What's Over the Horizon?

Future Challenges and Opportunities Facing Sustainable Forest Management

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Host:

Arkansas Center for Forest Business
College of Forestry Agriculture & Natural Resources
University of Arkansas at Monticello

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ARKANSAS CENTER FOR FOREST BUSINESS
UNIVERSITY OF ARKANSAS AT MONTICELLO
connecting people and forests

Editorial Note

On behalf of the Arkansas Center for Forest Business, I would like to extend our heartfelt thanks to all the attendees of the 2024 International Society of Forest Resource Economics. Your active participation, insightful questions, and engaging discussions played a crucial role in the success of this event. Your presence not only demonstrates your commitment to advancing our discipline but also contributes to building a stronger community within our profession. We hope the sessions provided valuable knowledge, sparked new ideas, and inspired collaboration. We look forward to seeing you in Myrtle Beach, SC in March 2025.

I would also like to extend my appreciation to the UAM team for all of their hard work in preparing and administering the 2024 International society of forest resource economics. Dr. Matt Pelkki, and Dr. Nana Tian provided excellent leadership and insight throughout the process and made sure all of the grading for graduate student prizes was organized and timely. The student award process has evolved into a big part of the ISFRE meeting and coordinating judges and scoring is not a small task. I also want to give special thanks to Sagar Chhetri and Ana Gutierrez-Castillo for their tireless efforts and positive attitudes throughout the whole process. Your dedication and expertise were invaluable and I am grateful for your collaboration.

See you all in Myrtle Beach in 2025!

Shaun Tanger, Ph.D.
Chair, ISFRE 2024
University of Arkansas at Monticello

Further Acknowledgements

We thank the ISFRE group at Mississippi State University for their help with organizing the meeting. Thanks to Wilson Brothers Lumber Co., Rison, Arkansas for a field trip.

We wish to thank the keynote speaker, congressman Bruce Westerman for his talk about the current challenges and opportunities in the forestry sector. Also, we thank all oral and poster presenters and conference attendees who helped in making the meeting a success.

We are thankful to all the sponsors: Journal of Forest Business Research and Boise Cascade for providing prizes for the best student presenter awards.

To those students who participated we would like to welcome you to return as possible for future meetings and to our professional colleagues thank you for attending and we look forward to seeing you next year.

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Plenary Session

What's Over the Horizon? Future Challenges and Opportunities Facing Sustainable Forest Management

Panelists

- **John McAlpine, R.F., A.C.F., MAI**
  Manager and President - Kingwood Forestry

  John is President of Kingwood Forestry Services, Inc. and a second-generation forester. He is a 1998 Graduate of UAM in Forestry. He is a Registered Forester in 2 states, Certified General Appraiser in 5 States and Real Estate Broker in 2 states. John also serves as a Commissioner on the Arkansas Forestry Commission. John leads the company in modern technology from field collection to harvest scheduling. John also serves at the national level leading the Forestry Committee with the National Association of Conservation Districts, while also on the Executive Board of the Association.

- **Vic Ford, C.F., R.F., Ph.D.**
  Associate Vice President - Agriculture and Natural Resources

  Dr. Ford is a northeast Tennessee native and earned a Bachelor of Science in Forest Management and Master of Science from the University of Tennessee and a Doctor of Philosophy in Forestry and Forest Products from Virginia Tech. He spent five years as an Extension Forester for the University of Arkansas at the Southwest Research and Extension. Dr. Ford worked for the next 20 years for Westvaco and later MeadWestvaco in Kentucky, West Virginia, Alabama, and Texas as a Scientist, Research Center Leader, and Project Leader. In 2008, he became Director and Professor of the University of Arkansas Southwest Research and Extension Center. He was later asked to serve as Interim Associate Director from 2016-2019 and was named Associate Director in 2019 and Associate Vice President in 2020. Dr. Ford has over 80 publications and presentations and is a wetlands consultant. Vic has been a member of the Society of American Foresters (SAF) since 1982. He was named Fellow of the Society of American Foresters in 2014.

- **Russell Hatcher, C.F., R.F.**
  Manager - Wood Procurement at Boise Cascade

  Russell currently serves as a Wood Procurement Manager for Boise Cascade. He began his forestry education securing a Bachelor of Science from Louisiana Tech University, he also has a Master of Business Administration from the University of Tennessee at Knoxville. Russell is a certified forester and a registered forester in Georgia, Mississippi, and Arkansas. Russell has worked extensively throughout the southeast US for wood products companies focused on strategic sourcing of wood and fiber. He also has experience with western US forests during his time with Renergy Holdings

where he developed energy opportunities in accordance with state and federal legislation and initiatives, negotiating contracts with US Forest Service and collaborating with the White Mountain Apache Tribe to help it meet objectives for timberland ownership.

- **Jason Gibson, R.F.**
  Director - Forest Carbon at Weyerhaeuser

  Jason is currently leading Weyerhaeuser's efforts to establish a Natural Climate Solutions business focused on creating and selling forest carbon credits, working out of Hot Springs, Arkansas. He is a 1997 Graduate of Forestry at Stephen F. Austin. Jason also serves as Treasurer for the Arkansas Forestry Association. From 2000 to 2017 his career focused on all aspects of forest operations for Plum Creek and Weyerhaeuser, holding several different positions from silviculture to timber marketing. In 2018, he moved into a business development role concentrated on aligning Weyerhaeuser's Timberlands and Wood Products businesses to take advantage of growth in current and emerging markets.

Keynote Speaker

- **Congressman Bruce Westerman**
  Arkansas' Fourth Congressional District in the U.S. House of Representatives
  Chairman of the Committee on Natural Resources

  Keynote topics include the forest non-market evaluation given by Congressman Bruce Westerman who represents Arkansas's 4th congressional district. He is the only forester in the United States Congress currently, he holds an MS in forestry from Yale, and a BS in engineering from Arkansas-Fayetteville. Congressman Westerman will discuss congressional initiatives he thinks will benefit forests and forest landowners and provide insights into what challenges and opportunities for sustainable forest management he sees on the horizon.

Awards

2024 ISFRE Student Oral and Poster Presentation Awards:

Seven students were recognized for their exceptional research presentations and posters. The aim of this award was to encourage students to share their research ideas among forestry professionals and collect feedback to improve it. Any student who was both the primary author and presenter was eligible to compete for these awards. The award was sponsored by the Journal of Forest Business Research. The following students received the awards:

Oral Presentation Award Winner

- **Sushma Bhattarai**, Mississippi State University, Starkville
  Title: What affects landowner intentions to manage CWD on their land?

- **Junyeong Choi**, Texas A & M University, College Station
  Title: Socioeconomic drivers of emerald ash borer invasions in the United States

- **Austin Lamica**, North Carolina State University, Raleigh
  Title: Examining Drivers, Policies, and Efficiency of Wood Pellet Exports from the United States: An Application of the Stochastic Frontier Gravity Trade Model

- **Bandana Subedi**, University of Arkansas at Monticello, Monticello
  Title: Wood Processing Mills in Arkansas: Location, Distribution, and Factors Influencing Their Establishment

Poster Presentation Award Winner

- **Ally Whiteis**, Oklahoma State University, Stillwater
  Title: Quantitative Assessment of Ecosystem Services in the Cross-Timbers Ecoregion: A Comparative Study of Agroecosystems and Tradeoffs

- **Carson Raper**, Oklahoma State University, Stillwater
  Title: Perceived Risks of Eastern Redcedar Encroachment Among Rural and Non-rural Residents in Oklahoma

- **Shila Pokhrel**: North Carolina State University, Raleigh
  Title: Climate Change Impacts, Carbon Markets, and Climate Investment Funding on Urban and Community Forestry: Perspectives of Non-Profit Organizations and Public Agencies in California, USA

Forest Landowners

Abstracts for Oral Presentations

Financial and Technical Assistance for Revegetation on Private Lands in the United States

Dhruba Burlakoti and Srijana Baral

Colorado State University

Abstract: Several financial and technical assistance programs have been enacted in the US to encourage revegetation on private forestlands. However, there is a limited understanding of how these programs have shifted over time and how they have influenced revegetation efforts on private forestlands. We cataloged the existing state and federal revegetation assistance programs in the US and synthesized the current state of knowledge regarding landowner participation, needs, barriers, and opportunities related to those programs. We gathered information on active revegetation financial and technical assistance programs from various state and federal documents, reports, and web pages. We conducted a systematic review of the literature between 1970 and 2023 using online databases such as the Web of Science. We used a snowball sampling technique to collect more articles and cross-referenced the selected list of articles in Google Scholar. Our preliminary findings showed that programs offering both financial and technical assistance had notably advanced reforestation efforts, but their effectiveness varied considerably across the country. We identified several barriers to participation, including ineligibility due to small land parcels, restrictive regulations, and long-term commitments to ecosystem service payments. Moreover, our review suggested that, in marginal lands, reforestation can be more economically viable than traditional agriculture, offering landowners diverse revenue streams through timber production, hunting licenses, and carbon credits. The next phase of our research involves validating cataloged programs and using quantitative techniques to assess the relative strength of existing literature focusing on revegetation assistance programs.

Keywords: Assistance Programs, Economics, Private Forestland, Reforestation

Change in Forest Area and Forest Certification: A Global Perspective

Inoussa Boubacar and Yaya Sissoko

USDA Forest Products Lab
Indiana University of Pennsylvania

Abstract: In the face of accelerating forest degradation and deforestation, forest certification emerged in the early 1990s as a voluntary and market-based mechanism to promote environmentally appropriate, socially beneficial, and economically viable forest management worldwide. A key goal of forest certification is to reduce forest degradation and deforestation while enhancing the economic viability of forest enterprises. However, the extent to which forest certification contributes to achieving these goals remains uncertain. This study uses cross-country panel data within the framework of a dynamic model to empirically analyze the impact of forest certification on changes in forest area from 2000 to 2021 across 73 developed and developing countries. Our preliminary findings suggest that the effectiveness of forest certification depends on the income level of the country. Furthermore, the research distinguishes between short-run and long-run drivers of changes in forest areas. While income emerges as a short-run driver, population exerts a long-run effect on forest area change. Nevertheless, forest certification demonstrates influence on forest area change in both short and long-run contexts, with its efficacy varying based on the economic status of countries.

