2021 International Society of Forest Resource Economics Symposium
Theme: "Economics and Management of Forests in the Bioenergy Era: Externalities and Possibilities"

Held virtually and live via ZOOM May 18-19, 2021 (Central Standard Time)
ISFRE brings together representatives of industry, consulting, academia, and federal and state agencies to discuss current issues in the economics of forestry, timber markets, management and utilization, timberland investments, law, and forest products trade. The meeting will include a general session on the meeting theme and concurrent sessions relating to general forestry economics, management, and finance topics for meeting participants to deliver oral presentations with sessions for both long and short presentations.

AGENDA

May 18 (Central Standard Time)
8:50 to 9:00 Welcome & Announcements **CLICK HERE TO ENTER Main Room**
9:00 to 10:00 Panel Session (1 HOUR) **CLICK HERE TO ENTER Main Room**
Meeting ID: 937 0560 7808 Passcode: 120102
Moderator: Shaun M. Tanger, Mississippi State University

Panel Session Title: "Economics and Management of Forests in the Bioenergy Era: Externalities and Possibilities".

Panel Session Participants: Jennifer C. Jenkins, Ph.D., Enviva, Vice President & Chief Sustainability Officer; Tedrick Ratcliff Jr., Ph.D., Executive Vice President, Mississippi Forestry Association; Tom Schultz, Director of Resource & Government Affairs, Idaho Forest Group; and Tom Tomlinson, Operations Director - East Region, Molpus Woodlands Group

10:00 to 11:30 Concurrent Sessions (25-minute presentations with 5 minutes for questions)

Session 1a (1.5 HOURS) **CLICK HERE TO ENTER Main Room**
Meeting ID: 937 0560 7808 Passcode: 120102
3 scientific presentations
Moderator: Omkar Joshi, Oklahoma State University

1. Wood Pellets and Forestland Rents (Jesse D. Henderson, USDA Forest Service)
   Authors:
   Jesse D. Henderson, Research Economist, USDA Forest Service; Robert C. Abt, Professor, NC State University; Christopher Mihiar, Research Economist, USDA Forest Service; Mansfield Fisher, Project Forester, Aster Global Environmental Solutions
   Abstract:
   When the demand for wood pellets emerged, studies could only speculate about how or whether demand would continue to increase. Furthermore, studies that included market and carbon impacts had to make assumptions about the type of feedstocks pellet mills would consume, where they would be located, and how they would compete with existing industries (Abt et al., 2012). Pellet mills are now a significant consumer of pulpwood and a minor consumer of harvest residue, while non-pellet pine pulpwood consumption is at an all-time high. Additionally, low pine sawtimber prices and increasing pulpwood prices have increased the importance of pulpwood markets in forest land rents. This paper revisits the role of wood pellets in forest markets in the US South given these realizations. We focus on price, forest composition, and forest carbon impacts under a range of demand scenarios in the U.S. South.

Keywords: economics, wood pellets, land rents, forest carbon

2. Wood Pellets versus Pulp and Paper: Quantifying the Impacts of Wood Pellets on the Pulpwood Markets in the Southeastern United States (Rajan Parajuli, North Carolina State University)
Author:
Rajan Parajuli, Assistant Professor, Department of Forestry and Environmental Resources, North Carolina State University
Abstract:
Since the early 2010s, the production of industrial wood pellets for overseas exports has grown considerably in the Southern United States (U.S.). In order to meet the increasing demand for woody biomass feedstock, the wood pellet mills in the U.S. South consume roundwood pulpwood along with low-valued logging residues and sawmill wood wastes. By estimating the empirical roundwood pulpwood market models based on the bi-monthly time-series data, this study estimates the impacts of wood pellet production on the hardwood and softwood pulpwood stumpage prices in 12 southeastern Atlantic coastal micro-markets. Results suggest that the wood pellet industry has led to an increase in pine pulpwood prices, but no statistically significant impact is found on the hardwood pulpwood prices. The magnitude of the price impact on pine pulpwood ranges from just over 5% to 13%, contributing about $4 million additional stumpage value annually in the five Southeastern states. Furthermore, the impact of the COVID-19 Pandemic on the average pine and hardwood pulpwood prices is estimated to be -4% and -6%, respectively. This study provides empirical evidence and additional insights on the timber market dynamics and how small roundwood markets have reacted to the additional wood demand from a relatively newer and continuously growing bioenergy industry in the U.S. South.
Keywords: biomass feedstock, Pooled Mean Group, timber markets, wood basins, stumpage value, southeastern United States

