

## *Summaries of Initiatives at 1890 Universities that Receive McIntire-Stennis Funds*

### **1. Tuskegee University**

Project I:

Title: Forest Management Practices on Ecological Processes and Carbon Sequestration in Different Forest Stands

Microbial communities are critical components of soil and may be the earliest predictors of soil quality changes. Soil enzymes play a critical role in soil microbial ecology and can act as potential indicators of soil change. Measurement of soil enzymes can provide rapid assessment of effect of silvicultural practices on soil and provide information which could be integrated into monitoring and providing healthy forest stands with minimal impact on soil and environment. The goal of the research is to provide a better understanding of the relationship of the physico-chemical parameters of the soil with both soil enzyme activities and microbial communities under different forest management systems and land use to soil health and carbon sequestration. Results showed that forest soils tended to have lower microbial diversity compared to cultivated landscape at both the species and genus levels. Forest practices significantly changes microbial diversity. Bacterial richness was considerably low when compared to richness values in pastured and cultivated soils. Fertilized plots had much lower organic carbon compared to the unfertilized plots. Generally N fertilization increased organic carbon content in the soils. Within unfertilized plots herbicidal use affected soil organic carbon content. Herbicidal use was also found to influence phosphatase soil enzyme activities, especially alkaline phosphatase. A significant interaction was observed between N-fertilization and herbicidal use. The findings provide rapid assessment of the effects of silvicultural practices on soil and provide information which could be integrated into monitoring and providing healthy stands with minimal impact on soil and environment.

Project 2:

Using Goats to Control Undesirable Vegetation in Longleaf Pine Plantations/Stands

Prescribed burning is practiced routinely in longleaf pine stands to remove hardwood and shrub undergrowth. However, the use of fire is becoming increasingly restricted due to environmental and liability concerns. Usage of goats as a means to manage undesirable understory vegetation provides a promising alternative. The objectives were to determine the effects of different stocking rates of goats on understory plant biomass height and quantity, soil characteristics, crown cover density, animal productivity and damage to trees and tree growths. The results showed that the initial and the final soil bulk density, and soil compaction did not differ with stocking rates. Similarly, the plant biomass heights and biomass quantity were similar at the beginning and end of the grazing irrespective of the stocking rate. The average daily gains of the goats were not different but daily gain was close to zero with all the stocking rates at the end of the study probably due to the reduction in available forages.

### **2. West Virginia State University**

WVSU is working on improving the value of woody-biomass biochar as soil additive. Pyrolysis of woody biomass is an emerging technology for conversion of cellulosic biomass into bio-oil and fossil fuel replacement products (e.g. drop-in fuels, diesel, heating oil, etc.). Biochar, a charcoal like carbon-rich material is produced as a byproduct during the process. Use of biochar as soil amendment adds a rather recalcitrant carbon to the soil carbon pool, contributing to carbon sequestration and carbon emission mitigation effort. WVSU research group teamed up with bioenergy commercial partner (Piedmont Bioproducts, Gretna VA) and WV USDA natural resources conservation service (Alderson, WV) in evaluating the use of biochar produced from loblolly pine (*Pinus Taeda L.*) as soil amendment.

Developing an added-value product and promoting beneficial and environmentally sound use of the co-product will promote resiliency and strengthen regional bio-energy industry and contribute to sustainable use of natural resources. Agglomeration protocols and binder formulations are developed for efficient and safe handling of the originally dusty co-product. Augmentation of biochar with nutrient-rich byproducts are being developed and tested in lab and greenhouse trials to improve biochar impact on soil fertility.

### **3. Tennessee State University**

The McIntire-Stennis research program at Tennessee State University is focused on exploring the effects of land use change and carbon trading on small forest landowner's income, and evaluating forest harvesting logistics factors for the development of efficient supply chain logistics in Tennessee.

### **4. The University of Maryland Eastern Shore**

A UMES proposal entitled, 'Development of a model to predict short-term impacts of climate change on Delmarva's coastal, wetland and upland forests' has been approved and research has commenced. The project is focused on assessing the relationship between surface water quality and patterns, and forest composition over time due to climate change. We are in the process of filling a faculty position in urban forestry which will be part of our McIntire Stennis Forestry program. A new urban Forestry degree program at UMES has begun accepting students.