Keywords: Economics, Forest Certification, Forest Degradation

Improving Natural Resource Conservation Service forest management program recruitment using landowner perspectives

A. Priest, Elena Rubino, Jerrod Penn, Anne Mini, Bill Bartush, Austin Klais, S. Keith McKnight, Shannon Westlake, and Ashley Gramza

University of Arkansas System Division of Agriculture
Louisiana State University
Lower Mississippi Valley Joint Venture
US Fish and Wildlife Service
Playa Lakes Joint Venture

Abstract: A significant portion of forested land in the United States is privately owned, thus efforts to protect or improve wildlife habitat on forested land must involve engaging private landowners. Federal agencies, such as the Natural Resource Conservation Service (NRCS), offer assistance programs to aid landowners in achieving habitat conservation and management goals. However, there is a recognition that traditional approaches used in program recruitment have limited the expanse and diversity of program participants. This study used focus groups and interviews with 55 family forest landowners in southern Arkansas and northern Louisiana to explore their current land management practices, concerns about program enrollment, and preferred communication methods in an effort to improve forest management program recruitment. We found that landowners typically engaged in replanting, thinning (i.e., reducing basal area), and clear cutting on their land, with secondary management actions including burning and mowing. Concern about program enrollment consisted of land-related concerns (e.g., best management practices, management implementation) and program-related concerns (e.g., contracts, information, enrollment processes). Landowners indicated outreach that focused on hard copy, mailed pamphlets from reputable sources (e.g., government agencies, universities) would be most effective, as well as educational programs and the opportunity to directly connect with program delivery team members (e.g., private lands biologists). Based on our results, we recommend consolidating up-to-date program information online (e.g., contact information for partner organizations, NRCS office locations) and mailing program advertisements (using agency/university logos) that include information on each step of the application process and “myth busts” misconceptions about landowner assistance programs.

Keywords: Management, family forest landowners, habitat management programs

Factors underlying landowner decisions on active forest management in the Cross-Timbers region

Rodrigo, C., Joshi, O., Poudyal, N.C., Russell, A.

Oklahoma State University
US Geological Survey Southwest Biological Science Center

Abstract: Cross-Timbers Forests, located in a transition ecoregion between eastern forests and western grasslands of the Southern Great Plains of the United States, provide numerous ecosystem services in Oklahoma and its neighboring states. Growing climate variability, decades of fire suppression, woody plant encroachment, anthropogenic activities and lack of active forest management have altered the original composition of these forests. As most of these forests are privately owned, understanding the factors influencing landowners' willingness to implement active forest management is important. This study investigated landowner preferences regarding two key forest management practices – thinning and prescribed burning – through a mixed-mode survey of private forestland owners in the Cross-Timbers region. Analysis of the survey data in a bicop ordinal logit model suggested that landowners' willingness to adopt thinning and prescribed burning is significantly influenced by ownership objectives, forest land holding size, status of encroachment by invasive species, and demographics of the responding landowners. The presentation will discuss the implications of these findings in outreach, Extension, and incentive programs to increase landowner involvement in active forest management in the Cross-Timbers region.

Keywords: Active forest management, private landowners, Cross-Timbers region, prescribed fire

Adopting conservation easements on forestland: Evidence from the census of forest landowners in the United States

Changyou Sun, Jeffery D. Kline, Xiaofei Li

Mississippi State University
USDA Forest Service

Abstract: Conservation easements have become a prevalent method for conserving forestland in the United States in the face of housing and other development. In this study, we used data from the National Woodland Owner Survey conducted by the USDA Forest Service in 2017-2018 to examine patterns and determinants of conservation easement adoption on individual forestland parcels. A total of 9,349 landowners are included in the analysis, covering all 50 states. We used a spatial binary probit model to consider potential spatial dependence in conservation decisions among adjacent landowners. Our results reveal that significant spatial dependence exists, suggesting that about 30% of the total effect of any explanatory variable on easement adoption comes from an indirect spatial effect. Landowners' degree of awareness of conservation easements has the most significant positive effect. Easement adoption is also higher among landowners possessing non-commodity ownership objectives, such as wildlife protection, while adoption is lower among landowners with primarily timber and investment objectives. Demand for conserving forestland has increased in areas experiencing more remarkable population growth or household income. States adopting statutory conservation easement laws earlier tend to have higher rates of easement adoption. Policy implications of these findings are discussed for conservation entities and government agencies to promote conservation easements in the future.

Keywords: Conservation, Partial property rights, Probit model, Spatial dependence

Connecting with Family Forest Landowners in the Western Upper Gulf Coastal Plain to Enhance Forest Management and Promote Certification

Nana Tian, Sandeepa Pantha, Ana Gutierrez-Castillo

University of Arkansas at Monticello

Abstract: Sustainable benefits encompass ecological, economic, and societal advantages that result from responsible forest management. The preservation of these advantages in Arkansas (AR), Louisiana (LA), and Texas (TX) hinges on the commitment of 821,000 non-industrial family landowners, who possess a total of 32 million acres of forestland. This study aims to introduce an innovative connection-building approach targeting family forest landowners (FFLs), particularly those who are underrepresented. We established an Advisory Board comprised of primary users and stakeholders from each state. The Advisory Board members periodically define, assess, evaluate, and review program processes and metrics; meanwhile, they built facilitator teams (one per state), comprising staff from the Natural Resources Conservation Service, state foresters, and support vocational groups including certified public accountants, attorneys, surveyors, and certified peer-mentor landowners. Multiple training workshops were conducted to ensure the vocational group members were equipped with certification-relevant knowledge. The strategy intends to establish supportive networks for family landowners, facilitating their engagement in existing programs while fostering trust and connections within a more extensive and diverse FFL community. As a result, this approach will lead to expansion through the amplification of positive word of mouth (AWOM) and will encourage cooperative and communication-centered technical support to family landowners within essential landscapes, aiming to enhance forest management practices and promote certification.

Keywords: Advisory Board; Forest Certification; Family Forest Landowners; Western Upper Gulf Coastal Plain; Connections/Relationships

Biomas & Bioenergy

Abstracts for Oral Presentations

Life Cycle Emissions and Unit Production Cost of Sustainable Aviation Fuel from Logging Residues in Georgia

Hosne Ara Akter, Md Farhad Hossain Masum, Puneet Dwivedi

University of Georgia
Argonne National Laboratory

Abstract: Production of Sustainable Aviation Fuel (SAF) has gained popularity in recent years due to its capability to reduce carbon emissions from the aviation sector. This study estimates the life cycle carbon emissions and unit production cost of SAF produced from logging residues generated during harvest and thinning operations in Georgia, a major roundwood producing state in the United States. We considered two production pathways, i.e., Ethanol-to-Jet (ETJ) and Iso-Butanol-to-Jet (Iso-BTJ), to compute the carbon savings and unit production costs. A sensitivity analysis was performed to identify significant factors contributing to the overall carbon savings and unit production costs for the selected production pathways. After considering revenues generated from co-products, the minimum aviation fuel selling price (MASP) was $2.69 L-1 and $2.42 L-1 for ETJ and Iso-BTJ pathways, respectively. Capital investment cost at biorefinery accounted for most of the MASP, followed by the minimum haul rate for transporting biomass. Finally, after considering tax credit from the Inflation Reduction Act of 2022 and RIN (Renewable Identification Number) credit along with co-product revenue, the MASP ranged between $2.28 L-1 and 0.82 L-1 for the ETJ pathway and between $2.04 L-1 and $0.58 L-1 for the Iso-BTJ pathway. In addition, the ETJ and Iso-BTJ pathways had relative carbon savings of 70.8% and 58.22% compared to conventional aviation fuel (CAF). Our study shows that a wood-based SAF could reduce the overall carbon footprint of the aviation sector; however, policy support is needed to support its production, considering higher production costs.

Keywords: Economic Analysis, Aviation, Bioenergy, Logging Residue, Life Cycle Assessment, Sustainability

Identifying the Optimal Locations for Biochar Production Facilities in Arkansas

Sagar Godar Chhetri, Ram Adhikari

University of Arkansas at Monticello, Monticello
New Mexico Highlands University

Abstract: Biochar production provides an alternative market for woody biomass available in forest lands. Since the forest growth rate is almost double the removal rate in Arkansas, there are huge opportunities for utilizing the existing growing stock to produce biochar. In Arkansas, only one biochar production facility is located, which utilizes the woody residuals from forest operations. The surplus residuals in the forestland constitute a risk for wildfires and pest and disease outbreaks. Thus, it is necessary to establish the woody residual utilizing facilities such as biochar plants. The study aims to provide appropriate locations for additional biochar production facilities based on several criteria, such as available raw materials, road networks, wildfire risk, and soil conditions. The study helps utilize biomass residues to improve forest health and expand the market for forest products. The study used a two-step process: 1) selection of potential sites and 2) identification of optimal sites using the location-allocation method. The study identified several potential sites and optimal locations for biochar production facilities for centralized and moderate-size facilities. Establishing biochar production facilities can generate supplemental income for forest landowners and contribute to local and regional economies. The study concludes that the centralized biochar plants are more efficient in consuming available feedstock.

Keywords: Biochar, biomass, optimal, facilities

Impact of Forest Market on Forest Fuel Treatment Activities in Colorado

Kritagya Gyawali, Srijana Baral

Colorado State University

Abstract: While confronting the wildfire crisis through hazardous fuel reduction activities has become a shared goal of many agencies, the cost of implementing it remains a significant challenge. Increasing biomass utilization, which relies on the growth of wood products industries, can be a strategy for reducing net fuel reduction costs. Yet very little is known about the impact of wood manufacturing facilities on fuel treatment activities in Colorado. We examine whether the proximity of manufacturing facilities influences fuel reduction activities in National Forests (USFS) and Bureau of Land Management (BLM) lands using the fuel treatment data (n = 9,718 sites for USFS and n = 779 sites for BLM), location of active manufacturing facilities, and treatments in the Wildland-Urban Interface (WUI) between 2012 and 2020. We find that proximity to wood manufacturing facilities significantly impacts the treatment decisions, with sites that are relatively close in proximity treating more acres and utilizing more biomass than those further away. Mixed model regression analysis for USFS reveals a significant negative proximity coefficient (-3.8272, $p < 0.0001$) and positive WUI coefficient, indicating higher treatments in WUI. Similar results are observed for treatments in BLM (-0.999, $p < 0.0001$). We also find a significant negative proximity coefficient for both USFS and BLM in case of biomass utilization. Additionally, we identify a threshold of 70 minutes beyond which proximity is insignificant for both lands. Our study underscores the importance of strategic planning focused on establishing well-distributed wood-processing facilities across the state for effective hazardous fuel cost management.

