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TEMPORAL ANALYSIS OF FIELD, SSURGO, AND LIDAR DERIVEDSITE INDICES IN THE SOUTHEASTERN U.S.

A Thesis Presented to the Graduate School of Clemson University

In Partial Fulfillment of the Requirements for the Degree Master of Science Forest Resources

> by Steven A. Ham May 2013

Accepted by: Dr. Elena Mikhailova, Committee Chair Dr. Lawrence Gering Dr. Christopher Post

ABSTRACT

Sustainable forest management requires accurate information about site index (SI, tree height at a base age). The objectives of this study were to compare site indices from field inventory data (2008-2009), Soil Survey Geographic Database (SSURGO), and Light Detection and Ranging (LiDAR, 2008), and to determine the uncertainty in the site indices from the southern part of the Clemson Experimental Forest. When LiDAR derived analysis were used to compare to SSURGO there were statistical differences for site indices for all of the tree species in this study: loblolly pine (*Pinus taeda*), scarlet oak (*Quercus coccinea*), shortleaf pine (*Pinus echinata*), white oak (*Quercus alba*), and yellow poplar (*Liriodendron tulipifera*). LiDAR has the potential to provide reliable and rapid estimates of site index variability within the soil map units. Loblolly pine and shortleaf pine had the greatest statistical differences with the LiDAR derived site indices being much larger than the SSURGO values. The results of this study indicate that a larger sample size for LiDAR is a better option to decrease variation, and that the map unit level may be the best option.

Keywords and abbreviations: basal area factor (BAF), Clemson Experimental Forest (CEF), climate change, diameter at breast height (DBH), forest inventory, Light Detection and Ranging (LiDAR), loblolly pine, site index (SI), soil inventory, Soil Survey Geographic Database (SSURGO)

DEDICATION

I would like to dedicate this thesis to Steve Ham, Sherry Dalton, Larry Grimes, and Sheila Fernandez. Without their support and help along the way, I would not have been able to get through college, or be the person that I am today.

ACKNOWLEDGMENTS

I want to express my sincere appreciation to my committee: Dr. Elena Mikhailova, Dr. Lawrence Gering, and Dr. Christopher Post for their help and support throughout this study. I wish to thank and acknowledge Benjamin Kendall and Knight Cox for providing the forest inventory cruise data for the Clemson Experimental Forest, the Anderson County Assessor's Office and the South Carolina Department of Natural Resources for the LiDAR datasets, and Dr. William Bridges for the help with the statistics. Financial support for this project was provided by Clemson University. Technical Contribution No. 6069 of the Clemson University Experiment Station.

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CHAPTER ONE INTRODUCTION

Statement of the Problem

Soil quality is the most important factor in assessing forest productivity and forest management decisions (Hamilton, 2007). Concerns about the effects of global climate change have triggered intensive research over recent decades on the impacts of land use on biomass production in forest ecosystems (Poudel et al., 2011). The temperature increase in higher latitudes associated with global warming may stimulate forest production due to longer growing season and more favorable conditions for photosynthesis (Bergh et al., 2003; Poudel et al., 2011). Several studies predicted higher forest productivity (by 10-30% in the next 100 years), reduced length of rotation periods by 5-10 years, and increased carbon stocks (Pussinen et al., 2002; Kirilenko and Sedjo, 2007; Eggers et al., 2008; Subedi et al., 2009). Current research on climate change over the continental United States using a moisture index (Grundstein, 2009) showed that the southeastern part of the country has been getting wetter, and cooler. The question, then, is how do these combined changes affect forest productivity and site index in the Southeastern U.S.?

Literature Review

Site index (SI) is defined as the total height to which dominant trees of a given species will grow on a given site at some index age, usually 50 years in the Southeast (Hamilton, 2007). Site index is commonly used to evaluate site productivity and is

provided through the SSURGO (Soil Survey Staff, 2013). The site index can be determined by two methods: 1) from the site index curves using accurate age and height measurements or 2) from the tables in the soil survey (Baker and Langdon, 2012). For example, site index for loblolly pine at age 50 can vary from 60 to 120 feet depending on soil and other site characteristics. Site index curves were developed in various time periods ranging from early 1920's to late 1980's (National Register of Site Index, 2013). Site index does not provide the measure of uncertainty due to soil, site, and climate variability.

South Carolina has diverse soil coverage. Seven of twelve soil orders occur in South Carolina: Histosols, Entisols, Inceptisols, Mollisols, Alfisols, Spodosols, and Ultisols. Lynchburg is a state soil of South Carolina (it belongs to the order of Ultisols) because it is a prime farmland and has a high site index for loblolly pine. Approximately four hundred soil series (of 21,000 soil series) occur in South Carolina. In the Southeastern U.S., soils in the Piedmont physiographic province are severely eroded and contain low quantities of soil C as a result of agricultural activity prior to 1940 (Dunn and Holladay, 1977; Richter et al., 1999). Conversion of degraded croplands to forests likely has increased terrestrial carbon stocks (Richter et al., 1999), although the magnitude of this increase and the impact of forest management on it are unclear because of the lack of long-term data and the high variability in existing soil and plant data. Impacts of land use and climate on site index are poorly understood. A previous study in the Pacific Northwest indicates LiDAR derived site indices correlate well with field site indices (Gatziolis, 2007).

Research Questions

- How reliable is the site index provided by SSURGO?
- Are site indices developed in the 1920's valid today?
- What are the ways to incorporate variability and uncertainty in the site index?
- Does climate change affect the site index in the SE of the United States?
- Can advanced techniques (e.g. SSURGO etc.) be used to evaluate and update site index in the SSURGO as needed?

Research Objectives

- Compare site indices from SSURGO to the most recent forest inventory cruise data;
- Compare site indices from SSURGO to LiDAR derived site indices;
- Conduct statistical analysis for any trends and to determine the uncertainty in the site indices.

CHAPTER TWO MATERIALS AND METHODS

Study Area

The location for this study is the southern part, Anderson County (Figure 1) of the Clemson University Experimental Forest (CEF) in Clemson, SC (N 34° 41' 55.7", W 82° 52' 45.7") (Griffith et al., 2002). The CEF lies in the upper Piedmont region at the base of the foothills. The climate is generally mild and has four distinct seasons with annual precipitation averaging 54.01 inches with annual temperatures ranging from an average minimum temperature of 29.80°F in January to an average maximum annual temperature of 90.6°F in July (IDcide 2013). The CEF is divided into 15 divisions, which are subdivided by compartment and then broken down to stand level. In total, the forest has more than 2,000 stands and 41 of them were used in this study (Tables 15-19). The entire forest is an intensively managed multi-use forest with research areas, natural areas, timber production areas, and wildlife managed areas. The cover type ranges from hardwood coves, upland hardwoods, mixed hardwood and pine, natural pines, to pine plantations (Forest inventory 2008-2009). The data for the study area were limited to the forest area in Anderson County. Attention was given to points that had field forest inventory (2008-2009), SSURGO, and LiDAR data (Table 1).

History of Ownership and Management

The CEF was previously eroded farm land before Clemson College began supervision of the lands in 1939 under an agreement with the federal government (Dunn and Holladay, 1977). In 1946 a forester, Norbert Goebel, was hired to manage the forestlands (Dunn and Holladay, 1977). Silvicultural practices (planting, thinning and harvests) to improve the timber production, wildlife habitat and water quality were initiated. In 1954, the project was deeded to Clemson College, due to the efforts of U.S. Senators Charlie Daniel, Strom Thurmond, State Senator Edgar Brown and Dr. George H. Aull (Dunn and Holladay, 1977).

Forest Inventory

The cruise data were gathered from the forest inventory in 2008-2009 according to field forest specification for the CEF (Table 2). It was inventoried as point-level data measured in cubic feet. The point location was determined by a resource grade GPS and previous point locations on the forest. Each point was measured on a tree level basis. At each point trees were tallied using a BAF (basal area factor) = 10 prism. For each tally tree species, diameter at breast height (DBH) (1 inch class), type of product, merchantable height, total height, the percent defect, and any comments about the tree were recorded. The trees were measured with a diameter tape and mechanical clinometer. Height measurements were obtained to the nearest foot and diameter DBH to the nearest 1-inch class (Table 2). The contractor provided the tree data for volume determinations. The points are numbered and correspond to a GPS location. Stand information was also available for the entire Clemson Experimental Forest as GIS and Excel spreadsheets. The amount of volume harvested for each stand and the date the stand was cut was also available. This allowed for any points to be nullified if stands were harvested after the 2008 LiDAR data were flown, or before the 2011 LiDAR data were flown.

Soil Inventory and Site Index from SSURGO

Soil Survey Geographic Database (SSURGO) tabular and spatial complete data were downloaded from http://soils.usda.gov/survey/geography/ssurgo/ for Anderson County, South Carolina. Site index is listed for various tree species at base age 25 or 50. The field inventory data were collected at base age 50. Therefore, this base age was used throughout the analysis. The forest inventory GIS data were used to spatially compare the SSURGO data to the study area (Figure 2). First, all the stands in the study area within Anderson County were selected using a county outline from ArcGIS and exported the file into NAD83 UTM Zone 17N meters. A "select by location" using the county outline as the source layer and selected the stands that are within the source layer was performed. The selection was then exported as a new layer. The spatial SSURGO map unit data layer was joined to the component key table by the map unit key in both attribute tables. Then the soil map unit table was joined to the forest productivity component table by the component key. The ACCESS database associated with the SSURGO data were then used and a report for site index was created and exported as an excel file. The Excel file was then edited to create one row for each map unit. The excel file was then exported to the project geodatabase as a single table and joined by the map unit symbol to the spatial

SSURGO data. Each Map unit symbol contained its own site indices for various tree species and was compared to the inventory data and LiDAR derived measurements.

Point to Plot Conversion

In order to be able to compare LiDAR to field data the point data (collected with a basal area factor (BAF) = $10 \text{ ft}^2/\text{ac}$ prism) had to be converted to fixed radius plot data. The first step was to calculate the basal area (BA) for each inventoried tree. This was found using equation (1):

$$BA_{each tree} = 0.005454 * (DBH_{class})^2$$
(1)

where $BA_{each tree}$ is calculated in (ft²/tree) and represents the per tree basal area for the point; and DBH_{class} (in) is the 1-inch diameter at base height (DBH) class for each tree on the point. Once $BA_{each tree}$ was calculated, the tree factor for each individual tree could be calculated. The equation for this calculation is:

$$F_{t} = \frac{F}{BA_{each tree}}$$
(2)

where \mathbf{F}_{t} is calculated in (Number of trees/ac) and represents the tree factor for each tree, \mathbf{F} (ft²/ac) is the BAF represented by the prism, and $\mathbf{BA}_{each tree}$ is measured in (ft²/tree). Once \mathbf{F} was calculated for each tree, the total number of trees per acre for the entire point was calculated. This was found using the equation:

$$\frac{\text{Trees}}{\text{acre}} = \sum F_{t} \text{ each tree on the point}$$
(3)

where $\frac{\text{Trees}}{\text{acre}}$ is calculated in (trees/ac) and represents the total number of trees per acre on a particular point, and \mathbf{F}_{t} is measured in (trees/ac). The next step was to calculate the total basal area per acre for the point. This was found calculated using the equation:

$$\frac{BA}{acre} = F * Number trees tallied on the point$$
(4)

where $\frac{BA}{acre}$ represents the basal area per acre for the entire plot in (number of trees*ft²/ac), and **F** (ft²/ac) is the BAF of the prism used. With the $\frac{BA}{acre}$ calculated, the mean basal area for the mean tree on the plot was then calculated using the equation below:

$$BA_{mean} = \frac{\frac{BA}{acre}}{\frac{Trees}{acre}}$$
(5)

where BA_{mean} represents the basal area for the mean tree of a particular point in $(ft^2/tree)$, and $\frac{BA}{acre}$ is measured in (number of trees*ft²/ac), and $\frac{Trees}{acre}$ is measured in (number of trees/ac). After the basal area for the mean tree, calculate the DBH for the mean tree in the equation below:

$$\mathsf{DBH}_{\mathrm{mean}} = \sqrt{\frac{\mathsf{BA}_{\mathrm{mean}}}{0.005454}} \tag{6}$$

where DBH_{mean} represents the DBH for the mean tree of the point in (in), and BA_{mean} is measured in (ft²/tree). The mean DBH was then used to calculate the radius for the plot in the equation below:

$$R_{mean} = \frac{DBH_{mean}}{\left[12*\left(\frac{1}{BB}\right)\right]}$$
(7)

Where R_{mean} represents the mean radius of the plot equivalent for each individual point centered at the location of the variable radius plot in (ft), and DBH_{mean} is measured in inches. The R_{mean} (ft) is then used to get the area represented by each plot in the equation below:

$$A_{\text{mean}} = \pi R_{\text{mean}}^2$$
(8)

where A_{mean} represents the average area of the plot for the average tree on the point in (ft²), and R_{mean} is measured in (ft). All of the point-to-plot conversions were done in Excel.

Remote Sensing Data

Two LiDAR datasets flown over Anderson County, SC in 2007 and 2011 were used in this study and were collected by the South Carolina LiDAR Consortium. The first dataset (2007) was obtained from the South Carolina Department of Natural Resources, and is single return data with nominal point spacing of approximately 1.4m and was processed using Terrascan software. The second LiDAR dataset (2011) was obtained from Anderson County, SC Assessors office and had a nominal point spacing of 1.4m. This data were collected by Towill Inc. using an Optech Orion M-200 LiDAR system. The data were originally collected as waveform data and discrete pulses were extracted and provided in the dataset as up to 4 discrete returns per LiDAR pulse. Data were processed with Terrascan as well as the Terrasolid software suite.

Site Index Inventory by LiDAR

Newly flown, multi-return, LiDAR data are available for Pickens (5/2012), Anderson (8/2012) and Oconee counties (8/2012).

Anderson County LiDAR data from 2008 are already available (Figure 3). Tree locations, heights and crown diameters were extracted from the LiDAR data using the TIFFS software package version 8.0 beta (Globalidar). This software uses the raw LAS files and tiles the raw data and filters out ground and non-ground returns. The filtered data are then used to derive a digital elevation model and canopy height model, which it subsequently uses to identify tree locations using watershed analysis techniques within Matlab based on individual tree crown structures (Chen, 2007).

The point-to-plot conversion radii were put into an Excel file and exported as a dbase file and added to ArcMap. The forest inventory spatial data were also added to ArcMap. Stands in Anderson County were added if they contained relevant information for determining LiDAR site index. The CEF points file are points corresponding with the stand data of the stands that they are in. The attribute table was joined to the Excel file based on the recognized number for the points in the CEF data and the point number in the dbase file with only matching records being kept. The new attribute table was exported to create a new shapefile. A buffer was then applied to create a polygon file with the plot radii from the point shapefile's radius (m) as the buffering distance.

LiDAR tree locations (points) were then added to ArcMap and extracted where only those trees contained inside the plots were kept. The tree locations are points that contain information on individual tree heights. Once the trees were extracted the next

thing was to create an excel spreadsheet summarizing the LiDAR heights in each point and corresponding the age of the trees on the point to plot conversion and the SI species with the stand data. The summary sheet was then used to choose the proper SI species curves (Figures 4-8) to derive site indices for each point. Upland oaks (Figure 6) site index curves were used for scarlet oak.

The tallest tree on each point and the stand age were used to derive an SI from the SI Curves (interpolated/extrapolated between two curves) and added to the Excel sheet. The assumption of tree selection is that the tallest tree(s) will be the same specie as the SI specie of the stand from the CEF data. The mean and standard deviation on each LiDAR (2008) point were summarized by map unit and SI species. The procedures were repeated for the LiDAR (2011) dataset with the stand ages adjusted to the proper age. An observation was defined as a single point. The total number of points for a particular specie that were grouped together by matching criteria by map unit, stand number, or a combination of the two defined the sample size for the particular criteria.

After the plot data were summarized they were then summarized for entire map units in a similar manner. Stands were selected by their SI species from the point summary Excel file and exported as a new file. SSURGO soils map units were extracted by SI species from the point summary excel file. Each map unit within a stand was exported as an individual shapefile. Both LiDAR (2008) and LiDAR (2011) tree data were extracted by each individual map unit layer within a stand. Any stand that had trees from multiple files were selected and then merged together and exported as one file to properly select the correct amount of trees from each file. The sample from each stand

was calculated as the tallest 5% of all trees, or the tallest 20, whichever was greatest. The stand age was then gathered in the same manner by the corresponding stand identification number. The height was then converted to a SI the same way as the plot data. This data was then added to its own excel file summarized by mean SI and standard deviation for each species in three ways: each stand number as its own occurrence in a map unit, each map unit within a stand, and by each map unit.

Statistical Analysis

The statistical analysis proceeded in three stages. The first stage was to calculate means and standard deviations of site indices of each species broken down by soil map unit for both plot level and soil map unit level and further break the map unit level data down by stand. The second stage was to compare the means to the SSURGO standard using a series of t-tests. The third stage was to convert R^2 -values to t-values and compare using a series of t-tests. The reason for using the t-test is that it provided a direct test of the hypothesis that the mean value was different from the SSURGO in whichever direction that occurs. All calculations were performed in Excel.

CHAPTER THREE RESULTS AND DISCUSSION

Soil Evaluation

Sixteen soil map units (soil order: Ultisols) were identified (Table 3). Map units CdB and CdC had the highest SI for loblolly pine (83 ft, base age 50). The lowest SI for loblolly pine was HwC2 (71 ft, base age 50). CdD had the highest SI for scarlet oak (81 ft, base age 50). The lowest SI for scarlet oak were map units MaC and MaE both had the lowest SI for scarlet oak (75 ft, base age 50). Map unit PaE had the highest site index for shortleaf pine (70 ft, base age 50). The lowest SI for shortleaf pine was map unit CcC2 (55 ft, base age 50). Map units MaD and MaE had the same SI for white oak (75 ft, base age 50). The lowest SI for yellow poplar (96 ft, base age 50). The lowest SI for yellow poplar was map unit PaE (90 ft, base age 50).

