PINE STRAW PRODUCTION: FROM FOREST TO FRONT YARD

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ABSTRACT

Southern forestry may be undergoing a paradigm shift in which timber production is not necessarily the major reason for owning forested land. However, there remains interest in generating income from the land and landowners are exploring alternatives, including agroforestry practices and production of non-timber forest products (NTFPs). One such alternative more recent to the Southeast is collecting and selling pine straw for use in urban landscapes. It has been shown that longleaf pine straw will bring the landowner more money than straw from other southern pine species. The Regional Longleaf Growth Study will be utilized to provide information on the potential for pine straw production based on overstory density, age class, and site quality. This information will be combined with results of surveys of pine straw producers and buyers in Alabama to provide insight into pine straw markets in the state –from the forest to the front yard.

INTRODUCTION

Markets for timber are disappearing as demand for forest products declines and manufacturing facilities are moved overseas. Recent decades have witnessed forest industry consolidation (Bliss et al. 2010), transfer and subdivision of large amounts of forest acreage (Wear and Greis 2002), and the decline of long-term ownership (Clutter et al. 2007). Owners of small tracts are increasingly cut out of traditional markets. Landowners seek new ways to generate income from their forestland, while maintaining ecologically diverse, sustainable forest systems. Harvesting of pine straw is one option available to forestland owners looking to get short-term income while allowing timber to remain "on the stump." Harvesting pine straw is considered a form of "forest farming," one category of agroforestry (Hill and Buck 2000). Pine straw is a byproduct of a natural biological process – pine trees shed their needles regularly. Aside from being decorative, pine straw provides many mulching benefits, which is why it has become a valuable commodity among landscapers across the country. Pine needles interlock and stay in place while protecting against surface erosion, moderating soil temperature and moisture, and inhibiting growth of weeds (Pote et al. 2004).

Pine straw is considered a non-timber forest product (NTFP) and provides forestland owners with short-term income while allowing timber to remain standing. Through proper planning and development of a management regime, landowners can harvest straw without jeopardizing the growth potential of their pine trees. Pine straw yields usually peak well before stands reach rotation age (Gholz et al. 1985), and many authors recommend beginning harvesting operations as early as 7 or 8 years old (Duryea 2000, Morris et al. 1992, Taylor and Foster 2004). This provides an opportunity for landowners to secure regular, short-term income early in a rotation, prior to any thinning that may occur. Extra income can be used by landowners to cover living expenses, property taxes (thus, continued ownership), or to further invest in land management.

Taylor and Foster (2004) state that pine straw can be harvested on marginal or poor quality forest acreage or sites unsuitable for wood fiber production. The authors estimate that (in East Texas) 25- to 50-pound bales of pine straw sell (wholesale) for $5 to $10. Landowners who chose to lease their land for pine straw operations are typically paid on either a per-bale basis or a per-acre basis. One source states that if paid on a per-bale basis, landowners can expect to receive approximately $0.10 to $0.25 per bale (Taylor and Foster 2004); another source cites higher estimates of $0.50 to $0.65 (Cassanova 2007). If paid on a per-acre basis, landowners get approximately $12.50 to $30 per acre (Taylor and Foster 2004). However, higher-quality straw (especially longleaf pine straw) can yield much higher rates.

Figure 1 shows the farm gate value for pine straw in Georgia starting in 2000 (the first year the University of Georgia Center for Agribusiness and Economic Development compiled data for pine straw as a separate commodity). In 2000, pine straw was valued at $15,563,253 and accounted for 2.1 percent of the forest products market (Doherty et al. 2001). Boatright and McKissick (2010) estimate that in 2009, pine straw contributed more than $81 million to Georgia's economy (up 80.9 percent from the 2000 commodity figures), and accounted for more than 16 percent of the forest products market.