Keywords: Biomass, Economics, Fuel Treatment, Wood Manufacturing Facilities

Land Use Change and Forest Markets

Jesse D. Henderson, Robert C. Abt, Karen L. Abt

USDA Forest Service
North Carolina State University (Emeritus)

Abstract: Increased demands for timber products remove carbon from forests, however previous literature has suggested that higher resulting prices could spur forestland expansion, ameliorating the forest carbon impacts. We examine the impacts on forest carbon from harvest increases with an empirical forest sector model, coupled with an econometric model of endogenous land use change model that differentiates the impacts of population, income, and pine plantation rents among forest management types and non-forest land uses. We explore the sensitivity of forest area and carbon to a suite of scenarios by varying timber product demands combined with a sensitivity analysis on pine plantation responses to pine plantation rents. Our results identify the tradeoffs and relative impacts among product demands and pine plantation rent sensitivity and provide insights on the sustainability of increased harvest of southern pine. The econometric results show that pine plantation rents lead to increases in pine plantation area and that all non-urban land uses are negatively affected by both per capita income and population. Scenario projections show that (1) higher pulpwood demands lead to lower forest carbon outcomes; (2) higher sawtimber demands exacerbate the known cycles in sawtimber prices and result in corresponding cycles in forest area and carbon. All scenarios show increases in forest carbon over time, though some scenarios increase faster than others. The length of the projection period affects forest carbon outcome conclusions. Along with results from the paper, we present extended results from an analogous land use change model in a global context.

Keywords: economics, forest carbon, wood pellets, land-use change

Examining Drivers, Policies, and Efficiency of Wood Pellet Exports from the United States: An Application of the Stochastic Frontier Gravity Trade Model

Austin Lamica

North Carolina State University

Abstract: The global wood pellet markets have substantially grown over the past two decades with supports from various regional and national renewable energy policies. The United States (US) has been the major exporter of wood pellets, particularly to the United Kingdom, European nations, and lately Asian countries. In this study, we develop and estimate a stochastic frontier gravity trade model to assess the various key trade determinants and policies driving the wood pellet exports from the US. Moreover, we evaluate the impact of ongoing war between Russia and Ukraine on the global wood pellet trade. Based on the data from 2012 to 2023, preliminary findings suggest that importer GDP, importer domestic biomass production incentives, and exchange rates significantly reduce US wood pellet exports. In contrast, US GDP, distance, importer policy targeting biomass consumption, and importer sustainability requirements are found to be positive drivers of US wood pellet exports. Similarly, the Russian-Ukrainian War is estimated to have a positive influence on US wood pellet exports. The findings shed light on the export market dynamics, implication of the Russia-Ukraine war, and efficiency potential of the US wood pellet industry.

Keywords: wood pellets, trade, efficiency, stochastic frontier gravity model, Russia-Ukraine War

Integrated Economic Analysis of Populus deltoides as a biomass feedstock

Pratima Poudel, Austin Himes

Mississippi State University

Abstract: In the United States (US), woody biomass is becoming increasingly important for renewable bioenergy production. The most widely used species are Eucalyptus, Populus, and Salix, Populus trees make them an excellent feedstock for renewable biofuel, bioenergy, and bioproducts. They endure biochemical conversion to fuels without complexity, making them a promising, purpose-grown, woody perennial energy source with environmental benefits, such as air filtration, erosion prevention, carbon sequestration for climate change mitigation, increased agricultural biodiversity, and soil remediation, including mining site restoration. Populus species produce a huge amount of biomass in a short rotation and even after harvesting it can be grown rapidly which can resprout from stumps. Therefore, Growing Populus for biomass on marginal lands has the potential to promote rural economies and can relieve strain on natural forests by providing a valuable resource.
The study will be based on secondary and primary data sources of Poplar species to assess the overall sustainability of using Populus deltoides as biomass feedstock.
Therefore, to better understand the potential financial and environmental benefits of growing Populus for biomass we will conduct a techno-economic analysis (TEA) and use a discounted cash flow model over a 20-year rotation with a 2-year establishment cycle followed by 2-year coppice cycles. Data from field trials grown from 2020 to 2024 at Pontotoc Ridge-Flatwoods Branch Experiment Station near Pontotoc, MS, the Bearden Dairy Research Center near Starkville, MS on the Upper Coastal Plain physiographic subsection, and two sites in the Lower Mississippi Alluvial Valley will be used to estimate site preparation costs, and planting expenditures, and yields.

Keywords: Poplar species, Economic Assessment, Biomass

Operations & Products

Abstracts for Oral Presentations

An Analysis of the Logging Sector in East Texas: Current Status and Future Prospects

Pooja Chhetri, Anusha Shrestha, Matthew W. McBroom, Xufang Zhang

Stephen F. Austin State University
Texas A&M Forest Service

Abstract: The logging sector plays a critical role in the wood supply chain and in forest management. It connects forest resources with mills, who consequently use that wood to manufacture a multitude of products. A better understanding of the state of the logging businesses among policymakers is crucial in sustaining this industry. Therefore, this study's objective was to estimate the economic contribution made by this sector using Impact Analysis for Planning (IMPLAN). Furthermore, this study determined the status of the logging sector using online and mail surveys. IMPLAN results showed that the logging sector contributed 3,860 total jobs, $178 million in total labor income, $216 million in total value added, and $365 million in total output in 2021. The total economic contribution from 2012 to 2021 was determined which provided insights that, on average, the contribution increased over the past decade with an additional 972 jobs, $62 million in labor income, $101 million in value added, and $165 million in output. Based on the surveys data, the average age of business owners were 54 years. Eighty-seven percent of respondents were owners, 77% had been in the business for more than 20 years, and 90% had 1-3 crews to operate their businesses. Further, 51% of the harvested volume came from corporate owned forests and 62% used own trucks to transport their harvested volume. The results will be useful to provide an update to the sector's baseline economic data and to ensure the continued supply of wood products to the mills.

Keywords: Economic Contribution, IMPLAN, Input-Output model, Mail Survey, Qualtrics.

Building with Hardwood Cross-Laminated Timber: Assessing Potential Timber Supply and Economic Impacts in Kentucky

Vaine Onyango, Thomas O. Ochuodho

University of Kentucky

Abstract: Building constructions contributes 39% of global greenhouse gas emissions (11% from construction materials, concrete, and steel) leading to increased global warming. Cross-laminated timber serves as a viable construction alternative to traditional materials due to its ability to sequester and store carbon. CLT is primarily manufactured from softwoods with southern yellow pine (Pinus spp) being the predominant species with limited exploration into the CLT potential of hardwoods. The goal of this research is to explore the opportunities around, and feasibility of using hardwood CLT in building construction in Kentucky. The research objectives are to: (1) assess the current and projected timber supply of select hardwood species for hardwood CLT production in Kentucky; (2) assess potential economy-wide impacts of using hardwood CLT in building construction in Kentucky. Key species of focus are yellow poplar (Liriodendron tulipifera), white oak (Quercus alba), red oak (Quercus rubra), red maple (Acer rubrum) and American beech (Fagus sylvatica). For objective 1, Forest Vegetation Simulator (FVS) and Sub-Regional Timber Supply (SRTS) models will be used to project hardwood timber supply over the 2023-2073 period, using Forest Inventory Analysis data. Computable General Equilibrium (CGE) modelling framework implemented with General Algebraic Modelling System (GAMS) software will be applied to achieve objective 2. Results of this research will guide formulation of policies and strategies that promote sustainable management of hardwoods for CLT production for economic growth. Further, results will provide opportunity for developing hardwood CLT building codes as well as avenues for incentives to promote use of hardwood CLT in construction industry.

Keywords: Cross-laminated timber, hardwoods, forest vegetation simulator, economic impacts.

Tallying timber: a user's guide to NRUM data in the West

Samuel G. Scott, Todd A. Morgan, Thale Dillon, , Clayton W. Dutton, Glenn A. Christensen, John D Shaw

University of Montana

Abstract: The USDA Forest Service's National Resource Use Monitoring (NRUM) program tracks and reports the use of timber products from all land ownerships across the United States. In 12 western states, the University of Montana's Forest Industry Research Program collects, analyzes, and disseminates consumption, production, and economic data from mills as well as harvest utilization data from active timber sales in support of NRUM. I will discuss several interesting applications of the dataset including economic contribution analysis, carbon modeling, and National Forest System planning. In addition, I will discuss public availability and access, and how NRUM data could be used in your work.

Wood Processing Mills in Arkansas: Location, Distribution, and Factors Influencing Their Establishment

Bandana Subedi, Sagar G. Chhetri, Matthew H. Pelkki, Kevin Boston

University of Arkansas at Monticello

Abstract: In Arkansas, the forest sector contributes over six billion dollars annually to the Gross Domestic Product. However, the sawmill sector in Arkansas has witnessed a substantial rate of closures, nearly 59% of sawmills alone were closed from 2007 to 2017. The impact of these closures was further compounded by the onset of the COVID-19 pandemic, which inflicted additional strain on wood processing industries across the state. Considering these circumstances, this study aims to understand the spatial distribution of wood processing mills in Arkansas and the county-level factors influencing their establishment. The data were collected from multiple sources: sociodemographic information from the U.S. Census Bureau; socioeconomic information was collected from the Department of Finance and Administration; forestland attributes from FIA; and wood processing mill data from USDA and Timber Product Output. We found that primary wood processing mills are present in 59 out of the 75 counties in Arkansas. We have employed logistic regression with the presence or absence of mills as the binary dependent variable. The study found that counties with a higher labor population ($p < 0.01$) and substantial timberland areas ($p < 0.01$) are more likely to have primary wood processing mills. Similarly, the growth-to-drain ratio ($p<0.01$) and private forest land ($p<0.05$) are also positively significant with the presence of mills. Whereas, government-owned forest land ($p < 0.01$) is negatively significant. The study will further incorporate other important variables such as roads and railway networks in the next steps of this study.