Forest Inventory vs. SSURGO

Loblolly pine and shortleaf pine species were the only SI species at the forest inventory level that significantly differed from the SSURGO site indices. Ten out of the thirty one map unit and specie combinations were statistically different than the SSURGO site indices with 8 being higher. All the loblolly pine map units that were different were higher, and shortleaf pine was split with 2 being higher and 2 being lower (Tables 4A and 4B).

LiDAR Derived Plot Level vs. SSURGO

Almost half of the plot level LiDAR derived site indices were statistically different than the SSURGO SI (28 out of 57 total observations). The majority of the 2008 LiDAR plot map unit derived site indices were statistically different than the SSURGO site indices (16 out of 31 total observations) and occurred in each soil series. Ten out of the sixteen map unit symbols' species combinations LiDAR derived site indices were statistically lower than the SSURGO site indices occurring in all five species. The six map unit symbols that were higher occurred in loblolly pine (5 map unit symbols) and shortleaf pine (1 map unit symbol).

The 2011 LiDAR derived plot site indices were statistically different than the SSURGO site indices for all five species. The majority of the derived site indices that were statistically higher occurred mainly in loblolly pine species. Two shortleaf pine map unit symbol site indices were statistically lower with none being higher (Tables 4A and 4B) which was different than 2008. The high variability associated with using plot data can be seen in Figure 9. The variability could be caused from the small sample sizes in the plot data. Another contributing factor on the graph is all the species and all the map units are represented on the graph together.

LiDAR Derived Map Unit Level vs SSURGO

The majority of the standard deviations of the map unit level data were lower than the plot level data (Tables 4A and 4B). With the higher variability and small sample sizes in

the plot level data it was necessary to take another approach and to use map unit level data which had greater sample sizes. The majority of the map unit level LiDAR derived mean site indices for the map unit symbols (2008, 2011, and 2008 and 2011 combined) were statistically higher than the SSURGO site indices and occurred in all five species across each soil series (Tables 4A and 4B). When looking at Tables 4A and 4B there were 6 combinations where LiDAR derived mean site indices were statistically lower than the SSURGO site indices. These occurred in loblolly pine (CbC and HaB), scarlet oak (MaE), and yellow poplar (CdC).

The site indices by map units were further broken down by stand within a map unit for further analysis. When loblolly SI was broken down by stand within a map unit the majority of the derived mean site indices are statistically higher than the SSURGO site indices except for map units CbC, CdC, HaB, and MaC (Tables 5A and 5B). This was different than what was summarized from Tables 4A and 4B, that CbC and HaB were the only two map units where the LiDAR derived mean site indices were statistically lower than SSURGO site indices.

Scarlet oak did not pick up any more map unit symbols that had observations indicating a statistically lower mean SI than when the map units were broken down into stands (Tables 6A and 6B). On the summary tables (Tables 4A and 4B) shortleaf pine did not have any map unit symbols with statistically lower LiDAR derived mean site indices than SSURGO site indices, but when broken down by stand within a map unit 4 map unit symbol LiDAR derived site indices (CbB, CbC, CdC, and CdD) were significantly lower than SSURGO site indices (Tables 7A and 7B).

Tables 4A, 4B, 8A, and 8B show white oak did not have any map unit symbols indicating that LiDAR derived mean site indices were statistically lower than SSURGO site indices. Yellow poplar map unit symbols broke down into stands indicated that one other LiDAR derived map unit symbol's SI was statistically lower than the SSURGO (CdD). Tables 10-14 (A and B for each) are intermediate tables showing where the numbers for Tables 4A and 4B came from. Each table is a single species.

Figure 10 shows the high variability in the relationship between SSURGO and forest inventory site indices. The variability is likely present due to the graph showing all species and all map units combined where site index is based on one tree species for one map unit where tree species have different growth patterns. Another possible contributing factor is that both are reported as one single number without a standard deviation.

There are a couple trends present. One trend is that LiDAR derived maximum heights (2008) are significantly higher than the forest inventory measured maximum heights. The model equation shows that in 2008 the LiDAR and forest inventory heights correlate well (Figure 11). Another trend is LiDAR derived maximum heights (2011) are significantly higher than the LiDAR derived maximum heights (2008) indicating growth has occurred (Figure 12). Tables 5B, 7B, and 9B show that some stands had negative growth and indicate a stand has had one of the following or combination of the following occur: the stand has been harvested, trees were lost to some sort of event, an overestimation of LiDAR derived tree heights in 2008, or an underestimation of LiDAR derived tree heights in 2011 has occurred. A contributing factor to the variability is more than likely the different growth patterns of each species (Figures 9-12).

CHAPTER FOUR

CONCLUSIONS

The objectives of this research were to compare site indices from SSURGO to the most recent forest inventory cruise data, compare site indices from SSURGO to LiDAR derived site indices, and conduct statistical analysis for any trends and to determine the uncertainty in the site indices. Site index is supposed to be static and not change. Tables 4A and 4B show the only two species that had a difference were loblolly and shortleaf pine. However, when LiDAR derived analysis was used to compare to SSURGO there were differences. There were statistical differences for site indices for all of the tree species in this study: loblolly pine, scarlet oak, shortleaf pine, white oak, and yellow poplar. This raises the question what methods can produce reliable and rapid estimates of site index?

LiDAR has the potential to provide reliable and rapid estimates of site index variability within the soil map unit (Tables 4A and 4B) unlike the field forest inventory data which provides limited and expensive data. Newly available free LiDAR data sets provide an opportunity to evaluate variability across thousands of soil map units and tree species combinations. Through the LiDAR analysis all the tree species had statistically different site indices than that recorded in SSURGO. The only way to accurately and cheaply answer the question if environmental and anthropogenic changes affect the site index in the SE of the United States is to determine tree heights and the associated

variability across large spatial areas (with numerous soil map units and forest characteristics).

The only way to update and evaluate the site index is to have sufficient forest data which is possible through LiDAR analysis. Advanced genetics, different silvicultural practices, recent droughts, warmer temperatures, and other anthropogenic and environmental changes may be having an effect on SI. Even though SI is static, this study indicates there are statistical differences in SI from the LiDAR data which means that through environmental and anthropogenic changes, SI may be changing and more research is needed to understand the effects of these changes. The results of this study indicate that a larger sample size for LiDAR is a better option to decrease variation, and that the map unit level may be the best option.

There are some errors that arise using LiDAR. Ground sampling errors can occur due to dense closed canopy forests. Underestimation of tree height can also occur due to tree lean or when LiDAR returns capture the wrong tree apex. These errors are usually small (Gatziolis, 2007).

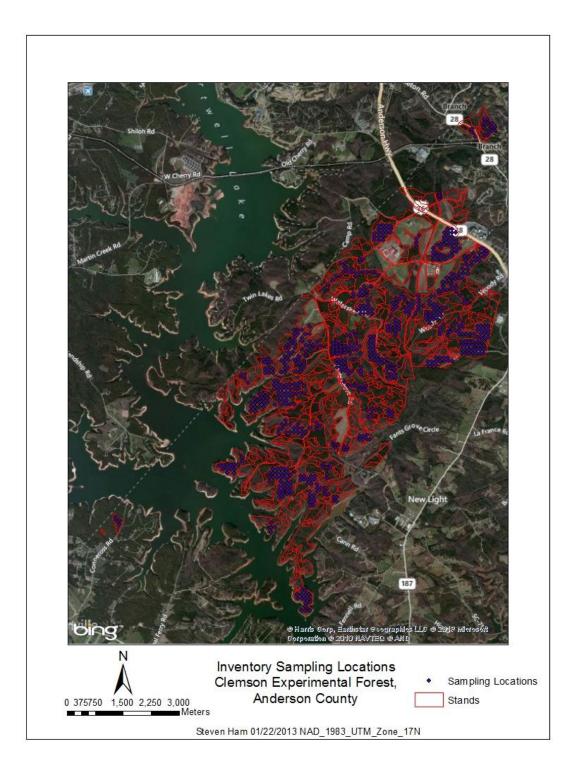


Figure 1. Map of the part of the Clemson Experimental Forest.

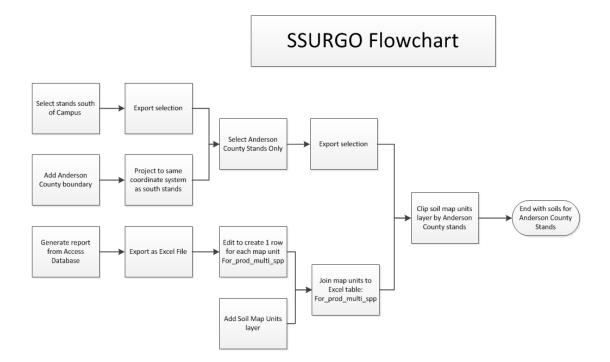


Figure 2. Process of extracting soil data for the southern part (Anderson County) of the Clemson Experimental Forest.

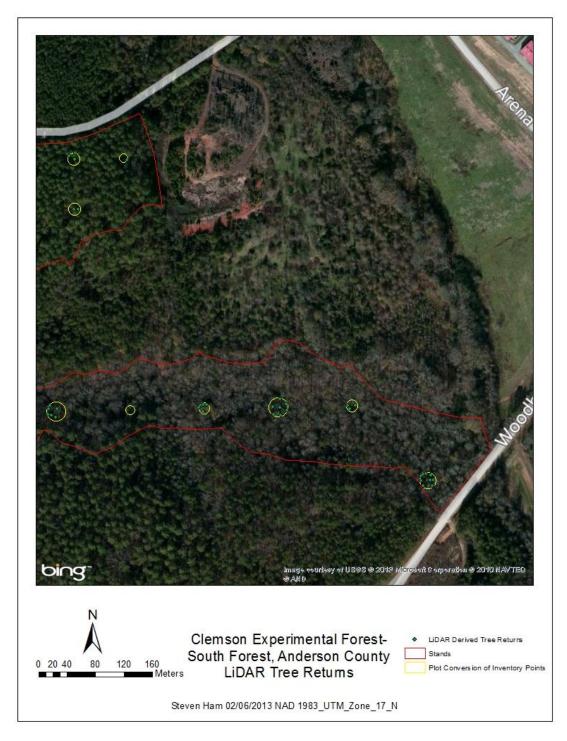
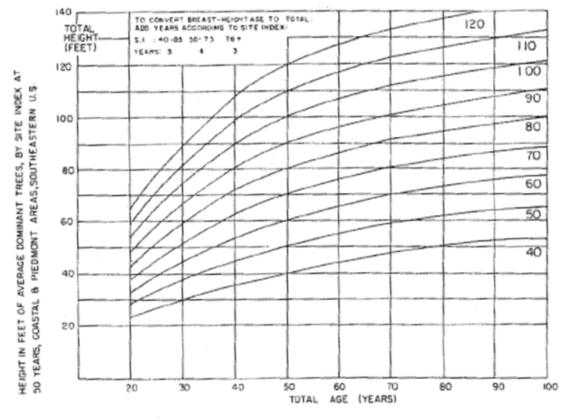


Figure 3. Clemson Experimental Forest, South Forest, Anderson County LiDAR tree returns(2008).

LOBLOLLY PINE



SOURCE: VOLUME, YIELD & STAND TABLES FOR SECOND-GROWTH SOUTHERN PINES, U.S.D.A. MISC PUBL. NO. 50 (1929). REVISED BY COILE & SCHUMACHER, JOURNAL OF FORESTRY, JUNE 1953.

Figure 4. Loblolly pine Site Index classes for coastal and piedmont areas of the

Southeastern U.S. (adapted from Coile & Schumacher, 1953).

SHORTLEAF PINE

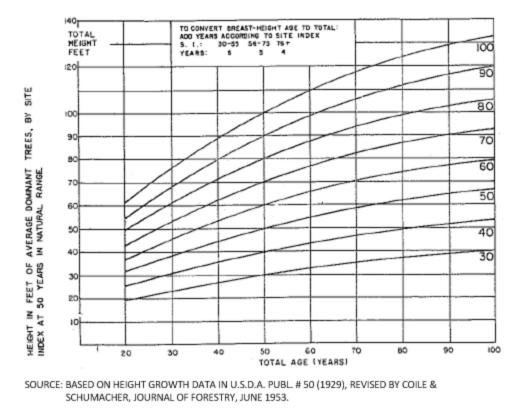
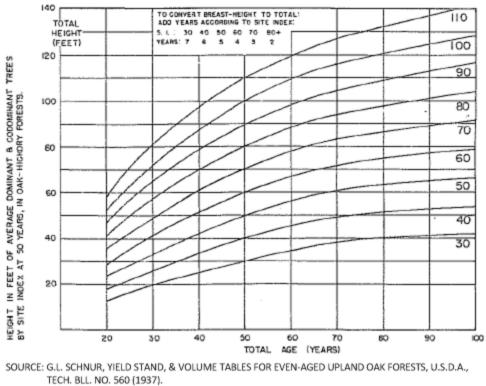


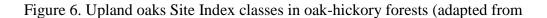
Figure 5. Shortleaf pine Site Index classes in natural range (adapted from

Coile & Schumacher, 1953).

UPLAND OAKS

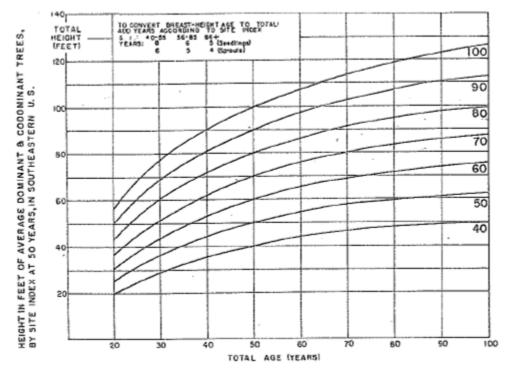






Olson, 1959).

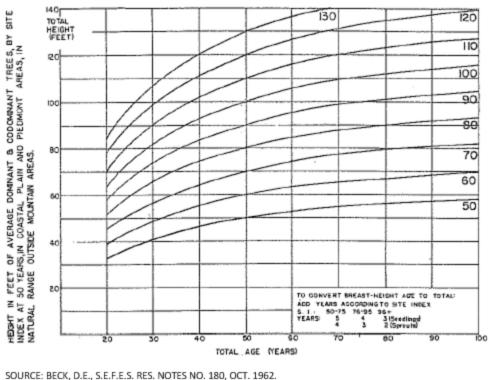
WHITE OAKS



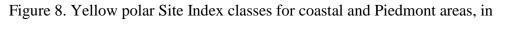
SOURCE: BASED ON DATA FROM OLSON, D.J. S.E.F.E.S. RES. NOTES NO. 125, 1959

Figure 7. White oaks Site Index lasses in the Southeastern U.S. (Olson 1959).

YELLOW POPLAR



McCARTHY, E.F., U.S.D.A. TECH. BULL. NO. 356, 1933.



natural range outside mountain areas (Beck, 1962).

Data layer ^{a)}	Source	Resolution/scale
	Imagery	
LiDAR data from Anderson county, SC	SC Department of Natural Resources, 2013	1:24000 scale
	Soil	
Soil map of Anderson county, SC	Soil Survey Staff, 2013	Varies from 1:12000 to 1:63360 scale
	Forest	
Clemson Experimental Forest (SC) forest inventory field data	Cox, 2013	1:7920 scale

Table 1. Spatial data sources and descriptions used in this study.

^{a)}All data layers projected to Universal Transverse Mercator Zone 17 North (UTM Zone 17 N), North American Datum (NAD) 1983.

Table 2. Field forest inventory specifications for Clemson Experimental Forest.

Basal Factor 10 prism points to be taken in approximately 273 stands on the Clemson Experimental Forest for a total of approximately 2000 points.

Stand Maps and x, y coordinate locations for point locations in each stand to be sampled will be provided. The inventory contractor will be required to navigate to the x, y coordinate location to within 30 feet of the given position, place a flag with the point number at the point center and collect inventory data as described below.

Data required on each point will include:

- 1. DATE AND CREW
- 2. STAND ID.
- 3. POINT NUMBER
- 4. LATITUDE AND LONGITUDE of POINT
- 5. COVERTYPE (general covertype represented by point, from list)
- 6. TOPOGRAPHIC POSITION of POINT (bottom, cove, lower middle, upper, ridge)

7. **REPRODUCTION** on point. (# stems < 0.6 inch DBH. on .001 acre (3.7 ft. radius) circular plot by species group (pine, oak, yellow poplar, other).

The following information must be recorded for each tree determined to be in on the BAF 10 sampling point.

8. TREE NUMBER for each tree tallied on point.

9. **SPECIES** of each tree tallied. A species list with corresponding species code will be provided.

10. **DBH** of all sample trees 2 inch and greater DBH in point sample. Borderline trees must be measured for distance and diameter to determine if they are in the sample. Tree diameters must be recorded within \pm 1 inch of dbh.

11. **PRODUCT**, the highest value produce for each tree. (pulpwood, CNS, pole, sawtimber, veneer)

12. **MERCHANTABLE HEIGHT** in feet, of each merchantable size tree tallied to reflect the product assigned. (top minimum diameter by product table will be provided)

13. TOTAL HEIGHT in feet of each tree.

14. **PERCENT DEFECT**, for adjustment of merchantable volume estimated for each tree using a table provided.

Trees shall be tallied beginning from North and proceeding clockwise around the point. Each tally tree must be marked with a spot of paint, ink or durable crayon facing the point center.

The data collected must be provided at a minimum in DBF 4 (.dbf) database IV format, and delivered as stands are completed.