The top pine straw producing county in Georgia (Laurens County) harvests straw from about 55,000 acres at an average per-acre value of $125, totaling $6,875,000 for 2009

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(Boatright and McKissick 2010). For the most part, pine straw is harvested from privately-owned property. Alabama ranks number two in the country in terms of the percent of forestland owned by non-industrial private landowners – second only to Georgia. Alabama, Georgia, Florida and Mississippi contain more than half of the area of pine plantations in the South. In 1995, Alabama ranked third in the area of pine plantations on private land, but is expected to surpass Florida and become second by 2040 (Wear and Greis 2002). It is difficult to estimate pine straw harvests for Alabama – yields are not reported in the state's Agricultural Statistics. Yet, despite the high potential for pine straw production in the state's many pine plantations, the market is not well developed.

Anecdotal evidence and unpublished data suggest that buyers in Alabama (e.g. garden centers, landscapers, and nurseries) often purchase pine straw from more than 200 miles away, usually from Florida or southwest Georgia. Research of alternative forest management regimes provides insight to why landowners are not engaging in such practices. Workman et al. (2003) cite poor market development and inadequate education of the public and of land use professionals as constraints to agroforestry development (including forest farming). Access and distance to markets is an important factor in the successful implementation of alternative forestry systems (Hauff 1998).

In a mail survey conducted by Workman et al. (2003), 67 percent of landowners in Alabama and Florida were familiar with non-timber forest products, but only 18 percent of Alabama landowners engage in forest farming. More than 40 percent of Alabama landowners expressed interest in learning about forest farming and production of non-timber forest products. When asked about benefits of agroforestry regimes, Alabama landowners rank wildlife habitat, soil conservation, and aesthetic value as the most important potential benefits. Top rated obstacles among respondents were lack of equipment, component competition, lack of land area, and lack of demonstrations. Land use professionals in Alabama and Florida cite lack of familiarity with the practices and lack of demonstrations as obstacles to agroforestry (Workman et al. 2003).

Workman et al.'s (2003) findings provide a starting point for the proposed research project. Yet, many questions remain regarding the 40 percent of Alabama landowners who expressed interest in NTFPs. Information is needed about their ownership objectives, current management practices, environmental concerns, market awareness, and interest in harvesting pine straw. There is also a need for information about the pine straw market and consumer demands.

This study aims to expand upon the work of others and develop a clearer picture of the pine straw market in Alabama and the potential for landowners to engage in that market and better meet market demands. The results of this study can help identify ways outreach programming can meet landowner needs while boosting the pine straw production market. This paper represents a first step in answering questions about the potential for pine straw as a commercial non-timber forest product in Alabama. Along with presenting three major project objectives, we share preliminary results from pine needle yield data (Objective 1) and from a mail survey of pine straw buyers located in six metro regions of Alabama (Objective 2).

PROJECT OBJECTIVES

Objective 1: Analyze pine straw yield data collected as part of the Regional Longleaf Growth Study.

The goal of Objective 1 is to develop a biological framework within which the remaining components of the study can be conducted. The information collected and generated through tasks associated with Objective 1 will be a quantitative assessment of the biologic potential of longleaf pine forests, based on various stand characteristics. This information is crucial to knowing production potential and, therefore, market potential of longleaf pine straw in the Southeast. Research questions to be addressed in Objective 1 include: What variables show strong correlations to higher needle fall? How do interactions of different site characteristics impact pine straw production? What stand characteristics appear to have biggest impact on pine straw production?

Several tasks under Objective 1 have been completed. The first task was to obtain data, including trees per acre, basal area, site indices, stand locations (by county), and needle fall by weight, for plots throughout the Southeastern United States. These data come from the Regional Longleaf Growth Study, or RLGS (Kush et al. 1987). In the mid-1960s, the U.S. Forest Service established this study to track growth and mortality of naturally-regenerated, even-aged longleaf pine (*Pinus palustris*) stands in five Southeastern States (Mississippi, Alabama, Georgia, Florida, and North Carolina). The study, now in its 45-year re-measurement, includes collection of pine straw yield data (needle fall) on more than 200 plots. Figure 2 shows the locations of pine straw data collection by county. After obtaining these data, the information was organized, and means for plots, years, and months were generated. Classes were defined for site index, age, basal area, and density (classes will be ranges of the number of trees per acre based on square tree spacings). Project personnel will test for correlations between the independent variables and the dependent variable (pine straw yield), as well as run multiple regressions. An alpha level of 0.05 will be used to determine statistical significance.