Keywords: Forest Economics, Economic Development, Wood Processing Mills, Logistic Regression

Navigating the dynamics of demand and supply of feedstock for emerging Mass Timber Industry in the Lakes States

Ichchha Thapa, Raju Pokharel, Emily Huff, Greg Latta, Ram Dahal, Sandra Lupien, George Berghorn, Jagdish Poudel

Michigan State University
University of Idaho
Wisconsin Department of Natural Resources

Abstract: Mass timber is gaining traction as the major climate smart commodity to address the increasing carbon footprint of the building materials and the construction sector overall. Forest rich areas like the Lakes States have been facing new challenges in managing their forest resources with forest growth exceeding removals in the recent decade. This study aims to explore demand-related factors and identify feedstock availability including competition hotspots for emerging mass timber industry in Michigan and Wisconsin of the Lakes States region. We conducted surveys with the different stakeholders working in the mass timber industry and Michigan adults. We found over half of the surveyed Michigan adults supporting programs like tax breaks to help mass timber buildings more mainstreamed in Michigan. Stakeholders' awareness on engineering properties of wood and mass timber and confidence with mass timber varied significantly which highlights the gap in understanding of the mass timber industry across different stakeholders. We employed a transportation logistics modeling approach to estimate the forest products market extent and competition while minimizing procurement costs of feedstock to the potential mass timber manufacturing locations in Michigan and Wisconsin. Our finding of the mass timber demand is estimated to generate approximately 400 additional jobs with a total output of $68.58 million in the economy. Examining different market-based supply and demand scenarios will help prospective manufacturers, and decision-makers provide information on the market direction of mass timber in the Lakes States.

Timber Prices

Abstracts for Oral Presentations

Outsourcing Stumpage Price Uncertainty with the American Put Option for Active Timber Management

Sun Joseph Chang, Fang Zhang

Louisiana State University
Nielsen IQ

Abstract: Timber production is an inherently risky business. Stumpage price fluctuates all the time, creating price uncertainty for forestland owners and managers. In this paper, we address this challenge by outsourcing the stumpage price uncertainty with an American put option to determine the reservation prices at different ages and calculate the corresponding reservation prices. When the spot price exceeds the reservation price at a particular age, the high stumpage price triggers an immediate timber harvest. The resulting harvest value and age are then incorporated into the generalized Faustmann formula to determine the corresponding land expectation value.

Splitting wood: Identifying divergence in softwood timber and lumber prices in the southern United States

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North Carolina State University
USDA Forest Service
University of Georgia
University of Arkansas at Monticello

Abstract: Historically, softwood timber and lumber prices have been strongly correlated within the supply chain, however, the interval between these prices has widened since the 2008 financial crisis, with the COVID-19 pandemic further intensifying this divergence. We examine the impact of various economic shocks on the widening gap between timber and lumber prices from 1999 to 2023, employing a Markov Switching Autoregressive model by incorporating variables, including housing starts, lumber futures, mortgage rate and employments in the logging industry to identify periods of divergence and stability in the forest products market. The analysis reveals that significant shift in the price interval between lumber and timber primarily occurred during two key periods: around 2015/16 and from 2019 to 2022, with minor fluctuations also observed between 2000 and 2004, indicating the state of divergence. The results suggest that external shocks can greatly amplify the divergence in prices, primarily through alterations in supply and demand dynamics. A combination of these factors contributes to the fluctuating timber-lumber price gap, with the impact varying between the divergent and stable market states. Moreover, findings suggest that the market tends to persist in a state of divergence, gradually adjusting back to the equilibrium.

Keywords: Economics, Economic Shocks, Market divergence, Markov switching, Timber market, Timber-Lumber price gap

Copula-based and Smooth Transition Autoregressive Models of the Law of One Price for sawtimber stumpage prices in the US South

Mateus Niroh Inoue Sanquetta, Bruno Kanieski da Silva, Jacek Siry, Pete Bettinger, Stephen Matthew Kinane

University of Georgia

Abstract: Timber markets in the Southern United States are driven by a dynamic interaction between numerous landowners and wood-consuming mills. These interactions are linked through market equilibrium conditions, where price movements are transmitted across various locations. To capture price transmission across multiple regions in the US South, we used Copula-based estimates and, Logistic and Exponential Smooth Transition Autoregressive models on pine sawtimber stumpage prices from 11 TimberMart-South markets from the States of Alabama, Florida, Georgia, North Carolina, South Carolina, and Tennessee. Prices were observed quarterly from 1976 to 2023. Our findings indicate nonlinear behavior in some price pairs and highlight the cointegration of different markets at different levels. In most of our scenarios, the price transmission occurred between $20 and $30. Landowners and timberland investors could use this study to assist their financial decisions after market shocks.

Keywords: Timber prices, Copulas, Sawtimber market, price transmission

Impacts of COVID-19 and contract changes on the financial performance of lumber futures

Nan Zhang, Bin Mei

Duke University

Abstract: The U.S. lumber futures market has exhibited substantial volatility since 2017. In our study, we employed the event study and the generalized autoregressive conditional heteroskedasticity (GARCH) model to explore the market's reaction to the COVID-19 pandemic and specific contract changes in 2022. We analyzed the abnormal returns, volatility, and trading volume of lumber futures, considering both the inclusion and exclusion of GARCH effects. The results reveal the varied reactions of lumber futures to external shocks and particular market events, as well as help us understand the financial performance of lumber futures.

Keywords: Financial performance; Event study; Abnormal return; Volatility

Chronic Wasting Disease

Abstracts for Oral Presentations

Impact of chronic wasting disease prevalence rates on the private land hunting benefits: Combined travel cost and contingent behavior model

Ram K. Adhikari, Neelam C. Poudyal, Robert K. Grala, Shaun Tanger, Kevin Hunt, Lisa Muller, James Henderson

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University of Tennessee
University of Arkansas at Monticello

Abstract: Most of deer hunting, a popular recreational activity in the United States, takes place on private lands. However, the spread of chronic wasting disease (CWD) in deer population has posed a significant threat to the hunter welfare as well as the sustainability of hunting as a population management tool. This study examined the impact of CWD prevalence rates on the net benefit of deer hunting access on private lands. A mixed mode survey of deer hunters (n = 2266) in CWD counties of Tennessee and Mississippi was conducted in Fall 2022. The combined travel cost and contingent behavior approach revealed that increased CWD prevalence rates have significant negative impacts on the net benefit of hunting trips. The findings showed that the consumer surplus of hunting access to the private lands decreased gradually with the increase of CWD prevalence rates. These findings provide new insights on the extent of CWD impact on the recreational value of deer hunting and can assist stakeholder of hunting industry in comprehending the economic implications of varying CWD prevalence levels and in devising effective disease control strategies for private lands.

Keywords: consumer surplus, deer hunting, white-tailed deer

What affects landowner intentions to manage CWD on their land?

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Mississippi State University
University of Tennessee

Abstract: Chronic wasting disease (CWD) is a fatal disease transmissible within the Cervidae family to animals such as white-tailed deer (Odocoileus virginianus), mule deer (Odocoileus hemionus), and elk (Cervus canadensis). Since its initial detection in Colorado in the 1960s, the disease has spread to both wild and captive cervids in North America, Europe, and Asia. CWD can result in a reduced survival rate, decrease population growth, and have undesired ecological and economic impacts. Although effective CWD management necessitates active engagement from various stakeholders, including forest landowners, little is known about landowner attitudes toward the disease and its management. This study investigated landowner behavior and their intentions toward managing CWD on their land. Data was collected through a randomly selected mail survey of landowners residing in CWD-affected counties of Mississippi and Tennessee. Landowners were aware of the presence of CWD in both states and expressed a high-risk concern about the health of the deer population and the potential transmission of the disease to other animals and cattle. Landowners' behavioral intention in response to CWD management revealed that they did not favor actions such as avoiding planting food plots, disallowing mineral licks, and granting access to agencies for deer harvest on their property. The findings will inform wildlife managers on how to develop more effective strategies aimed at increasing landowner participation in CWD management.

Keywords: Cervidae, human dimension, intention, landowner, management

Is CWD prevalence capitalized into a deer hunting lease price?

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University of Tennessee
New Mexico Highlands University
Mississippi State University
University of Arkansas at Monticello

Abstract: Lease hunting on private land provides opportunity for forest landowners and hunters to exchange hunting rights for hunting fees. However, the recent emergence of chronic wasting disease (CWD) in several southeastern states has raised serious questions regarding the future of the region's hunting economy. Our current understanding of whether and how CWD impacts the demand for, and value of hunting lease rate is limited. To fill this gap in knowledge, this study collected and analyzed lease hunting data from hunters in CWD impacted counties of Mississippi and Tennessee to quantify how CWD prevalence is capitalized into a hunting lease price. Market data on deer hunting lease in the CWD-affected counties was used to develop a hedonic model of lease value. Our preliminary results from IV-regression that accounts for the endogeneity in CWD prevalence in hedonic model show that the CWD discovery at the property level significantly and negatively impacts the lease price, whereas the detection near the lease property alone does not. Findings will be useful to landowners and other stakeholders in the hunting lease industry to understand the effect of game disease on lease demand and revenue.

Keywords: lease hunting, game disease, hedonic valuation, IV regression, land rent

Evaluating preferences for chronic wasting disease management options using latent profile analysis

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Texas State University

Abstract: Extensive research has explored hunters' support for chronic wasting disease management, but many studies do not account for differences between types of hunters nor the tradeoffs hunters make in their decision-making about management alternatives. To address these deficiencies, we used latent profile analysis to create different typologies of hunters based on a survey of Texas hunters, then analyzed discrete choice experiments investigating the CWD management preferences of these typologies. Across five hunter typologies, we found strong overall support for CWD management, although attitudes towards Texas Parks and Wildlife Department were variable. Preferences for CWD management policies greatly differed between each hunter typology. Wildlife agencies can refer to our findings to better develop hunter-preferred CWD management policies and identify areas of compromise between typologies.

Keywords: Management, hunter perceptions, choice experiment methodology

Professional Development & Labor

Abstracts for Oral Presentations

Impacts of COVID-19 on forestry migrant workers in the United States South

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University of Georgia

Abstract: The COVID-19 pandemic, a global health emergency, has disrupted many aspects of life and affected many sectors, including forestry. The US South's forest sector depends on temporary migrant guest workers who do jobs that are difficult to fill with local labor. The current study explored how the pandemic affected these migrant workers using a qualitative case study of a labor contracting company in the US South that supplies migrant labor for seedling nursery work, planting, and pine straw harvesting. We conducted 25 semi-structured interviews with migrant workers, supervisors, and employers. The workers had limited interaction with outsiders as they lived, traveled, and worked together, which reduced their exposure to COVID-19. However, this also increased the risk of transmission if one of them was infected, as there was limited opportunity to isolate the sick workers. Moreover, the workers did not have health insurance for non-work-related medical expenses, making them more vulnerable if infected. In June 2020, President Trump issued a proclamation suspending new H-2B workers from entering the country until the end of the year. In August 2020, the Department of State issued guidance that forestry work could be exempt from the ban considering national interest reasons. However, the situation caused a delay in the arrival of H-2B workers, resulting in less planting activity and losses for seedling nurseries that had to discard unused seedlings. The findings demonstrate the major impacts of the pandemic on migrant workers and provide information that could inform future policies and practices to mitigate such impacts.

