

2006
USDA Forest Service Biomass Grant Award

**“WOODY BIOMASS UTILIZATION ON NATIONAL FOREST SYSTEM LANDS
TO ACHIEVE UNMET MANAGEMENT NEEDS”**

Bi-annual Progress Report: June 1, 2007 – November 30, 2007

Objective 1: Improve forest health conditions on NFAL lands through utilization of the more cost-effective method of harvesting biomass to achieve forest management objectives.

Responsible Partner: **Talladega National Forest – Oakmulgee District**

- **Task:** Forest Service will prepare 500 - 1000 acres of over stocked pine stands for biomass removal using a Stewardship Integrated Resource Contract. When: June, 2006 – December, 2007

The Talladega National Forest – Oakmulgee District continues to evaluate its local market for small diameter and sub-merchantable wood products. Much of this evaluation is done in search of the “best” approach to implementing a 13,000-acre forest health restoration project. At the close of Fiscal Year 2006 1,702 acres (13%) of mixed products (excluding biomass) sales had been placed under contract. These acres were sold through a competitive bidder process. At this time only 310 acres (18% of sold acres/2% of project acres) have been actually cut; and given the current drought conditions there is likelihood that additional acres, which are predominately upland, may not be harvested this calendar year. Thus the “management needs” that precipitated the project development remain “unmet” and are probably increasing in scope and intensity.

To further explore the role of biomass as a management tool, the Oakmulgee District has focused on the following areas:

- 1) In March 2006, the Oakmulgee completed a **pilot biomass removal project** treating 32 acres. The pilot project treated three sites with varying stand conditions and prescriptive contract specifications. The contract - - an Integrated Resources Timber Sale Contract (IRTSC), provided a value assessed for the biomass removed and a service value for the treatment. This “goods for services” approach allowed the Forest Service to compensate the logger for the “service” of harvesting the biomass, while providing the accountability of assessing a value for the biomass “goods”. This project was negotiated with a local bidder as a sole source, after two other potential bidders failed to express interest. The intent of this project was to improve forest conditions while gaining knowledge of the IRTSC, as well as better understand the limitations of today’s harvesting methods for biomass removal. The lessons learned and questions for future projects include:
 - Forest Service policy for sale preparation, volume attainment, and contract oversight result in a high administrative cost, especially when compared to the current market value of biomass. Questions for future projects include:
 - What parameters need to be evaluated to determine if biomass harvesting is the “best-value” treatment?
 - What inventory techniques should be applied to assess stand homogeneity relative to sampling for volume determination?
 - Can we effectively implement a “designation by prescription” harvest design and still maintain accountability standards for contract compliance?
 - Is there a market for three-product sale to include saw timber, pulpwood, and biomass?

- Internal Forest Service values do not totally embrace chipping for biomass as an appropriate use of small diameter trees. Therefore cost-effectiveness of biomass harvesting may not be fully evaluated until the management benefits are assessed. (See Task #4) Questions for future projects include:
 - What are the measures for assessing the value of ecosystem restoration?
 - Given that the intent of the Oakmulgee’s restoration program is to restore the “full suite of ecosystem components”, what are the criteria for measuring success?
 - What are the decision points for determining the best tool (biomass, traditional two product sale, service cut & leave, mastication, etc) to achieve desired results?
- 2) In June – August 2006, the Oakmulgee District hosted two summer students, one each from Southern University and Alabama A & M. These students began **stand inventory** on acres with potential for biomass harvesting.
 - 3) On January 13, 2007, the partnership hosted a meeting of local landowners and forest practitioners. While a portion of that meeting was to orient the local community on the project, it was also used as a forum to query land managers on their information needs relative to making decisions on biomass harvesting. (also supports Tasks #4 and #5) Their responses included:
 - Better economic data on cost of harvest vs. market value
 - Management responses including wildlife habitat, soil loss, site preparation for stand conversion, etc.
 - 4) In January 2007, the Oakmulgee District regained focus on the **Southern Pine Beetle Abatement Project** that identifies 6,700 acres of forest health restoration objectives. Currently undergoing the 30-day administrative review required by the Healthy Forest Restoration Act, this project compliments the previous Record of Decision on 13,000 acres for longleaf restoration and will provide additional opportunity for biomass harvesting and evaluation of outcomes. Decision Notice anticipated mid-June.
 - 5) During Fiscal Year 2006 to present, the Oakmulgee District has completed **two comparison treatments**. One treatment included a *cut and leave* treatment on 749 acres to achieve red-cockaded woodpecker habitat objectives and additional 154 acres of *cut and leave* treatment in longleaf pine plantations less than age 10 to release the young pines from competing vegetation. The direct cost of treatment ranged between \$110 and \$125 per acre. Several of these acres have received a prescribed burn treatment and can now be evaluated as a comparison relative to effectiveness of biomass harvesting.
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- Figure 1 Cut and leave treatment 1 year post burn**
- 6) **Funding has been secured** through partnerships and appropriations to develop a maximum of 950 acres for potential biomass removal examining a variety of parameters. Parameters currently under consideration are:
 - Age class of loblolly pines best suited for biomass harvesting/thinning (21-30 years vs. 31-40 years)
 - Potential for biomass harvesting/thinning in longleaf pines 11-20 years (explores management option of delaying release treatment gain benefits of biomass)
 - Cost effectiveness of final harvest of highly damaged loblolly pine stands as an offset to cost of regeneration.
 - Potential for biomass harvesting/thinning in longleaf stands greater than age 40 as a treatment to improve red-cockaded woodpecker foraging habitat.
 - 7) The timeline for this Task has been adjusted to target **Summer 2007** for the award of the contract/start of the project. See Task #4 for ongoing work to evaluate project results.