3. Systematic evaluation of carbon pools using forest inventory data: assessment within timberlands of procurement areas of wood pellet mills of the US coastal southeast (Francisco X Aguilar, Swedish University of Agricultural Sciences)
Authors:
Francisco X. Aguilar, Department of Forest Economics, Swedish University of Agricultural Sciences
Houston Sudekum, School of Natural Resources, University of Missouri
Karen Abt, Southern Research Station, United States Forest Service
Ronald McGarvey, Industrial & Manufacturing Systems Engineering, Harry S. Truman School of Public Affairs, University of Missouri
Benjamin Knapp, Department of Forest Economics, Swedish University of Agricultural Sciences
Grant Domke, Southern Research Station, United States Forest Service
Abstract:
In a panel model framework we controlled for factors of anthropogenic and natural origins influencing contemporaneous carbon stocks recorded in forest inventory (FIA) plots. Using a quasi-randomized sample of FIA plots within timberlands of the coastal southeast, we

assembled a panel dataset spanning 20 years to discern net effects associated with proximity to wood pellet mills. Net of other anthropogenic and natural factors, we found statistically higher concurrent levels of carbon stocks in live trees with temporal increases within FIA plots nearer wood pellet mills. We found lower carbon stocks levels within soils in plots nearer wood pellet mills during the same inventory year. Within FIA plots' dead tree carbon pools there was a lagged contemporaneous association after at least 10 years (i.e. two inventory periods). Expected rents from commercial timber is the most likely driver factor underpinning higher levels in total carbon pools, and management within the forestry intensity frontier may explain effects on soil carbon pools. Other explanatory factors inclusive of ownership and ecological descriptors captured strong associations.

Session 1b (1.5 HOURS) **CLICK HERE TO ENTER Room 2**
Meeting ID: 938 6049 7972 Passcode: 157889
3 scientific presentations
Moderator: Robert Grala, Mississippi State University

1. Development and performance of timber REITs in the United States: A review and some prospects (Srijana Baral, University of Georgia)
   Authors:
   Srijana Baral, Graduate Student, Warnell School of Forestry and Natural Resources, University of Georgia
   Bin Mei, Hargreaves Professor of Forest Finance, Warnell School of Forestry and Natural Resources, University of Georgia
   Abstract:
   Timber real estate investment trusts (REITs) are companies that own and manage timberland and generate revenue by harvesting and selling timber or other forest-related products. Due to their popularity with investors, timber REITs in the United States have attracted growing research interest in the recent decade. This necessitates a review of existing knowledge on timber REITs' evolution and their financial performance trend over the years. In this review, we summarized the history and development of timber REITs, discussed tax policies applicable to timber REIT growth and their implications. We also reviewed past studies focusing on the financial performance of timber REITs and synthesized methodologies used in those studies. At the end, we posited the possibility of consolidation waves in the timber industry and identified some opportunities for future research. This review can shed some new light on the evolution of public timber REITs and their financial performance.
   Key words: forest finance, real estate, timber industry, timberland investment, timber taxation.