Objective 2: Determine demands and preferences of pine straw consumers.

The goal of Objective 2 is to assess the current pine straw market in Alabama in terms of volume demand and characteristic preferences. The information collected through tasks associated with this objective (including a mail survey of companies) will be used to help outreach professionals know what pine straw producers and retailers can expect as they enter the market. Included in the tasks will be an assessment of quality preferences of landscapers, contractors, and retailers, as well as consumer willingness to pay (WTP) for pine straw. With this knowledge, outreach professionals can help prepare landowners for potential market-related challenges and inform them of management practices that may increase product quality and efficiency of pine straw operations. Research questions to be addressed in Objective 2 include: How much demand is there for pine straw? Are there preferences regarding species, bale shape, or bale binding? How important are certain quality characteristics, such as cleanliness, needle length, or location or timing of harvesting? How much do wholesale buyers and retail consumers pay for pine straw? Do buyers receive volume discounts? How much do retailers or suppliers sell pine straw for? How far are sellers willing to travel? Does demand fluctuate by month/season?

As with first objective, several tasks associated with Objective 2 have been completed. The first task was to review literature related to pine straw markets, in particular reports on markets in the Southeastern United States. There is limited information available, however, what has been published proved helpful when conducting the second task: developing a questionnaire aimed at assessing volume demand, seasonality, and market structure of pine straw as well as characteristic preferences of buyers. This mail survey was administered in Fall 2010 using Dillman's (2000) Tailored Design Method (TDM). TDM calls for four mailings (a prenotice letter, a first-round survey, a follow-up postcard, and a second-round survey). The survey was sent to 198 retailers, landscapers, lawn maintenance specialists, landscape suppliers, and nurseries in six metropolitan regions in Alabama. These types of businesses buy and sell pine straw. Owners and managers of such companies can provide insight to the pine straw market and identify consumer preferences, while providing data on sales volume and prices. Those selected for the study have operations in six metropolitan regions in Alabama (Huntsville/Madison, Birmingham, Montgomery, Mobile, Tuscaloosa, and Dothan). These regions were selected because they are in the top ten metro regions of the State and are geographically diverse.

Names and addresses for survey subjects were selected from a list provided by the executive director of the Alabama Nursery and Landscaper Association (ALNLA). Additional names and addresses were selected from publicly-available listings of businesses (such as the Yellow Pages). As completed surveys were received, responses were coded. Predictive Analytics Software (PASW) was used to generate descriptive statistics and will be used to analyze the data and observe statistically significant relationships between variables. Tests will also be run to check for differences among regions and respondent type (e.g. retailers, landscape contractor). A alpha level of 0.05 will be used to determine statistical significance.

Objective 3: Assess willingness of Alabama forestland owners to establish pine straw harvesting operations.

The goal of Objective 3 is to gauge the potential for higher involvement of Alabama forestland owners in a pine straw market. Mail survey results will be used to assess landowner interest and knowledge of agroforestry systems and, more specifically, production of non-timber forest products (NTFPs). Those whose lands do produce pine straw will be asked willingness to accept (WTA) questions in order to determine an approximate expected price range based on various factors (such as respondent location and pine species). This information is vital to developing programming geared toward expanding market opportunities. Research questions to be addressed in Objective 3 include: What factors are important to non-industrial private forestland (NIPF) owners when making management decisions about forestland? How interested are Alabama forestland owners in harvesting pine straw? For what reasons would forestland owners engage in agroforestry practices? Why might they choose not to?

Many private landowners in Alabama own and manage their forests to fulfill non-economic objectives (Zhou 2010). However, ownership objectives often correlate with tract size – Zhou (2010) reports that large-scale landowners in Alabama are more interested in timber production. This project will test several hypotheses regarding willingness of forestland owners to harvest pine straw and factors in that willingness, including tract size, species, and current management practices. Pine straw holds potential even for those for whom timber is not the primary ownership objective. Pine straw operations require a clean understory, meaning they can complement plans already managing for aesthetics.