Map unit symbol	Map unit name	Surface texture rating	Taxonomic class	Slope (%)	Tree species (number of points from field inventory, 2007-2008)	SSURGO Site Index (ft) at base age 50
CbB	Cataula	Sandy loam	Fine, kaolinitic, thermic Oxyaquic Kanhapludults	2-6	Loblolly pine (4) Shortleaf pine (20)	80 66
CbC	Cataula	Sandy loam	Fine, kaolinitic, thermic Oxyaquic Kanhapludults	6-10	Loblolly pine (4) Shortleaf pine (6)	80 66
CeC2	Cataula	Clay loam	Fine, kaolinitic, thermic	6-10	Shortleaf pine (5)	55
CdB	Cecil	Sandy loam	Conseque reminaproduces Fine, kaolinitic, thermic Typic Kanhapludults	2-6	Loblolly pine (5) Shortleaf pine (7)	83 69
CdC	Cecil	Sandy loam	Fine, kaolinitic, thermic Typic Kanhapludults	6-10	Loblolly pine (10) Shortleaf pine (29) Yellow poplar (10)	83 69 92
CdD	Cecil	Sandy loam	Fine, kaolinitic, thermic Typic Kanhapludults	10-15	Scarlet oak (4) Shortleaf pine (14) Yellow poplar (7)	81 69 92
CeC2	Cecil	Clay loam	Fine, kaolinitic, thermic Typic Kanhapludults	6-10, eroded	Loblolly pine (10)	72
HaB	Hiwassee	Sandy loam	Very-fine, kaolinitic, thermic Rhodic Kanhanludults	2-6	Loblolly pine (9)	85
HaC	Hiwassee	Sandy loam	Very-fine, kaolinitic, thermic Rhodic Kanhachudults	6-10	Shortleaf pine (8)	75
HaD	Hiwassee	Sandy loam	Very-fine, kaolinitic, thermic Rhodic Kanhanluchuts	10-15	Shortleaf pine (3)	75
HwC2	Hiwassee	Clay loam	Very-fine, kaolinitic, thermic Rhodic Kanhapludults	6-10, eroded	Loblolly pine (5)	12
MaC	Madison	Sandy loam	Fine, kaolinitic, thermic Typic Kanhapludults	6-10	Loblolly pine (14) Scarlet oak (8)	80 75

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80 75	80 75 75 96	78 70 90	60
Loblolly pine (10) White oak (8)	Loblolly pine (3) Scarlet oak (12) Shortleaf pine (6) White oak (5) Yellow poplar (4)	Loblolly pine (5) Shortleaf pine (11) Yellow poplar (46)	Shortleaf pine (13)
10-15	15-25	15-25	10-15
Fine, kaolinitic, thermic Typic Kanhapludults	Fine, kaolinitic, thermic Typic Kanhapludults	Fine, kaolinitic, thermic Typic Kanhapludults	Fine, kaolinitic, thermic Typic Kanhapludults
Sandy loam	Sandy loam	Sandy loam	Clay loam
Madison	Madison	Pacolet	Pacolet
MaD	MaE	PaE	PcD2

aparison of Site Index data fron lata, n = 258 plots for LiDAR.	m SSURGO database for study area by plot level ($n = 302$ plots for	11 data).
Table 4A. Con LiDAR 2008 d	varison of Site Index data from	lata, n = 258 plot

Map	Map unit	Surface	Slope	Tree species (number of	SSURGO	Field	LiDAR	LiDAR
unit	name	texture	(%)	points from field	Site	Inventory	derived Site	derived Site
symbol		rating		inventory with 2008	Index (ft)	Data Site	Index (ft) at	Index (ft) at
				LiDAR) (number of	at base	Index (ft) at	base age 50	base age 50,
				points from field	age 50	base age 50,	(2008)	plot data
				inventory with 2011		(2007-2008)	Mean (std.)	(2011)
				LiDAR)		Mean (std.)		Mean (std.)
CbB	Cataula	Sandy	2-6	Loblolly pine (4) (4)	80	86.5(4.04)*	89.8(13.72)	80.0(28.72)
		loam		Shortleaf pine (20) (18)	66	64.1(9.51)	70.0(17.65)	71.6(17.63)
				T -1-1-11-1	00			
CBC	Cataula	Sandy	01-0	Loololly pine (4) (U)	80	80.0(0.0U)	108.0(15.51)	
		loam		Shortlear pine (o) (b)	00	01:2(10:11)	61.7(4.32)*	66.7(12.52)
رىرى	Catanla	Clav	<u>6-10</u>	Shortleaf nine (5) (4)	55	70 8/0 15/**	(VL BCJY VL	17 5170 871
	Cataula	loam			2		(+1.02)0.41	(70.02)(.1)
CdB	Cecil	Sandy	2-6	Loblolly pine (5) (4)	83	101.2(17.44)*	110.0(18.18)*	114.5(9.00)**
		loam		Shortleaf pine (7) (7)	69	50.0(0.00)	61.1(10.51)*	46.4(1.86)**
				N				
CdC	Cecil	Sandy	6-10	Loblolly pine (10) (8)	83	95.4(14.38)*	113.3(25.56)**	122.9(13.85)**
		loam		Shortleaf pine (29) (27)	69	66.1(14.16)	57.1(13.33)**	62.1(14.07)**
				Yellow poplar (10) (9)	62	85.0(0.00)	58 1(14 54)**	69 3(12 12)**
					1			
CdD	Cecil	Sandy	10-15	Scarlet oak (4) (4)	81	(00.0)069	74.8(11.59)	81.0(6.68)
		loam		Shortleaf pine (14) (12)	69	59.6(5.42)**	51.0(15.04)**	61.7(26.43)
				Yellow poplar (7) (7)	92	93.9(8.32)	64.6(27.01)*	74.9(25.25)
CeC2	Cecil	Clay	6-10,	Loblolly pine (10) (10)	72	70.0(0.00)	71.1(12.87)	76.9(1.35)**
		loam	eroded	•				
HaB	Hiwassee	Sandy	2-6	Loblolly pine (9) (7)	85	86.2(3.27)	67.8(26.00)*	57.3(10.77)**
		loam						
HaC	Hiwassee	Sandy	6-10	Shortleaf pine (8) (5)	75	68.3(3.11)**	79.1(21.54)	75.0(17.13)
		loam						

HaD	Hiwassee	Sandy	10-15	Shortleaf pine (3) (0)	75	72.0(0.00)	95.3(17.04)	
HwC2	Hiwassee	loam Clay loam	6-10, eroded	Loblolly pine (5) (0)	71	90.0(0.00)	108.0(8.72)**	·
MaC	Madison	Sandy loam	6-10	Lobiolly pine (14) (12) Scarlet oak (8) (4)	80 75	92.4(8.00)** 69.0(0.00)	78.0(28.47) 58.5(4.63)**	83.2(32.31) 74.3(13.43)
MaD	Madison	Sandy loam	10-15	Loblolly pine (10) (10) White oak (8) (8)	80 75	94.0(8.43)** 72.0(0.00)	96.8(27.37)* 70.4(7.46)	99.7(26.45)* 77.9(0.64)**
MaE	Madison	Sandy loam	15-25	Loblolly pine (3) (0) Scarlet oak (12) (10) Shortleaf pine (6) (5) White oak (5) (5) Yellow poplar (4) (4)	80 75 64 96	103.3(5.77)** 70.0(0.00) 78.3(9.48)** 72.0(0.00) 105.0(0.00)	103.3(15.57) 39.9(15.24)** 63.0(28.62) 66.0(7.38)* 110.8(19.97)	- 50.8(16.19)** 73.4(29.77) 59.4(30.62) 118.0(9.66)**
PaE	Pacolet	Sandy loam	15-25	Loblolly pine (5) (0) Shortleaf pine (11) (11) Yellow poplar (46) (44)	78 70 90	90.0(0.00) 70.1(5.77) 91.3(5.80)	86.8(21.56) 84.9(15.53)** 84.3(18.58)	- 97.5(17.99)** 86.8(19.47)
PcD2	Pacolet	Clay loam	10-15	Shortleaf pine (13) (13)	60	62.4(8.30)	59.9(19.19)	68.3(17.85)
* Indi	cates signi: cates signi	ficantly d	lifferent	* Indicates significantly different than SSURGO at $\alpha = 0.05$ level **Indicates significantly different than SSURGO at $r = 0.01$ level	5 level.			

**Indicates significantly different than SSURGO at $\alpha = 0.01$ level.

			5					U Y CI: 1	ח ארו: ז
Map	Map unit name	Surface	Slope	I ree species (number of points from field	SSUKGO Site	Field Inventory	LiDAK derived Site	LIDAK derived Site	LIDAK Combined
symbol		rating		inventory with 2008	Index (ft)	Data Site	Index (ft) at	Index (ft) at	derived Site
•)		LiDAR) (number of	at base	Index (ft) at	base age 50,	base age 50,	Index (ft) at
				points from field	age 50	base age 50,	soil map unit	soil map unit	base age 50,
				inventory with 2011		(2007-2008)	(2008)	(2011)	soil map unit
				LiDAR)		Mean (std.)	Mean (std.)	Mean (std.)	(2008 and
									2011)
							4		Mean (std.)
CbB	Cataula	Sandy	2-6	Loblolly pine (4) (4)	80	86.5(4.04)*	101.6(15.66)**	95.6(9.84)**	98.5(13.18)**
		loam		Shortleaf pine (20) (18)	<u>66</u>	64.1(9.51)	84.5(20.20)**	84.9(20.24)**	84.7(20.19)**
CPC	Cataula	Sandy	6-10	Loblolly pine (4) (0)	80	80.0(0.00)	125.3(2.54)**	52.6(27.45)**	92.2(40.93)*
		loam		Shortleaf pine (6) (6)	66	61.2(10.11)	70.5(9.23)**	74.5(10.55)**	72.3(9.99)**
CoC2	Cataula	Clay	6-10	Shortleaf pine (5) (4)	55	70.8(0.45)**	101.0(4.53)**	100.6(5.51)**	100.8(5.02)**
		loam							
CdB	Cecil	Sandy loam	2-6	Loblolly pine (5) (4) Shortleaf pine (7) (7)	83 69	101.2(17.44)* 50.0(0.00)	107.4(16.01)** 78.0(4.82)**	110.9(17.26)** 74.7(9.08)**	108.9(16.58)** 76.4(7.32)**
((. (- č		1 -1-1-11-11-11-11-11-11-11-11-11-11-11-	5	*/00 711 JU	**(07 0175 701	**\[[JC/0 CO]	**\77 5070 711
	Cecil	Sandy loam	01-0	Lobiolly pine (10) (8) Shortleaf pine (29) (27)	69 69	7(86.41)4.66 (61.14.16)	80.3(11.08)**	81.7(10.38)**	81.0(10.77)**
				Yellow poplar (10) (9)	92	85.0(0.00)	81.8(6.27)**	93.9(6.06)*	87.1(8.64)**
CdD	Cecil	Sandv	10-15	Scarlet oak (4) (4)	81	69.0(0.00)	79.7(5.84)	87.7(3.14)**	83.2(5.79)**
		loam		Shortleaf pine (14) (12)	69	59.6(5.42)**	91.1(11.99)**	95.1(12.08)**	92.9(12.18)**
				Yellow poplar (7) (7)	92	93.9(8.32)	100.4(9.76)**	108.1(9.92)**	103.9(10.53)**
CeC2	Cecil	Clav	6-10.	Loblolly pine (10) (10)	72	70.0(0.00)	92.9(5.17)**	97.9(5.87)**	95.1(6.02)**
l))	ł	loam	eroded			~	~		×
HaB	Hiwassee	Sandy	2-6	Loblolly pine (9) (7)	85	86.2(3.27)	87.4(19.68)	77.6(14.70)**	83.3(18.41)
		loam							

Table 4B. Comparison of Site Index data from SSURGO database for study area by map unit level (n = 20 or 5%, whichever is preatest. for each map unit within a stand for LiDAR 2008 and 2011 data).

-10 Shortleaf pine (8) (5) 75 68.3(3.11)** 87.4(4.56)** 93.6(3.73)** 90.0(5.21)**)-15 Shortleaf pine (3) (0) 75 72.0(0.00) 121.3(3.93)** 116.0(2.51)** 118.6(4.20)**	-10, Lobiolly pine (5) (0) 71 90.0(0.00) 119.5(2.12)** 82.0(23.17)** 101.0(24.86)** oded	-10 Lobiolly pine (14) (12) 80 92.4(8.00)** 103.1(27.03)** 98.1(36.27)** 101.0(31.26)** Scarlet oak (8) (4) 75 69.0(0.00) 79.5(6.28)** 87.8(5.27)** 82.2(7.13)**)-15 Loblolly pine (10) (10) 80 94.0(8.43)** 122.0(16.52)** 121.1(21.04)** 121.6(18.71)** White oak (8) (8) 75 72.0(0.00) 81.8(3.97)** 91.6(4.40)** 86.0(6.38)**	5-25Loblolly pine (3) (0)80 $103.3(5.77)^{**}$ $134.5(5.85)^{**}$ $136.2(7.36)^{**}$ $135.2(6.57)^{**}$ Scarlet oak (12) (10)7570.0(0.00) $64.4(6.32)^{**}$ 74.0(7.32) $68.6(8.29)^{**}$ Shortleaf pine (6) (5) 64 78.3(9.48)^{**} $90.4(17.73)^{**}$ $90.7(13.26)^{**}$ $90.5(15.76)^{**}$ White oak (5) (5)7572.0(0.00) $86.9(4.21)^{**}$ $93.4(4.48)^{**}$ $89.5(5.36)^{**}$ Yellow poplar (4)96 $105.0(0.00)$ $113.1(22.37)^{**}$ $126.3(5.13)^{**}$ $121.0(6.86)^{**}$	5-25 Loblolly pine (5) (0) 78 90.0(0.00) 109.3(3.74)** 91.1(2.86)** 101.2(9.69)** Shortleaf pine (11) (11) 70 70.1(5.77) 98.7(18.29)** 101.3(17.21)** 99.9(17.77)** Yellow poplar (46) 90 91.3(5.80) 110.6(13.31)** 115.0(9.44)** 112.7(11.37)** (44)	
6-10 Sho	10-15 Sho	6-10, Lob eroded	6-10 Lob Scar	10-15 Lob Whi	15-25 Lob Sca Sho Whi Yell	15-25 Lob Sho Yell	10-15 Sho (13)
Sandy	Sandy	Clay loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Clay loam
Hiwassee	Hiwassee	Hiwassee	Madison	Madison	Madison	Pacolet	Pacolet
HaC	HaD	HwC2	MaC	MaD	MaE	PaE	PcD2

Table 5A. Comparison of Site Index soil data from SSURGO database by SSURGO Map
Unit Symbol within a stand with loblolly pine as Site Index species for the study area
(2008)

Map	Stand	Stand	SSURGO	Lidar	LiDAR	Lidar	Lidar	Age	LiDAR SI (ft,
Unit Symbol	Ð	SI (ft, base age 50)	SI (ft, base age 50)	Total Number Trees (2008)	n (20 or 5% greatest) (2008)	Mean Ht (ft) (2008)	Std Dev (2008)	(2008)	base age 50) Mean (std dev) (2008)
CbB	90217	83	80	412	21	6.99	10.0	30	89.8(12.77)**
	90512	06	80	187	20	101.1	4.9	39	114.1(5.01)**
CbC	90509	80	80	465	24	110.1	2.6	37	125.3(2.54)**
CdB	90315	109	83	470	24	93.1	4.3	23	128.3(4.54)**
	100429	70	83	876	44	86.9	3.1	41	95.9(3.17)**
CdC	90315	109	83	613	31	97.8	3.0	23	135.7(2.88)**
	90209	80	83	341	20	105.5	3.1	37	120.5(3.14)**
	90703	83	83	305	20	102.8	2.1	41	112.0(2.45)**
CeC2	100429	70	72	2422	122	83.9	5.2	41	92.9(5.17)**
HaB	110504	83	85	731	37	109.2	3.6	46	113.2(3.57)**
	110509	90	85	995	50	71.7	7.5	46	74.6(8.25)**
	110826	87	85	634	32	74.3	13.9	46	77.6(14.04)**
HwC2	90512	90	71	635	32	106.4	2.0	39	119.5(2.12)**
MaC	110128	92	80	931	47	68.5	6.8	47	69.5(6.92)**
	110401	100	80	906	46	82.7	5.5	25	123.8(5.10)**
	110504	83	80	507	26	96.6	3.0	46	99.5(3.26)**
	110817	80	80	406	21	96.7	4.3	24	137.3(3.67)**
MaD	110401	100	80	775	39	89.3	8.6	25	129.7(7.39)**
	110509	90	80	127	20	92.9	9.2	46	96.6(9.14)**

133.0(4.58)**	137.4(6.84)**	109.3(3.74)**	
23	25	39	
4.5	7.6	3.9	evel.
91.0	97.7	97.3	SURGO at $\alpha = 0.05$ level
54	30	31	IRGO at
1063	584	606	than SSU
80	80	78	different
110	100	60	ficantly
110101 110	110401 100	90512	ates signi
MaE		PaE	* Indic