- 8) Site selection is underway, as well as volume determination, for the 500 acres scheduled for biomass removal. Sale packaging is likely to begin in 1st quarter 2008.

Objective 2: Explore new uses and determine capacity of woody biomass to augment coal fired power generation.

Responsible Partners: **USFS Oakmulgee Ranger District of the Talladega National Forest**
The Southern Company
Auburn Forest Products Development Center @ Auburn University
Forest-Based Economic Development Services, Inc.

- **Task:** Test firing 1,000 tons of refined biomass, followed by one or more units selected for long term (1 year) co-firing using up to 20,000 tons of biomass. When: July, 2007 – December, 2007

The USFS Oakmulgee Ranger District of the Talladega National Forest has focused its efforts in the following area during this initial 6 month period:

- 1) To facilitate a savings in transportation cost, suitable biomass removal sites have been identified on the Talladega National Forest - Shoal Creek Ranger District. This should result in a saving of \$5,000-\$10,000 in haul cost for the partnership. The supporting work is underway by the Shoal Creek District and a negotiated sale of 1,000 tons of biomass is targeted for July 2007.

The Southern Company has focused its efforts on testing the co-firing of wood & coal at Plant Gadsden during the past 6 month period:

- 1) Attended planning meetings with Forest Service and Auburn University Forestry School personnel on methods to produce small wood chips for use in utility pulverized coal boilers - Auburn, AL;
- 2) Attended planning meetings with Forest Service and Auburn University at the Alabama Power Company's steam at Plant Gadsden and Gadsden, Alabama to assess the following: storage & handling of woody biomass upon delivery; timing & tentative scheduling of the test burn; volume of woody biomass required by the Alabama Power Company; internal testing and evaluation of wood co-fired with coal by the Power Company to determine burn rate, emissions, etc.;
- 3) Made a series of presentations around the Southeast and elsewhere in support of biomass for energy as follows:
 - a) Mississippi State University – Biomass Power, gasification and renewables
 - b) Georgia Bio-energy Conference – Tifton, Georgia
 - c) DOE Biomass Roadmap Advisory meeting – Syracuse, NY
 - d) Biomass Co-firing – EPA Headquarters in Washington, DC
 - e) Renewable Energy – American Association of Construction Engineers, Birmingham, AL
 - f) Bio-refinery Project Review @ Princeton University, Princeton, NJ
 - g) Biomass Co-firing presentation to media group @ Plant Gadsden, Gadsden, AL
 - h) Biomass Co-firing presentation DOE Opportunity Forum, Washington, DC
 - i) Biomass Power – University of Georgia, Athens, GA

- 4) Subject: Small Wood Chip Project:

The Southern Company's Gadsden Steam Plant is teaming with the U.S. Forest Service to use 1,125 tons of un-merchantable forest products, trees too small to sell in the pulp industry, and other biomass harvested from the Talladega National Forest to combine with coal for power generation. It is anticipated that forest products can be used as a renewable energy source that helps to reduce overall CO₂ emissions. Alabama Power will study the optimum amount of biomass that can be combined with coal to co-fire the Gadsden plant, with the wood percentage expected to be between 5 percent and 15 percent. The upper limit will be determined during the testing.

One of the objectives of this study is to determine the effect of biomass on the power plant operations, boiler and auxiliary equipment performance and efficiency. Other objectives include identifying the potential emissions reductions from co-firing biomass and the overall effect on power plant emissions. This is just the latest project in testing of biomass materials by Southern Company going back more than 15 years.

Early tests at Gadsden using up to a 15% mixture of wood chips and coal at a feed rate of 26,000 pounds per hour were deemed successful. Little to no degradation or performance issues were noted in the coal feed system, bunker, pulverizer and exhauster equipment. In addition, LOI results from the testing on August 17 were very promising.



Figure 2 Coal Storage Area - Gadsden Steam Plant

The experimental project also involves the Auburn University School of Forestry & Wildlife Sciences, the University of Alabama Center for Economic Development and other research organizations.

The harvesting will improve the health of the forest, while also creating an economic opportunity for the Forest Service and private landowners. The project is starting in the Shoal Creek District, where loblolly pines are being harvested from 37 acres of a native longleaf pine site. Plans have been developed to replant this site with the native longleaf pine next year. Overcrowding in the forest is forcing the Forest Service to trim and remove trees that would otherwise be considered a waste product, but some of those costs might be recouped by selling the biomass, as fuel to the power company and other industries.

Precision Husky Corp. of Leeds, Alabama helped overcome one obstacle by developing a horizontal grinder that they are loaning to the project that will cut the forest biomass into 3/8 inch to 3/4 inch pieces. A primary objective of the research is to determine if this size wood chip can be handled by the coal handling equipment and be burned with coal in the Gadsden boilers.

Researchers will also be studying up to 1,000 acres of the Talladega National Forest, Okmulgee District near Tuscaloosa, to see if the proposed biomass harvesting is better for the environment than traditional logging methods.



Figure 3 Piles of small wood chips at Plant Gadsden prior to testing

Small Wood Chip Testing Plan*:

10/15/07 to 11/15/07

- * GPP Unit 2 Set Up
- * Small Wood Chip Test Phase 1 (short fiber)
- * Small Wood Chip Test Phase 2 (long fiber)
- * Conduct Emission Testing (Sanders)
- * Small Wood Chip Test Phase 3 (production chips)
- * Unit 2 HVT Profile Testing
- * Sample Analysis Results Available

12/17/07

- * Report Draft Preparation

01/01/08 to 02/01/08

- * Report Draft Comments

02/04/08 to 02/15/08

- * Final Report

03/03/08

- * * Note - Testing based on Unit 2 return to service by 10/14/07,
- * * Note - No significant turbine / generator operational startup and running anomalies.
- * * Note - Unit 2 mill motor repairs / replacements to be completed October 15.



