E-04	-7.92E-03	1.19E-04	-	1.05E-01	1.34E-01	5.06E+00
LFf	BALSAM POPLAR	SE	**CFBA**	4.76E-02	1.65E-03	5.31E-04	6.13E-04	1.94E-03	1.05E-03	-			
LFf	BALSAM POPLAR	SIG	**CFBA**	<0.0001	2.41E-01	1.07E-01	1.51E-01	<0.0001	9.10E-01	-			0.0002
LFf	BALSAM POPLAR	**COEFF**	**AFDI**	0.42707	-2.05E-03	-9.20E-05	-1.07E-04	-1.51E-04	-7.60E-05	-	2.13E-01	1.26E-01	1.17E+01
LFf	BALSAM POPLAR	SE	**AFDI**	3.84E-02	1.22E-03	2.55E-05	2.26E-05	2.48E-05	1.73E-05	-			
LFf	BALSAM POPLAR	SIG	**AFDI**	<0.0001	0.0952	0.0004	<0.0001	<0.0001	<0.0001	-			<0.0001
LFf	BALSAM POPLAR	**COEFF**	**AFBA**	0.37779	-1.91E-03	-1.11E-04	-1.04E-04	-3.50E-04	-1.57E-04	-	1.53E-01	1.31E-01	7.80E+00
LFf	BALSAM POPLAR	SE	**AFBA**	4.23E-02	1.44E-03	3.79E-05	4.34E-05	6.97E-05	4.48E-05	-			
LFf	BALSAM POPLAR	SIG	**AFBA**	<0.0001	1.87E-01	3.80E-03	1.76E-02	<0.0001	6.00E-04	-			<0.0001
LFf	BALSAM POPLAR	**COEFF**	**DIST**	0.33714	1.79E-03	-2.09E-03	-1.87E-03	-2.10E-03	-2.06E-03	-	1.64E-01	1.30E-01	8.49E+00
LFf	BALSAM POPLAR	SE	**DIST**	2.97E-02	1.06E-03	6.50E-04	4.41E-04	5.10E-04	6.50E-04	-			
LFf	BALSAM POPLAR	SIG	**DIST**	<0.0001	9.30E-02	1.50E-03	<0.0001	<0.0001	1.70E-03	-			<0.0001
LFf	BALSAM POPLAR	**COEFF**	**INDS**	0.30224	1.95E-03	-6.39E-02	-1.34E-02	-4.85E-02	-5.51E-02	-	1.78E-01	1.29E-01	9.34E+00
LFf	BALSAM POPLAR	SE	**INDS**	2.59E-02	1.04E-03	1.57E-02	4.37E-03	1.14E-02	1.76E-02	-			
LFf	BALSAM POPLAR	SIG	**INDS**	<0.0001	6.22E-02	<0.0001	2.60E-03	<0.0001	2.00E-03	-			<0.0001
LFf	BALSAM POPLAR	**COEFF**	**Heygi**	0.33580	0.00010	-0.03510	-0.01100	-0.05590	-0.04600	-	0.18	0.129	9.6
LFf	BALSAM POPLAR	SE	**Heygi**	2.96E-02	1.10E-03	9.32E-03	3.74E-03	1.27E-02	1.47E-02	-			
LFf	BALSAM POPLAR	SIG	**Heygi**	<0.0001	0.926	0.000	0.004	<0.0001	0.002	-			<0.0001
LFf	BALSAM POPLAR	**COEFF**	**Ma-Ek**	2.81E-01	7.82E-04	-3.41E-04	6.22E-06	-1.18E-03	-7.02E-04	-	9.34E-02	1.35E-01	4.45E+00
LFf	BALSAM POPLAR	SE	**Ma-Ek**	3.29E-02	1.27E-03	1.89E-04	4.91E-05	3.43E-04	3.23E-04	-			