### **5. Delaware State University**

Delaware State University:

- a. Is conducting a sample street tree inventory for the city of Dover and for the towns of Camden and Wyoming.
- b. Assessed the environmental and ecological services provided by urban forests to the communities.
- c. Conducted a complete campus tree inventory of Delaware State University campus (incl GPS coordinates)
- d. Developed an online campus tree tour. Please take the online tour at : [itreeatdsu.x10.mx](http://itreeatdsu.x10.mx)  
(At [itreeatdsu.x10.mx](http://itreeatdsu.x10.mx), users can virtually tour different tree species on campus. The 28 trees featured on the website represent the most abundant tree species on campus in descending order. The website features a two-panel layout in which a user can see the individual tree, and how it appears on campus, and also where the tree is located on satellite map of the campus (provided by Bing maps). In addition to the aesthetics that the trees provide, the website also displays different financial benefits/costs based on ecological processes performed by each species (energy, storm-water interception, air quality, etc...). All values presented were determined using i-Tree streets)

### **6. Lincoln University**

The university's most current project is entitled "Improving Quantitative Understanding of Urban Forest Carbon Sequestration and Climate Mitigation" The purpose of this project is to identify urban forest types that maximize carbon sequestration and to identify the forest stand and canopy characteristics necessary to optimize urban climate and thus reduce energy consumption. The study takes place in sites along an urbanization gradient in Columbia, MO.

### **7. Kentucky State University**

Kentucky has 12.5 million acres of forested land and 467,000 private woodland owners; therefore, forest management approaches are important to the people of the Commonwealth. Kentucky also has long-term

goals for generating electricity, in part, by co-firing with biomass or gasifying biomass. Agroforestry and bioenergy production practices for Kentucky's small woodland owners could provide economic benefit and management practices that promote healthy forest ecosystems. At Kentucky State University our McIntire-Stennis research program focuses on:

- a. Using geospatial characterization and mapping of Kentucky forest lands to examine the relationships among forest health, incidence of native plant species, biomass production, and invasive plants infestation.
- b. Identifying unique genetic material in pawpaw, American persimmon, and spicebush populations in Kentucky that could become new crops for small land owners.
- c. Assessing various native wood species for renewable energy and biomass production for gasification systems and generation of electricity.
- d. Examining the potential of native and invasive forest species in Kentucky for unique wood chemistry potential and biomass production.

## **8. Alcorn State University**

Alcorn is concentrating its McIntire-Stennis funding on “Silvopasture Demonstration Plot Creation.” There are two demonstration plots for the Silvopasture System: In both plots the following parameters were recorded: Stem diameter, total tree height, merchantable height and basal area. In the 10’ x 10’ plot, the following trees identified: hickory, box elder, American elm, hackberry, black locust, white oak, sweet gum, basswood, gogwood, dogwood, American chestnut, and red mulberry. In the 20’ x 20’ plot, the following tree identified: black locust, dogwood, box elder, white oak, sweet gum, English elm, hackberry, red mulberry, pecan, American elm, hickory

## **9. Alabama A&M University**

Project 1: “Outdoor Recreation Use Patterns on Public Lands in Northern Alabama – Case Study of Bankhead National Forest and Sipsey Wilderness” updates are:

Data has been collected on users’ characteristics and use patterns and some analysis has been undertaken. Data is currently being collected on barriers and constraints militating against minority use of and participation in outdoor recreation opportunities at the Bankhead. Approximately four Alabama A&M University undergraduate students have, at different times during the life of the project, been mentored and participated in the project. The students’ participation in data collection, data entry, data analysis provided them with an introduction for outdoor recreation research.

Project 2: Aquatic and Terrestrial Wildlife Community Response to Forest Management Practices in the Bankhead National Forest. Highlights:

- Discovery of White-nose syndrome on bats in Alabama (first detection in the state)
- 9 presentations of McIntire-Stennis supported research by students and faculty at national and state scientific conferences
- Recruitment of a black female to graduate school on the McIntire Stennis project
- Another graduate student (Native American female) has been supported on the project and will receive her doctorate this academic year.
- 10 undergraduate students have been supported to help conduct research on the project over the 5-year period

- We presented research results to numerous citizen's groups (eg., Bankhead Nat. For. Citizens' Liaison Panel, Flint River Conservation Association, Alabama A&M Green team) and at other public forums (water festivals, Earth day events, etc.) to discuss the impact of forest management activities on wildlife and water quality.
- Our data has been used by the USDA Forest Service to help monitor wildlife and water quality responses to thinning and burning practices in their restoration plan.
- An undergraduate student and faculty member travelled to China to analyze food habits of bats. This study was first conducted in Alabama as part of the McIntire Stennis project and replicated in China.
- Faculty, staff, and students presented inventory data at Alabama state wildlife meeting to make recommendations on conservation protection status for mammals and aquatic species.