For Objective 3, only initial tasks have been completed thus far and no preliminary results are available. The first task associated with the objective was to review literature related to private forestland owners and willingness to engage in alternative practices and markets. Based on that information, the second task was to develop a questionnaire aimed at understanding landowner management practices, ownership objectives, awareness of – and interest in – agroforestry

practices (including production of non-timber forest products), perceived costs and benefits of such practices, and needs for technical assistance or incentive programs. Again, Dillman's Tailored Design Method will be used to conduct the survey, which will be sent to owners of forestland in six counties in Alabama (Jackson, Shelby, Autauga, Baldwin, Houston, and Pickens). These counties were chosen because of their close proximity to the metropolitan areas selected for the survey administered as part of Objective 2. Survey questions will be designed to elicit information that will provide insight to the potential for forestland owners in the region to meet the market demands of pine straw buyers in the adjacent urban area. Recipient names have been collected from publicly-available tax assessment records.

Once surveys are received and all responses coded and entered into a spreadsheet, statistical analyses will be performed to identify (1) trends among Alabama forestland owners, (2) correlations between independent variables, and (3) causal relationships between landowner or site characteristics and willingness to engage in production of NTFPs (including pine straw). An alpha level of 0.05 will be used to determine statistical significance. The primary dependent variable will be landowner interest in harvesting pine straw from their land.

PRELIMINARY RESULTS

OBJECTIVE 1

Table 1 displays descriptives of the longleaf stands and pine needle yield data generated through the RLGS. Plots were measured monthly with an average of 38 recordings between 1993 and 1997. All data were recorded in metric units then later converted to English. On average, stands were 51 years old with approximately 551 trees per acre. Basal area averaged 80 square feet per acre and site index averaged 70 feet, with a base age of 50. Mean needle fall was 3,494 pounds per acre per year. This amounts to an average of 175 bales per acre per year. This is based on 20-pound green-weight bales.

Figure 3 shows mean pine straw yield (in green bales per acre per year) by basal area class at various age classes. As to be expected, as basal area increases, so too does pine straw yield. However, once basal area reaches a certain point (this point appears to be about 120 square feet per acre when looking at 30-square-feet increments), younger stands with lower basal area produce more pine straw than older stands with higher basal area.

Figure 4 shows mean pine straw yield (in green bales per acre per year) by tree density class at various site index classes. At lower densities, site index does not appear strongly correlated to pine straw yield. In contrast, as density increases, stands with higher site indices yielded much higher amounts of pine straw.

Further analyses will be conducted using the data, including running multiple regressions with pine straw yield as the dependent variable. A resulting regression equation can be used to make estimations of pine straw yield using known independent variables, such as basal area, stand age, and site index.

OBJECTIVE 2

Wolfe et al. (2005) examine pine straw characteristic preferences among buyers of pine straw; however, their study was limited in size (29 respondents, only 20 of whom use pine straw) and geographic scope (within a 60-mile radius of Eufaula, Alabama). The strongest characteristic preference among respondents was that pine straw be free of sticks and cones (90 percent), followed by free of leaves (75 percent). Findings such as these have implications for landowners, who are expected to maintain clean, flat stands with little herbaceous material (Taylor and Foster 2004). The main research method employed thus far to achieve Objective 2 of the research project was a mail survey administered in Fall 2010. The survey was designed to elicit kinds of information similar to that found in Wolfe et al. (2005), but with more detail and the ability to test for differences by region of the state and buyer type. Questionnaires were sent to 198 recipients located in six metro regions of Alabama. A response rate of 42 percent was attained.

An analysis of the pine straw market can help answer questions about whether there is room for more producers to enter the market and whether forestland owners would benefit from developing management regimes geared toward pine straw production and harvesting. Information collected through this survey on product preferences and market demands can be used by pine straw producers who may be interested in expanding operations or need guidance determining pricing schedule or marketing channels. What follows are some preliminary findings from the survey mailed to pine straw buyers.