**Indicates significantly different than SSURGO at $\alpha = 0.01$ level.

Map Unit								A DESCRIPTION OF A DESC			1	
	Stand	Stand	SSURGO	LIDAR	LiDAR	LiDAR	LiDAR	Age	Growth	LIDAR SI	LiDAR SI (ft,	LiDAR
Svmhol	a	IS E	SI (ff, hase age	Total	n (20 or 5%	Mean H+ (#)	Std Dev	(2011)	(3 Veare)	(ft, base	base age 50) Maan (std	Combined SI
		base age	50)	Trees (2011)	greatest) (2011)	(2011)	(2011)		(ema)	Difference	dev) (2011)	50) Mean (std dev)
		ſ'nc										(2008 and 2011)
CbB	90217	83	80	517	26	73.4	9.4	93 3	6.5	m	92.8(11.80)**	91.5(12.21)**
	90512	90	80	159	20	92.4	3.9	42	-8.7	-15	99.3(4.68)**	106.7(8.91)**
cbc	90509	80	80	191	20	46.1	25.5	40	-64.1	-73	52.6(27.45)**	92.2(40.93)*
CdB	90315	109	83	399	20	7.76	4.4	26	4.5	0	130.0(4.42)**	129.1(4.52)**
	100429	70	83	632	32	90.8	17.1	44	3.9	ŝ	98.5(9.12)**	97.0(6.42)**
CdC	90315	109	83	492	25	101.7	3.2	26	3.9	-2	133.7(3.16)**	134.8(3.14)**
	90509	80	83	182	20	48.5	15.5	40	-57.0	-66	54.4(17.79)**	87.4(35.74)
	90703	83	83	279	20	106.5	1.2	44	3.7	0	112.5(1.23)**	112.2(1.93)**
CeC2	100429	70	72	1878	94	92.8	5.7	44	8.9	ŝ	97.9(5.87)**	95.1(6.02)**
HaB	110504	83	85	476	24	66.3	16.5	49	-42.9	-45	68.6(16.92)**	95.6(24.50)**
	110509	06	85	652	33	79.3	8.3	49	7.6	9	80.3(8.34)**	76.9(8.69)**
	110826	87	85	526	27	81.3	15.7	49	7.0	Ŷ	82.3(15.64)	79.7(14.85)**
HwC2	90512	90	71	606	31	75.9	21.7	35	-30.5	-37	82.0(23.17)**	101.0(24.86)**
MaC	110128	92	80	512	26	74.9	7.9	50	6.4	\$	74.9(7.91)**	71.4(7.68)**
	110401	100	80	689	35	90.9	6.8	28	8.2	1	124.4(7.03)**	124.0(5.98)**
	110504	83	80	234	20	42.6	3.9	29	-54.1	-56	43.6(3.94)**	75.2(28.24)
	110817	80	80	299	20	101.2	2.2	27	4.5	0	137.0(1.82)**	137.1(2.89)**
MaD	110401	100	80	570	29	98.4	6.1	28	9.2	ςΩ	132.9(5.97)**	131.0(6.95)**
	110509	06	80	112	20	90.8	15.7	49	-2.1	Ŷ	91.7(15.72)**	94.1(12.93)**
	110817	80	80	237	20	97.4	3.0	27	6.0	1	133.3(2.75)**	132.9(2.91)**

Table 5B. Comparison of Site Index soil data from SSURGO database by SSURGO Map Unit Symbol within a stand with

132.7(3.88)**	139.8(7.89)**	101.2(9.69)**	
132.4(2.73)**	142.9(8.19)**	91.1(2.86)**	
	9	-18	
5.5	10.5	-12.4	
57	33	34	
2.9	8.4	2.6	PVP
96.4	108.2 8.4	85.0	nan SSURGO at $\alpha = 0.05$ level
41	23	25	IRGO at
803	459	490	than SSI
80	80	78	different
110	100	90	ficantly
101011	110401 100	90512 90	ates sioni
MaE		PaE	* Indic

* Indicates significantly different than SSURGO at $\alpha = 0.05$ level. **Indicates significantly different than SSURGO at $\alpha = 0.01$ level. Note: A negative number in growth indicates that a stand has been harvested, trees were lost to some sort of damage, or an overestimation in 2008 or underestimation in 2011 has occurred.

Table 6A. Comparison of Site Index soil data from SSURGO database by SSURGO Map
Unit Symbol within a stand with scarlet oak as Site Index species for the study area
(2008).

Map	Stand	Stand	SSURGO	Lidar	Lidar	Lidar Lidar /	Lidar	Age	LiDAR SI
Unit	9	SI	SI (ft,	Total	n (20 or	Mean	Std	2008)	(ft, base age
Symbol		(Ĥ	base age	Number	5%	Ht (ft)	Dev		50) Mean
I		base	50)	Trees	greatest)	(2008)	(2008)		(std dev)
		age 50)	(2008) (2008)	(2008)	(2008)				(2008)
******		(22)							
CdD	110906	69	81	938	47	91.9	5.4	65	80.0(5.05)
MaC	110906	69	75	1590	80	91.2	6.7	65	79.5(6.28)**
MaE	110403	70	75	2790	140	77.1	6.9	70	64.4(6.32)**
* Indic	ates sign	ufficantl	[*] Indicates significantly different than SSURGO at $\alpha = 0.05$ level.	than SSI	URGO at	$\alpha = 0.05$	level.		
T1:-		1	$I_{1} := :: :::::::::::::::::::::::::::::::$	ייוריי ממו		2 - 0.01	[2110]		

**Indicates significantly different than SSURGO at $\alpha = 0.01$ level.

Unit Symbol		Stand SI (ft, base age 50)	d Stand SSUKGO LIDAK LIDAK LIDAK LIDA SI SI $(\hat{f}_i, Total n (20 or Mean(\hat{f}_i, base age Number 5% Ht (\hat{f}_i)base 50) Trees greatest) (2011age (2011) (2011)50)$	LiDAR Total Number Trees (2011)	LiDAR n (20 or 5% greatest) (2011)	LıDAR Mean Ht (ft) (2011)	LiDAK Std Dev (2011)	LiDAR LiDAR Age Growth Mean Std (2011) (3 Ht (ft) Dev years) (2011) (2011)	Growth (3 years)	LiDAR SI (ft, base age 50) Difference	Growth LiDAR SI LiDAR SI) (3 (ft, base (ft, base age years) age 50) 50) Mean Difference (std dev) (2011)	LiDAR Combined SI (ft, base age 50) Mean (std dev) (2008 and 2011)
CdD	110906 69	69	81	677	34	101.8	3.4	68	9.9	8	87.7(3.14)**	83.
MaC	MaC 110906 69	69	75	752	38	102.0	5.8	68	10.9	8	87.8(5.27)** 82.2(7.13)**	82.2(7.13)*
MaE	MaE 110403 70	70	75	2215	111	88.7	7.9	73	11.6	10	74.0(7.32)	68.6(8.29)**

Table 6B. Comparison of Site Index soil data from SSURGO database by SSURGO Map Unit Symbol within a stand with

				 / # #					ידיניני איזייני איזיין איזיין איזיין איזיין איזיין איזיא איזיין איזיא איזיאין איזיא איזיין איזיא איזיין איזיין
D Sta	Stand ID	Stand SI (ft,	SSURGO SI (ft, base age	LiDAR Total Number	LiDAR n (20 or 5%	LiDAR Mean Ht (ft)	LiDAR Std Dev	Age (2008)	LiDAR SI (ft, base age 50) Mean (std
		base age 50)	50)	Trees (2008)	greatest) (2008)	(2008)	(2008)		dev) (2008)
ι Ω	90215	11	66	1469	74	91.0	5.2	43	98.0(5.1)**
9	90301	55	66	79	20	41.2	5.5	48	42.2(5.5) **
9	90419	70	66	272	20	73.4	4.1	27	100.2(4.0)**
6	90918	50	66	525	27	80.0	3.5	49	81.0(3.54)**
Π	111306	47	66	214	20	62.5	6.6	45	66.2(6.95)
9	10£06	55	66	841	43	66.0	3.6	48	67.0(3.56)*
6	90507	70	99	566	29	80.9	7.3	50	80.9(7.29)**
6	90915	47	66	137	20	62.1	7.2	49	63.1(7.22)*
6	90215	11	55	268	20	94.0	5.1	43	$100.9(4.90)^{**}$
<u>e</u>	90419	70	55	286	20	74.0	4.0	27	101.1(4.25)**
2	90918	50	69	1026	52	77.0	4.8	49	78.0(4.82)**
9	90428	80	69	2113	106	73.0	10.9	40	82.5(12.22)**
6	90507	70	69	59	20	74.0	5.7	50	74.0(5.68)**
6	90915	47	69	248	20	67.6	5.4	49	68.6(5.42)
<u>e</u>	90918	50	69	1249	63	80.8	4.5	49	81.8(4.53)**
10	100504	70	69	360	20	81.9	3.0	78	66.5(2.48)**
<u>1</u>	100508	55	69	616	31	78.1	3.4	55	74.1(3.51)**
11	111302	60	69	176	20	81.7	3.5	35	99.0(4.01)**
11	111306	47	69	508	26	81.0	6.0	45	85.4(8.16)**
9	90301	55	69	275	20	65.3	3.7	48	66.3(3.67)**

95.5(4.70)**	98.4(7.26)**	97.7(5.16)**	77.3(3.66)**	87.4(4.56)**	121.3(3.93)**	68.7(6.20)**	107.6(5.98)**	94.3(4.80)**	69.5(2.95)	100.5(4.25)**	116.9(3.54)**	102.3(9.27)**	91.8(6.98)**	71.5(4.51)**	
38	n I	35	45	65	35	40	30	38	78	38	30	35	43	48	
4.8	6.9	4.7	3.5	5.3	4.6	5.7	6.8	4.7	3.6	5.1	4.5	9.3	6.5	4.5	level. level.
82.7	76.7	80.5	73.5	0.66	105.7	60.6	84.2	81.5	85.8	87.5	95.0	85.4	85.8	70.5	x = 0.05 x = 0.01
39	23	92	32	29	20	25	27	20	20	20	26	20	55	53	RGO at (RGO at (
772	449	1830	626	574	362	491	593	294	329	393	506	251	1098	1056	* Indicates significantly different than SSURGO at $\alpha = 0.05$ level. **Indicates significantly different than SSURGO at $\alpha = 0.01$ level.
69	69	69	69	75	75	64	64	64	70	70	70	70	60	60	different different
68	70	60	47	66	72	80	88	67	70	68	75	60	71	55	ficantly ficantly
111026	111209	111302	111306	90324	10106	90428	110142	110207	100504	111026	111218	111302	90215	90301	ates signi ates signi:
				HaC	HaD	MaE			PaE				PcD2		* Indic **Indic:

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<u>_</u>		ł
stand with	Lidar	;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
Table 7B. Comparison of Site Index soil data from SSURGO database by SSURGO Map Unit Symbol within a stand with shortleaf pine as Site Index species for the study area (2008 and 2011).	I Stand SSURGO LIDAR LIDAR LIDAR LIDAR Age Growth LIDAR SI LIDAR SI (ft,	
⁄lap Unit S	LIDAR SI	
URGO N	Growth	ç
e by SS).	Age	() + () ()
) databas and 2011	Lidar	Ę
SSURGC a (2008 a	LIDAR	
ata from (study are	Lidar	000
ex soil da s for the	Lidar	Ē
Table 7B. Comparison of Site Index soil data from SSURGO database l shortleaf pine as Site Index species for the study area (2008 and 2011).	SSURGO	07.10
parison s Site In	Stand	07.10
7B. Com] af pine at	Stand	Ę
Table ' shortle	Map	. 11

Map Unit Symbol	Stand ID	Stand SI	SSURGO SI (ft, hate are	LiDAR Total Mumher	LiDAR n (20 or 5%	LiDAR Mean Ht (A)	LiDAR Std Dav	Age (2011)	Growth (3	LiDAR SI (ft, base	LiDAR SI (ft, base age 50) Moon (ctd	LiDAR Combined SI
		base age 50)	50) 50)	Trees (2011)	greatest) (2011)	(2011)	(2011)		y cars)	Difference	dev) (2011)	(II, Juase age 50) Mean (std dev) (2008 and 2011)
CbB	90215	71	66	1252	63	96.0	5.0	46	5.0	1	99.0(5.01)**	98.5(5.07)**
	90301	55	99	61	20	47.0	5.1	51	5.8	4	46.0(5.08)**	44.1(5.58)**
	90419	70	99	212	20	80.4	4.2	30	7.0	4	103.7(4.04)**	102.0(4.34)**
	90918	50	99	482	25	79.2	6.8	52	-0.8	ų	78.2(6.79)**	79.7(5.49)**
	111306	47	66	174	20	68.1	5.6	48	5.6	ເግ	69.1(5.58)*	67.6(6.40)
cbC	90301	55	66	564	29	74.9	4.5	51	9.0	7	73.9(4.48)**	69.8(5.21)**
	90507	70	99	429	22	87.0	7.9	53	6.1	ŝ	84.0(7.90)**	82.2(7.64)**
	90915	47	99	121	20	66.0	10.6	52	58.7	2	65.0(10.57)	64.0(8.98)
CcC2	90215	71	55	215	20	96.6	6.7	46	2.6	-	99.8(6.98)**	100.3(5.98)**
	90419	70	55	211	20	78.0	3.3	30	4.0	0	101.4(3.50)**	101.2(3.85)**
CdB	90918	50	69	938	47	75.7	9.1	52	-1.4	ų	74.7(9.08)**	76.4(7.32)**
cdc	90428	80	69	1794	90	78.7	8.4	43	5.7	ςΩ	85.2(8.82)**	83.8(10.85)**
	90507	70	69	50	20	74.6	3.1	53	9.0	5	71.6(3.07)**	72.8(4.67)**
	90915	47	69	213	20	67.1	5.0	52	-0.5	'n	66.1(5.00)**	67.3(5.31)*
	90918	50	69	1163	59	81.0	4.2	52	0.2	-2	80.0(5.73)**	81.0(4.46)**
	100504	70	69	260	20	88.5	2.7	81	6.7	5	71.1(2.13)**	68.8(3.28)
	100508	55	69	467	24	86.1	6.1	58	8.1	9	80.0(5.73)**	76.7(5.43)**
	111302	60	69	138	20	86.7	4.4	38	5.1		99.9(3.84)**	99.4(3.90)**
	111306	47	69	393	20	90.5	5.3	48	9.4	9	91.5(5.32)**	88.0(7.62)**
CPD	10000	1										

	111026	68	69	606	31	87.1	3.3	41	4.4	13	97.2(3.56)**	96.2(4.29)**
	111209	70	69	424	22	84.8	5.1	34	8.0	5	103.6(6.18)**	101.0(7.18)**
	111302	60	69	1418	71	90.1	4.9	38	9.5	5	102.6(4.72)**	99.9(5.54)**
	111306	47	69	506	26	82.1	5.9	48	8.5	9	83.1(5.86)**	79.9(5.55)**
HaC	90324	66	75	407	21	108.0	4.4	68	0.0	9	93.6(3.73)**	90.0(5.21)**
HaD	90101	72	75	279	20	103.8	3.1	38	-1.9	-5	116.0(2.51)**	118.6(4.20)**
MaE	90428	80	64	429	22	68.5	4.2	43	8.0	5	$74.1(4.84)^{**}$	71.2(6.19)**
	110142	88	64	253	20	83.6	4.9	33	-0.7	-5	102.4(4.39)**	105.3(5.91)**
	110207	67	64	216	20	87.3	3.1	41	5.8	ŝ	97.4(3.36)**	95.8(4.39)**
PaE	100504	70	70	239	20	94.0	2.6	81	8.2	6	75.7(2.11)**	72.6(4.03)**
	111026	68	70	304	20	93.4	5.5	41	5.9	'n	103.8(5.57)**	102.1(5.16)**
	111218	75	70	371	20	104.4	2.3	33	9.4	4	121.3(2.05)**	118.8(3.69)**
	111302	60	70	194	20	6.19	8.4	38	6.5	0	104.6(7.92)**	103.4(8.59)**
PcD2	90215	71	60	820	41	91.5	5.6	46	5.7	ξ	94.5(5.61)**	93.0(6.54)**
	90301	55	60	781	40	79.5	4.4	51	8.9	7	78.5(4.40)**	74.5(5.62)**
* Indi	Indicates significantly different	ificantly	· differen		JRGO at	than SSURGO at $\alpha = 0.05$ level	level.					
**Indi	**Indicates significantly different	ificantly	differen		JRGO at	than SSURGO at $\alpha = 0.01$ level	level.					

Note: A negative number in growth indicates that a stand has been harvested, trees were lost to some sort of damage, an overestimation in 2008, or an underestimation in 2011 has occurred.

Table 8A. Comparison of Site Index soil data from SSURGO database by SSURGO
Map Unit Symbol within a stand with white oak as Site Index species for the study area
(2008).

Мар Ur (2008).	ut Symbo	l withi	Map Unit Symbol within a stand with white oak as Site Index species for the study area (2008) .	vith white	e oak as S	ite Index	species	for the s	study area	
Map	Stand	Stand	Stand SSURGO LIDAR LIDAR LIDAR Age	Lidar	Lidar	Lidar	Lidar	Age	LiDAR SI	
Unit	Ð	SI	SI (ft,	Total	n (20 or	Mean	Std	(2008)	(ft, base age	
Symbol		(ff,	base age	Number	5%	Ht (ft)	Dev		50) Mean	
		base	50)	Trees	greatest)	(2008)	(2008)		(std dev)	
		age 50)		(2008)	(2008)				(2008)	
MaD	110710	72	75	1407	71	91.8 4.0	4.0	65	65 81.8(3.97)**	
MaE	110710 72	72	75	1398	70	96.9 4.2	4.2	65	86.9(4.21)**	
* Indic	ates signi	ficantly	[*] Indicates significantly different than SSURGO at $\alpha = 0.05$ level.	than SSU	JRGO at c	$\chi = 0.05$	evel.			
**Indic	ates signi	ficantly	**Indicates significantly different than SSURGO at $\alpha = 0.01$ level.	than SSU	IRGO at c	$\chi = 0.01$	level.			

