WILDLAND FUELS AND FIRE MANAGEMENT IN TEXAS: AN ECOLOGICAL AND HUMAN-DIMENSION COMPARATIVE APPROACH

A McIntire-Stennis supported project

STEPHEN F. AUSTIN
STATE UNIVERSITY
Arthur Temple College of
Forestry and Agriculture

The current species composition and community structure of East Texas forests has drastically changed due to altered fire regimes, the introduction of exotic species, and anthopogenic management activities. Because of this, the region exhibits different potential wildland fire conditions than found historically. Additionally, land fragmentation caused by urban development provides opportunities for the movement and expansion of invasive plant species not included in previously classified fuel models. A greater understanding of these modern wildland fuel conditions in both growing and dormant seasons, and how those conditions may influence fire behavior and forest management is of utmost priority.

Using traditional field sampling methods for fuel assessment, along with chemical analysis of targeted species, vegetative communities of concern are being measured to determine fuel hazard conditions. This data will then be used in standard fire behavior models to evaluate if the changes in conditions found now cause differences in expected fire behavior.

About McIntire-Stennis

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USDA

COLLABORATION

The sites used for this project are owned or managed by various state and federal agencies, as well as a few private owners who generously provided access.

3
Graduate students are supported through this project.

IMPACT

This research directly augments scientfic understanding of the effects of Texas' altered landscape on wildland fires, allowing land managers to better understand current fuel conditions and adapt land management practices accordingly.

14,500
Communities within Texas' wildland urban interface

>$49.2 million
Spent fighting Texas' wildland fires during the 2011 fiscal year.

10,026,086
U.S. acres burned by wildland fires in the 2017.

RESTORATION ECOLOGY IN THE WEST GULF COASTAL PLAIN

A McIntire-Stennis supported project

STEPHEN F. AUSTIN
STATE UNIVERSITY
Arthur Temple College of
Forestry and Agriculture

The Arthur Temple College of Forestry and Agriculture is seeking to restore native forest ecosystems through the development of diverse silvicultural tools specific to key disturbances that have taken place over the past two centuries throughout the West Gulf Coastal Plain.

Bottomland hardwoods once degraded by historic logging practices are now on the path toward successful and cost-effective restoration. In many of these bottomland ecosystems, invasive species such as Chinese tallow continue to pose a major barrier to successful regeneration, but ongoing research into silvicultural treatments, as well as the response of competitive native species, shows promise in the effort to overcome this noxious invasive.

Additionally, researchers are investigating the effectiveness of mine reclamation techniques used in the Appalachian region to increase forest productivity on reclaimed lignite coal mining properties in East Texas.

Through these efforts, thousands of acres of degraded land may once again become productive ecosystems.

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COLLABORATION

Partners include Harris County Flood Control District, Harris County Soil and Water Conservation District,Texas Parks and Wildlife Department, and the Office of Surface Mining Regulation and Enforcement.

3
Graduate students are supported through this project.

IMPACT

Research findings are actively presented to landowners and timber growers through public meetings and the SFA silviculture website.

>12 million
Acres of forestland in East Texas.

$120 billion
Dollars in damage caused by invasive species each year in the U.S.

>2.6 million
Acres of mined land have been restored since the establishment of the Surface Mining Control and Reclamation Act.

QUANTIFYING THE ROLE OF DISTURBANCE IN MANAGEMENT OF CONTEMPORARY FORESTS

A McIntire-Stennis supported project

STEPHEN F. AUSTIN
STATE UNIVERSITY
Arthur Temple College of
Forestry and Agriculture

Anthropogenic influences and changes in climatic patters have resulted in alterations to historically recurring low to moderate intensity disturbance regimes in U.S. forests. Consequently, reintroduction of disturbances to these "contemporary," or altered forests, are often of extreme intensity, producing mixed effects on stand dynamics.

Research conducted by SFA seeks to improve the understanding of the role of disturbance in the management of contemporary forests by quantifying the consequences of departures in disturbance regimes, as well as the impacts of reintroduced disturbance on forest structure and composition, radial stem diameter growth, and forest health. The underlying influence of hydrology and climate and the impacts of interacting disturbances on forest stand dynamics will also be quantified.

Results will increase the predictability of disturbance impacts in contemporary forests, particularly during a time of increased threats such as drought and invasive species, to forest health and sustainability.

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USDA

COLLABORATION

Research will take place at three National Forests, one National Wildlife Refuge, and an Audubon Center across the states of Arkansas, Texas, California, and Mississippi.

2
Graduate students are supported through this project.

IMPACT

This research will provide direct knowledge of the role disturbances play in maintaining forested ecosystems and increase the predictability of disturbance effects in contemporary forests.

>245,000 acres
Of forestland in the Southern United States

$120 billion
Dollars in damage caused by invasive species each year in the U.S.