The majority of respondents were landscape contractors (37 percent), followed by retailers (29 percent), then lawn maintenance specialists (17 percent). The remaining respondents were categorized as "other" or were a combination of the previous buyer types. Respondents were asked what species of pine straw they usually purchase (responses were not mutually exclusive). Approximately 43 percent of the respondents purchase longleaf straw, about 38 percent purchase slash, and about a fourth buy loblolly. Eighteen percent of respondents said they do not know what

kind of pine straw they buy. Respondents were also asked to rank each species in terms of preference with 1=most desired, 2=second most desired, and 3=least desired. There was a strong preference for longleaf (mean rating of 1.20). In second was loblolly (2.24), closely followed by slash (2.29). Approximately 18 percent had no preference, which is not surprising given that 18 percent didn't know what species of pine straw they are purchasing. This suggests, however, that those who are familiar with the three different species have preferences.

Table 2 shows the mean number of bales of pine straw purchased by respondents, both on an annual basis and at a single time. On average, respondents are buying more than 8,000 square bales per year and about 600 square bales at a single time. More than half of the respondents pay between $2.50 and $3.50 per square bale.

Respondents were asked to estimate the distance between the origin (i.e. the forest) of the pine straw they purchase and their place of business. More than one-fourth of the respondents do not know where their pine straw is coming from. Approximately one-third of respondents are buying their pine straw from more than 150 miles away. Several respondents wrote in responses, saying they get their straw from southwest Georgia or the Florida panhandle.

Respondents were asked to rank each month of the year in terms of seasonality as a buyer of pine straw, with 1=busiest to 4=least busy. Results revealed that the busiest months are in spring (March, April, and May) while the least busy months are in winter (December, January, and February). These findings are interesting to note because most harvesting occurs around the time when (or shortly after) needle fall is highest – typically in September, October, and November. Therefore, straw is frequently harvested a full six months before demand peaks.

Respondents were also asked to express their preferences in terms of bale shape, binding, and method used to bale pine straw. Seventy-seven percent of respondents prefer square bales, 13 percent prefer round bales, and 10 percent expressed "no preference" for either bale shape. When it came to bale binding, there was a strong preference for bales bound with twine – 85 percent. Seven percent preferred bales bound with wire and eight percent expressed "no preference." Wolfe et al. (2005) found that buyers had a preference for hand-baled pine straw because of ease of application. However, our respondents appeared to feel differently – 53 percent preferred machine-baled pine straw. Only 20 percent expressed a preference for straw baled by hand. Approximately 27 percent stated "no preference" when it came to baling method.

Finally, respondents were given a list of pine straw characteristics and asked to rank each one in terms of importance. In other words, they were asked to state whether it was "not important" (coded 0), "important" (coded 1), or "very important" (coded 2) that the straw they buy possess these characteristics. Figure 5 shows that buyers do not care whether the pine straw they buy is harvested locally. Surprisingly (given the strong preference expressed by respondents for longleaf pine straw), "needles not broken" and "long needles" ranked lower than other characteristics. Also, "dry" and "fresh (recently harvested)" ranked lower than expected. The characteristic that ranked the highest in terms of importance was "no weeds or briars." In second place was "no foreign material (trash)." This is important to note because there are implications for landowners considering how best to utilize resources and prepare a site for pine straw harvesting operations. Keeping a clean stand and applying herbicide are clearly important components of a site preparation plan. Also, if needle length is less of a concern, then mechanical baling (which can cause breakage) can be a better option because it is less expensive than hand baling.

CONCLUSION

Based on the Farm Gate Value data out of Georgia – and the similarities between Georgia and Alabama forestlands – we believe there is potential for a more robust pine straw market in Alabama. However, there are biological factors that affect production potential and there needs to be a better understanding of those factors and how they interact. The buyer survey (Objective 2) showed that buyers prioritize clean straw over fresh and dry straw and long and unbroken needles. However, many buyers were unaware of the species they purchase or the origin of the pine straw; this suggests a need for consumer education efforts. The big unanswered question is whether landowners in Alabama are willing to harvest pine straw from their land. The research conducted under Objective 3 should help answer this question and help guide future outreach programming.