Figure 5 Pile of short fiber clean wood chips



Figure 5 Pile of long fiber whole tree chips



Figure 6 Pile of production chips - whole tree

Forest-Based Economic Development Services, Inc. (FBED) has focused its efforts in the following area during this 11 month period (July, 2006 – May 2007):

- 1) Identification and screening of loggers who are equipped with the equipment to harvest biomass for the 1,000 ton test at Plant Gadsden per grant objectives; Attended meetings with the USFS to discuss options relative to harvesting biomass as per grant objectives from the Shoal Creek District of the Talladega National Forest

Identification & screening of loggers; harvesting of biomass per project objectives:

10/13/06

FBED and the USFS Okmulgee District Ranger met with representatives of Taylor-Made Transportation/Reynolds Wood Products and Bobby Harrison, a wood producer working through Taylor-Made, to discuss the project and their interest in participating in it. Both have a high level of interest in the project. Will meet again soon for a site visit.

10/25/06

FBED and the following participants met at the USFS office in Brent to discuss field operations relative to the Biomass Grant Project objectives: Cindy and Joe Fowler of the Oakmulgee District; Dana Mitchell of the USFS; Ken Muehlenfeld of Auburn University; Billy Zemo and Loretta Aultman of Alabama Power Company; Jim Gober and Gene Quick of Forest Based Economic Development Services; Danny Tharp of Reynolds Wood Products; and Bobby Harrison, a logger/chipper operator. A field visit to a couple of potential sites for the biomass harvesting project took place following the planning meeting.

12/19/06

On December 19, 2006, Ken Muehlenfeld (AFPDC), Bob Rummer (USFS), and Gene Quick (FBED) met with Mike West of Precision-Husky at that Company's Leeds, Alabama facility. The purpose of the meeting was to discuss methods of reducing the particle size of wood chips produced in the field to meet the specification of Alabama Power Company. Precision-Husky is an international leader in the size reduction of raw wood. The Company designs and manufactures equipment ranging from stationary chippers and screens used at sawmills to in-woods machines that produce pulp-quality chips, fuel chips, and horizontal and tub-grinders with fixed-hammer or swing-hammer hammer-mills with changeable screens that can reduce or enlarge the size of the wood particles processed through the machines. The conclusion was that the best alternative for this project was to further process whole tree chips produced by Reynolds Wood Products logger, Bobby Harrison, through a swing-hammer tub grinder owned by Precision-Husky or one of their customers. This will be verified in a test run of a small volume of chips brought to the Precision-Husky site, or to another location determined with the help of Precision-Husky. Precision-Husky will join us as a partner in the Biomass project, and may absorb some of the costs involved in the particle size reduction phase of the project. Mike West and Precision-Husky are valuable additions to the Team.

1/12/07

FBED coordinated a planning meeting at the Gadsden Steam Plant with the Southern Company & the Alabama Power Company to discuss the details and operational requirements of the steam plant to co-fire woody biomass with coal. Topics discussed included the following: storage & handling of woody biomass upon delivery; timing & tentative scheduling of the test burn; volume of woody biomass required by the Alabama Power Company; internal testing and evaluation of wood co-fired with coal by the Power Company to determine burn rate, emissions, etc. ; others in attendance included USFS; Forest Products Development Center; FBED representatives.

2/13/07

Precision-Husky conducted a chip regrinding test at their Moody, AL, facility. Southern Company determined that the re-ground wood particles would not be satisfactory because of the "fuzzy" edges of the particles. Woody biomass with these characteristics would cause bridging in the fuel feed system at Gadsden.

Precision-Husky showed us samples of wood particles produced with their equipment in use in Europe but not in the U.S. One sample was of small chips from a chipper and well screened to produce wood particles of a maximum size of about 1/2", with most particles being smaller. The cost of this product would probably be too high. The other sample was from a horizontal grinder with knives installed in the hammer mill rather than the traditional hammers. The wood particles produced with this machine had distinct edges and were mostly 1/2" and less in size. The machine that produces the smaller "wood chip" (average 1"L x 1/2"W x 1/4"T) is a PH 3045 Horizontal Grinder @ 525 HP (\$350 - \$400m; estimated production capacity about 25 tons/hour). The Southern Company's representatives thought this product would be acceptable & asked us to further investigate the opportunity to produce and utilize the smaller chip.



Figure 7 Precision Husky 3045 horizontal grinder at biomass harvesting site on the Talladega National Forest-Shoal Creek District



Figure 8 Wood chip sample produced by PH 3045

3/8/07

FBED coordinated a Biomass Project briefing meeting at Precision-Husky in Leeds, Alabama for Liam Leightley (MS State), Bill Farthing (GTI), Scott Spear (AIME). Other participants were Jason Thompson of the USFS in Auburn. Bob Smith, Scott Smith and John Falkner of Precision-Husky hosted the meeting at the Precision-Husky facility.

3/20/07

FBED coordinated a Biomass Project briefing meeting at Precision-Husky in Leeds, Alabama for Dan LaMontagne and Gordon Moss of Plum Creek. Cindy Ragland with the USFS, Larry Felix of GTI and Tom Johnson and Doug Boylan of Southern Company also participated. Plum Creek is looking for an opportunity to utilize the estimated 5 million tons/yr. of biomass not now being captured and sold.