>100 million acres
In the South are classified as having moderate to extreme potential for wildland fire.

MECHANISMS OF WILDLIFE COMMUNITY ASSEMBLY IN SOUTHERN FOREST ECOSYSTEMS

A McIntire-Stennis supported project

STEPHEN F. AUSTIN
STATE UNIVERSITY
Arthur Temple College of
Forestry and Agriculture

Newly initiated research at the Arthur Temple College of Forestry and Agriculture will shed light on the effects of forest management practices on the underlying mechanisms that shape ecological communities in one of the nation's most productive forest regions.

While previous studies have tended to focus primarily on traditional community and population metrics of forest management on wildlife species (i.e. species richness, relative abundance), this project takes a functional approach by focusing on the pathways and mechanisms of energy flow, resource use and community organization that drives forest community organization and ecosystem function.

As landscapes and forest management practices continue to be modified to meet the needs of society, the relationship between the altered ecological communities and ecosystem function are of increasing importance. This project will examine how top-down forest management practices affect the persistence and/or loss of wildlife and, in turn, the functional properties of ecosystems.

COLLABORATION

Stakeholders and study areas include a mix of federal, state and private ownership that accurately reflect forest management of the region.

7
graduate and undergraduate researchers supported through this project.

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USDA

IMPACT

This research will directly augment the the understanding of how specific forest managment practices affect animal communities and food-web structure of productive southern forestlands.

>37 million
Acres of pine plantations in the Southern U.S.

$92.9 billion
Value estimate of Texas' forest ecosystem services in 2013.

40%
Of the Nation's 521 million acres of timber land is contained in the South.

MODELING THE GROWTH AND YIELD OF INTENSIVELY-MANAGED LOBLOLLY PLANTATIONS IN THE WESTERN GULF COASTAL PLAIN

A McIntire-Stennis supported project

STEPHEN F. AUSTIN STATE UNIVERSITY
Arthur Temple College of Forestry and Agriculture

Established in 1982, the East Texas Pine Plantation Research Project is a public-private partnership explicitly focused on developing growth and yield models for intensively-managed loblolly pine plantations in the Western Gulf Coastal Plain region.

While various growth and yield models exist for loblolly pine plantations, they were developed using data from the Southeastern U.S., and as such, may not be applicable to the Western Gulf region. For more than 30 years, the ETPPRP has worked with private industry within the region to create these region-specific growth and yield models while also incorporating environmental factors, such as climatic change into the management of pine plantations in the Western Gulf Coastal Plain.

Since the program's launch, more than 100 peer-reviewed publications and technical reports have contributed to the body of knowledge of factors affecting the region's timberlands.

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USDA

COLLABORATION

Industry partners include Rayonier, Resource Management Service, and Forest Resource Consultants.

25
graduate researchers supported through this project.

IMPACT

This research fills the gap that exists in growth and yield models specific to intensively-managed pine plantations of the Western Gulf Coastal Plains region.

>37 million
Acres of pine plantations in the Southern U.S.

$23.7 billion
Annual economic impact of forestry in Texas.

112%
Increase in total annual timberland growth between 1953 and 2015.

FORESTRY PROFESSIONALS AND HUMAN DIMENSIONS: BMPS OF EDUCATION, COMMUNICATION, LEADERSHIP AND PUBLIC ENGAGEMENT

A McIntire-Stennis supported project

STEPHEN F. AUSTIN
STATE UNIVERSITY
Arthur Temple College of
Forestry and Agriculture

Through an ongoing study of the state of forestry education in the United States, researchers at Stephen F. Austin State University are identifying and assessing research-based best management practices that develop foresters and natural resource professionals capable of meeting the challenges of an evolving society.

An overarching communications model will be tested to identify the best practices of training for leadership and communication across diverse communities. Furthermore, researchers will utilize transformative research experiences in outdoor recreation to help prepare students for leadership roles as managers/ researchers of natural resource systems and the humans who interact with those systems. An example of such opportunities include measurement of human engagement and impact on resources of the Greater Yellowstone Ecosystem, as well as the development, implementation, and evaluation of programs to help decision makers and the general public better understand coastal resiliency and necessary stewardship.

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USDA

COLLABORATION

Partners include, but are not limited to, the National Park Service, U.S. Forest Service, Texas A&M Forest Service, Texas Forestry Association, Texas Parks and Wildlife Department, National Association of University Forest Resource Programs.

20
graduate and undergraduate researchers supported through this project.

IMPACT

This research illuminates the current state of forestry education, as well as the direction forestry education needs to take in order to best prepare society-ready natural resource professionals.

53
Society of American Foresters accredited forestry programs in North America.

$44 trillion
Estimated worth of ecosystem services worldwide

329 million
Individuals depend on healthy ecosystems in the U.S.