We expect research results to provide useful information for Extension personnel interested in educating forestland owners about the revenue-generating pine straw market and in identifying cost and logistical issues that need to be considered when developing management regimes that incorporate pine straw harvesting operations. It is important that landowners, prior to beginning pine straw harvesting operations, be aware of how different management strategies impact the landscape. The survey conducted as part of Objective 3 will provide insight to what management practices landowners are currently employing and the level of importance placed on environmental stewardship,

biodiversity, water quality, and soil conservation. Extension publications and programming based on research findings can raise awareness among landowners of these issues and help them incorporate management practices from a landscape perspective.

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Table 1—Descriptive statistics of data collected from 201 plots as part of the Regional Longleaf Growth Study, 1993-1997

Variable	Unit	Minimum	Maximum	Mean	Standard Deviation
Age	Years	18	110	51	27
Density	Trees per acre	15	4452	551	800
Basal area	Square feet per acre	22	152	80	36
Site index (base age 50)	Based on height in feet	43	89	70	11
Needle fall	Pounds per acre per year	929	6696	3494	1273
Pine straw	Bales per acre per year[1]	46	334	175	64

[1] Based on 20-pound green weight bales

Table 2—Number of bales of pine straw purchased by respondents to the 2010 pine straw buyer survey, by bale shape

	N	Mean	Min	Max	SD
Purchased annually					
Square	56	8,272	50	100,000	17,840
Round	6	5,900	100	25,000	9,501
Purchased at a single time					
Square	58	635	10	7,500	1,047
Round	7	401	100	650	206