LFf	BALSAM POPLAR	SIG	**Ma-Ek**	<0.0001	5.40E-01	0.0721	0.8993	0.0007	0.0306	-			0.0007
LFf	BALSAM POPLAR	**COEFF**	**Alemdag**	2.45E-01	2.41E-03	-1.07E-03	-1.54E-04	-1.42E-03	-3.93E-04	-	2.55E-02	1.40E-01	1.13E+00
LFf	BALSAM POPLAR	SE	**Alemdag**	2.59E-02	1.37E-03	7.28E-04	8.07E-04	9.21E-04	9.87E-04	-			
LFf	BALSAM POPLAR	SIG	**Alemdag**	<0.0001	8.17E-02	1.42E-01	8.49E-01	1.24E-01	6.90E-01	-			0.3445
LFf	BALSAM POPLAR	**COEFF**	**Mixlight**	7.85E-02	-1.63E-03	-	-	-	-	2.78E-03	0.1218	0.13222	15.19

ECOSITE	SPECIES	*DATUM*	*CI*	Intercept	DBH	ASPEN	POPLAR	SPRUCE	PINE	Light	R^2	RMSE	F-Value
LFf	BALSAM POPLAR	SE	**Mixlight**	3.98E-02	1.14E-03	-	-	-	-	5.12E-04			
LFf	BALSAM POPLAR	SIG	**Mixlight**	5.00E-02	1.54E-01	-	-	-	-	<0.0001			<0.0001
LFf	LODGEPOLE PINE	**COEFF**	**DIAM**	0.20774	7.47E-04	-9.11E-05	-6.05E-04	-3.27E-04	-1.80E-04	-	2.25E-01	8.17E-02	1.16E+02
LFf	LODGEPOLE PINE	SE	**DIAM**	1.49E-02	5.24E-04	7.29E-05	1.50E-04	4.96E-05	1.36E-05	-			
LFf	LODGEPOLE PINE	SIG	**DIAM**	<0.0001	1.54E-01	2.12E-01	<0.0001	<0.0001	<0.0001	-			<0.0001
LFf	LODGEPOLE PINE	**COEFF**	**BASA**	0.16269	0.00257	0.00036	-0.00393	-0.00642	-0.00361	-	0.23	0.082	116.0
LFf	LODGEPOLE PINE	SE	**BASA**	1.27E-02	4.47E-04	1.19E-03	2.13E-03	8.75E-04	2.83E-04	-			
LFf	LODGEPOLE PINE	SIG	**BASA**	<0.0001	<0.0001	0.764	0.066	<0.0001	<0.0001	-			<0.0001
LFf	LODGEPOLE PINE	**COEFF**	**CFDI**	0.20884	-7.58E-05	-2.53E-03	-1.25E-02	-5.72E-03	-2.25E-03	-	2.15E-01	8.23E-02	1.09E+02
LFf	LODGEPOLE PINE	SE	**CFDI**	1.49E-02	5.61E-04	1.50E-03	2.99E-03	9.64E-04	1.75E-04	-			
LFf	LODGEPOLE PINE	SIG	**CFDI**	<0.0001	8.93E-01	9.07E-02	<0.0001	<0.0001	<0.0001	-			<0.0001
LFf	LODGEPOLE PINE	**COEFF**	**CFBA**	0.16744	1.08E-03	-3.44E-05	-3.24E-03	-3.85E-03	-1.10E-03	-	2.02E-01	8.29E-02	1.00E+02
LFf	LODGEPOLE PINE	SE	**CFBA**	1.29E-02	5.13E-04	8.90E-04	1.51E-03	6.54E-04	9.32E-05	-			
LFf	LODGEPOLE PINE	SIG	**CFBA**	<0.0001	3.45E-02	9.69E-01	3.17E-02	<0.0001	<0.0001	-			<0.0001