Keywords: Management, migrant labor, COVID-19, H-2B program

Cultivating Leadership Roles in the Forest Industry: Navigating Challenges and Fostering Growth

Shanna Knowles

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Abstract: Leaders in the forest industry must skillfully balance their efforts to foster sustainability, drive innovation, and navigate the complex array of employee challenges inherent in the workplace. Whether you are an owner, supervisor, or company leader without a formal title, collaborative efforts to create the desired culture within an organization are paramount to achieving success. Leaders often have the technical expertise and training needed to perform their job in the forest industry, but lack the training on how to deal with complex issues such as employee commitment, delegation, conflict management, establishing culture, or promoting diversity and inclusion. By equipping employees with fundamental leadership skills, businesses can not only add value to their operations but also foster a culture of continual improvement. This session will delve into leadership strategies aimed at empowering and inspiring professionals in the forest industry, thereby enhancing organizational performance and maximizing productivity.

Keywords: Leadership, management, productivity, ethics, conflict management, diversity, inclusion

Adapting the Forestry Capstone Experience to Current and Emerging Needs in Forestry

Eric McConnell

Mississippi State University

Abstract: Forestry programs around the world often culminate with a capstone course where students apply the knowledge, skills, and abilities gained during their academic training to an experience-based project. As national policy evolved, US forestry curricula likewise broadened from an original focus on timber supply to one of multiple resource use to the current paradigm of holistic ecosystem management. Consequently, forest management planning has advanced beyond just timber concerns to non-timber products, recreation, aesthetics, and non-market ecosystem services (e.g., runoff mitigation, health benefits, etc.) to meet broader social goals- all while respecting private sector land use and property rights. Certification of timber products and forest management practices as sustainable (e.g., SFI, etc.) is now an integral step to ensuring producers can compete in global markets. Forestry capstone courses must likewise progress to meet not only current forest sector needs but also those emerging that challenge professionals management of resources, finances, and people.

This presentation will briefly overview the current capstone course offered at Mississippi State University's Department of Forestry (FO 4423 Professional Practice), concepts discovered from the literature, along with thoughts on what may be missing. More important is opening dialogue to discuss views and experiences among attendees. Many participants experienced a forestry capstone course at some level, whether as a student, instructor, or reviewer of student teams and their management plans. The goal is to share perspectives on what works, but even more so, what did not- or has not yet- and why that might be so.

Keywords: Experiential learning, Forestry education, Forest Management and Planning

Arkansas Logging Business Analysis

Patrick Phillips, Matthew Pelkki, Kevin Boston

University of Arkansas at Monticello

Abstract: Key components of logging businesses include worker demographics, workforce training, logging infrastructure and capacity, general financial health, supply contract agreements, insurance availability and cost, and human resources management. A multimode survey of Arkansas loggers has been developed and will be presented, along with preliminary results from initial survey returns.

Keywords: economics, logging, supply chain, economic development.

Carbon

Abstracts for Oral Presentations

Forest Carbon Credit in the U.S.: Economics, Politics or Environmental Perceptions?

Sofwaan Ademonla Bakary, Noel Perceval Assogba

University of Tennessee

Abstract: We investigate the factors influencing enrollment in forest carbon programs in the U.S. using a fixed effect model and data from 2005 to 2022. Our results show that state income level and the political party of state governors influence enrollment in forest carbon programs in the U.S. These findings highlight the role of income level and politics in the success of forest carbon credit programs.

Keywords: Forest Carbon, Economics, Politics, Fixed-effect model Environmental perceptions.

An agent-based model for considering the trade-off between profit and carbon sequestration

Fatemeh Rezaei, Bruno Kanieski Da Silva, Jesse D. Henderson, Mohammad Marufuzzaman, Tanger Shaun

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USDA Forest Service
Mississippi State University
University of Arkansas at Monticello

Abstract: Understanding landowner behavior and their harvesting decisions in response to timber demand is crucial for promoting the economic and ecological sustainability of forest resources. In this paper, we employ an agent-based model to explore the interactions among forest landowners, wood-using mills, and a carbon offset aggregator as market agents to provide insights into the decision-making trade-offs faced by forest landowners. We develop a simulation-based model based on common landowner decision criteria in the US South. In this model, landowners harvest timberland to maximize their expected net present value (eNPV) while taking carbon sequestration into account. Our model examines the trade-off between timber harvesting and harvest deferral for carbon sequestration based on landowners' environmental awareness. We consider different scenarios to demonstrate the impact of various parameters, including carbon market price, timber price, timber demand, and landowners' awareness, on the amount of carbon sequestration. Our simulation findings indicate a positive association between carbon sequestration and landowners' environmental awareness. Increasing landowners' environmental awareness has a more significant impact on carbon sequestration than carbon market price. This line of inquiry can provide valuable insights for aggregators and forest products mills on strategically planning which wood basins are more suitable for their needs. Additionally, it allows landowners to better comprehend an additional income source (carbon offsets) and complement it with more established sources of income. The study also suggests that an efficient way to promote carbon sequestration is by increasing environmental information among landowners.

Keywords: Economics, Agent-based model, harvest policy, carbon sequestration

On the carbon additionality of working forests

Richard Mei

Duke University

Abstract: Using a hypothetical 62,742-hectare working forest in New Brunswick, Canada, we examine the benefit and cost of carbon additionality at the landscape level. The baseline scenario is set to maximize timber profit over a 100-year planning period, whereas the carbon scenario is set to have a 5- or 10-year rotation extension. Results from the discounted cash flows show that, at a carbon price of $8/tCO2e, the benefit of additional carbon sequestration from the working forest cannot offset its cost, which is the loss of timber income from deferred harvests over the 20-year crediting period. Compared with the 5-year extension scenario, the 10-year extension scenario stores more carbon and generates a higher total benefit but with the compromise of a lower benefit-cost ratio. Given the cost of forest carbon outweighs the benefit, government interventions might be needed to incentivize landowners to produce carbon credits.

Aligning private and societal objectives through harvest deferral-based carbon programs

Pedro Sartori, Stella Schons, Gregory Amacher

Virginia Tech University

Abstract: Forest carbon programs based on harvest deferral have been widely discussed in the literature and have caught much attention of woodland owners, carbon developers and extensionists as these programs flourish. Whereas important concerns about access and participation in carbon programs by woodland owners abound, little have we discussed about how to align their efforts with societal climate change mitigation goals. We propose an incentive-based policy or program that pays landowners to extend their forest rotation from the private to a socially optimum rotation age. We analytically derive the landowner's optimal decision in the presence of a carbon subsidy or payment, which corresponds to the marginal cost of carbon abatement. The subsidy or payment value is defined based on the social cost of carbon and the half-life of the forest products (sawtimber) the forest carbon is stored into (marginal benefit of abatement). Then, we simulate how the optimal rotation age changes for three different site indices and different social discount rate and forest products half-life assumptions. The higher the site index, the smaller the extension time due to the higher land and capital opportunity costs. Higher social discount rates increase the marginal benefit and push the socially optimum rotation age further in time, while decreasing the sawtimber half-age reduces the marginal benefit and, therefore, the socially optimum rotation age.

Keywords: economics, carbon program, harvest deferral, nonindustrial private landowners

Forest Valuation

Abstracts for Oral Presentations

Developing a Supply Chain Model for Sustainable Aviation Fuel Using Logging Residues in Georgia, United States

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University of Georgia
University of Illinois Urbana-Champaign

Abstract: Sustainable aviation fuel (SAF) as a drop-in fuel from biomass feedstocks has the capacity to reduce carbon emissions and provide resiliency to the aviation sector, considering volatile conventional aviation fuel (CAF) prices. The objective of the study is to develop a supply chain model for SAF derived from unutilized logging residues coming from harvest and thinning operations across Georgia, a prominent forestry state located in the southern region of the United States. We employed a mixed-integer linear programming (MILP) model to minimize the total discounted cost of the SAF supply chain using the Ethanol-to-Jet (ETJ) production pathway for 10 years of operation. Our model provided unit production costs of US$2.04 L-1, US$2.15 L-1, and US$2.36 L-1 for the high (20%), medium (10%), and low (5%) demand scenarios of the SAF supply chain model, respectively, for the Hartsfield-Jackson Atlanta International Airport. The capital investment and operating cost at bio-refineries accounted for 61.5% and 17.5% of the total unit cost. The GHG intensity of the SAF was 1.08 kg CO2e L-1, 1.07 kg CO2e L-1, and 1.06 kg CO2e L-1 for high, medium, and low demand scenarios, respectively, providing about 62% of carbon savings relative to CAF. The supply chain model suggested 74 biomass processing units (BPUs) and 13 bio-refineries across Georgia under the high demand, 37 BPUs and 7 biorefineries under the medium, and 19 BPUs and 4 bio-refineries under the low SAF demand scenario. Our study is expected to provide new insights into the emerging SAF market in Georgia.

Keywords: Management, Bioenergy Supply chain, Mixed-Integer Linear Programming, Sustainable Aviation Fuel, Logging Residues

Dynamic Optimization in Stochastic Primary Forest: A Case Simulation in Amazon Basin

Fayu Chong, Gregory Amacher, Kelly Cobourn

Virginia Tech University

Abstract: This paper considers the shift from primary forests to cleared land and secondary forests in the context of deforestation. This process is known to lead to irreversibility in the sense that ecosystem values are lost. In the worst-case scenario, there is a risk of ecosystem functions collapse at great social cost. We are interested in the irreversible land use transition that defines the tipping point as an ecosystem collapse. Past literature has discussed rotation issues under stochastic settings of price, or stocks volume and/or amenity values, however, we extend this body of work to show how stochastic processes concerning primary forests could lead to ecological collapse. Drift and volatility in these processes explain different types of shocks in tropical forest systems, such as fire, drought, or climate changes, and these are mechanisms that can drive ecosystem function to collapse. Common examples of severe ecosystem damage include the irreversible change from tropical forests to grassy savanna, fire events, and other climate problems. We test how drift and volatility determine the timing of a tipping point in the standard deforestation model where primary and secondary forests, as well as agricultural land, are present and determinants of the ecosystem function. The simulation approach examines the sensitivity of critical market and land use parameters to the probability of collapse under each specific setting. We find that stochasticity generally increases the threat of ecological collapse and extends the time to the turning point, highlighting the importance and urgency of policy solutions.