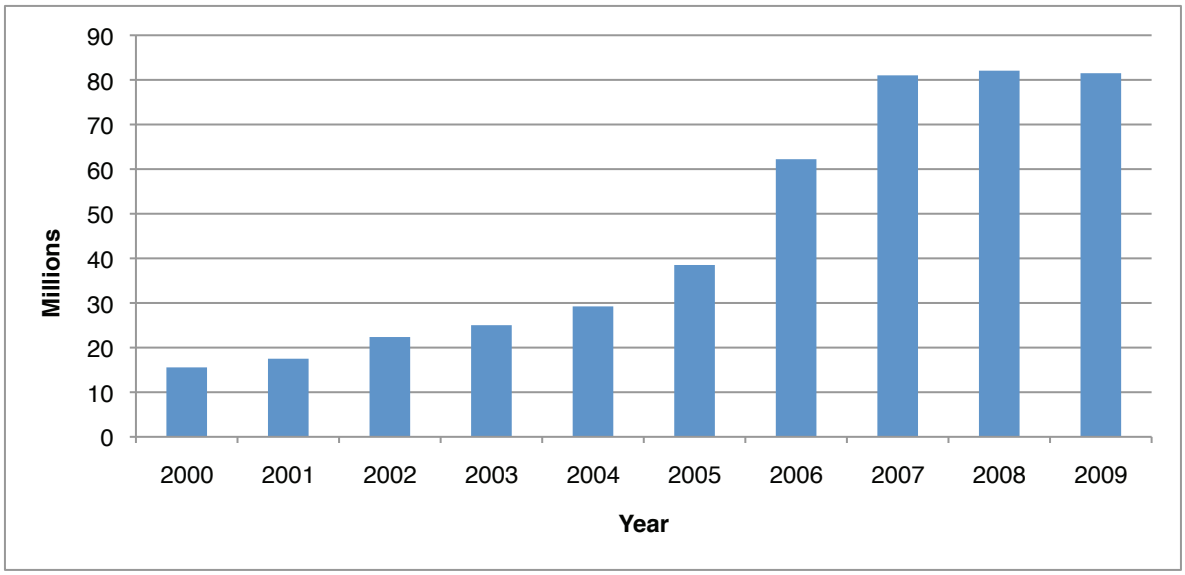

Figure 1—Farm Gate Value for Pine Straw in Georgia, 2000-2009

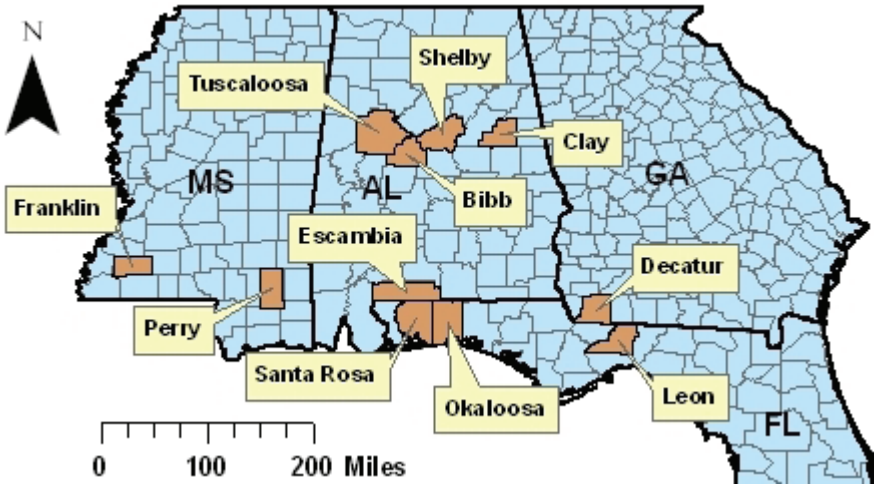

Figure 2—County locations of pine needle data collected as part of the Regional Longleaf Growth Study

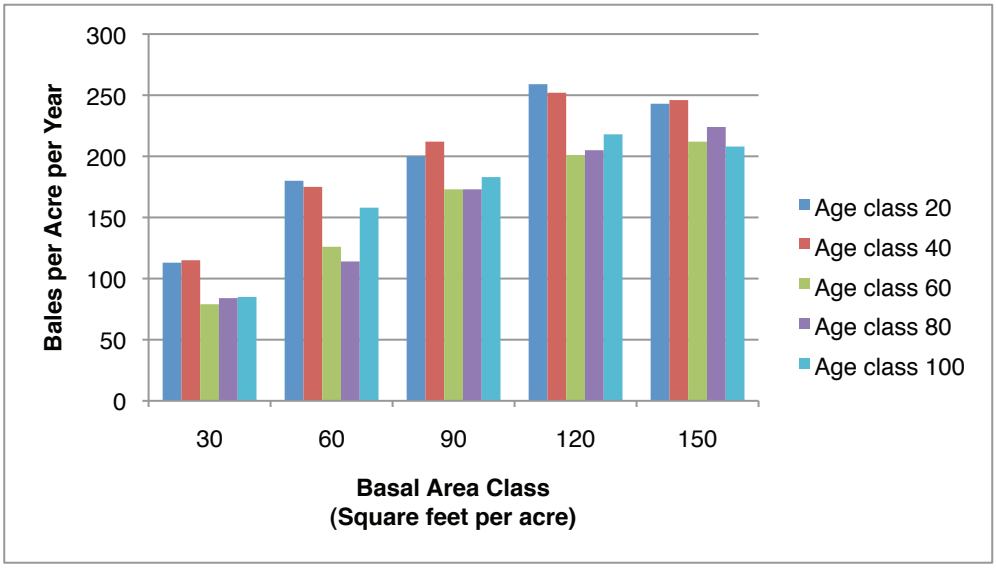

Figure 3—Mean pine straw yield, in green bales per acre per year, by basal area class at various age classes