4/3/07

Precision-Husky has agreed to build a spec machine that will be configured to produce a small chip that the Southern Company believes can be over-fired with coal to produce steam. Sometime probably in late July, we will test fire 500 to 1,000 green tons of in-woods produced chips at the Gadsden Steam Plant. Working with Precision Husky (PH) in Leeds, the project team has identified a small "wood chip" currently being produced in Europe that the Southern Company believes can be over-fired with coal successfully. The "wood chip" is being produced by one of PH's machines for the pellet industry in Europe from round-wood. The machine that produces the smaller "wood chip" (average 1"L x 1/2"W x 1/4"T) is a PH 3045 Horizontal Grinder @ 525 HP (\$350 - \$400m; estimated production capacity about 25 tons/hour). Unlike your standard horizontal grinder, this machine is fitted with hammers with chipper knives in-place of just blunt hammers. So rather than grinding wood into oblivion with hammers; the hammer/knives can be arranged to produce a small chip. Tree-length round-wood just like we saw today is fed into the horizontal grinder straight-in & perpendicular to the knives. Precision-Husky estimates the new machine will be ready in 7-8 weeks.

4/20/07

The machine to be built by Precision Husky will not be availability until late July for use in the production of woody biomass to be used in the test burn at Plant Gadsden. However, the machine is scheduled to be on the assembly line in early May, 2007. The machine loaned to the biomass grant project will be a Precision-Husky 3045 horizontal grinder, with the hammers in the hammer mill replaced with 9" wide knives.

7/18/07

Gene Quick met with Dannie Tharp of Reynolds Wood Products and Bobby Harrison of Harrison Logging to finalize unit costs and biomass harvest plan, including schedule and equipment, and labor.

7/26/07

Meeting at Precision-Husky with Southern Company, Westervelt, and George K. Moss Company to brief group on biomass grant. Present were John Falkner, Bob Smith, and Scott Smith of Precision-Husky; Steve Wilson and Tom Johnson of Southern Company; Mike Williams of Westervelt; and David Duffner of George K. Moss Company. Topics discussed: (1) evolution of chips to be used at Gadsden, and (2) the impact that a broader coal/wood co-firing program could have on the wood industry.

7/27/07

Harvest planning meeting at U.S. Forest Service Shoal Creek District office. Representatives from all organizations on the Team attended. Conference was followed by a trip to the harvesting site. Dannie Tharp signed U.S.F.S. Timber Sale Contract on behalf of Reynolds Wood Products. Receipt of payment had been confirmed earlier.

7/31/07

Gene Quick gave presentation on Biomass Grant and related topics to the Alabama Society of American Foresters in Birmingham. Approximately 75 people present.

8/04/07

Reynolds Wood Products began moving logging equipment to biomass harvesting site on Shoal Creek District. Specific equipment used will be described by Dana Mitchell in her report.

8/05/07

Harrison Logging cleared ramps and built roads onto harvest area, preparing for start of operation on August 6.

8/06/07

Biomass harvest began. Precision-Husky provided maintenance support person for entire operating period where the PH 3045 was used. Initial loads hauled to Alabama Power at Gadsden, and to Temple-Inland pulp mill at Rome, Georgia.



Figure 9



Figure 10

Figures 9 & 10 Production of small chip for testing at Plant Gadsden



Figure 11 Loaded out chip van en-route to Plant Gadsden

8/09/07

Visitor's day at biomass harvesting site on Shoal Creek District: Approximately 20 people attended, beginning with a briefing at the Shoal Creek office, followed by the field trip.

8/17/07 & 9/06/07 & 9/21/07

Meetings with Reynolds Wood Products to compile costs and prepare invoices: Attending were Dannie Tharp and Mike Reynolds of Reynolds Wood Products, and Bobby Harrison of Harrison Logging. Purpose was to verify every component of the total costs, match each load ticket from the accepting mill with truck drivers' load ticket, and verify payment from the accepting mill with that shown by Reynolds. Assist in preparation of invoices from Reynolds for services provided.

8/23/07

Completed Biomass Harvest

Final compilation of biomass harvested and delivered:

Alabama Power Company, Gadsden, AL –	1142.32
Temple-Inland, Rome, GA –	1148.84
Smurfit-Stone, Stevenson, AL –	51.02
International Paper Company, Selma, AL –	219.88
Weyerhaeuser, Pine Hill, AL –	<u>78.33</u>
Total woody biomass removed	2640.39 tons.

Wood was delivered to pulp mills other than Temple-Inland because of unloading problems at Temple-Inland. Reynolds Wood Product's relationships with the other mills was a critical factor in keeping the operation going when Temple-Inland could not unload trucks.

October 16, 2007

Team meeting at Forest Service office in Auburn. Reviewed project activities to date, and discussed future work to be done on the Oakmulgee District to support co-firing at other power plants.

November 5, 2007

Cawaco RC&D meeting in Birmingham, where Precision Husky was presented an award for their support of the biomass harvesting project. Attending from Precision Husky were Bob Smith and John Falkner.

November 8, 2007

Visit Gadsden plant to see wood/coal co-firing tests. Attending were J. W. Cole of Westervelt; Jason Harper, staff assistant to Congressman Aderholt; Gordon Moss of Plum Creek; John Falkner of Precision Husky; and Billy Zemo and Loretta Aultman of Southern Company.



Figure 12 Sample of test wood chips & coal prior to pulverization

November 13, 2007

Presentation on Biomass Grant to Black Warrior Chapter of the Society of American Foresters in Tuscaloosa. Approximately 25 people attended.