LFf	LODGEPOLE PINE	**COEFF**	**AFDI**	-2.71E-03	7.17E-03	-1.59E-04	-5.61E-04	-1.66E-05	2.27E-06	-	1.48E-01	8.57E-02	6.89E+01
LFf	LODGEPOLE PINE	SE	**AFDI**	1.16E-02	4.37E-04	5.76E-05	1.55E-04	8.99E-06	6.38E-07	-			
LFf	LODGEPOLE PINE	SIG	**AFDI**	8.15E-01	<0.001	5.80E-03	3.00E-04	6.57E-02	4.00E-04	-			<0.0001
LFf	LODGEPOLE PINE	**COEFF**	**AFBA**	5.05E-02	5.47E-03	-4.85E-04	-2.17E-03	-6.30E-05	-2.53E-06	-	1.46E-01	8.58E-02	6.80E+01
LFf	LODGEPOLE PINE	SE	**AFBA**	1.17E-02	4.61E-04	1.59E-04	4.51E-04	2.45E-05	1.36E-06	-			
LFf	LODGEPOLE PINE	SIG	**AFBA**	<0.0001	<0.0001	2.30E-03	<0.0001	1.03E-02	6.34E-02	-			<0.0001
LFf	LODGEPOLE PINE	**COEFF**	**DIST**	-6.05E-03	7.09E-03	-1.11E-03	-1.16E-03	-8.55E-04	2.07E-04	-	1.56E-01	8.52E-02	7.33E+01
LFf	LODGEPOLE PINE	SE	**DIST**	1.16E-02	3.89E-04	3.81E-04	6.91E-04	1.84E-04	5.75E-05	-			
LFf	LODGEPOLE PINE	SIG	**DIST**	6.04E-01	<0.0001	3.70E-03	9.26E-02	<0.0001	3.00E-04	-			<0.0001
LFf	LODGEPOLE PINE	**COEFF**	**INDS**	1.74E-02	6.62E-03	-1.37E-02	-5.70E-02	-2.15E-02	1.27E-03	-	1.55E-01	8.53E-02	7.30E+01
LFf	LODGEPOLE PINE	SE	**INDS**	1.14E-02	3.97E-04	6.03E-03	1.92E-02	3.42E-03	1.07E-03	-			
LFf	LODGEPOLE PINE	SIG	**INDS**	0.1267	<0.0001	2.36E-02	3.00E-03	<0.0001	2.37E-01	-			<0.001
LFf	LODGEPOLE PINE	**COEFF**	**Heygi**	0.10100	0.00415	-0.01950	-0.08040	-0.02320	-0.00584	-	0.17	0.084	82.6
LFf	LODGEPOLE PINE	SE	**Heygi**	1.35E-02	4.77E-04	5.32E-03	1.90E-02	3.43E-03	9.80E-04	-			
LFf	LODGEPOLE PINE	SIG	**Heygi**	<0.0001	<0.0001	0.000	<0.0001	<0.0001	<0.0001	-			<0.0001
LFf	LODGEPOLE PINE	**COEFF**	**Ma-Ek**	4.31E-02	5.64E-03	-4.23E-04	-1.43E-03	-3.98E-04	-3.06E-06	-	1.44E-01	8.58E-01	6.69E+01
LFf	LODGEPOLE PINE	SE	**Ma-Ek**	9.53E-03	4.09E-04	1.38E-04	4.73E-04	8.92E-05	4.40E-06	-			
LFf	LODGEPOLE PINE	SIG	**Ma-Ek**	<0.0001	<0.0001	2.20E-03	2.60E-03	<0.0001	4.86E-01	-			<0.0001
LFf	LODGEPOLE PINE	**COEFF**	**Alemdag**	1.73E-02	4.21E-03	-1.67E-04	-4.81E-04	-9.01E-04	2.95E-03	-	1.78E-01	8.41E-02	8.64E+01
LFf	LODGEPOLE PINE	SE	**Alemdag**	7.19E-03	4.28E-04	1.71E-04	3.07E-04	2.30E-04	3.13E-04	-			