Project 3: Effect of Regeneration of Upland Oak Hardwood Forest on Wildlife Communities: Restoring Oak Forests and Promoting Wildlife Biodiversity Highlights:

- The research is a cooperative effort of USDA Forest Service, private land owner (Stevenson Land Company), and Alabama A&M University that addresses urgent needs for forest resources management and conservation of biodiversity.
- 5 publications in peer-reviewed professional journals, 2 in USDA Forest Service Technical Reports, and 26 posters and presentations at regional, national and international conferences. Several peer reviewed publications are expected in the near future.
- 2 MS students graduated, 1 PhD student will graduate in fall 2013, and 1 MS student will graduate in Spring 2014.
- Secured leverage funds from EPSCoR and NASA (3 graduate fellowships) and USDA Forest Service.
- Trained 12 undergraduate students through internship program.
- Used study site for teaching and training purposes.

Project 4. The interrelationship between social, economic and ecological processes in forest function, cover, and dynamics Highlights:

- 1 graduate student supported (MS)
- Presentations: 2 at Ecological society of American 2012
- 1 peer-reviewed publication

## **10. Virginia State University**

Progress from the McIntire Stennis funded projects in Extension include the following:

- Surveyed forest landowners in Southside VA to determine interest in extension programs and methods to reach underserved populations.
- Established shortleaf pine provenance test.
- Evaluating economics of alley cropping and silvopasture systems to determine profitability for small-scale farmers.

## **11. Florida A&M University**

Project Title: Protection of Florida Forests Against Invasive Species Using Biological Control.

Goal 1: *In situ* evaluation of native grass species for the revegetation of cogongrass infested forest ecosystems following the application of imazapyr herbicide; and the economics of cogongrass biomass production.

Goal 2: Integrated pest management of the redbay ambrosia beetle, an exotic and newly introduced forest pest species in Florida.

Goal 1 Objectives:

- a. Evaluate the performance of four native grass species for the revegetation of imazapyr treated in situ cogongrass infested forest land
- b. Determine the most effective time for introducing planting materials into an imazapyr sprayed southern pine forest soil environment
- c. Identify and select native grass species plant genotypes with high levels of tolerance to imazapyr in situ plots.
- d. Provide the extent to which vegetational species will continue to prevent the reinvasion of forestlands by cogongrass
- e. To determine an optimum harvesting regime and intensity that would maximize the profitability and sustainability of harvesting cogongrass biomass as a feedstock for bioenergy.
- f. Will it be more beneficial to harvest cogongrass for bioenergy feedstock than controlling it for timber production.?

Goal 2 Objectives:

- i. Determining the presence of redbay ambrosia beetle in the Apalachicola, Ocala and Osceola National Forests as well as other State Forests in Florida.
- ii. What can we learn about the population dynamics of the ambrosia beetles?
- iii. What attractants are most effective for monitoring ambrosia beetles?

## **12. Southern University and A&M College**

Project Title: Urban Forest Management for Sustaining Healthy and Productive Historic Scott's Bluff Ecosystem in Scotland, Louisiana

The objectives of this project include 1. Comprehensive assessment of Scott's Bluff Urban Forest (SBUF) Ecosystem Structure and Function: a) Quantifying the structure and function of the SBUF ecosystem using several urban ecosystem models. 2. Environmental Quality Assessment by identifying and mapping the environmental pollution in the SBUF ecosystem. 3. Hazard Tree Assessment and inventory on the SBUF ecosystem including hazard tree identification, evaluation and documentation: a) Determine the frequency and severity of the trunk defects in high risk zones in the SBUF ecosystem; b) Incorporate the research into education and outreach activities and to develop scientific and educational materials to increase public awareness pertaining to hazard tree assessment and management. 4. Site Assessment: a) Evaluate streambank stabilization techniques (build-up structure versus biological); b) Assess the magnitude of the erosion rate from the Mississippi river bank along the Scott's Bluff bordering the Southern University Campus in Scotlandville, Louisiana using new water erosion prediction technology; c) Identifying and evaluating different vegetative covers (grasses, shrubs and trees) which could be used both as sustainable streambank and cost effective erosion stabilizers; d) Evaluate the riverbank for seepage erosion and determine seepage flow and erosion rates. 5. Urban Forest Health Assessment. 6. Climate Change Impact Assessment: a) Assess the Potential Consequences of Climate Change on the SBUF ecosystem ; b) Develop a specific Plant Species Selection (PSS) data-base for coping with climate

change impacting the SUBF Ecosystem. 7. Community Urban Forestry Needs and Perception Assessment. 8. GIS and Mapping a) Utilize remote sensing technology to provide digital imagery databases and aerial photography covering the above areas. Funding for this initiative is McIntire-Stennis Funding (\$150,000) and University Matching (\$150,000). Faculty involvement: 6 urban forestry faculty members, student involvement: 6 Ph.D. students, 6 MS students, and 10 undergraduate; Publications: 17 (7 refereed, 10 peer reviewed proceedings); Presentations: 25 (10 national, 5 regional, 2 international, 7 state and local).