- **Task:** Determine sustainable sources of woody biomass within both a 50 & 75 mile radii of selected Alabama Power facilities; and the capacity to develop markets for up to 800,000 tons of woody biomass from private and public lands. When: February, 2007 – May, 2008

The Auburn Forest Products Development Center has focused its efforts in three areas during this 11-month period from June, 2006 – December 2007:

- 1) Relative to this task, the Forest Products Development Center (FPDC) has focused its efforts in identifying databases, methodologies, and previous work products.
- 2) The FPDC has identified the information sources and methodology that will be used to estimate the availability of woody biomass, by source and type, within each of the designated drain areas. The USDA Forest Service's FIA program will serve as the primary data source, but will be supplemented with other public information and private file data.
- 3) Additionally, a format has been established for mapping wood residue sources that could be utilized for fuel.
- 4) Preliminary analysis has been conducted for woody biomass inventories within a 50-mile radius of each of Alabama Power Company's six coal-fired generating plants. This preliminary analysis included both forestry and mill residues, and will be further expanded in the next phase of the study in cooperation with FBED personnel. It has been agreed that the analysis will be conducted for both a 50-mile and a 75-mile radius, which will provide valuable information regarding the distribution of the resource opportunity around each plant location. This additional information will be important later in the project in determining the transportation economics of procuring various volume levels of woody biomass for each operation.

Forest-Based Economic Development Services, Inc. (FBED) has focused its efforts in three areas during this 18 month period (July, 2006 – December, 2007):

- 1) Identification of Alabama Power's pulverized coal power plants & their specific locations
- 2) Determination of the resources (agricultural, forest & mill residuals) to be evaluated & the determination of the extent of the inventory of each resource (volumes, types of residuals, distance to steam plants, etc.)
- 3) Sourcing of data

- 1) Identification of Alabama Power's pulverized coal power plants & their specific locations

The following pulverized coal power plants have been identified by the Southern Company as having potential for being able to co-fire woody biomass with coal:

Barry Steam Plant in Bucks - Mobile County

Gadsden Steam Plant in Gadsden - Etowah County

Gaston Steam Plant in Wilsonville - Shelby County

Gorgas Steam Plant in Parris - Walker County

Green County Steam Plant in Demopolis - Green County (assessment of the available agriculture & woody biomass resources underway)

Miller Steam Plant in Graysville - Jefferson County

- 2) Determination of the resources (agricultural, forest & mill residuals) to be evaluated & the determination of the extent of the inventory of each resource (volumes, types of residuals, distance to steam plants, etc.)

One of our tasks was to determine the sustainable sources & volumes of woody biomass within both a 50 & 75 mile radii of selected Alabama Power facilities. Those facilities identified are the following: Barry Steam Plant in Mobile County, Gadsden Steam Plant in Etowah County, Gorgas Steam Plant in Walker County, Green County Steam Plant in Green County and Miller Steam Plant in Jefferson County. As we have progressed, it has become apparent to the Project Team that the next steam plant that the Alabama Power Company will most likely try to co-fire wood & coal is the Green County Steam Plant near Demopolis, Alabama. We feel like our time and the focus of the grant project should help to facilitate the potential opportunities associated with burning wood fuel at this steam plant. Therefore, we would like to request the current task be changed to the following: (1) determine the consumers, sources and volumes of woody biomass within a 75 mile radius of the Green County Steam Plant and also (2) facilitate the opportunity to test burn wood & coal with a portion (to be determined) of the remaining grant funds in collaboration with the Alabama Power Company at the Green County Steam Plant.

Regarding the studies around other identified steam plants, we think the value of the information gathered as initially proposed would diminish over time as the information would become dated before it could be utilized by the Alabama Power Company. We do not anticipate the use of wood fuel at any of the other steam plants within the next 3 to 5 years. Also, the Green County Steam Plant in Demopolis, if wood were consumed for energy there, would provide a market for wood fuel harvested from the Oakmulgee District of the Talladega National Forest.

It was determined that available biomass resources to include agricultural be assessed and evaluated for each identified Steam Plant using both a 50 and 75 straight line mile radius. This would allow for a more comprehensive evaluation of available biomass resources found within an economically viable hauling distance.

4) Sourcing of data

The following sources will be used to gather necessary data needed to assess woody biomass availability around the **Green County Steam Plant in Demopolis, Alabama:**

USFS Timber Products Output State Reports
USFS Forest Inventory Analysis Data
U.S. Department of Agriculture
State of Alabama Dept. of Economic & Community Affairs - Energy Division
State of Alabama Agricultural Statistics Service
Forest Products Development Center @ Auburn University
Forest-Based Economic Development Services Internal Data

Objective 3: Increase the efficiencies in biomass removal, processing, and value of removed woody biomass. Early estimates anticipate a \$210 savings per acre for habitat management over the alternative of paid TSI with the development of processing technology to deliver ¼ “ chips to power generators.