GEOSPATIAL TECHNOLOGY RESEARCH AND APPLICATION FOR FORESTRY AND NATURAL RESOURCE MANAGEMENT

A McIntire-Stennis supported project

STEPHEN F. AUSTIN STATE UNIVERSITY
Arthur Temple College of Forestry and Agriculture

Spatial scientists in the Arthur Temple College of Forestry and Agriculture are examining the most effective applications of the rapidly expanding suite of geospatial technologies and how they can be most efficiently applied in natural and cultural resource conservation and management.

Texas' growing population is projected to place increasing stress on the state's water supply and other natural resources as land is converted to urban use. This also leads to instances of increased flooding. Using Soil and Water Assessment Tool technology, researchers will study land use and land cover impact on peak discharge and runoff to augment flood management in the state. Additionally, accuracy of remotely sensed data from different sensors, GIS platforms for desktop and mobile field data collection, as well as the diverse applications of unmanned aerial vehicles will be utilized to assess damage to natural and cultural resources at state recreation sites with the ultimate goal of improved accuracy of data for natural and cultural heritage resource managers.

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USDA

COLLABORATION

Collaborative partnerships will be forged with the U.S. Forest Service, the Texas A&M Forest Service, the Natural Resources Conservation Service, U.S. Army Corps of Engineers, the National Park Service, the Texas Water Development Board, Temple-Inland, and International Paper.

2
Graduate students supported through this project.

IMPACT

This research will provide key insight into the most effective applications of evolving geospatial technologies, empowering professionals in their mission to best manage and conserve natural and cultural resources.

>12 million
Acres of forestland in East Texas alone.

$18.3 billion
Of direct forest industry output contributed to the Texas economy in 2015.

>28 million Texans
With an expected population increase in coming years.

HYDROLOGICAL CHARACTERIZATION OF VERNAL POOLS IN THE LOWER COASTAL PLAIN OF EAST TEXAS

A McIntire-Stennis supported project

STEPHEN F. AUSTIN
STATE UNIVERSITY
Arthur Temple College of
Forestry and Agriculture

Home to five of the United States' fastest growing cities, Texas has seen a drastic rise in land conversion and urbanization, oftentimes threatening or destroying critical ecological habitat. Vernal pools, once abundant throughout the lower coastal plain of the state, provide valuable hydrologic functions, but are currently not protected under the Clean Water Act, resulting in increased vulnerability to the effects of urban sprawl.

Researchers at SFA's Arthur Temple College of Forestry and Agriculture are working within the Houston metroplex to expand the understanding of these lower Gulf coastal plain vernal pools located within the Piney Woods forest ecosystem. To date, these vernal pools have not been extensively studied.

Groundwater monitoring wells, as well as chemical analysis of water present will provide critical information on how these disappearing systems function and perhaps provide additional justification for their conservation.

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USDA

COLLABORATION

The study site is owned by The Earth Partners who help private companies and government agencies develop solutions for their wetland and stream mitigation needs.

2
Graduate student research projects supported in this study.

IMPACT

The vernal pools being studied provide flood mitigation, groundwater recharge, and pollutant uptake and transformation for more than 6 million Texans.

57%
Of Texas' water supply is located in the Pine Woodlands ecoregion.

17%
Projected increase in Texas water demand from 2020 to 2070.

28.3 million
Texans benefit from ecosystem services provided by wetlands and other hydrologic features.

GEOSPATIAL TECHNOLOGIES FOR FOREST RESOURCES MANAGEMENT IN EAST TEXAS

A McIntire-Stennis supported project

STEPHEN F. AUSTIN STATE UNIVERSITY
Arthur Temple College of Forestry and Agriculture

Spatial scientists in the Arthur Temple College of Forestry and Agriculture are examining the most effective applications of the rapidly expanding suite of geospatial technologies available to natural resource professionals, with a special emphasis on East Texas forests.

As the population of Texas expands, placing increasing stress on the state's natural resources, it is imperative that resource professionals have access to not only the most cost-effective, but field-accessible and accurate tools available in order to make the most effective managment decisions in both rural and urban environments.

This ongoing project will explore the latest technologies in global navigation satellite system/global positioning system receivers, remotely sensed data from different sensors, GIS platforms for desktop and mobile field data collection, as well as the diverse applications of unmanned aerial vehicles from a field-forester's perspective.

COLLABORATION

Through partnerships with the National Center for Pharmaceutical Crops, Hydrex Environmental, and the U.S. Army Corps of Engineers, researchers investigated the spread of the invasive plant giant salvinia using unmanned aircraft systems and remote sensing technologies.

3
Graduate and undergraduate students are supported through this project.

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USDA

IMPACT

This research will provide key insight into the most effective applications of evolving geospatial technolgies, enpowering professionals in their mission to best manage and conserve natural resources.

>12 million
Acres of forestland in East Texas alone.