LFf	LODGEPOLE PINE	SIG	**Alemdag**	1.65E-02	<0.0001	0.3287	0.1177	<0.0001	<0.0001	-			<0.0001
LFf	LODGEPOLE PINE	**COEFF**	**Mixlight**	-5.15E-03	1.86E-03	-	-	-	-	1.47E-03	0.2215	8.18E-02	283.55
LFf	LODGEPOLE PINE	SE	**Mixlight**	7.21E-03	4.04E-04	-	-	-	-	9.50E-05			
LFf	LODGEPOLE PINE	SIG	**Mixlight**	0.4749	<0.0001	-	-	-	-	<0.0001			<0.0001
LFf	WHITE SPRUCE	**COEFF**	**DIAM**	1.57E-01	3.37E-03	-2.15E-04	6.41E-05	-1.63E-04	-2.15E-05	-	2.58E-01	1.06E-01	2.65E+01
LFf	WHITE SPRUCE	SE	**DIAM**	4.89E-02	1.35E-03	6.39E-05	1.73E-04	5.18E-05	5.39E-05	-			
LFf	WHITE SPRUCE	SIG	**DIAM**	1.50E-03	1.27E-02	9.00E-04	7.12E-01	1.80E-03	6.91E-01	-			<0.0001
LFf	WHITE SPRUCE	**COEFF**	**BASA**	0.12700	0.00433	-0.00304	0.00118	-0.00275	-0.00007	-	0.25	0.107	25.1
LFf	WHITE SPRUCE	SE	**BASA**	4.75E-02	1.24E-03	1.08E-03	2.64E-03	1.08E-03	1.13E-03	-			

ECOSITE	SPECIES	*DATUM*	*CI*	Intercept	DBH	ASPEN	POPLAR	SPRUCE	PINE	Light	R^2	RMSE	F-Value
LFf	WHITE SPRUCE	SIG	**BASA**	0.008	0.001	0.005	0.655	0.012	0.951	-			<0.0001
LFf	WHITE SPRUCE	**COEFF**	**CFDI**	0.14964	3.16E-03	-3.99E-03	5.79E-04	-1.81E-03	-3.28E-04	-	2.64E-01	1.06E-01	2.74E+01
LFf	WHITE SPRUCE	SE	**CFDI**	4.00E-02	1.24E-03	1.02E-03	2.51E-03	5.25E-04	7.48E-04	-			
LFf	WHITE SPRUCE	SIG	**CFDI**	0.0002	0.0112	0.0001	0.8174	0.0006	0.6617	-			<0.0001
LFf	WHITE SPRUCE	**COEFF**	**CFBA**	0.1156	3.99E-03	-1.81E-03	2.11E-04	-6.22E-04	-3.89E-05	-	2.60E-01	1.06E-01	2.68E+01
LFf	WHITE SPRUCE	SE	**CFBA**	3.20E-02	1.06E-03	4.70E-04	1.06E-03	2.18E-04	4.37E-04	-			
LFf	WHITE SPRUCE	SIG	**CFBA**	0.0003	2.00E-04	1.00E-04	8.42E-01	4.60E-03	9.29E-01	-			<0.0001
LFf	WHITE SPRUCE	**COEFF**	**AFDI**	-7.23E-03	7.46E-03	-2.63E-05	5.55E-04	2.38E-06	2.48E-05	-	2.60E-01	1.06E-01	2.67E+01
LFf	WHITE SPRUCE	SE	**AFDI**	2.90E-02	8.72E-04	2.10E-05	2.05E-04	2.51E-06	8.59E-06	-			
LFf	WHITE SPRUCE	SIG	**AFDI**	8.03E-01	<0.0001	2.11E-01	7.10E-03	3.43E-01	4.10E-03	-			<0.0001