Responsible Partners: **USFS – Southern Research Station @ Auburn, Alabama**
Auburn Forest Products Development Center @ Auburn University

- **Task:** Field test equipment, techniques, and technologies that will increase efficiencies in harvesting biomass and reducing it to a suitable size for utilization in co-firing energy production plants. When: October, 2006 – October, 2007

The Auburn Forest Products Development Center has focused its efforts in following areas during the 11-month period from June, 2006 – December, 2007:

- 1) The FPDC has focused its efforts to date in this task in investigating potential processing machinery options for producing the desired fuel form by means of a single pass operation. There are a variety of in-woods chipping and grinding systems available in today’s market for processing both roundwood and forest residues into biomass fuel. In-woods chipping systems and horizontal grinders can effectively process tree stems and longer pieces of roundwood, while tub grinders are more effective in processing wood waste material of odd shapes and sizes. Our investigation to date, however, suggests that none of these systems, in their current configuration, will be capable of producing fuel wood within the size limitations demanded by the Alabama Power Company generating plant.
- 2) The machinery evaluated includes product offerings from Peterson Pacific, Morbark, CBI, Trelan, Bandit, and others. Cooperating in this evaluation was Robert Rummer, of the USDA Forest Service’s G.W. Andrews Forestry Sciences Laboratory. Preliminary work done suggested that under the current state of the industry, it would be necessary to utilize a two-pass processing system to achieve the particle size limitations for woody fuel to the generating plant. Obviously, there would be significant advantages associated with a single-pass system, most notably economics. Therefore, we have continued to evaluate new possibilities for single-pass systems as they have been identified.
- 3) Due to earlier findings, considerable efforts during the period were focused on evaluating secondary processing machinery. Plans were developed for the harvested material to be converted to whole tree chips in the forest. These chips would then be delivered to a secondary processing machine for further particle size reduction. It was believed that the secondary processing step could be accomplished with a modified tub grinder having specially-designed screens. However, subsequent testing of this process was not successful in consistently producing fuel with the required size limitations.
- 4) Machinery evaluated included products from Precision Husky, Ribtec, Rader, Jeffrey, and others. Precision Husky emerged as an Alabama company with considerable interest in this project and a willingness to expend time, effort, and money to assist the project team in developing a workable technical solution to the fuel processing challenge. Precision Husky manufactured specially-designed screens for a conventional tub grinder, installed them in a used machine, and conducted a test to determine the feasibility of secondarily processing whole tree chips from the forest. This test was

conducted on February 13, 2007 at the Precision Husky plant in Leeds, Alabama, and proved to be unsuccessful in producing fuel of the desired particle size and surface qualities. This test was an extremely important milestone in our investigation, and caused us to reevaluate our thinking regarding two-step processing with conventional equipment.

- 5) Consultations with Precision Husky engineers and examination of other products manufactured by the company revealed a specialized one-step processing machine, which had been produced for the European fuel pellet industry. Examination of the output of this machine by Alabama Power Company plant engineers has suggested that this material may have a good chance of being successfully fed through the pulverized coal infeed system at the Gadsden Steam Plant, and presumably other Alabama Power Company operations. Since a machine of the type in question was not currently available in the United States, Precision Husky agreed to manufacture a new machine in their Leeds facility. The new machine will be used for our project testing purposes, then will be subsequently marketed by Precision Husky. It should be noted that Precision Husky normally only manufactures machines which have been pre-sold. Producing a spec machine for use by our project team is a significant contribution to the overall effort, and should be duly recognized as such. The machine is expected to be completed and ready for shop testing in late June.
- 6) Current plans call for harvesting to be accomplished in July, 2007. The newly-developed machine will be utilized to process between 500 and 1000 tons of low-valued, tree-length timber from the Talladega National Forest. The material generated from this one-pass processing system will be transported to the Gadsden Steam Plant, with a co-firing test to be conducted immediately following. Arrangements have been made for the purchase, logging, processing, and transportation of the woody biomass for this purpose.
- 7) Pursuant to the accomplishment of the above and to planning of subsequent activities, the FPDC attended meetings on the following dates: 6/26/06, 8/8/06, 8/18/06, 10/25/06, 12/19/06, 1/12/07, and 2/13/07
- 8) Precision Husky completed the fabrication and testing of their specialized chipping machine, the ProGrind 3045, in late July, 2007. The approximate eight-week fabrication period was used primarily for planning the activities of the fuel harvesting activities on the Shoal Creek demonstration plot and for preparing plans for receiving and handling test fuels at Alabama Power Co.'s Gadsden Steam Plant. Sale contracts and required documentation for purchase of the fuel wood and other timber products were also prepared and executed during this period, as well as the service contracts for harvesting and delivery. Also, arrangements had to be made to process and deliver surplus fuel material from the demonstration plot, since the volumes to be generated exceeded the needs for test burns at Gadsden. Arrangements were made to process this material through a Bandit Beast 4680 horizontal grinder, and deliver the material to Temple Inland's pulp mill in Rome, Georgia for burning in their wood-fired boiler.
- 9) The fuel wood harvesting activities occurred during a two-week period in August when over 1,000 tons of material was harvested and processed by the ProGrind 3045 for testing at the Gadsden Steam Plant. In addition, another 1,000+ tons of fuel wood was harvested and processed by the Bandit Beast 4680 for sale to Temple Inland and other nearby markets. Detailed data was collected throughout the harvesting and processing operations so that production and costing information can be accurately developed for subsequent economic evaluation of these activities. No significant difficulties were encountered and the material processed appeared to meet expectations with regard to particle size distributions and overall quality. Production rates through the ProGrind 3045 were in line with expectations. Several different sizes of wood fuels were produced for testing at the Gadsden Steam Plant. In addition, chips were produced from whole trees and separately from the main bole of the tree only. These variations in the chip sizes and composition will allow the investigators at the Gadsden Steam Plant to study the effects of these different attributes within their fuel system.
- 10) An extensive series of tests were planned at the Gadsden Steam Plant, however, technical difficulties at the plant, which were unrelated to our study effort, significantly delayed the test schedule. In addition, the stored fuel increased substantially in moisture content, which will affect test results, and must be mathematically compensated for in the analysis of results. While some testing has been completed, there is additional testing yet to be done. At this time, we have been able to determine that wood fuel chips

processed via the ProGrind 3045 will pass through the fuel system at the Gadsden Steam Plant and will co-fire successfully with coal at percentages of 10% or less of energy content. This technical determination represents a major milestone for the project, meaning that the process is technically feasible. Much additional testing and results analysis is required to determine optimal procedures and economics for the procedure in a commercial environment. Expectations are that many of these answers will be forthcoming in the months ahead.