$18.3 billion
Of direct forest industry output contributed to the Texas economy in 2015.

>66,000 Texans
Are employed by the Texas forest sector.

QUANTIFYING FORESTS AND NATURAL RESOURCES USING CUTTING EDGE SPATIAL SCIENCE TECHNOLOGY

A McIntire-Stennis supported project

STEPHEN F. AUSTIN
STATE UNIVERSITY
Arthur Temple College of
Forestry and Agriculture

Spatial technologies such as satellite remote sensing, global positioning systems, and unmanned aerial systems are enabling professionals to quantify forests and other natural resources more efficiently and systematically than ever before.

With the rapid advancements in cutting-edge spatial technology, however, it is imperative to assess the feasibility and accuracy of these tools that are increasingly becoming essential components of a forester's tool kit.

Ongoing research at SFA will evaluate the accuracy of technologies such as unmanned aerial systems, Pictometry, consumer-grade global positioning systems, as well as past, current and proposed satellite digital imagery in quantifying and qualifying forests and other natural resources.

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COLLABORATION

Partners inlude the Texas A&M Forest Service, U.S. Forest Service,U.S. Army Corps of Engineers, U.S. National Park Service, Natural Resources Conservation Service, Texas Parks and Wildlife, Texas Commission on Environmental Quality, and Texas Water Development Board.

9
Graduate students are supported through this project.

IMPACT

This research will provide key insight into the most effective applications of evolving geospatial technolgies, enpowering professionals in their mission to best manage and conserve natural resources.

>12 million
Acres of forestland in East Texas alone.

$18.3 billion
Of direct forest industry output contributed to the Texas economy in 2015.

2.5%
Within actual tree height using Pictometry digital imagery as a measurement tool.

PAYMENT FOR ECOSYSTEM SERVICES AS AN INSTRUMENT FOR FOREST CONSERVATION AND ECONOMIC DEVELOPMENT

A McIntire-Stennis supported project

STEPHEN F. AUSTIN
STATE UNIVERSITY
Arthur Temple College of
Forestry and Agriculture

Forests provide ecosystem services essential to human well-being including clean air and water and soil health. However, global forest degradation and deforestation pose a major threat to these integral services and, subsequently, the human population.

Researchers at SFA are addressing this threat by exploring the ecological and economic foundations of payment for ecosystem services (PES) programs such as identification, definition, and valuation of forest ecosystem services.

The ultimate goal will be the creation of a protocol available to land managers, city planners and personnel at federal, state, and local agencies that will facilitate the identification of ecosystem services, their mapping and economic valuation, and the development of payments for ecosystem services programs to promote conservation and economic development.

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USDA

COLLABORATION

Domestic and international partnerships are a foundation of this research. Domestic partners include the U.S. Forest Service, National Park Service, Texas Parks and Wildlife Department, Sustainable Forestry Initiative, and Campbell Global.

6
Graduate students supported through this project.

IMPACT

PES programs have potential to become important tools supporting conservation and economic development efforts. This research will advance effective protocols, design and implementation of these diverse programs.

60 million
Americans rely on National Forests for drinking water.

$3.8 billion
U.S. air pollution reduction costs saved annually through urban trees

784,000 tons
Of pollutants removed by urban trees in the U.S. each year

ASSESSING DRIVERS OF LONG-TERM POPULATION DECLINES IN GAME AND NON-GAME WILDLIFE SPECIES IN SOUTHERN FORESTS

A McIntire-Stennis supported project

STEPHEN F. AUSTIN
STATE UNIVERSITY
Arthur Temple College of
Forestry and Agriculture

Over the past two centuries Southern forests have experienced drastic changes in composition and land cover due in large part to anthropogenic forces. In many cases, this modification has resulted in the disappearance, degradation, and endangerment of native plant communities vital to wildlife species.

To better understand current population declines in key game and non-game avian species of conservation concern, researchers at Stephen F. Austin State University are investigating the factors influencing wildlife species occupancy, abundance, and population health among the Eastern wild turkey, Northern bobwhite, and Bachman's sparrow, among others.

The research will monitor and assess the impacts of bottomland harwood and open pine forest management practices on habitat availability and suitability for these species and provide fundamental knowledge for forest managers as they guide recovery efforts for wildlife species with declining population trends.

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USDA

COLLABORATION

Partners include the Texas Parks and Wildlife Department, the USDA Forest Service, as well as additional non-governmental organizations and private landowners.

>5
Undergraduate and graduate student supported in this study.

IMPACT

This research directly addresses the population decline among a selection of the 132 terrestrial vertebrate species of conservation concern in the Southern U.S.

63%
Of the original bottomland hardwood forests in East Texas have been lost

14%
Projected decline in the South's upland hardwood forests by 2020

38
Wildlife species are considered to be imperiled in the South.