Keywords: deforestation, ecosystem collapse, stochastic dynamic programming

Terminal value: A crucial and yet often forgotten element in timber harvest scheduling and timberland valuation.

Bruno Kanieski da Silva, Fatemeh Rezaei, Tanger Shaun, Jesse Henderson, Eric McConnell, Changyou Sun

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University of Arkansas at Monticello
US Forest Service
Mississippi State University

Abstract: A forest investment's returns are generated from three sources: the land's gain in value, the timber's growth in size and product class improvement, and the timber price change. Land appreciation is rapidly leading to an inverse relationship with tenure. This phenomenon has turned what was once an academic exercise of land appraisal into a practical one that incorporates the asset's terminal value. We found that failing to account for the terminal value can lead to sizable differences in forest value, although those differences diminish with increasing planning time horizons. The findings can be of use to those who conduct appraisal work for larger timberland owners because (1) land held under short holding times has offered an increasingly large share of timber supply, (2) classical models fail to capture the complexity of management decisions under this regime, and (3) "short term" holders face a terminal value risk, which we evaluate through scenario analysis.

Keywords: Terminal Value, Forest Appraisal, Timberland investments, Sustainable Forest Management

Comparing financial returns of regionally important forest cover types across the United States

Curtis L. VanderSchaaf

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Abstract: The art and science of forest management is practiced on many acres in the Lake States, Pacific Northwest, and Southeast regions of the United States. These forests provide woody fiber for timber products, biomass for heat and electricity, hunting and recreational opportunities, wildlife habitat, they sequester carbon, among other benefits. Forest products produced from the harvest of these forests includes pulp and paper, oriented strand board, and lumber. This analysis compares the per-acre financial returns of a few select, but widely managed, cover types/species in these regions. The objective is to provide an example of how these types of analyses can help foresters, managers, planners, and legislators determine the competitive status of their forests. Regional comparisons can help determine if local tax incentives and particular management regimes, such as extended forests, cover type conversions, etc., create an advantage or disadvantage to managing in a sustainable, but economically wise manner. In today's global economy, it's important to realize that providing economic opportunities and incentives can produce investment in primary and secondary wood production facilities. When states market their forest resources, it is important to know how growth and yield and financial returns of common cover types compare to other regions of the country. This can aid states in marketing and attracting investment from both nationally- and internationally-owned wood processing companies. Cover types analyzed include Aspen/Balm (ABg) and red pine plantations from the Lake States, Douglas-fir plantations from the "Westside" of Oregon and Washington, and loblolly pine plantations from the Western Gulf.

Keywords: growth and yield, economics, forest management, management, silviculture

Public Land

Abstracts for Oral Presentations

Perceptions and reality: How National Forest System employee views correlate with frequency of unsold timber offerings

Sonia R. Bruck, Gregory E. Frey

USDA Forest Service

Abstract: “No-bids” are timber tracts that are offered for sale and do not receive any bids from prospective buyers. Timber contracts that are put up for sale by the National Forest System (NFS) can take significant time and effort to assemble and may result in lost ecosystem management or income to the agency if unsold. A survey was administered to NFS employees in 2021 to explore their perceptions of reasons for no-bids. The goal of our analysis was to cross-validate employee perceptions of no-bid offerings against observational data from the Timber Information Manager (TIM) database. We found that underlying factors, such as perceptions of market information and unplanned road costs, were positively correlated with observational data. However, perceptions of proximate causes, such as marketability risk and hauling costs, were not validated. Our findings may suggest that bidders themselves have a better understanding of proximate causes, while NFS employees handle underlying factors more regularly.

Keywords: Management; No-bids; Timber sales; Timber auctions

Nuisance or not? Tourism impacts from Spongy Moth tree defoliation in U.S. National Parks

Sonia R. Bruck, Matthew R. Sloggy, Tom Coleman, Michelle Thompson

USDA Forest Service
Oak Ridge Institute for Science and Education (ORISE)

Abstract: Spongy moth (Lymantria dispar), a non-native invasive pest, was introduced to the northeastern United States in 1869. Spongy moth is a polyphagous tree defoliator, preferring oak species (Quercus spp.). Infestation events have the potential to reduce benefits for recreation visitors due to poor scenic quality and treatment area closures, among other nuisances. Previous research assessing the impacts of spongy moth infestations on tourism have primarily relied on survey methods. In contrast, we gathered 17-years of visitor day data from the National Park Service's database to assess the causal effects of spongy moth defoliation events. Our findings suggest that defoliation from spongy moth reduces the number of visitor days in the same year as the defoliation event, as well as in the year that follows.

Keywords: Economics; Invasive species; Tourism and recreation; Revealed preference

Reacting to Stumpage Price Market: A Review and Descriptive Analysis of the Roll-Back Factors in State Timber Sale Programs

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Abstract: Determining the advertised price involves appraising timber and establishing its fair market value, a figure that varies depending on the organization conducting the appraisal. Subsequently, a rollback factor or room-to-bid is often applied to secure adequate competition, mitigate potential shifts in the forest products industry market, and accommodate the risks associated with economic conditions. While the timber appraisal process is firmly established in state timber sale programs, adapting to economic downturns or market fluctuations necessitates adjusting the room-to-bid percentage. This paper begins by scrutinizing the rollback factor employed by select state agencies and the U.S. Forest Service. Specifically, it delves into the calculation and application of the rollback factor to determine the optimal advertised price. Utilizing Michigan DNR timber sale data, this study investigates whether modifications in the room-to-bid have resulted in a decrease in the average stumpage price or have caused conditions of no-bid or over-bid sales. The findings from this research will offer recommendations to inform decisions regarding setting the rollback factor.

Keywords: stumpage price, roll-back factor, economics, appraisal, timber sales, room to bid

Forest Disturbance

Abstracts for Oral Presentations

Socioeconomic drivers of emerald ash borer invasions in the United States

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Texas A&M University

Abstract: The Emerald Ash Borer (EAB), Agrilus planipennis Fairmaire, has been devastating ash forests in both rural and urban settings in North America by killing millions of its host trees since it was unintentionally introduced from Asia. EAB infestations have caused adverse ecological, economic, and social consequences including negative impacts on human health. Both biophysical and socioeconomic factors are attributable to EAB invasions. Using machine learning algorithms, we attempt to identify predictors for annual EAB spreading in the eastern United States. Although international trade might be the blame for the introduction of EBAs to the United States, socioeconomic factors seem to have played a minor role in EAB spreading in the eastern United States. The most important feature for predicting EAB spreading is host characteristics, followed by weather and socioeconomic factors. Our findings can aid in developing and deploying more effective EAB monitoring and controlling strategies while enhancing the understanding of EBA invasion drivers.

Keywords: Emerald Ash Borer (EAB), machine learning, predictive models, sample balancing method, and invasive species management

A Tree Falls in the Woods: Shocks to International Trade

Jesse D. Henderson, Craig M. T. Johnston, Jeffrey P. Prestemon, Jinggang Guo, Jennifer Costanza

USDA Forest Service
Bank of Canada
Louisiana State University

Abstract: Wind damage is a threat to forests that in the extreme case can lead to total economic losses as well as forest carbon losses. The influx of downed timber following extreme wind events has been shown to induce shocks in markets at local and regional levels. In this study we develop methodologies to estimate the annual forest stock shocks due to wind. We estimate probability densities of area percentages subject to wind damage based on Forest Inventory and Analysis (FIA) data. We also explore empirical relationships between area damage rates and volume loss. The resulting methodologies are applied to an international context by incorporating wind damage occurring in the United States within a global forest product model, the Forest Resource Outlook Model (FOROM), to assess the significance of wind disturbance on global forest product markets and international trade.

Keywords: economics, hurricane, disturbance, forest sector

Impact of Hurricanes on Forest-Based Employment in the Southern United States: A Case of Hurricane Michael

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USDA Forest Service

Abstract: The extent and intensity of forest disturbances such as fires, insect and pest infestation, and hurricanes can significantly influence forest inventory and the forest-based supply chain in the short and long run. Devastating events, such as hurricanes, cause tree damage and mortality that results in direct economic loss to forest landowners. The resulting loss in quantity and quality of timber supply can negatively impact the local forest industry as well. Using Hurricane Michael as a case, we evaluate the impact on forest-based employment in the hurricane-affected region. We employ a causal inference (Difference-in-Differences) modeling approach using a set of exogenous variables characterizing each southern county (between 1999 and 2022) in terms of base economy, mill capacity, forest resources, and population, among other relevant features. We hypothesize that Hurricane Michael significantly impacted forest-based employment in the affected counties in Florida and Georgia. Additionally, we expect to observe the impacts on neighboring areas that could result from potential shifts in wood procurement by mills beyond hurricane-affected areas.

Keywords: Economics, Hurricane, Forest Employment, Causal Inference, Southern United States

Stakeholder Behavior

Abstracts for Oral Presentations

Factors Affecting Missouriland Mangers' willingness-to-adopt Agroforestry Practices

Kelsi Stubblefield, Zhen Cai *, Sarah Lovell, Mary Hendrickson, Matt Smith

USDA Forest Product Laboratory

Abstract: Temperate agroforestry practices offer various ecological, social, and economic benefits, yet these systems are not prevalent on the US agricultural landscape. Furthermore, data surrounding adoption of agroforestry in the US remains unclear. A survey of Missouri agricultural land managers was conducted to determine the extent of agroforestry adoption in the state, current knowledge and perceptions of agroforestry, and interest in implementing agroforestry practices. A choice experiment model was employed to assess participants' willingness to accept (WTA) payment for adopting agroforestry practices and to determine land managers' valuation of technical assistance and environmental benefits. Across the sample, self-reported agroforestry knowledge was minimal to low. Perceptions of agroforestry systems for management and economic aspects were mixed, but perceptions of agroforestry for promotion of biodiversity and environmental services were especially positive. Using a mixed logit regression model, if cost to establish a given agroforestry system was $2,500 per acre, it was determined that the average Missouri land manager would accept a payment of $7,697 per acre to implement agroforestry. Additionally, among those who were willing to implement agroforestry technologies, technical assistance was valued at $1,670, while environmental benefits were valued at $2,992. In a second model constructed to assess interaction variables, participants with greater knowledge of agroforestry practices were significantly more willing to adopt agroforestry practices, as well as those with higher incomes. Participants with larger farms were less likely to engage with agroforestry. Additionally, those who agreed with statements regarding agroforestry's ability to improve soil health were significantly more likely to express interest in implementing agroforestry practices.