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MaD1107107275107754103.54.16811.71091.6(4.40)**86.0(6.38)**MaE110710727590346105.24.2688.3793.4(4.48)**89.5(5.36)*** Indicates significantly different than SSURGO at $\alpha = 0.05$ level.**Indicates significantly different than SSURGO at $\alpha = 0.01$ level.	Map Unit Symbol	Stand ID	Stand SI (ft, base age 50)	Stand SSURGO SI SI (ft, (ft, base age base 50) age 50)	LiDAR Total Number Trees (2011)	LiDAR n (20 or 5% greatest) (2011)	LiDAR Mean Ht (ff) (2011)	LiDAR Std Dev (2011)	Age (2011)	LiDAR LiDAR Age Growth Mean Std (2011) (3 Ht (ft) Dev years) (2011) (2011)	LiDAR SI (ft, base age 50) Difference	LiDAR SI LiDAR SI (ft, base (ft, base age age 50) 50) Mean Difference (std dev) (2011)	LiDAR Combined SI (ft, base age 50) Mean (std dev) (2008 and 2011)
2 68 8.3 7	MaD	110710	72	75	1077	54	103.5	4.1	68	11.7	10	91.6(4.40)**	86.0(6.38)**
	MaE	110710	72		903	46	105.2	4.2	68	8.3	7	93.4(4.48)**	89.5(5.36)**
	* Indic.	ates signi ates signi	ificantly ficantly	y different y different	than SSU than SSU	RGO at o RGO at o	x = 0.05] t = 0.01]	evel. evel.				,	

Table 8B. Comparison of Site Index soil data from SSURGO database by SSURGO Map Unit Symbol within a stand with white oak as Site Index species for the study area (2008) Table 9A. Comparison of Site Index soil data from SSURGO database by SSURGO Map Unit Symbol within a stand with yellow poplar as Site Index species for the study area (2008).

LiDAR SI (ft, base age 50) Mean (std dev) (2008)	81.8(6.27)**	106.4(4.08)**	83.9(6.95)**	103.4(5.75)**	117.2(5.28)**	118.8(6.26)**	104.8(4.84)**	125.1(6.76)**	96.9(3.99)**	106.3(7.12)**	100.9(6.57)**	101.4(3.92)**	
Age (2008)	85	62	85	55	45	45	55	48	49	62	85	55	
LiDAR Std Dev (2008)	6.8	4.3	7.5	5.8	5.1	6.2	4.9	6.8	4.0	7.3	7.6	3.9	level. level.
LiDAR Mean Ht (ft) (2008)	93.0	112.9	95.3	106.4	113.1	115.0	107.9	124.1	95.9	113.1	114.0	104.4	x = 0.05 x = 0.01
LiDAR n (20 or 5% greatest) (2008)	66	22	20	67	28	20	104	181	20	44	137	34	IRGO at (IRGO at (
LiDAR Total Number Trees (2008)	1319	378	396	1332	542	268	2065	3611	347	863	2723	679	than SSU than SSU
SSURGO SI (ft, base age 50)	92	92	92	92	96	06	90	90	90	90	06	90	* Indicates significantly different than SSURGO at $\alpha = 0.05$ level **Indicates significantly different than SSURGO at $\alpha = 0.01$ level
Stand SI (ft, base age 50)	85	100	85	102	105	105	16	90	90	100	85	102	ficantly ficantly
Stand ID	100503	100414	100503	111027	90426	90426	90707	100229	100310	100414	100503	111027	ttes signi
Map Unit Symbol	cdC	CdD	CdD	CdD	MaE	PaE	PaE	PaE	PaE	PaE	PaE	PaE	* Indica **Indica

SISI (ft, hase age S0) maneTotal base age Number $7/6$ S6Ht (ft) Ht (ft)Dev years) 2011 $(3$ years) $(ft,$ base age S0) mean (std base (s0) $3ge$ 50)Treesgreatest) (2011) (2011) (2011) (2011) $3ge$ 20)Treesgreatest) (2011) (2011) (2011) (2011) $3ge$ (2011) (2011) (2011) (2011) (2011) (2011) $3ge$ 90 92 (100) 92 (2011) (2011) $3ge$ 92 119.7 4.4 65 6.8 9.9 $9.2.7(5.17)$ 7 102 92 200 119.7 4.4 65 6.8 9.9 $9.2.7(5.17)$ 7 102 92 201 105.2 6.0 88 9.9 9.9 $9.2.7(5.17)$ 7 102 96 118.9 6.1 58 12.1 9 $112.9(6.00)^*$ 7 102 96 108.8 9.9 9 $9.2.7(5.17)$ $9.2.7(5.17)$ 7 102 96 118.9 6.1 58 8.0 9.9 $9.2.6(3.62)^*$ 7 91 90 173 20 125	Map		Stand	SSURGO	Lidar	Lidar	Lidar	Lidar	Age	Growth	LiDAR SI	LiDAR SI (ft.	LiDAR
Symbol (ft, base age Number 5% It (ft) Dev Near(st) age 50 Mean (std (ft, base age Number 5% 1011) (2011) (2011) Difference dev) (2011) (5) Mean (std dev) age (2011) (2011) (2011) (2011) (2011) (5) Mean (std dev) (6v) age (2011) (2011) (2011) (2011) (2011) (5) (4v) age (1) (2) (2) (2) (4v)	Unit	Ð	SI	SI (ft,	Total	п (20 ог	Mean	Std	(2011)	3	(ft, base	base age 50)	Combined SI
base 50) Trees grantest (2011) 50) Mean (av) (2011	Symbol		(ff,	base age	Number	5%	Ht (ft)	Dev		years)	age 50)	Mean (std	(ft, base age
age (2011) (2011) (2011) (2008 an (2008) 50) (2008 an (2011) (2011) CdC 100503 85 92 1005 51 106.9 7.5 88 13.9 12 93.9(6.06)* 87.1(8.64) CdD 1000414 100 92 283 20 119.7 44 65 6.8 5 111.5(4.32)** 108.8(4.89) CdD 100503 85 92 206 20 119.7 44 65 6.8 5 111.5(4.32)** 108.8(4.89) CdD 11027 102 92 206 20 119.7 44 65 6.8 5 111.6(7.61) 87.1(5.17) 88.3(7.51) MaE 90426 105 96 361 20 125.3 5.1 4 12.2(6.16)** 107.4(7.51) MaE 90426 105 96 5.1 3.8 6.6 4 12.2(6.16)** 107.4(7.51) PaE 100219			base	50)	Trees	greatest)	(2011)	(2011)			Difference	dev) (2011)	50) Mean (std
50) 2010 CdC 100503 85 92 10050 87.1(8.64) CdD 100414 100 92 283 201 CdD 100414 100 92 283 20 119.7 4.4 65 6.8 5 111.5(4.32)** 108.8(4.89) CdD 100414 100 92 283 20 119.7 4.4 65 6.8 5 111.5(4.32)** 108.8(4.89) CdD 110027 102 92 286 50 118.9 6.1 58 12.7 93.9(6.06)** 87.1(8.64) CdD 110027 102 92 286 50 118.9 6.1 58 10 112.6(.50)** 107.4(7.51) 88.3(7.51) MaE 90426 105 96 361 20 121.6 3.6 48 107.4(7.51) 88.3(7.51) PaE 90707 91 90 91 153 71 51 12 166.6(3.62)** 120.6(6.6)* 107.4(5.4)** 120.6(6.6)* 88.3(7.6) <t< td=""><td></td><td></td><td>age</td><td></td><td>(2011)</td><td>(2011)</td><td></td><td></td><td></td><td></td><td></td><td></td><td>dev)</td></t<>			age		(2011)	(2011)							dev)
Cdc1005038592100551106.97.58813.91293.9(6.06)*87.1(8.64)CdD1004141009228320119.74.4656.85111.5(4.32)**108.8(4.89)CdD100503859229620105.26.0889.9992.7(5.17)88.3(7.51)CdD111027102929650118.96.15812.510112.9(6.00)**107.4(7.51)MaE904261059636120125.35.14812.19126.3(5.13)**120.6(6.8%PaE904261059017320121.63.6486.64122.6(3.02)**120.7(5.06PaE904079190156579115.83.8588.05109.8(3.60)***107.0(5.06PaE1002199091156579115.83.8588.05109.8(3.60)***107.0(5.06PaE10021090903435172123.67.15111.687.06.0(7.64)PaE10021090903332094.23.25.188.0510.0(6.86)PaE100414100903332094.23.25.11111.6122.6(7.14)**123.8(7.06)PaE1002198590 <t< td=""><td></td><td></td><td>50)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>(2008 and 2011)</td></t<>			50)										(2008 and 2011)
CdD1004141009228320119.74.4656.85111.5(4.32)**108.8(4.89)CdD100503859229620105.26.0889.9992.7(5.17)88.3(7.51)CdD1110271029292650118.96.15812.510112.9(6.00)**107.4(7.51)MaE904261059636120125.35.14812.1992.7(5.13)**121.0(6.86PaE904261059017320121.63.6486.64122.6(3.62)**107.4(7.51)PaE907079190156579115.83.8588.05109.8(3.80)**107.0(5.06PaE10022990903435172123.57.151116.8-3102.2(5.13)**123.6(7.04)PaE10031090903435172123.57.151116.8-3107.0(5.06PaE10031090903332094.23.252-1.8-493.2(7.14)**123.6(7.04)PaE100310909068735125.05.66511.911116.8(5.65)**110.9(8.36)PaE100310909068735126.84.888122.8(7.14)**103.0(7.04)PaE10031090906873	CdC	100503	85	92	1005	51	106.9	7.5	88	13.9	12	93.9(6.06)*	87.1(8.64)**
CdD100503859229620105.26.0889.9992.7(5.17)88.3(7.51)CdD111027102929650118.96.15812.510112.9(6.00)**107.4(7.51)MaE904261059636120125.35.14812.1912.6(5.60)**107.4(7.51)PaE904261059017320121.63.6486.64122.6(5.62)**120(6.86)PaE907079190156579115.83.8588.05109.8(3.80)**107.0(5.06)PaE907079190156579115.83.8586.64122.6(3.62)**120.7(5.41)PaE10031090903435172123.57.151116.8-3122.6(3.62)**120.7(5.06)PaE100414100903435172123.57.151116.8-3122.5(7.14)**123.8(7.06)PaE100414100903332094.23.25.56.511911106.8(5.65)**110.9(8.36)PaE1004141009068735122.65.66511.911116.8(5.65)**110.9(8.36)PaE10102710290902029102122.12.74.2588.25106.7(4.24)**103.7(4.80) <td>CdD</td> <td>100414</td> <td>100</td> <td>92</td> <td>283</td> <td>20</td> <td>119.7</td> <td>4.4</td> <td>65</td> <td>6.8</td> <td>5</td> <td>111.5(4.32)**</td> <td>108.8(4.89)**</td>	CdD	100414	100	92	283	20	119.7	4.4	65	6.8	5	111.5(4.32)**	108.8(4.89)**
CdD1110271029298650118.96.15812.510112.9(6.00)**107.4(7.51)MaE904261059636120125.35.14812.19126.3(5.13)**121.0(6.86)PaE904261059017320121.63.6486.64122.6(3.62)**120.7(5.41)PaE904261059017320121.63.6486.64122.6(3.62)**120.7(5.41)PaE907079190156579115.83.8588.05109.8(3.80)**107.0(5.06)PaE10022990903435172123.57.151116.8-3122.6(3.62)**120.7(5.41)PaE10021090903332094.23.252-1.8-493.2(7.14)**123.8(7.06)PaE1004141009068735125.05.66511.91111.8(5.55)**100.9(8.36)PaE1002108020902029102126.84.88812.895.0(4.04)PaE10020385902029102126.74.2588.25100.7(4.44)**105.0(7.44)PaE111027102902029102126.74.2588.25106.7(4.24)**103.7(4.80)*Indicates significantly diffe	CdD	100503	85	92	296	20	105.2	6.0	88	6.6	6	92.7(5.17)	88.3(7.51)**
MaE 90426 105 96 361 20 125.3 5.1 48 12.1 9 126.3(5.13)** 121.0(6.86 PaE 90426 105 90 173 20 121.6 3.6 48 6.6 4 122.6(3.62)** 120.7(5.41) PaE 90707 91 90 1565 79 115.8 3.8 58 8.0 5 109.8(3.80)** 107.0(5.06 PaE 100210 90 93 3435 172 123.5 7.1 51 116.8 -3 122.5(7.14)** 123.8(7.06 PaE 100310 90 3435 172 123.5 7.1 51 116.8 -3 122.5(7.14)** 123.8(7.06 PaE 100210 90 333 20 94.2 35.2 -1.8 4 95.0(4.04) PaE 100271 100 90 687 35 125.6 55 110.9 111.9 111.0 111.6	CdD	111027	102	92	986	50	118.9	6.1	58	12.5	10	112.9(6.00)**	107.4(7.51)**
PaE904261059017320121.63.6486.64122.6(3.62)**120.7(5.41)PaE907079190156579115.83.8588.05109.8(3.80)**107.0(5.06)PaE10022990903435172123.57.151116.8-3122.5(7.14)**123.8(7.06)PaE1002299090903435172123.57.151116.8-3122.5(7.14)**123.8(7.06)PaE10031090903332094.23.25.2-1.8-493.2(3.18)**95.0(4.04)PaE1004141009068735125.05.66511.911116.8(5.65)**110.9(8.36)PaE1004141009068735125.05.66511.911116.8(5.65)**100.8(3.36)PaE11027102902029102126.84.88812.810106.7(4.24)**105.0(7.44)PaE1110271029049425112.74.2588.25106.7(4.24)**103.7(4.80)* Indicates significantly different than SSURGO at $\alpha = 0.05$ level.*107.102.102.102.102.102.102.102.102.102.102	MaE	90426	105	96	361	20	125.3	5.1	48	12.1	6	126.3(5.13)**	121.0(6.86)**
PaE907079190156579115.83.8588.05109.8(3.80)**107.0(5.06)PaE10022990903435172123.57.151116.8-3122.5(7.14)**123.8(7.06)PaE10031090903332094.23.25.2-1.8-493.2(3.18)**95.0(4.04)PaE1004141009068735125.05.66511.911116.8(5.65)**110.9(8.36)PaE10050385902029102126.84.88812.81010.8(3.65)**100.9(7.44)PaE10050385902029102126.84.88812.81010.4(4.44)**105.0(7.44)PaE1110271029049425112.74.2588.25106.7(4.24)**103.7(4.80)* Indicates significantly different than SSURGO at $\alpha = 0.05$ level.**10.7(4.24)**103.7(4.80)**Indicates significantly different than SSURGO at $\alpha = 0.01$ level.*10.7(4.24)**103.7(4.80)	PaE	90426	105	06	173	20	121.6	3.6	48	6.6	4	122.6(3.62)**	120.7(5.41)**
Page10022990903435172123.57.151116.8-3122.5(7.14)**123.8(7.06)Page10031090903332094.23.25.2-1.8-493.2(3.18)**95.0(4.04)Page1004141009068735125.05.66511.911116.8(5.65)**110.9(8.36)Page10050385902029102126.84.88812.810101.6(4.44)**105.0(7.44)Page111027102902029102126.74.258825106.7(4.24)**105.0(7.44)* Indicates significantly different than SSURGO at $\alpha = 0.05$ level.**Indicates significantly different than SSURGO at $\alpha = 0.05$ level.588.25106.7(4.24)**103.7(4.80)* Indicates significantly different than SSURGO at $\alpha = 0.05$ level.588.25106.7(4.24)**103.7(4.80)* Anotive number in growth indicates that a stand has been harvested trees used for the source of of damage and has been harvested trees used for the source of of damage and source of at a stand has been harvested trees used for the source of of damage and source of at a stand has been harvested trees used for the source of of damage and source of at a stand has been harvested trees used for the source of of damage and source of at a stand has been harvested trees used for the source of of damage and source of at a stand has been harvested trees used for the source of of damage and source of at a stand has been harvested trees used for the source of at a stand has been harvested trees used fo	PaE	70709	91	90	1565	79	115.8	3.8	58	8.0	5	109.8(3.80)**	107.0(5.06)**
PaE10031090903332094.23.252-1.8-493.2(3.18)**95.0(4.04)PaE1004141009068735125.05.66511.911116.8(5.65)**110.9(8.36)PaE10050385902029102126.84.88812.810110.4(4.44)**105.0(7.44)PaE111027102902029102126.84.88812.810110.4(4.44)**105.0(7.44)* Indicates significantly different than SSURGO at $\alpha = 0.05$ level.*.258.25106.7(4.24)**103.7(4.80)* Indicates significantly different than SSURGO at $\alpha = 0.05$ level.Note: A matrixe number in growth indicates that a stand has been harvested trace used for the source of of damage and been harvested trace used for the source of of damage and been harvested trace used for the source of of damage and been harvested trace used for the source of of damage and been harvested trace used for the source of of damage and been harvested trace used for the source of of damage and been harvested trace used for the source of of damage and been harvested trace used for the source of of damage and been harvested trace been harvested trace of of damage and been harvested trace of been harvested trace of of damage and been harvested trace of of the been harvested trace of of the been harvested trace o	PaE	100229	90	90	3435	172	123.5	7.1	51	116.8	ų	122.5(7.14)**	123.8(7.06)**
Page 100414 100 90 687 35 125.0 5.6 65 11.9 11 116.8(5.65)** 110.9(8.36) Page 100503 85 90 2029 102 126.8 4.8 88 12.8 10 110.4(4.44)** 105.0(7.44) Page 111027 102 90 2029 102 126.7 4.2 58 10 110.4(4.44)** 105.0(7.44) * Indicates significantly different than SSURGO at $\alpha = 0.05$ level. * 8.2 5 106.7(4.24)** 103.7(4.80) **Indicates significantly different than SSURGO at $\alpha = 0.05$ level. * 8.2 5 106.7(4.24)** 103.7(4.80)	PaE	100310		06	333	20	94.2	3.2	52	-1.8	4-	.93.2(3.18)**	95.0(4.04)**
PaE 100503 85 90 2029 102 126.8 4.8 88 12.8 10 110.4(4.44)** 105.0(7.44) PaE 111027 102 90 494 25 112.7 4.2 58 8.2 5 106.7(4.24)** 103.7(4.80) * Indicates significantly different than SSURGO at $\alpha = 0.05$ level. **Indicates significantly different than SSURGO at $\alpha = 0.01$ level.	PaE	100414	100	06	687	35	125.0	5.6	65	11.9	11	116.8(5.65)**	110.9(8.36)**
Pat1110271029049425112.74.2588.25106.7(4.24)**103.7(4.80)* Indicates significantly different than SSURGO at $\alpha = 0.05$ level.**Indicates significantly different than SSURGO at $\alpha = 0.01$ level.Note: A matrix number in growth indicates that a stand has been harvested trees user lost to some sort of damage and solved to be an event of damage and solved to some sort of damage and solved to solve and solved to some sort of damage and solved to solve and solved to solved to solve and solved to solve and solved to solve and solved to solve	PaE	100503	85	06	2029	102	126.8	4.8	88	12.8	10	110.4(4.44)**	105.0(7.44)**
* Indicates significantly different than SSURGO at $\alpha = 0.05$ level. **Indicates significantly different than SSURGO at $\alpha = 0.01$ level. Note: A managine number in growth indicates that a stand has been harvested, trees users lost to some sort of damage an	PaE	111027		06	494	25	112.7	4.2	58	8.2	5	106.7(4.24)**	103.7(4.80)**
**Indicates significantly different than SSURGO at $\alpha = 0.01$ level. Note: A manative number in growth indicates that a stand has been harvested, trees were lost to some sort of damage an	* Indic	ates sign	ificantl	y different	than SSU	IRGO at ($\chi = 0.05$	level.					
Note: A menotive number in growth indicates that a stand has been henvested, trees were lost to some sort of demage an	**Indic	ates sign	ificant	y different	than SSU	IRGO at ($\chi = 0.01$	level.					
	Note: A	negative	4 minut	er in prowf	h indicate	se that a s	tand has	heen har	vested	trees we	re lost to so	me sort of dar	пяое, ап

Table 9B. Comparison of Site Index soil data from SSURGO database by SSURGO Map Unit Symbol within a stand with supplies for the study area (2008 and 2011) Cito Indow ...11o.,

overestimation in 2008, or an underestimation in 2011 has occurred.