Objective 4: Evaluate the response of fuels and under-story vegetation to biomass removal relative to Condition Class.

Responsible Partner: **USFS Oakmulgee Ranger District of the Talladega National Forest**

- **Task:** Identify treatment areas, review management history, collect baseline vegetation data, establish and implement a monitoring program. **When: August, 2006 – November, 2007**

The USFS Oakmulgee Ranger District of the Talladega National Forest has focused its efforts in the following area during this initial 11 month period:

- 1) On December 16, 2006 the Oakmulgee District, the Nature Conservancy, and the University of Alabama Natural History Museums hosted a field day targeting university professors and researchers. Professors and students were invited to participate in the establishment of the baseline and evaluation process for this project.
 - Currently under development is a partnership arrangement with US Forest Service, Forest Health and Protection, Auburn University (Dr. Lori Eckhardt), and others to establish the following study, *“Forest Health Evaluation of Stand Health in Association with Biomass Removal and Standard Silvicultural Practices between Two Land Managers”*. This study will evaluate the treatments implemented in Task #1 in comparison with traditional treatments. Parameters to be examined include the response to root-feeding insects, tree vigor (includes soil nutrient status), and vegetation and duff densities. Scheduled to begin in the fall of 2007, project will run for 3 years. The graduation student will be supported by funding from this grant.
 - On a separate project funded through the Joint Fire Science Program, researchers from University of Alabama and Birmingham Southern are establishing baseline data collection sites to assess the responses of “time since burn” for reptiles and amphibians, and plant composition and structure. This information, while not a true comparison, could be used to begin defining the biological parameters of condition class.
- 2) Study plots have been established for the *“Forest Health Evaluation of Stand Health in Association with Biomass Removal and Standard Silvicultural Practices between Two Land Managers”* study to be conducted by Auburn University and Forest Health and Protection (U.S. Forest Service). Insect trapping to begin in Spring 2008.

Objective 5: Improve local economies of rural towns and communities by creating new, more stable markets, new enterprises and processing techniques for public and private land managers.

Responsible Partner: **The University of Alabama Center for Economic Development**

- **Task:** Expand awareness of biomass resource and potential for management in local communities. Conduct public meetings and outreach. Determine direct and indirect effects to local economies. Determine potential for long-term economic growth. **When: September, 2006 – December, 2007**

The University Center for Economic Development (UCED) has focused its efforts in three areas during this 11 month period (July, 2006 – December, 2007):

- 1) Coordinating with project partners
- 2) Leading a community planning effort for Bibb County
- 3) Strengthening relationships and communication with elected officials and civic leaders
- 4) Identifying opportunities and preparing feasibility studies for prospective investments

1) Coordinating with project partners

UCED has participated in various project planning meetings for the purpose of organizing project elements, coordination of resources and information sharing. These meetings resulted in direction and details for programming which included orientation field trips, community education meetings, strategic planning meetings, Heritage workshop, community listening sessions and mechanisms for communicating and presenting information to leaders and landowners in the project area. UCED staff has participated in conference calls and various meetings of the Biomass partners during the timeframe of this report.

2) Leading a Community Planning Effort for Bibb County

Through research of best practices, UCED determined that the engagement of the civic and elected leaders and landowners provides the basis of community organization which facilitates long-term planning and the implementation of objectives leading to sustainable economic development. This process has been underway since the fall of 2006, with organizational meetings being held separately with elected officials, the leadership of the various county organizations (10 special interest or non-profit, five local government, 2 educational, the local hospital, the Chamber and the Industrial Development Authority). The purpose of these meetings was to lay the groundwork and develop the collaboration from the various in-County organizations. Through a series of forums, and educational and planning sessions, a core of support and cohesiveness has been built. Committees have been established for Infrastructure, Economic Development, Education and Partnerships. These committees have been active in forming and implementing their work plans. An additional benefit has been the renewed interest and commitment for improving the County and insuring the sustainability of the natural resources. The final version of the Outdoor Recreation and Tourism Plan will emphasize these points and will be widely distributed.

A proposal to the Corporation for National and Community Service (AmeriCorps VISTA) was submitted and approved for five Vista staffers to work in Bibb, Dallas, Hale and Perry Counties. The project partners included several organizations in west-central Alabama in areas of high poverty with few financial assets. However, these areas are rich in historical and natural resources that can organize governments, nonprofits, and citizen organizations to develop a strategy for Nature and Heritage Tourism, thus creating economic opportunities for jobs and business through nature and heritage based outdoor recreation. These four counties: Bibb, Dallas, Hale and Perry Counties are among the most rural and under-developed counties within Alabama, lacking long-term investments in infrastructure, public facilities and exhibiting low rates of business development and investment. With severely limited resources these communities face challenges in developing collaborative networks to identify and secure resources that can conserve the natural and cultural assets while allowing economic growth.

The five Vista will be assigned to work in support of the locations, each with a specific geography to cover, and with specific local objectives. In addition, there will be shared regional objectives which all of the five Vista will contribute time and effort to jointly accomplish. Project objectives and activities will be discussed and planned by the project team, which includes the project manager, the project partners (who provide oversight at each of the five locations) and the Vista volunteers. Monthly project meetings will bring together the project team to plan, report on progress towards project goal benchmarks, and discuss needs and issues. The Vista staff should be hired and begin their 12-month work period by February of 2008.