LFf	WHITE SPRUCE	**COEFF**	**AFBA**	2.56E-02	6.68E-03	-7.18E-05	5.99E-04	-1.17E-06	4.29E-05	-	2.54E-01	1.06E-01	2.60E+01
LFf	WHITE SPRUCE	SE	**AFBA**	2.79E-02	9.23E-04	3.08E-05	3.40E-04	3.78E-06	2.01E-05	-			
LFf	WHITE SPRUCE	SIG	**AFBA**	3.60E-01	<0.0001	2.00E-02	7.93E-02	7.56E-01	3.34E-02	-			<0.0001
LFf	WHITE SPRUCE	**COEFF**	**DIST**	7.88E-02	6.28E-03	-1.70E-03	6.15E-04	-5.78E-04	1.40E-04	-	2.86E-01	1.05E-01	3.05E+01
LFf	WHITE SPRUCE	SE	**DIST**	2.50E-02	6.80E-04	4.51E-04	7.68E-04	1.74E-04	2.59E-04	-			
LFf	WHITE SPRUCE	SIG	**DIST**	0.0018	<0.0001	0.0002	0.4237	0.001	0.5903	-			<0.0001
LFf	WHITE SPRUCE	**COEFF**	**INDS**	7.30E-02	5.99E-03	-2.42E-02	-5.92E-04	-9.32E-03	7.64E-03	-	2.81E-01	1.05E-01	2.98E+01
LFf	WHITE SPRUCE	SE	**INDS**	2.34E-02	6.92E-04	8.85E-03	1.36E-02	2.67E-03	4.04E-03	-			
LFf	WHITE SPRUCE	SIG	**INDS**	1.90E-03	<0.0001	6.40E-03	9.65E-01	5.00E-04	5.94E-02	-			<0.0001
LFf	WHITE SPRUCE	**COEFF**	**Heygi**	0.10700	0.00475	-0.01720	0.00091	-0.00849	0.00212	-	0.28	0.105	29.9
LFf	WHITE SPRUCE	SE	**Heygi**	2.84E-02	8.61E-04	5.07E-03	9.93E-03	2.19E-03	3.49E-03	-			
LFf	WHITE SPRUCE	SIG	**Heygi**	0.000	<0.0001	0.001	0.927	0.000	0.543	-			<0.0001
LFf	WHITE SPRUCE	**COEFF**	**Ma-Ek**	8.94E-02	4.94E-03	-6.84E-04	3.64E-04	-8.95E-05	2.09E-05	-	2.82E-01	1.05E-01	3.00E+01
LFf	WHITE SPRUCE	SE	**Ma-Ek**	2.37E-02	8.23E-04	1.74E-04	2.25E-04	2.65E-05	3.87E-05	-			
LFf	WHITE SPRUCE	SIG	**Ma-Ek**	2.00E-04	<0.0001	1.00E-04	1.07E-01	8.00E-04	5.89E-01	-			<0.0001
LFf	WHITE SPRUCE	**COEFF**	**Alemdag**	1.09E-02	7.74E-03	-1.49E-03	1.66E-03	-3.88E-04	2.54E-04	-	2.75E-01	1.05E-01	2.90E+01
LFf	WHITE SPRUCE	SE	**Alemdag**	1.54E-02	7.90E-04	4.70E-04	4.62E-04	5.47E-04	4.38E-04	-			
LFf	WHITE SPRUCE	SIG	**Alemdag**	4.80E-01	<0.0001	1.60E-03	4.00E-04	4.79E-01	5.63E-01	-			<0.0001
LFf	WHITE SPRUCE	**COEFF**	**Mixlight**	3.64E-02	3.36E-03	-	-	-	-	1.05E-03	0.2655	0.10561	69.57
LFf	WHITE SPRUCE	SE	**Mixlight**	1.57E-02	1.02E-03	-	-	-	-	2.40E-04			
LFf	WHITE SPRUCE	SIG	**Mixlight**	2.08E-02	1.10E-03	-	-	-	-	<0.0001			<0.0001