CbB 90217 83 80 412 21 66.9 10.0 30 89.8 12.8 101.6(15.60)*** 90512 90 80 187 20 101.1 4.9 39 114.1 5.0 05512 90 80 455 24 110.1 2.6 37 125.3 2.5 125.3(2.54)*** CbC 90315 109 83 470 24 93.1 4.1 5.0 101.4(16.01)*** CdC 90315 109 83 613 31 97.8 3.0 23 123.7 2.9 124.7(10.62)*** CdC 90315 109 83 341 20 105.5 3.1 37 120.5 3.1 247.7(10.62)*** CdC 90315 109 83 341 20 105.5 3.1 37.7 2.9 124.7(10.62)*** PGC 9033 81 20 102.5 3.1 37 120.5	Map Unit Symbol	Stand ID	Stand SI (ff, base age 50)	SSURGO SI (ft, base age 50)	LiDAR Total Number Trees (2008)	LiDAR n (20 or 5% greatest) (2008)	LiDAR Mean Ht (ft) (2008)	LiDAR Std Dev (2008)	Age (2008)	LiDAR SI (ft, base age 50) (2008)	LiDAR SI Std Dev (2008)	L.IDAR SI (ft, base age 50) Mean (2008)
90512 90 80 187 20 101.1 4.9 39 114.1 5.0 90509 80 465 24 110.1 2.6 37 125.3 2.5 90315 109 83 470 24 93.1 4.1 95.9 3.2 90315 109 83 613 31 97.8 3.1 41 95.9 3.2 90315 109 83 613 31 97.8 3.1 41 95.9 3.2 90703 83 31 20 105.5 3.1 37 120.5 3.1 90703 83 33 305 20 105.5 3.1 41 112.0 2.9 90703 83 85 731 37 1092.3 3.6 46 113.2 3.6 1100429 70 72 2422 122 83.9 5.7 41 120.5 3.6 1105	CbB	90217	83	80	412	21	66.9	10.0	30	89.8	12.8	101.6(15.66)**
90509808046524110.1 2.6 37 125.3 2.5 90315109834702493.14.195.93.290315109836133197.83.14195.93.290315109836133197.83.023135.72.990509808334120105.53.13.137120.53.190703838334120105.53.13.124.12.990703838334320105.53.13.124.22.490703838333020102.82.141112.02.490703838373137109.23.646113.23.690703838373137109.23.646113.23.690703838573137109.23.646112.02.4907038772242212283.95.24192.93.690703877337109.23.646113.23.69070387878337109.23.64677.64.0907038787743774764.076769071290716374.313.946 <td></td> <td>90512</td> <td>06</td> <td>80</td> <td>187</td> <td>20</td> <td>101.1</td> <td>4.9</td> <td>39</td> <td>114.1</td> <td>5.0</td> <td></td>		90512	06	80	187	20	101.1	4.9	39	114.1	5.0	
90315109834702493.14.323128.34.510042970838764486.93.14195.93.290315109836133197.83.023135.72.990509808334120105.53.137120.53.190703838330520105.53.141112.02.490703838330520102.82.141112.02.490703838573137109.23.646113.23.6110504838573137109.23.646113.23.6110504878573137109.23.64674.6 8.2 11050487873274.313.94677.614.0290512907163.56.846113.23.611082687873274.313.94677.614.011012892809064682.75.525123.85.111012892809064682.75.525123.85.111012892809064682.75.525123.85.111020483805072696.63.04695	cbc	90209	80	80	465	24	110.1	2.6	37	125.3	2.5	125.3(2.54)**
	CdB	90315	109	83	470	24	93.1	4.3	23	128.3	4.5	107.4(16.01)**
90315 109 83 613 31 97.8 3.0 23 135.7 2.9 90509 80 83 341 20 105.5 3.1 37 120.5 3.1 90703 83 341 20 105.5 3.1 37 120.5 3.1 90703 83 85 731 27 122 83.9 5.2 41 120.5 3.6 110504 83 85 731 37 109.2 3.6 46 113.2 3.6 110504 87 731 37 109.2 3.6 46 14.0 2.6 8.2 110504 87 85 503 74.3 13.9 46 74.6 8.2 110826 87 73 32 106.4 2.0 33 119.5 2.1 110128 92 80 906 46 82.7 55 25 13.6 14.0		100429	70	83	876	44	86.9	3.1	41	95.9	3.2	
90509 80 83 341 20 105.5 3.1 37 120.5 3.1 90703 83 335 20 102.8 2.1 41 112.0 2.4 100429 70 72 2422 122 83.9 5.2 41 92.9 5.2 110504 83 85 731 37 109.2 3.6 46 113.2 3.6 110509 90 85 995 50 71.7 7.5 46 77.6 8.2 110826 87 85 634 32 74.3 13.9 46 77.6 14.0 2 90512 90 71 635 53 13.9 46 77.6 14.0 110826 87 86 53 13.9 46 77.6 14.0 110128 92 80 931 47 68.5 6.9 14.0 1101204 83 80 </td <td>CdC</td> <td>90315</td> <td>109</td> <td>83</td> <td>613</td> <td>31</td> <td>97.8</td> <td>3.0</td> <td>23</td> <td>135.7</td> <td>2.9</td> <td>124.7(10.62)**</td>	CdC	90315	109	83	613	31	97.8	3.0	23	135.7	2.9	124.7(10.62)**
90703 83 305 20 102.8 2.1 41 112.0 2.4 110504 83 85 731 37 109.2 3.6 46 113.2 3.6 110504 83 85 731 37 109.2 3.6 46 113.2 3.6 110504 87 85 995 50 71.7 7.5 46 74.6 8.2 110509 90 87 32 74.3 13.9 46 77.6 14.0 2 90512 90 71 635 5.5 2.1 14.0 2 90512 90 71 635 6.9 74.6 8.2 110128 92 80 906 46 82 14.0 110128 92 80 506 46 74.6 82 110128 92 80 506 46 74.6 86 51 110504		90509	80	83	341	20	105.5	3.1	37	120.5	3.1	
1 100429 70 72 2422 122 83.9 5.2 41 92.9 5.2 110504 83 85 731 37 109.2 3.6 46 113.2 3.6 110509 90 85 995 50 71.7 7.5 46 71.6 8.2 110509 90 87 85 634 32 74.3 13.9 46 71.6 8.2 110826 87 85 634 32 106.4 2.0 39 14.0 2 90512 90 71 635 68 47 69.5 69 110128 92 80 906 46 82.7 55 21 14.0 110401 100 80 906 46 82.7 55 23.3 3.7 110504 83 80 507 26 96.6 3.0 46 95.5 3.7 <		90703	83	83	305	20	102.8	2.1	41	112.0	2.4	
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	CeC2	100429	70	72	2422	122	83.9	5.2	41	92.9	5.2	92.9(5.17)**
110509 90 85 995 50 71.7 7.5 46 74.6 8.2 110826 87 85 634 32 74.3 13.9 46 77.6 14.0 110826 87 85 634 32 74.3 13.9 46 77.6 14.0 110826 87 85 635 32 106.4 2.0 39 119.5 2.1 110128 92 80 906 46 82.7 5.5 25 123.8 5.1 110504 83 80 507 26 96.6 3.0 46 97.5 3.3 110504 83 80 571 555 25 123.8 5.1 110504 80 806 206.6 3.0 46 97.5 3.3 110817 80 80 575 25 129.7 7.4 1106401 100 80 127 2	HaB	110504	83	85	731	37	109.2	3.6	46	113.2	3.6	87.4(19.68)
110826 87 85 634 32 74.3 13.9 46 77.6 14.0 2 90512 90 71 635 32 106.4 2.0 39 119.5 2.1 110128 92 80 931 47 68.5 6.8 47 69.5 6.9 110401 100 80 906 46 82.7 5.5 25 123.8 5.1 110817 80 906 46 82.7 5.5 25 123.8 5.1 110817 80 906 46 82.7 5.5 25 123.8 5.1 110817 80 80 775 39 89.3 86 25 137.3 3.7 110817 80 80 775 39 86.6 25 137.3 3.7 110817 80 80 73 86.6 25 129.7 7.4 110817 80 </td <td></td> <td>110509</td> <td>90</td> <td>85</td> <td>995</td> <td>50</td> <td>71.7</td> <td>7.5</td> <td>46</td> <td>74.6</td> <td>8.2</td> <td></td>		110509	90	85	995	50	71.7	7.5	46	74.6	8.2	
2 90512 90 71 635 32 106.4 2.0 39 119.5 2.1 110128 92 80 931 47 68.5 6.8 47 69.5 6.9 110128 92 80 906 46 82.7 5.5 25 123.8 5.1 110504 83 80 507 26 96.6 3.0 46 95.5 3.3 110504 83 80 507 26 96.6 3.0 46 99.5 3.3 110610 100 80 775 39 89.3 8.6 25 129.7 7.4 110401 100 80 127 20 92.9 92.9 91.7 7.4 110817 80 80 127 20 92.9 129.7 7.4 110817 80 80 313 20 91.5 31 7.4 110817 80		110826	87	85	634	32	74.3	13.9	46	77.6	14.0	
110128 92 80 931 47 68.5 6.8 47 69.5 6.9 110401 100 80 906 46 82.7 5.5 25 123.8 5.1 110504 83 80 507 26 96.6 3.0 46 99.5 3.3 110817 80 80 507 26 96.6 3.0 46 99.5 3.3 110817 80 80 406 21 96.7 4.3 24 137.3 3.7 1106401 100 80 775 39 89.3 8.6 25 129.7 7.4 110509 90 80 127 20 92.9 92.9 91.7 7.4 110817 80 80 313 24 137.5 3.1 110817 80 80 127 20 92.9 92.7 7.4 110817 80 80 313 </td <td>HwC2</td> <td>90512</td> <td>90</td> <td>11</td> <td>635</td> <td>32</td> <td>106.4</td> <td>2.0</td> <td>39</td> <td>119.5</td> <td>2.1</td> <td>119.5(2.12)**</td>	HwC2	90512	90	11	635	32	106.4	2.0	39	119.5	2.1	119.5(2.12)**
110401 100 80 906 46 82.7 5.5 25 123.8 5.1 110504 83 80 507 26 96.6 3.0 46 99.5 3.3 110817 80 80 507 26 96.6 3.0 46 99.5 3.3 110817 80 80 406 21 96.7 4.3 24 137.3 3.7 110609 90 80 775 39 89.3 8.6 25 129.7 7.4 110509 90 80 127 20 92.9 92.9 96.6 9.1 110817 80 80 313 20 91.5 3.1 24 132.5 3.1 110101 110 80 1063 54 91.0 4.5 23 133.0 4.6	MaC	110128	92	80	931	47	68.5	6.8	47	69.5	6.9	103.1(27.03)**
110504 83 80 507 26 96.6 3.0 46 99.5 3.3 110817 80 80 406 21 96.7 4.3 24 137.3 3.7 110817 80 80 775 39 89.3 8.6 25 129.7 7.4 110509 90 80 127 20 92.9 92.9 92.4 137.3 3.7 110509 90 80 127 20 92.9 92.2 46 96.6 9.1 110817 80 80 313 20 91.5 3.1 24 132.5 3.1 110101 110 80 1063 54 91.0 4.5 23 133.0 4.6		110401	100	80	906	46	82.7	5.5	25	123.8	5.1	
110817 80 80 406 21 96.7 4.3 24 137.3 3.7 110401 100 80 775 39 89.3 8.6 25 129.7 7.4 110509 90 80 127 20 92.9 9.2 46 96.6 9.1 110817 80 80 313 20 91.5 3.1 24 132.5 3.1 110101 110 80 127 20 91.5 3.1 24 132.5 3.1		110504	83	80	507	26	96.6	3.0	46	99.5	3.3	
110401 100 80 775 39 89.3 8.6 25 129.7 7.4 110509 90 80 127 20 92.9 9.2 46 96.6 9.1 110817 80 80 313 20 91.5 3.1 24 132.5 3.1 110101 110 80 1063 54 91.0 4.5 23 133.0 4.6		110817	80	80	406	21	96.7	4.3	24	137.3	3.7	
110509 90 80 127 20 92.9 9.2 46 96.6 9.1 110817 80 80 313 20 91.5 3.1 24 132.5 3.1 110101 110 80 1063 54 91.0 4.5 23 133.0 4.6	MaD	110401	100	80	775	39	89.3	8.6	25	129.7	7.4	122.0(16.52)**
110817 80 80 313 20 91.5 3.1 24 132.5 3.1 110101 110 80 1063 54 91.0 4.5 23 133.0 4.6		110509	06	80	127	20	92.9	9.2	46	90.6	9.1	
110101 110 80 1063 54 91.0 4.5 23 133.0 4.6		110817	80	80	313	20	91.5	3.1	24	132.5	3.1	
	MaE	110101	110	80	1063	54	91.0	4.5	23	133.0	4.6	134.5(5.85)**

Table 10A. Comparison of Site Index soil data from SSURGO database for SSURGO Map Unit Symbol with loblolly pine as Site Index species for the study area (2008).

	*	l	
	109.3(3.74)**		
6.8	3.7		
137.4	109.3		
25	39		
7.6	3.9	level.	-
<i>T.</i> 72	97.3	1 SSURGO at $\alpha = 0.05$ level.	
30	31	JRGO at	
584	606	nt than SSI	100 177
80	78	differen	1
100	90	ficantly	1
110401	90512	* Indicates signifi	J
	PaE	* Indi	· [·] * *