Assessment of Landowner Willingness to participate and implement a forestry cooperative in the state of Arkansas

Patrick Phillips, Matthew Pelkki

University of Arkansas at Monticello

Abstract: Nonindustrial private forest owners are an important element of the forestry sector in the state of Arkansas. As prices for wood products increase, landowners often do not see a proportional increase in stumpage prices and profits from timber harvesting. Increasing landowner market access, assistance in management services, and certification is vital to facilitating success in the timber industry in Arkansas. Developing a landowner owned and controlled cooperative in the state might be an answer to solving landowner needs and issues. Historically, forest cooperatives have not been successful in the US South. We believe that identifying critical aspects of a cooperative model for forestry is key to its success. As part of the initial phase of this project, focus group discussions with landowners will identify critical components of a forestry cooperative business model. Our preliminary findings indicate equal sharing of profits, retaining land ownership rights, privacy, and liability issues are important to landowners. The results of these focus groups will be used to construct a statewide multimode survey that gauges general landowner interest in cooperatives, expand on the elements landowners would deem as critical to the business model, and identify potential participants in the formation of a cooperative.

Keywords: economics, landowners, cooperative, economic development.

Wildfire & Prescribed Burning

Abstracts for Oral Presentations

Self-efficacy toward prescribed burning among female and male family forest landowners in Georgia, US

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Abstract: Around 9.6 million family forest landowners collectively own 36% of the forestland in the United States (US), playing a vital role in managing and shaping the forests across the country. There is an array of forest management practices that these families can pursue on their forestlands, including prescribed burning, which, although controversial, is a tool with many social and environmental benefits, such as hazardous fuels and wildfire reduction. Drawing on mail survey data to family forest landowners in Georgia, US, this study examines, through structural equation modeling and significance testing, how gendered self-efficacy (i.e., beliefs about gender roles in forestry, confidence in forest management skills, and knowledge about prescribed burning), predict intentions to carry out prescribed burning among female and male forest landowners. Our results show that male respondents believe in masculine gender roles in forestry, have more confidence in their forest management skills and their self-reported knowledge about prescribed fire, and are more likely to carry out a prescribed burn in the near future, compared to their female counterparts. Exhibiting high self-efficacy in terms of confidence in own's forest management skills and prescribed burning knowledge increases the likelihood of prescribed burning intentions among family forest landowners. On the other hand, low self-efficacy among female family forest landowners is a negative predictor for their prescribed burning intentions in the next five years. We conclude that boosting female forest landowners' self-efficacy through same-gender peer learning groups would increase their prescribed burning intentions, benefiting their forestlands, the southern forested landscape, and society.

Keywords: Management; gender roles; women; confidence

Assessing the Effect of Climatic and Non-Climatic Variables on Wildfire Suppression Cost

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Abstract: Over the past three decades, there has been a substantial rise in the extent of wildfires. As a result, wildfire management organizations such as the USDA Forest Service are facing higher costs in their efforts to control these fires. This study used time series analysis and monthly data to investigate the significant seasonal effects, predict the impact of variables on suppression costs and assess the joint distribution of variables by using copulas (potential nonlinear dependencies). The suppression expenditure of USDA FS, Niño 3.4 SST, NAO, and LF implies seasonality. A strong positive dependency was observed between Niño 3.4 (1.38) and suppression expenditure of Western aggregated regions of USDA FS with upper tail dependency (0.35), PDO has a dependency value of 0.34 and a lower tail dependency (0.87), and the PDSI has a negative dependency (-0.09) with no tail dependency. On the other hand, only Niño 3.4 (-0.55) showed a negative dependency with suppression expenditure of the Southern region, and AO (0.59) showed a strong positive dependency, and both indicated no tail dependency. Suppression costs represent different dependencies results with other variables. This study suggests modeling suppression expenditure on the appropriate temporal scale to predict and understand different variables impact on expenditure.

Keywords: wildfires, suppression costs, wildland-urban interface, climate change

Poster Presentations

Abstracts

The economic contribution of support activities for forestry in New Mexico

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Abstract: The forest products industry is an important contributor to New Mexico's economy. Particularly, the support activities for forestry help improve forest health and contribute other forestry related economic activities including outdoor recreation. A periodic assessment of the contributions of the forest products industry is necessary to illustrate the importance of this sector to policymakers and other stakeholders. Using the input-output model, we analyzed the economic contribution of the forest products industry to New Mexico's economy between 2013 and 2022. We found that the forestry sector created more than 4,517 jobs and contributed $380 million to the state's economy in 2022. Between 2013 and 2022, the total economic contribution of the forest sector decreased, however, the contribution of a specific subsector, i.e., support activities for forestry were increased. The increase of economic contribution from the support activities for forestry was associated with forest restoration activities including prescribed fire and thinning operations. This result suggests that non-traditional forestry businesses such as forest restoration activities are more promising in New Mexico.

Keywords: forest industry, input-output model, outdoor recreation, prescribed fire, and thinning

The interlink between Diversity Equity Inclusion (DEI) and Economics: A review of the Forest and Wood Products Workforce Literature

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Abstract: The Forest and Wood Products (FWP) Inclusion Council was founded by the U.S. Endowment for Forestry and Communities to unite the forest sector in addressing the obstacles encountered regarding diversity, equity, and inclusion (DEI) in the FWP sector. This study is a part of a larger research project funded by the Inclusion Council with an aim to understand the current FWP workforce. Utilizing a concept-driven systematic literature review approach proposed by Webster and Watson, we identified 1,047 potential articles from Web of Science database by Thomson Reuters. While these articles are also being used for another study, this presentation will focus on how DEI issues interlink with economics. Employing inclusion and exclusion criteria such as search strings, scientific contribution, and location (U.S. and Canada only), we identified seven documents consisting of four articles and three theses/dissertations. We followed a qualitative content analysis approach and found emerging DEI themes in the workforce literature. While equity and inclusion were not apparent, we found three emerging “diversity” themes: economic diversity, employment diversity, and community diversity. Preliminary findings from the reviewed studies reveal the relationship between economic and employment diversity with the local/regional economic performance. For instance, communities relying on a single economic activity (i.e. high forest dependence) tend to underperform in terms of higher unemployment and lower per capita income. This highlights the importance of economic diversification as a strategy to reduce the local vulnerability to disruptions in the forest sector.

Keywords: Economic diversity, economic wellbeing, employment diversity, community diversity, poverty.

Afforestation/Reforestation and Avoided Conversion Carbon Offset Programs in the United States

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Abstract: Afforestation/Reforestation (A/R) and Avoided Conversion (AC) are two important types of carbon offset programs aimed at restoring tree cover and preventing the conversion of lands at significant risk, while also generating a high volume of carbon offsets. However, little is known about the status of existing A/R and AC projects within the voluntary carbon market. We compiled a database of all A/R and AC projects registered under three public registries: American Carbon Registry, Climate Action Reserve, and Verra. We gathered and examined the project design, verification, and implementation reports of a total of 51 projects, including the avoided grassland conversion projects. Results revealed that existing A/R and AC projects were distributed across eight different states, covering total areas of 58,722 acres and 111,896 acres, respectively. While larger projects were concentrated in the Western region, with California accounting for a significant (~ 70%) portion, more than 84% of carbon offset credits were issued for the projects developed in the Southeastern region. We also found that the number of credits issued by the ownership type varied considerably between A/R and AC project types. This study offers comprehensive insights into the A/R and AC carbon programs in the United States.

Keywords: Carbon Emissions Reduction, Carbon Offset Markets, Natural Climate Solutions, Management

A Profile of Alabama's Logging Community: Demographics and Challenges Identified by a State-wide Survey

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Abstract: We report on a statewide survey of logging business owners in Alabama completed in the spring of 2023 with the goal of collecting information about the current economic climate for logging businesses in the state. The survey is an extension of a survey conducted in the state of Georgia at five-year intervals since 1987 and in South Carolina since 2012. We expect that receiving a survey from loggers' state forestry school from researchers they are familiar with will maximize response rates. The Alabama survey was led by Alabama A&M University in partnership with the Alabama Loggers Council and was conducted by mail with additional phone interviews with non-respondents.

The survey provides data on logging company size, timber source, timber buyer, production, and age, as well as demographic information about business owners and employees themselves. In addition, the loggers provided examples of business challenges and concerns about current and future aspects of logging. These findings can offer state agencies, logging and forestry associations, and university researchers a knowledge base to help form policy options and business or educational opportunities to address these challenges.

Keywords: Economics, logging industry, statewide survey

Economic Potential of Improved Loblolly Pine for Carbon Trading in Southeastern USA

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Abstract: Improved loblolly pine varieties demonstrate accelerated growth and biomass, enhancing distinct carbon sequestration rates (MtCO2e/acre), suggesting the potential for enhanced long-term profits through longer rotations. With anticipated increases in carbon prices, optimizing loblolly management for both timber production and participation in carbon markets emerges as a strategic goal for boosting additional income for landowners. This study will estimate land expectations value to compare cost-benefit analysis on hypothetical scenarios of loblolly plantations in Southern USA, comparing various varieties, including Open-pollinated, Mass Control Pollinated, and Varietals. The research anticipates that landowners adopting these improved loblolly varieties will experience increased profitability, capitalizing on the dual benefits of wood products and carbon sequestration for potential inclusion in carbon trading initiatives. Notably, carbon markets and trading are relatively emerging in the Southern United States, and exploring the untapped potential of improved loblolly varieties is a unique aspect of this study. By shedding light on the economic viability and ecological benefits of cultivating these plantations, this research aims to contribute valuable insights into the evolving landscape of sustainable forestry practices, especially in regions where carbon markets are still in their early stages.