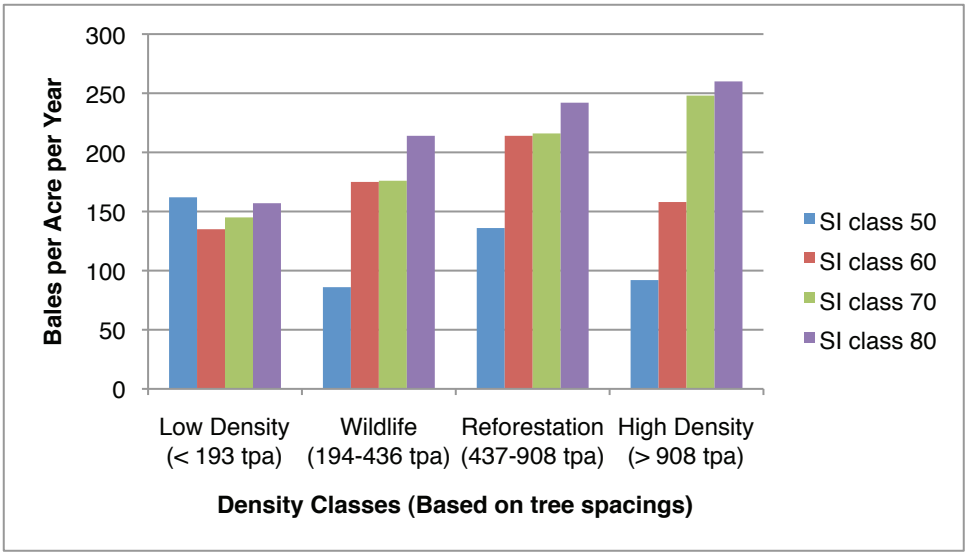

Figure 4—Mean pine straw yield, in green bales per acre per year, by tree density class at various site index classes

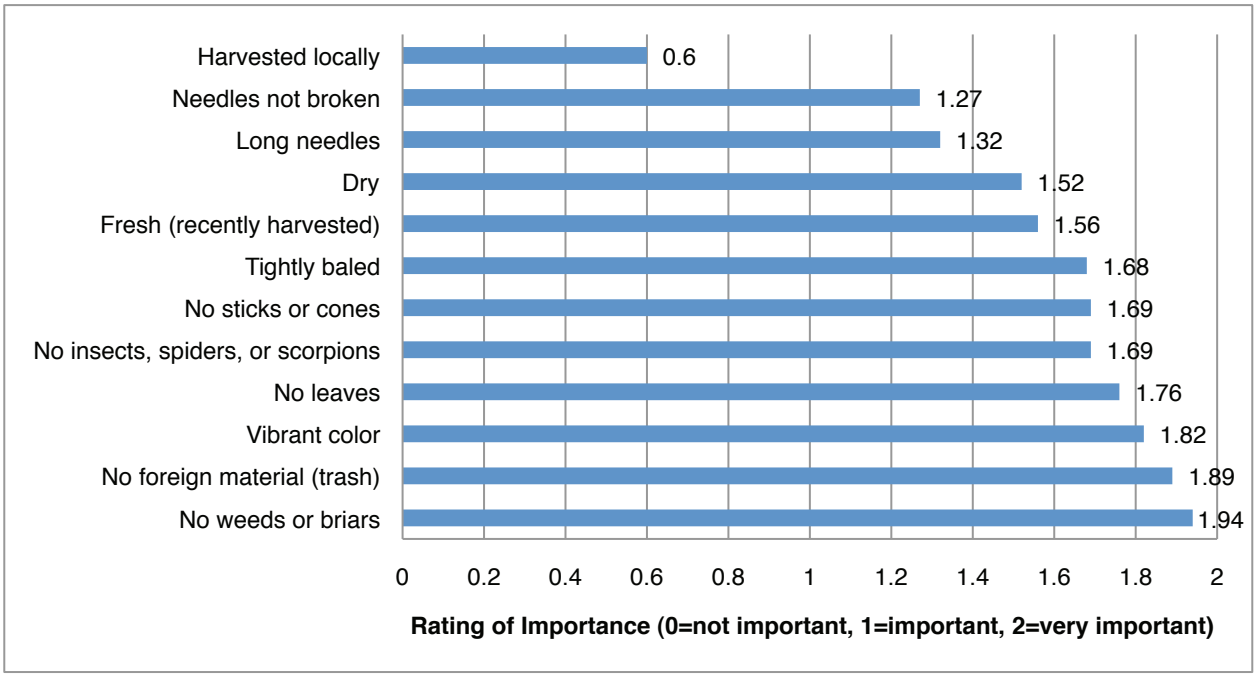

Figure 5—Pine straw characteristic preferences according to the 2010 pine straw buyer survey, by mean rating