**Indicates significantly different than SSURGO at $\alpha = 0.01$ level.

$ \begin{array}{lcccccccccccccccccccccccccccccccccccc$	Map	Stand	Stand	SSURGO	LiDAR	Lidar	Lidar	Lidar	Age	Lidar	Lidar	LiDAR SI (ft,	Lidar
Nat. Nat. <t< th=""><th>Unit Symhol</th><th>9</th><th>IS €</th><th>SI (ft, hase are</th><th>Total</th><th>n (20 or 5%</th><th>Mean H+ (#)</th><th>Std</th><th>(2011)</th><th>SI (ft, hage</th><th>SI Std</th><th>base age 50)</th><th>Combined</th></t<>	Unit Symhol	9	IS €	SI (ft, hase are	Total	n (20 or 5%	Mean H+ (#)	Std	(2011)	SI (ft, hage	SI Std	base age 50)	Combined
S0) S17 26 73.4 9.4 33 92.8 11.8 95.6(9.84)** 90512 90 80 517 26 73.4 9.4 33 92.5 5.5 5.5.6(9.84)** 90512 90 80 191 20 94.1 10.9 5.5 5.5.6(2.44)** 90515 109 80 191 20 94.1 10.0 7.5 5.5.6(2.745)** 90515 109 83 192 23 90.8 17.1 44 26 130.0 4.4 110.0(17.26)** 90515 109 83 492 25 101.7 3.2 26 27.5 52.6(27.45)** 90510 80 193 167 44 17.8 10.0(17.26)** 90510 82 132.7 44 17.8 17.6(14.70)** 90703 83 27 14 97.9 59.10(2.67.47)** 110504 87 28 15.7 4	100m Co		base age	50)	Trees (2011)	greatest) (2011)	(2011) (2011)	(2011)		age 50) (2011)	(2011)		base age 50) (11, base age 50) (2008 and
9021783805172673.49.4339.2.811.895.6(9.84)**9051290801592092.43.94755.6(3.745)**9050980801912046.125.54052.627.552.6(3.745)**90315109833992097.74.426130.04.4110.9(17.26)**903151098349225101.73.226133.73.2102.8(35.11)**9030383836323290.817.14498.59.110.9(17.26)**9031510983836322097.74.426133.73.2102.8(35.11)**9050980831822090.61.24417.810.9(17.26)**90513838327920106.51.24417.811.9(17.6)**90703838327920106.51.24417.814.17.890703838327986.315.74497.95997.16(14.70)**911050483837718.74980838316.617.6(14.70)**9110504838377.981.377.982.0(23.17)**11.611.611.611.611.69110504838377.981.377.982.0(23.17)**<			50)										2011)
905129080159209243.94.799.34.79050980801912046.125.54052.627.552.6(77.45)**90315109833992097.74.426130.04.4110.9(17.26)**903151098349225101.73.226133.73.2102.8(35.11)**903151098349225101.73.226133.73.2102.8(35.11)**903038383832792016.51.24411.21.21.2.8(35.11)**9070383838327920106.51.24411.21.28.37.9.59070383838327920106.51.24411.2.51.28.1.6.89070383838327920106.51.24411.2.51.28.1.6.8910304838327920106.51.24411.2.51.28.2.0(23.17)**11050483854762375.64980.38.38.33.2.0(23.17)**11050483836523377.581.377.6(14.70)**8.2.0(23.17)**1105048786656577.677.679.677.6(14.70)**110504878777.679	CbB	90217	83	80	517	26	73.4	9.4	33	92.8	11.8	95.6(9.84)**	98.5(13.187)**
9650980801912046.1 $2.5.5$ 40 $5.2.6$ $2.7.5$ $5.2.6(27,45)^{***}$ 903151098339920 97.7 4.4 26 130.0 4.4 $110.9(1726)^{***}$ 10042970836323290.8 17.1 4.4 98.5 9.1 $110.9(1726)^{***}$ 903151098349225101.7 3.2 2.6 13.7 3.2 $102.8(35.11)^{***}$ 90509808318220 48.5 15.5 4.0 $5.4.4$ 17.8 $10.9(1726)^{***}$ 9070383838327920 106.5 1.2 4.4 $11.2.5$ $12.8(35.11)^{***}$ 9070383838327920 106.5 1.2 4.4 $11.2.5$ $12.8(37.11)^{***}$ 90703838327920 106.5 1.2 4.4 $11.2.5$ $12.8(37.11)^{***}$ 110504838327920 106.5 1.2 4.4 $11.2.5$ $12.8(37.11)^{***}$ 1105048785552749 5.7 4.9 5.9 $97.9(5.87)^{***}$ 110504878787272497.9 5.9 $97.9(5.87)^{***}$ 1105048787877980 $77.6(14.70)^{**}$ 11050487877997.9 80.3 82.3 $15.6(2.3.17)^{***}$ 11050483 </td <td></td> <td>90512</td> <td>06</td> <td>80</td> <td>159</td> <td>20</td> <td>92.4</td> <td>3.9</td> <td>42</td> <td>99.3</td> <td>4.7</td> <td></td> <td></td>		90512	06	80	159	20	92.4	3.9	42	99.3	4.7		
903151098339920 97.7 4.4 26 130.0 4.4 $110.9(1726)^{**}$ 10042970836323290.817.1 4.4 98.5 9.1 903151098349225101.7 3.2 26 133.7 3.2 $102.8(35.11)^{**}$ 90303808318220 48.5 15.5 40 54.4 17.8 90703838327920 106.5 1.2 44 11.25 1.2 90703838327920 106.5 1.2 44 17.8 90703838327920 106.5 1.2 44 17.8 910504838327920 106.5 1.2 44 11.25 1.2 91050590856523379.3 83.3 492 80.3 83.3 91050590878552627 49 80.3 83.3 91050590716063175.6 $77.6(14.70)^{**}$ 1004211008051279.3 83.3 79.3 83.3 91050587 57.9 49 80.3 82.3 $92.9(2.87)^{**}$ 1010289287 $77.6(14.70)^{**}$ 79.6 $77.6(14.70)^{**}$ 1010289287 77.9 80.3 82.3 79.6 79.6 110289280 <t< td=""><td>CbC</td><td>90509</td><td>80</td><td>80</td><td>161</td><td>20</td><td>46.1</td><td>25.5</td><td>40</td><td>52.6</td><td>27.5</td><td>52.6(27.45)**</td><td>92.2(40.93)*</td></t<>	CbC	90509	80	80	161	20	46.1	25.5	40	52.6	27.5	52.6(27.45)**	92.2(40.93)*
	CdB	90315	109	83	399	20	<i>T.</i> 70	4.4	26	130.0	4.4	110.9(17.26)**	108.9(16.58)**
90315 109 83 492 25 101.7 3.2 26 133.7 3.2 102.8 (35.11)** 90509 80 83 182 20 48.5 15.5 40 54.4 17.8 90703 83 83 279 20 106.5 1.2 44 112.5 1.2 110504 83 83 476 24 66.3 16.5 49 68.6 16.9 77.6(14.70)** 110509 90 85 652 33 79.3 8.3 49 80.3 8.3 110509 90 71 606 31 75.9 21.7 35 82.0 77.6(14.70)** 2 90512 90 77 49 80.3 8.3 75.6 77.6 77.6(14.70)** 2 90512 90 71 65 79 86.3 79 97.9 98.1(36.27)** 100420 87 83 75 21<		100429	70	83	632	32	90.8	17.1	44	98.5	9.1		
90509 80 83 182 20 48.5 15.5 40 54.4 17.8 90703 83 279 20 106.5 1.2 44 112.5 1.2 100429 70 72 1878 94 92.8 5.7 44 97.9 5.9 97.9(5.87)** 110504 83 85 476 24 66.3 16.5 49 68.6 16.9 77.6(14.70)** 110504 87 85 526 27 81.3 15.7 49 80.3 8.3 2 90512 90 71 606 31 75.9 21.7 35 82.0 23.2 82.0(23.17)** 2 90512 90 71 606 31 75.9 82.3 15.6 77.6(14.70)** 110128 92 71 93 83.3 15.6 77.9 98.1(36.27)** 110120 80 51 74.9 7.9 <td< td=""><td>CdC</td><td>90315</td><td>109</td><td>83</td><td>492</td><td>25</td><td>101.7</td><td>3.2</td><td>26</td><td>133.7</td><td>3.2</td><td>102.8 (35.11)**</td><td>114.2 (27.64)**</td></td<>	CdC	90315	109	83	492	25	101.7	3.2	26	133.7	3.2	102.8 (35.11)**	114.2 (27.64)**
90703 83 279 20 106.5 1.2 44 112.5 1.2 97.9(5.87)** 110504 70 72 1878 94 92.8 5.7 44 97.9 5.9 97.9(5.87)** 110504 83 85 476 24 66.3 16.5 49 68.6 16.9 77.6(14.70)** 110509 90 85 652 33 79.3 8.3 49 80.3 8.3 110509 90 85 526 27 81.3 15.7 49 80.3 8.3 2 90512 90 71 606 31 75.9 21.7 35 82.0 23.2 82.0(23.17)** 2 90512 90 71.6 77.9 79.9 83.3 75.6 77.6(14.70)** 11010128 92 81.3 15.7 49 80.3 82.0 74.9 70 110401 100 80 512.4		90509	80	83	182	20	48.5	15.5	40	54.4	17.8		
1 100429 70 72 1878 94 92.8 5.7 44 97.9 5.9 97.9(5.87)** 110504 83 85 476 24 66.3 16.5 49 68.6 16.9 77.6(14.70)** 110504 83 85 526 33 79.3 8.3 49 80.3 8.3 110826 87 85 526 27 81.3 15.7 49 80.3 8.3 2 90512 90 71 606 31 75.9 21.7 35 82.0 23.2 82.0(23.17)** 2 90512 90 71 606 31 75.9 21.7 35 82.0 74.9 7.0 83.1(36.27)** 2 90512 90 71.9 606 31 75.9 21.7 35 82.0(23.17)** 110128 92 80 50 74.9 7.0 98.1(36.27)** 110204		90703	83	83	279	20	106.5	1.2	44	112.5	1.2		
110504 83 85 476 24 66.3 16.5 49 68.6 16.9 77.6(14,70)** 110509 90 85 652 33 79.3 8.3 49 80.3 8.3 110826 87 85 526 27 81.3 15.7 49 80.3 15.6 110826 87 85 526 27 81.3 15.7 49 80.3 8.3 101028 90 71 606 31 75.9 21.7 35 82.0 23.2 82.0(23.17)** 110128 92 80 512 26 74.9 7.9 82.0 74.9 7.9 110401 100 80 512 26 74.9 7.9 98.1(36.27)** 110817 80 512 22.0 74.9 7.0 98.1(36.27)** 110817 80 80 234 20 24.9 7.0 98.1(36.27)**	CeC2	100429	70	72	1878	94	92.8	5.7	44	97.9	5.9	97.9(5.87)**	95.1(6.02)**
110509 90 85 652 33 79.3 8.3 49 80.3 8.3 2 90512 90 71 606 31 75.9 21.7 35 82.3 15.6 110826 87 85 526 27 81.3 15.7 49 82.3 15.6 110828 92 80 512 26 74.9 7.9 50 74.9 7.9 98.1(36.27)** 110128 92 80 512 26 74.9 7.9 50 74.9 7.9 98.1(36.27)** 110401 100 80 512 26 74.9 7.9 50 23.2 82.0(23.17)** 110504 83 80 512 26 74.9 7.9 50.2(23.17)** 110504 83 80 512 27 17.9 7.9 98.1(36.27)** 110504 83 80 57 29 29 29 3.9	HaB	110504	83	85	476	24	66.3	16.5	49	68.6	16.9	77.6(14.70)**	83.3(18.41)
110826 87 85 526 27 81.3 15.7 49 82.3 15.6 2 90512 90 71 606 31 75.9 21.7 35 82.0 23.2 82.0(23.17)** 110128 92 80 512 26 74.9 7.9 50 74.9 7.9 98.1(36.27)** 110401 100 80 512 26 74.9 7.9 50 74.9 7.0 110401 100 80 512 26 74.9 7.9 58.1(36.27)** 110504 83 80 512 26 74.9 7.0 98.1(36.27)** 110817 80 80 234 20 6.8 28 124.4 7.0 110401 100 80 234 20 43.6 3.9 59.1(36.27)** 110610 80 570 239 28 124.4 7.0 50.1(36.27)** 110610		110509	90	85	652	33	79.3	8.3	49	80.3	8.3		
2 90512 90 71 606 31 75.9 21.7 35 82.0 23.2 82.0(23.17)** 110128 92 80 512 26 74.9 7.9 50 74.9 7.9 98.1(36.27)** 110128 92 80 512 26 74.9 7.9 58.1(36.27)** 110401 100 80 512 26 74.9 7.9 98.1(36.27)** 110504 83 80 512 20 74.5 3.9 98.1(36.27)** 110504 83 80 234 20 42.6 3.9 28 124.4 7.0 110610 80 234 20 42.6 3.9 29 43.6 3.9 110401 100 80 270 222 27 137.0 1.8 110509 90 70 29 46.1 2.0 27 137.0 1.8 110817 80 8		110826	87	85	526	27	81.3	15.7	49	82.3	15.6		
110128 92 80 512 26 74.9 7.9 57.9 98.1(36.27)** 110401 100 80 689 35 90.9 6.8 28 124.4 7.0 98.1(36.27)** 110504 83 80 689 35 90.9 6.8 28 124.4 7.0 110504 83 80 234 20 42.6 3.9 29 43.6 3.9 110817 80 80 299 20 101.2 2.2 27 137.0 1.8 110401 100 80 570 299 98.4 6.1 28 132.9 6.0 121.1(21.04)** 110509 90 80 112 20 90.8 15.7 49 91.7 15.7 110817 80 80 237 20 97.4 3.0 27 133.3 2.8 110817 10 80 80 230 97.4	4wC2	90512	90	71	606	31	75.9	21.7	35	82.0	23.2	82.0(23.17)**	101.0(24.86)**
110401 100 80 68 35 90.9 6.8 28 124.4 7.0 110504 83 80 234 20 42.6 3.9 29 43.6 3.9 110504 83 80 234 20 42.6 3.9 29 43.6 3.9 110817 80 80 270 299 20 101.2 2.2 27 137.0 1.8 110401 100 80 570 29 98.4 6.1 28 132.9 6.0 121.1(21.04)** 110509 90 80 112 20 90.8 15.7 49 91.7 15.7 110817 80 80 237 20 97.4 3.0 27 133.3 2.8 110810 110 80 803 41 96.4 2.9 57 132.4 2.7 136.2(7.36)**	МаС	110128	92	80	512	26	74.9	7.9	50	74.9	7.9	98.1(36.27)**	101.0(31.26)**
110504 83 80 234 20 42.6 3.9 29 43.6 3.9 110817 80 80 299 20 101.2 2.2 27 137.0 1.8 110817 80 80 570 29 98.4 6.1 28 132.9 6.0 121.1(21.04)** 110601 100 80 570 29 98.4 6.1 28 132.9 6.0 121.1(21.04)** 110509 90 80 112 20 90.8 15.7 49 91.7 15.7 110817 80 80 237 20 97.4 3.0 27 133.3 2.8 110101 110 80 803 41 96.4 2.9 57 136.2(7.36)**		110401	100	80	689	35	90.9	6.8	28	124.4	7.0		
110817 80 80 299 20 101.2 2.2 27 137.0 1.8 110401 100 80 570 29 98.4 6.1 28 132.9 6.0 121.1(21.04)** 110509 90 80 112 20 90.8 15.7 49 91.7 15.7 110817 80 80 237 20 97.4 3.0 27 133.3 2.8 110101 110 80 803 41 96.4 2.9 57 133.3 2.8		110504	83	80	234	20	42.6	3.9	29	43.6	3.9		
110401 100 80 570 29 98.4 6.1 28 132.9 6.0 121.1(21.04)** 110509 90 80 112 20 90.8 15.7 49 91.7 15.7 110817 80 80 237 20 97.4 3.0 27 133.3 2.8 110101 110 80 803 41 96.4 2.9 57 132.4 2.7 136.2(7.36)**		110817	80	80	299	20	101.2	2.2	27	137.0	1.8		
110509 90 80 112 20 90.8 15.7 49 91.7 15.7 110817 80 80 237 20 97.4 3.0 27 133.3 2.8 110101 110 80 803 41 96.4 2.9 57 132.4 2.7 136.2(7.36)**	MaD	110401	100	80	570	29	98.4	6.1	28	132.9	6.0	121.1(21.04)**	121.6(18.71)**
110817 80 80 237 20 97.4 3.0 27 133.3 2.8 110101 110 80 803 41 96.4 2.9 57 132.4 2.7 136.2(7.36)**		110509	90	80	112	20	90.8	15.7	49	91.7	15.7		·
110101 110 80 803 41 96.4 2.9 57 132.4 2.7 136.2(7.36)**		110817	80	80	237	20	97.4	3.0	27	133.3	2.8		
	MaE	110101	110	80	803	41	96.4	2.9	57	132.4	2.7	136.2(7.36)**	135.2(6.57)**

. Comparison of Site Index soil data from SSURGO database for SSURGO Map Unit Symbol with loblolly pine lex species for the study area (2008 and 2011).
Table 10B. Comparison of Site as Site Index species for the stu

-

	101.2(9.69)**		
	91.1(2.86)**		
8.2	2.9		
33 142.9	91.1		
33	34		
8.4	2.6	level.	level.
108.2	85.0	SSURGO at $\alpha = 0.05$ level.	SSURGO at $\alpha = 0.01$ level.
23	25	JRGO at	JRGO at
459	490	it than SSU	it than SSU
80	78	differer	differer
100	90	ficantly	ficantly
110401	90512	cates signi	cates signi
	PaE	* Indi	**Indi

			as price many appended tot me study atta (2000).	ידו זהו ביו	ouuy ar	0007) DO	÷				
Map	Stand	Stand	SSURGO	Lidar	Lidar	Lidar	Lidar	Age	Lidar	Lidar	LiDAR SI
Unit	Ð	IS	SI (ff.	Total	n (20 or	Mean	Std	(2008)	SI (ft,	SI Std	(ft. base age
Symbol		£	base age	Number	5%	Ht (ft)	Dev		base	Dev	50) Mean
		base	50)	Trees	greatest)	(2008)	(2008)		age 50)	(2008)	(2008)
		age 50)		(2008)	(2008)				(2008)		
4									****		41
CaD	110906	69	81	938	47	91.9	5.4	65	80	5.1	79.7(5.84)
MaC	110906	69	75	1590	80	91.2	6.7	65	79	6.3	79.5(6.28)**
MaE	MaE 110403	70	75	2790	140	77.1	6.9	70	64	6.3	64 4(6.32)**
* Indice	Indicates signi	ficantly	ifficantly different than SSURGO at $\alpha = 0.05$ level	than SSU	RGO at o	t = 0.05	level.				(
**Indicates sign	ttes signi	ficantly	ifficantly different than SSURGO at $\alpha = 0.01$ level.	than SSU	RGO at o	k = 0.01	level.				

Table 11A. Comparison of Site Index soil data from SSURGO database for SSURGO Map Unit Symbol with scarlet oak as Site Index species for the study area (2008).

	LiDARLiDARLiDARLiDARLiDARLiDARLiDARLiDARTotaln (20 orMeanStd(ft, SI Std(ft, base ageCombinedNumber5%Ht (ft)DevbaseDev50) MeanMean SI (ft, base age 50)Treesgreatest)(2011)(2011)(2011)(2011)(2011)(2008 and 2011)(2011)(2011)(2011)(2011)(2011)(2011)(2008 and 2011)	677 34 101.8 3.4 68 88 3.1 87.7(3.14)** 83.2(5.79)**			5 level. 1 level.
		68	68	73	7
	LiDAR Std Dev (2011)	3.4	5.8	7.9	level. level.
·(1 1 A 7 1	LiDAR Mean Ht (ft) (2011)	101.8	102.0	88.7	(= 0.05] (= 0.01]
	LiDAR n (20 or 5% greatest) (2011)	34	38	111	RGO at c RGO at c
uu) maa	LiDAR Total Number Trees (2011)	677	752	2215	than SSU than SSU
	Stand SSURGO SI SI (ft, (ft, base age base 50) age 50)	81	75	75	different different
	Stand SI (ft, base age 50)	69	69	70	ficantly ficantly
	Stand ID	110906	110906	110403	ttes signif ttes signif
	Map Unit Symbol	CdD	MaC	MaE	* Indica **Indica

Table 11B. Comparison of Site Index soil data from SSURGO database for SSURGO Map Unit Symbol with scarlet oak as Site Index species for the study area (2008 and 2011).