3) Strengthening Relationships with Elected Officials, Civic Leaders and Landowners

- a) Updated listing of organizations, elected officials and civic leaders has been developed. This includes membership organizations such as Treasured Forest. The initial list included 20 organizations, which has grown to 45. The database created for this project has grown since the project began. Originally the database included 20+ organizations, elected officials and civic leaders, and interested businesses. The database has increased to forty-five organizations that include Treasured Forest, Friends of the Refuge, Cahaba River Authority, Citizens for Wildflowers and the County Farmers Federation, Alabama Department of Conservation & Natural Resources, Better Hometown Group, Brierfield State Park, Cahaba Trace Commission, West Blocton Improvement Committee and many others.
- b) Efforts to organize a county-wide mechanism for communication and planning are underway in Bibb County, as a result of UCED's support for organizing the process and providing a forum for discussion and planning.
- c) An education and information newsletter was distributed in January 2007. A second newsletter will be printed and distributed in the first quarter of 2008.
- d) A Forest Field Tour of the Talladega National Forest – Oakmulgee District was held December 16, 2006 which showcased the mosaic of forest conditions and associated management challenges.
- e) A landowners meeting was held January 13, 2007 at the USDA Forest Service Work Center in Brent, AL to learn about the woody biomass developments in Alabama.
- f) UCED organized several forums and community meetings, moving these meetings around Bibb County and involving a variety of elected and civic leaders. Twenty-five groups were identified and invited to participate and provide leadership on different efforts. Litter and dumping were identified as the number one issues leading to degradation of the natural resource and landscape. Clean up efforts were organized by the towns of Brent and Woodstock, as well as county-wide to coincide with the Cahaba National Wildlife Refuge Clean up for Earth Day. A similar effort is under discussion to coincide with National Public Lands Day.
- g) The county-wide forums and planning efforts has engendered partnering between organizations, a surge of interest by local business owners to explore entrepreneurial opportunities regarding outdoor recreation and tourism, and a renewed commitment by the Industrial Development Board to expand its activities to consider land use and its role in supporting and promoting outdoor recreation and tourism.
- h) A Strategic Planning meeting was held June 7, 2007 where action steps were identified as well as who should implement the action and the timeframe they should occur. Committees were formed for Economic Development, Infrastructure, Education and Partnerships. A strategy list was created from the meeting, and the committees have started working through the process. During the meeting the following mission was adopted: **Bibb County is committed to preserving our heritage while promoting the social and economic growth of the area by bringing tourism to the forefront of economic development.**



Figure 13 Oakmulgee Ranger District tour stop of red cockaded wood pecker insert tree

- i) A database of landowners contiguous to the US Forest has been updated and compiled into a working database. The database now has in excess of 8,000 names and addresses that can be converted to mailing labels as well as by township. This project involved research of ownership at each County Courthouse as well as surveying elected and civic leaders. The database development project was concluded in October.
- j) A county-wide outdoor recreation and tourism listening session was held June 19, 2007 at the Alabama National Guard Armory in Brent, AL. The purpose was to identify and prioritize recreation and nature-based tourism needs that can be supported by the Talladega National Forest – Oakmulgee District. Forest Service staff discussed assets such as the Wildlife Management Area, Shooting Ranges, and Payne Lake Recreation Area as well as many under-utilized recreation possibilities including existing events and tours in addition to potential events.
- k) Heritage Day at Payne Lake was held Saturday, October 13. This event was attended by folklorists, genealogists and local citizens interested in how the land the people came together to shape the place they call “home”. The ongoing effort to have the Alabama Black Belt and surrounding lands designated as a National Heritage Area challenges the citizens to identify and research the local heritage, especially as it relates to the forest and nearby communities. The event was facilitated and stories were documented. The findings from the Heritage Day will be summarized and distributed by December. It is anticipated that the stories will be submitted for inclusion in the Black Belt Heritage Area designation which would give international attention to the region which is important for the history and impact on race relations, culture, recreation, and natural resources.
- l) The annual visit to Bibb County, Alabama by U.S. Senator Jeff Sessions was hosted by the Oakmulgee District on November 29, 2007. Senator Sessions was briefed on the progress of the grant.



Figure 14 Alabama Senator Jeff Sessions visit to the Oakmulgee Ranger District & Briefing of the Biomass Grant

Targets for the next six months will include the educational field visits, the educational sessions on biomass utilization for power generation and other uses, and facilitated planning sessions with landowners and citizens who utilize US Forest for recreation and tourism.

4) Identifying Opportunities for A Sustainable Local Economy

UCED is researching approaches and best practices in comparable settings. Preliminary information suggests that the engagement of the civic and elected leaders and landowners provides the basis of community organization which facilitates long-term planning and the implementation of objectives leading to sustainable economic development. Steps have been taken to initiate this process. UCED’s research has identified the following prospects for the area surrounding the National Forest: value-added forest products (building materials, niche products), biomass as an alternative to natural gas for industrial use, nature-based outdoor recreation and tourism, and businesses to support tourism.

- a) This project is exploring the use of biomass as an alternative to natural gas in relation to a potential investment.
- b) UCED has completed a feasibility project for a prospective manufacturing plant for in the building material sector.

- c) There is entrepreneurial interest by existing business owners to expand their activity into areas to support tourism and increased visitation to the County.
- d) Elected officials are identifying sources of funding to improve amenities within the County to support outdoor recreation and tourism. The US Forest Service and the US Fish & Cahaba National Wildlife Refuge are identifying appropriate recreation activities that can be supported at these locations.