Keywords: Economics, Improved Loblolly Pine, Carbon, Southern USA

Perceived risks of eastern redcedar encroachment among rural and non-rural residents in Oklahoma

Carson Raper, Omkar Joshi, Chris B. Zou, Rodney E. Will

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Abstract: The encroachment of Eastern redcedar (Juniperus virginiana, ERC) in the Great Plains has profoundly impacted the natural ecosystem and increased the fire risks at the urban-wildland interface. Many of the risks result directly from fire exclusion, which is among one of the most prevalent enablers of the invasion of ERC. With its rapid encroachment in sub-urban areas, active management is necessary to prevent further damage. A survey was conducted to assess the knowledge of ERC encroachment and perceived risks among the general non-rural (urban/suburban) and rural general residents in Oklahoma. Collected data were processed through ordinal logistic analysis. Findings indicated that individuals with knowledge of ERC encroachment, elderly residents, and those perceived to have longer drought periods were more likely to have a perceived risk of ERC encroachment. Additionally, respondents in rural areas were more knowledgeable about ERC encroachment than their urban or suburban counterparts. Study results suggest the need for outreach to educate urban and suburban populations on the potential negative impacts of ERC encroachment.

Keywords: Brant test, urban population, active management

Enhance certification program adoption among family forest landowners: perspectives from foresters

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Abstract: Forest certification programs play a crucial role in promoting sustainable forest management, addressing environmental concerns, and meeting market demands. Despite their potential benefits, family forest landowners (FFLs) in the southern United States face challenges in adopting these programs, with less than 10% of their forests currently certified, though they own over 60% of the region's forests. Foresters are the most important advice and assistance provider for FFLs, and understanding their perspectives on the challenges in improving certification program among landowners is crucial. The objective of this study is to gather foresters' insights of communication with family landowners on certification associated information and to explore efficient and effective communication methods and tools. A regional Qualtrics survey involving 564 registered foresters in Arkansas, Louisiana, and Texas was conducted in the summer of 2023, with a response rate of 34%. Correlation methods were employed to examine the relationship between communication information, methods, dissemination tools, and the certified acreage of FFLs. The findings revealed that over 40% of FFL clients adopted certification programs in the past five years, with a median acreage size of 100 acres. Furthermore, more than 50% of these certified landowners were small FFLs with acreage ranging from 10-100 acres. The study aims to contribute to the understanding of communication challenges between foresters and FFLs, particularly small and family landowners, which is critical for increasing forest certification adoption rates. We are currently working on further data analysis using different statistical methods and will report the results on the ISFRE meeting.

Keywords: Forest certification, Forest management, Forester's perspective, Family Forest Landowners, Communication Methods, Communication Tools

Mississippi Log Trucking Liability Insurance Rates: A Hedonic Analysis

James Shannon, Eric McConnell

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Abstract: Rising liability insurance rates have negatively impacted log trucking businesses, and consequently timber prices, in Mississippi. Business owners were surveyed for data to construct a hedonic regression model to identify log trucking business characteristics influencing annual liability insurance premiums. Attributes' marginal implicit prices were then calculated at the predicted premium, $11,358, when all were entered at their sample averages: years hauling, 20.3 years; owner age, 51.3 years; miles per year per truck, 69,531; haul distance, 56.5 miles; loads per week, 16.9; number of drivers, 3.91, number of safety violations per year, 0.19; number of service violations per year, 0.04; number of weight violations per year, 0.83; number of safety technologies and practices instituted, 7.03. Each year of owner experience decreased mean insurance premium by -$68.15 ($p = 0.04$). Each additional 1,000 miles traveled by log trucks contributed $40.00 ($p < 0.01$); each safety violation accounted for $3,125 ($p = 0.01$); and an overweight violation influenced the mean insurance premium by $1,230 ($p = 0.03$). Investments of time (e.g., regular equipment inspections, completing needed repairs, and scheduled preventative maintenance) and finances (purchasing truck scales, telematics, etc.) would reduce negative roadside inspection results, and most importantly crashes, that contribute significantly towards escalating liability insurance premiums.

Keywords: Marginal Implicit Price; Revealed Preference; Timber Harvesting

Impacts of mill wait length on owner-operator log truck driver net revenues in the Western Gulf

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Abstract: Forest harvesting allows landowners to manage their forests and to receive financial compensation for their capital investment. After felling, skidding, delimbing and often topping, and merchandizing of trees, logs must be loaded onto a truck for the hauling of that raw woody resource to a mill. Mills commonly pay for hauling with a haul rate that is calculated per ton per loaded mile ($/ton/loaded mile). This analysis is focused on owner-operator truck drivers. These self-employed drivers pay for the truck and trailer and associated insurance, licensing, maintenance, fuel, mandatory training, salary, fringe benefits such as health insurance, retirement, etc.
This analysis looks at the impacts of mill waits, along with basic assumptions about insurance and diesel costs, hauling conditions and maintenance costs, and varying rates of salary received per load ($/ton/loaded mile of $0.13 to $0.23 by two cents), on the net annual revenue of an average log truck driver. Here, no costs related to purchasing the truck and trailer were included. We all should be extremely concerned about adequate salaries to log truck drivers; without these drivers, forest management options become minimal.

Keywords: logging, forest harvesting, tractor-trailers, finance

Growth, carbon storage potential, and economics of loblolly pine plantations for marginal forestlands

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Oklahoma State University
Oregon State University

Abstract: While the southeastern corner of Oklahoma has an active forest industry supported by approximately one million acres of pine plantation, lands to the north and west mostly are not managed for forest products because of a lack of markets, precipitation deficits that limit productivity, unproductive soils, and previous land use conversions. These marginal lands have the potential to contribute toward climate change mitigation through afforestation or improved forest management. To understand the growth potential and the economic viability of afforestation of these marginal lands, we estimated the total stand carbon of loblolly pine plantations using the Forest Vegetation Simulator. We further conducted a relative price analysis to understand the tradeoffs between carbon-focused management and the traditional pulp-sawtimber based forest management. Our findings indicate that financial returns from carbon focused forest management are profitable until the majority timber products are in pulpwood sizes (<12 inches). Similarly, in comparison to productive timberlands, the differences in financial returns are relatively modest in the marginal forestlands. Study results provide insights for private landowners, timber industries, and other stakeholders interested in carbon market opportunities.

Keywords: Net present values, discount rates, relative prices

Quantitative Assessment of Ecosystem Services in the Cross-Timbers Ecoregion: A Comparative Study of Agroecosystems and Tradeoffs

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Abstract: Grasslands and oak woodlands in the Cross-Timbers Ecoregion of the south-central Great Plains are at risk of ecosystem transition to juniper (Juniperus virginiana L., redcedar) woodland or conversion to biofuel production using monocultures of perennial grass. While many studies investigated the ecological and hydrological impact of these transitions, there are few systematic and balanced assessments of the impact on multiple ecosystem services to inform land management decisions. This project employed a quantitative approach to assess a suite of services provided by different agroecosystems within the Cross-Timbers Ecoregion of Oklahoma. To accomplish this, four agroecosystems (native grassland, oak woodland, juniper woodland, switchgrass feedstock system) were selected, and eight ecosystem services, including supporting services (plant biodiversity, aboveground net primary productivity), provisioning services (water quantity, forage production), regulating services (soil organic carbon, flood regulation), and cultural services (recreation, aesthetics), were identified for balanced assessment. These services were quantified using data collected over the past decade. Each service was assessed and ranked across different agroecosystems to calculate environmental sustainability indicators. Individual services were weighted based on an expert survey to determine the maximum aggregate sustainability of each agroecosystem. Our preliminary results suggested that the native grassland and oak woodland tended to provide a balance in benefits across the eight services while the juniper woodland and switchgrass feedstock system provided an imbalance in services, i.e., high benefits in a few services but little benefits for others. Future studies should investigate management of the Cross-Timbers Ecoregion to balance social needs for services and economic return.

Keywords: management, environmental sustainability indicators, juniper woodland, oak woodland

Stacking Payments for Ecosystem Services within the Faustmann-Hartman Framework

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Abstract: Woodland owners and policy makers have been paying closer attention to ecosystem services provided by forests beyond timber production, such as carbon sequestration, water quality and quantity, biodiversity, among others. Payments for ecosystem services (PES) schemes are policies that seek to compensate the owner of a resource for the production of a certain ecosystem service. For example, in forest carbon programs, landowners receive payments in exchange for carbon sequestration when they change their forest management practices. This change in behavior generates carbon credits that may be traded in carbon markets. Within the forest economics literature, ecosystem services are known as amenities and are treated within the Faustmann- Hartman family of models. To the best of our knowledge, amenities are taken into account individually in these models. However, a unit area of forestland produces more than one type of ecosystem service and payments for these different services could happen as a bundle (for example REDD+ projects) or they could be stacked. We use the Faustmann–Hartman framework to investigate the implications of payments for ecosystem services stacking. We analyze the costs and benefits of stacking versus not stacking payments, considering cases in which the ecosystem services provided by the forest are complements or substitutes. This analysis may be useful as we look for ways to reduce forestland conversion to other land uses, such as solar panel farms and urban sprawl.

Keywords: economics, Hartman, payments for ecosystem services, stacking

Climate Change Impacts, Carbon Markets, and Climate Investment Funding on Urban and Community Forestry: Perspectives of Non-Profit Organizations and Public Agencies in California, USA.

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Abstract: Urban and community forests (U&CF) are increasingly acknowledged for their multiple market and non-market benefits including their recognition as a natural climate solution in urban and developed areas. This study examines the perspectives of Non-Profit Organizations (NPOs) and public agencies involved in U&CF management in California toward various climate-induced extreme weather events such as wildfires, winds, high heat, drought, flooding, and invasive species. Additionally, it also explores their involvement in carbon-related opportunities such as the Carbon Offset Markets (COM) and California Climate Investment Funding (CCIF) program. Data are collected through a state-wide online survey of NPOs and public agencies, specifically municipalities and county governments in California in 2022-2023. Results suggest that these organizations in California perceived drought, high heat, and wind as the most significant negative impacts of climate change, and increased health issues among trees, higher tree mortality rates, and increased operational costs were reported as the major challenges in U&CF activities due to climate change. Both NPOs and municipal governments were found to have limited current participation as well as future likeliness to participate in carbon-related opportunities. The current participation and likeliness to participate in COM and CCIF programs varied significantly by the size of the organizations measured by their total operational budget and the number of employees. This study emphasizes the importance of informed decision-making for U&CF stakeholders in developing and promoting climate change mitigation and adaptation plans, as well as advancing carbon-related policies and programs in California.

Keywords: Urban and community forestry, Climate change events, Carbon related opportunities, Practitioners Perceptions

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