	A	SI (Ĥ,	SSUKGO SI (ft, base age	LiDAR Total Number	LiDAR n (20 or 5%	LiDAK Mean Ht (ft)	LiUAK Std Dev	Age (2008)	LiDAR SI (ft, base	LiUAK SI Std Dev	LiDAR SI (ft, base age 50) Mean (2008)
		base age 50)	50)	Trees (2008)	greatest) (2008)	(2008)	(2008)		age 50) (2008)	(2008)	
	90215	71	66	1469	74	91.0	5.2	43	98.0	5.1	84.5(20.20)**
	10206	55	99	79	20	41.2	5.5	48	42.2	5.5	
	90419	70	66	272	20	73.4	4.1	27	100.2	4.0	
Ξ,	81606	50	99	525	27	80.0	3.5	49	81.0	3.5	
	111306	47	66	214	20	62.5	6.6	45	66.2	6.9	
cbC 5	90301	55	99	841	43	66.0	3.6	48	67.0	3.6	70.5(9.23)**
<u>,</u>	90507	70	99	566	29	80.9	7.3	50	80.9	7.3	
5,	90915	47	99	137	20	62.1	7.2	49	63.1	7.2	
CcC2	90215	71	55	268	20	94.0	5.1	43	100.9	4.9	101.0(4.53)**
	90419	70	55	286	20	74.0	4.0	27	101.1	4.3	
CdB 9	81606	50	69	1026	52	77.0	4.8	49	78.0	4.8	78.0(4.82)**
	90428	80	69	2113	106	73.0	10.9	40	82.5	12.2	80.3(11.08)**
5,	90507	70	69	59	20	74.0	5.7	50	74.0	5.7	
U,	90915	47	69	248	20	67.6	5.4	49	68.6	5.4	
0,	81606	50	69	1249	63	80.8	4.5	49	81.8	4.5	
1(100504	70	69	360	20	81.9	3.0	78	66.5	2.5	
1(100508	55	69	616	31	78.1	3.4	55	74.1	3.5	
[]	111302	60	69	176	20	81.7	3.5	35	0.66	4.0	
11	111306	47	69	508	26	81.0	6.0	45	85.4	8.2	
CdD 9	10206	55	69	275	20	65.3	3.7	48	66.3	3.7	91.1(11.99)**
11	111026	68	69	772	39	82.7	4.8	38	95.5	4.7	

Table 12A. Comparison of Site Index soil data from SSURGO database for SSURGO Map Unit Symbol with shortleaf pine as Site Index species for the study area (2008).

				level.	x = 0.05	RGO at (different than SSURGO at $\alpha = 0.05$ level.	different	ficantly	* Indicates signif	* Indic:
	4.5	71.5	48	4.5	70.5	53	1056	60	55	90301	
81.9(11.76)**	7.0	91.8	43	6.5	85.8	55	1098	60	71	90215	PcD2
	9.3	102.3	35	9.3	85.4	20	251	70		111302	
98.7(18.29)**	3.5	116.9	30	4.5	95.0	26	506	70		111218	
	4.2	100.5	38	5.1	87.5	20	393	70		111026	
	2.9	69.5	78	3.6	85.8	20	329	70		100504	PaE
	4.8	94.3	38	4.7	81.5	20	294	64	67	110207	
	6.0	107.6	30	6.8	84.2	27	593	64		110142	
90.4(17.73)**	6.2	68.7	40	5.7	60.6	25	491	64		90428	MaE
121.3(3.93)**	3.9	121.3	35	4.6	105.7	20	362	75		90101	HaD
87.4(4.56)**	4.6	87.4	65	5.3	0.66	29	574	75		90324	HaC
	3.7	77.3	45	3.5	73.5	32	626	69		111306	
	5.2	7.76	35	4.7	80.5	92	1830	69	60	111302	
	7.3	98.4	31	6.9	76.7	23	449	69	70	111209	

0.00 JCYCL.	I level.
5	= 0.0
3	ಶ
3	а
market or a second and a second of the secon	/ different than SSURGO at $\alpha = 0.01$ level.
	<pre>**Indicates significantly different</pre>

Map	Stand	Stand	SSURGO	Lidar	Lidar	Lidar	Lidar	Age	LiDAR	Lidar	Lidar SI (f).	LIDAR
Unit Sverbol	Ð	SI ŧ	SI (ff. hore are	Total	n (20 or 502	Mean	Std	(2011)	SI (ff.	SI Std	base age 50)	Combined
IOOTI		رير. base	0455 4gc 50)	Trees	greatest)	(11) 11 (2011)	(2011)		oase age 50)	(2011)	Mean (2011)	Mean SI (II, base age 50)
		age 50)		(2011)	(2011)				(2011)		~	
CbB	90215	71	66	1252	63	96.0	5.0	46	0.66	5.0	84.9(20.24)**	84.7(20.19)**
	90301	55	66	61	20	47.0	5.1	51	46.0	5.1		
	90419	70	66	212	20	80.4	4.2	30	103.7	4.0		
	81606	50	66	482	25	79.2	6.8	52	78.2	6.8		
	111306	47	66	174	20	68.1	5.6	48	69.1	5.6		
cbc	90301	55	66	564	29	74.9	4.5	51	73.9	4.5	74.5(10.55)**	72.3(9.99)**
	90507	70	66	429	22	87.0	7.9	53	84.0	7.9		
	90915	47	99	121	20	66.0	10.6	52	65.0	10.6		
CcC2	90215	11	55	215	20	96.6	6.7	46	99.8	7.0	100.6(5.51)**	100.8(5.02)**
	90419	70	55	211	20	78.0	3.3	30	101.4	3.5		
CdB	90918	50	69	938	47	75.7	9.1	52	74.7	9.1	74.7(9.08)**	76.4(7.32)**
CdC	90428	80	69	1794	90	78.7	8.4	43	85.2	8.8	81.7(10.38)**	81.0(10.77)**
	90507	70	69	50	20	74.6	3.1	53	71.6	3.1		
	90915	47	69	213	20	67.1	5.0	52	66.1	5.0		
	90918	50	69	1163	59	81.0	4.2	52	80.0	4.2		
	100504	70	69	260	20	88.5	2.7	81	71.1	2.1		
	100508	55	69	467	24	86.1	6.1	58	80.0	5.7		
	111302	60	69	138	20	86.7	4.4	38	99.9	3.8		
	111306	47	69	393	20	90.5	5.3	48	91.5	5.3		
CdD	90301	55	69	227	20	72.4	3.5	51	71.4	3.5	95.1(12.08)**	92.9(12.18)**
	111076	68	69	606	12	071	"	11	C 70	ソた		

Table 12B. Comparison of Site Index soil data from SSURGO database for SSURGO Map Unit Symbol with shortleaf

	111209	70	69	424	22	84.8	5.1	34	103.6	6.2		
	111302	60	69	1418	71	90.1	4.9	38	102.6	4.7		
	111306	47	69	506	26	82.1	5.9	48	83.1	5.9		
HaC	90324	99	75	407	21	108.0	4.4	68	93.6	3.7	93.6(3.73)**	90.0(5.21)**
HaD	90101	72	75	279	20	103.8	3.1	38	116.0	2.5	116.0(2.51)**	118.6(4.20)**
MaE	90428	80	64	429	22	68.5	4.2	43	74.1	4.8	90.7(13.26)**	90.5(15.76)**
	110142	88	64	253	20	83.6	4.9	33	102.4	4.4		
	110207	67	64	216	20	87.3	3.1	41	97.4	3.4		
PaE	100504	70	70	239	20	94.0	2.6	81	75.7	2.1		
	111026	68	70	304	20	93.4	5.5	41	103.8	5.6		
	111218	75	70	371	20	104.4	2.3	33	121.3	2.1	101.3(17.21)**	**(771)**
	111302	60	70	194	20	91.9	8.4	38	104.6	7.9	,	
PcD2	90215	71	60	820	41	91.5	5.6	46	94.5	5.6	86.6(9.51)**	83.9(11.08)**
:	90301	55	60	781	40	79.5	4.4	51	78.5	4.4		,
* Indica	ates signif	icantly (different	Indicates significantly different than SSURGO at $\alpha = 0.05$ level.	SGO at (x = 0.05 l	evel.					
**Indics	**Indicates significantly differe	icantly (different	int than SSUBGO at $\alpha = 0.01$ level	SGO at <i>i</i>	v = 0.01	d/Je					

Indicates significantly different than SSURGO at $\alpha = 0.01$ level.

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MapStandStandSSURGOLiDARLiDARLiDARLiDARAgeUnitIDSISIR,Totaln20 orMeanStd2008)Symbol(ft,base50)Treesgreatest)(2008)(2008)2008)age50)Treesgreatest)(2008)(2008)(2008)65MaD110710727514077191.84.065
and SSI SI

Table 13A. Comparison of Site Index soil data from SSURGO database for SSURGO Map Unit Symbol with white oak as Site Index species for the study area (2008).

s ior une study area (z008 and 2011).	StandSSURGOLiDARLiDARLiDARLiDARLiDARLiDARLiDARSISIRt,Totaln (20 orMeanStd(ft,SI (ft,SI (ft,SI (ft,SI (ft,SI (ft,SI (ft,base ageCombined(ft,base50)Treesgreatest)(2011)(2011)SI (ft,SI (ft,base50)MeanMeanSI (ft,base50)Treesgreatest)(2011)(2011)(2011)(2011)base age 50)(2011)base age 50)age(2011)(2011)(2011)(2011)(2011)(2011)50)50)	72 75 1077 54 103.5 4.1 68 91.6 4.4 91.6(4.40)** 86.0(6.38)**	68 93.4 4.5	P P P P P P P P P P P P P P P P P P P	**Indicates significantly different than SSURGO at $\alpha = 0.01$ level
	SSURGO I SI (ft, base age N 50) (75	75	' different that	' different that
species tor	ld Stand SI (ft, base age 50)	10 72	10 72	gnificantly	gnificantly
ann inte species int and	Map Stand Unit ID Symbol	MaD 110710	MaE 1107	* Indicates si	**Indicates si

Table 13B. Comparison of Site Index soil data from SSURGO database for SSURGO Map Unit Symbol with white oak as Site Index species for the study area (2008 and 2011)

LiDAR SI (ft,	base age 50)			81.8(6.27)**	100.4(9.76)**			113.1(22.37)**	110.6(13.31)**							
LiDAR	SI Std	(2008)		9	4	7	6	S	6	Ŷ	7	4.0	7.1	6.6	3.9	
LiDAR	SI (ft, bace	uase age 50)	(2008)	82	106	84	103	117	119	105	125	96.9	106.3	100.9	101.4	
Age	(2008)			85	62	85	55	45	45	55	48	49	62	85	55	
Lidar	Std Dav	(2008)	·	6.8	4.3	7.5	5.8	5.1	6.2	4.9	6.8	4.0	7.3	7.6	3.9	evel. evel.
Lidar	Mean Ut (#)	(11) 111 (2008)		93.0	112.9	95.3	106.4	113.1	115.0	107.9	124.1	95.9	113.1	114.0	104.4	c = 0.05
LiDAR	n (20 or 5%	greatest)	(2008) (66	22	20	67	28	20	104	181	20	44	137	34	RGO at o RGO at o
LiDAR	Total	Trees	(2008)	1319	378	396	1332	542	268	2065	3611	347	863	2723	679	than SSU than SSU
SSURGO	SI (ft, base age	uase age 50)	`	92	92	92	92	96	90	90	90	90	90	06	90	* Indicates significantly different than SSURGO at $\alpha = 0.05$ level. **Indicates significantly different than SSURGO at $\alpha = 0.01$ level.
Stand	SI ∉	ريار. base	age 50)	85	100	85	102	105	105	16	90	06	100	85	102	ficantly ficantly
Stand	8			100503	100414	100503	111027	90426	90426	90707	100229	100310	100414	100503	111027	tes signi tes signi
Map	Unit	Inninge		CdC	CdD			MaE	PaE							* Indicates signifi **Indicates signifi

Table 14A. Comparison of Site Index soil data from SSURGO database for SSURGO Map Unit Symbol with yellow poplar as Site Index species for the study area.

oplar a	s Site Inc	lex spe	poplar as Site Index species for the study area (2008 and 2011).	e study ar	ea (2008 i	and 2011	<u>.</u>			 	poplar as Site Index species for the study area (2008 and 2011).	
Map Unit	Stand ID	Stand SI	SSURGO SI (ft.	LiDAR Total	LiDAR n (20 or	LiDAR Mean	LiDAR	Age (2011)	LiDAR SI (fi	LiDAR	LiDAR SI (ft, hase age 50)	LiDAR
Symbol		(Ĥ,	base age	Number	5%	Ht (ft)	Dev	(110-2)	base	Dev	Mean (2011)	Wean SI (ft.
			50)	Trees	greatest)	(2011)	(2011)		age 50)	(2011)		base age 50)
		age 50)		(2011)	(2011)				(2011))
CdC	CdC 100503	85	92	1005	51	106.9	7.5	88	93.9	6.1	93.9(6.06)*	87.1(8.64)**
CdD	100414	100	92	283	20	119.7	4.4	65	111.5	4.3	108.1(9.92)**	103.9(10.53)**
	100503	85	92	296	20	105.2	6.0	88	92.7	5.2		
	111027	102	92	986	50	118.9	6.1	58	112.9	6.0		
MaE	90426	105	96	361	20	125.3	5.1	48	126.3	5.1	126.3(5.13)**	121.0(6.86)**
PaE	90426	105	90	173	20	121.6	3.6	48	122.6	3.6	115.0(9.44)**	112.7(11.37)**
	90707	16	06	1565	61	115.8	3.8	58	109.8	3.8		
	100229	90	06	3435	172	123.5	7.1	51	122.5	7.1		
	100310	90	06	333	20	94.2	3.2	52	93.2	3.2		
	100414	100	90	687	35	125.0	5.6	65	116.8	5.6		
	100503	85	06	2029	102	126.8	4.8	88	110.4	4.4		
	111027	102	60	494	25	112.7	4.2	58	106.7	4.2		
* Indic: **Indic:	ates signi ttes signi	ficantly ficantly	* Indicates significantly different than SSURGO at $\alpha = 0.05$ level. **Indicates significantly different than SSURGO at $\alpha = 0.01$ level.	than SSU than SSU	RGO at a RGO at a	i = 0.05 [$i = 0.01 $]	evel. evel.					

Table 14B. Comparison of Site Index soil data from SSURGO database for SSURGO Map Unit Symbol with yellow

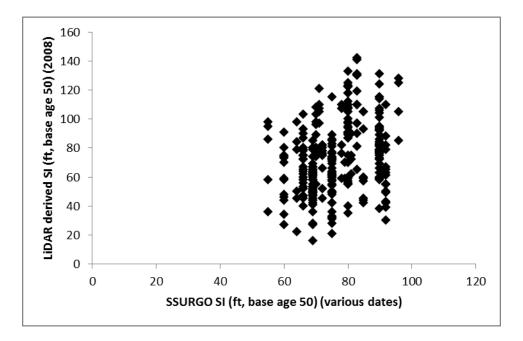


Figure 9. A plot of the LiDAR derived site index (2008) against SSURGO site index (various dates) of 302 plots.

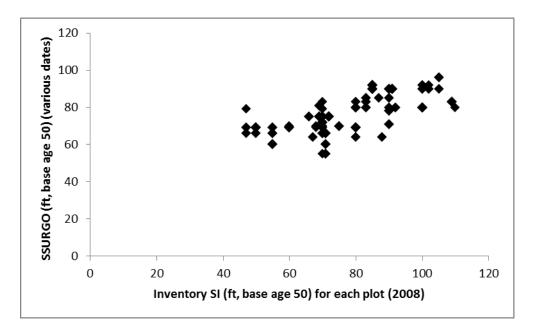


Figure 10. A plot of the SSURGO site index (2008) against Inventory measured site index (2008) of 302 plots.

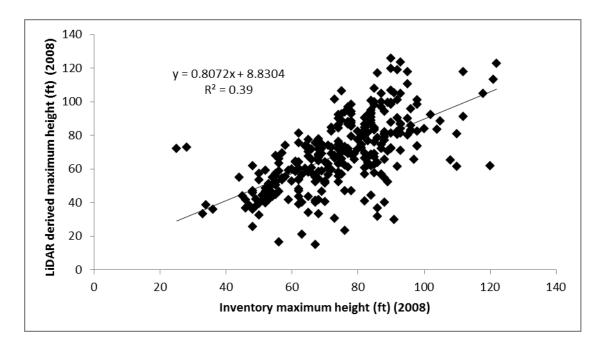


Figure 11. A plot of the LiDAR derived maximum height (2008) against Inventory (2007-2008) measured maximum height of 302 plots.

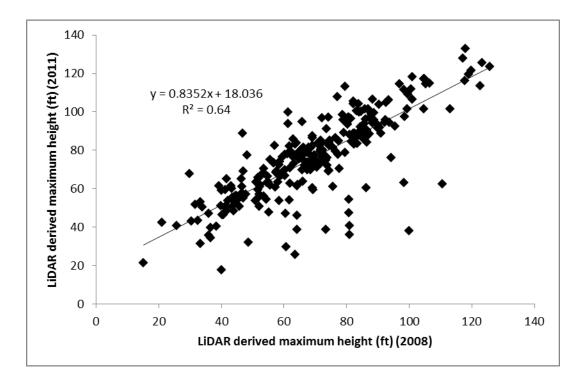


Figure 12. A plot of the LiDAR derived maximum height (2011) against LiDAR derived maximum height (2008) of 258 plots.

Figure	R^2	n	t-test	t-value $\alpha = 0.05$	t-value $\alpha = 0.01$	p-value
11	0.39	302	13.84930607	1.645	2.326	<.0001
12	0.64	258	21.33333333	1.645	2.326	<.0001

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