2. Mixed-asset portfolios with timberland investments under the mean conditional value-at-risk framework (Héctor I. Restrepo, American Forest Management, Inc.)
   Authros:
   Héctor I. Restrepo, American Forest Management, Inc.
   Weiyi Zhang, Hancock Natural Resource Group
   Bin Mei, Warnell School of Forestry and Natural Resources, UGA
   Abstract:
   Mixed-asset portfolios have been traditionally addressed using the mean-variance (M-V) approach. However, since the asset returns are usually not normally distributed, the M-V

method is not suitable to construct optimal portfolios. The alternative method, the mean conditional value-at-risk (mean-CVaR), does not require the asset return to be normally distributed, but it is more mathematically challenging and computationally demanding than the M-V counterpart. We investigate the time-varying role, utilizing 15-year rolling windows, of private- and public-equity timberlands in mixed-asset portfolios. The remaining assets in the portfolio are private-equity commercial real estate, public REITs, S&P 500 index, short- and long-term government bonds, and long-term corporate bonds. Time-varying efficient frontiers expose the stochastic nature of constructing mixed-asset portfolios. Results reveal that the weight on timberland in the mixed-asset portfolio does vary with time for both the lowest risk portfolio and the tangency portfolio due to its changing return-to-risk ratio and correlation with other assets. In particular, private-equity timberland asset plays a more significant role in the constrained optimal portfolios invested by 15-year closed-end funds maturing in recent years.
Keywords: finance, institutional investments, portfolio optimization, real estate, TIMOs, REITs

3. Payments for forest-based ecosystem services from private lands in the United States: magnitudes, trends, mechanisms, and services supported (Gregory E. Frey, USDA Forest Service)
Authors:
Gregory E. Frey, USDA Forest Service, Southern Research Station
Chalisa Kallayanamitra, USDA Forest Service, Southern Research Station
Philadelphia Wilkens, USDA Forest Service, Southern Research Station
Natasha A. James, USDA Forest Service, Southern Research Station
Abstract:
This manuscript reports on an effort to account, estimate, and document, to the fullest extent possible, direct payments for ecosystem services to private forest landowners in the United States. This includes payments derived from Coasean markets, Pigouvian subsidies, and hybrid approaches, from both governmental and non-governmental sources. A variety of data sources were compiled and estimation approaches utilized to create a conservative and comprehensive understanding of the nature, magnitude, and trends of programs and markets that provide payments for forest-based ecosystem services (PFES). Programs and markets were classified by categories of ecosystem services supported (carbon sequestration and storage, water quality and watershed protection, biodiversity habitat, and bundled services), as well as payment mechanism (public payments, compliance transactions, and voluntary transactions). Findings show that voluntary markets for biodiversity, in particular hunting leases, are the largest payment source for private forest landowners, and has grown substantially over the past decade-plus. At the same time, compliance and voluntary markets for carbon and water have also grown. In particular, the establishment of a market for carbon offsets within California's cap-and-trade program has increased the size of forest carbon offset markets by two orders of magnitude since 2013. However, public programs connected PFES have steadily decreased in real dollar terms over time, as has participating land area. Various states and regions in the U.S. have higher or lower level of PFES connected to different service categories, for a myriad of apparent reasons.
Keywords: private forest finance; cost-sharing; voluntary incentive programs; offset trading; mitigation banking; conservation easement;

12:30 to 2:00 Concurrent Sessions (25-minute presentations with 5 minutes for questions)

Session 2a (1.5 HOURS) **CLICK HERE TO ENTER Main Room**
Meeting ID: 937 0560 7808 Passcode: 120102
3 scientific presentations
Moderator: Jesse D. Henderson, USDA Forest Service

1. Forests and Forest Product Markets in North America, Europe, and Russia, 2015 to 2040 (Jeffrey P. Prestemon)
   Authors:
   Jeffrey P. Prestemon, USDA Forest Service, Southern Research Station
   Prakash Nepal, USDA Forest Service, Forest Products Laboratory
   Abstract:
   In 2021, USDA Forest Service Scientists led a team of economists and foresters to assess the future of the forest products sector in the United States, Canada, the Russian Federation, and Europe. This assessment, the Forest Sector Outlook Study of the UN Economic Commission for Europe and the Food and Agricultural Organization, sought to understand future trends and characterize possible changes to the sector. Quantitative scenarios were modeled with a global forest sector model (GFPM) under a reference case of the future, with trends continuing, and several what-if scenarios in which significant changes occur in demand, supply, trade, and climate. We present the results of the study, with a focus on what-if scenarios of new product demand, planted forest expansion, and climate change related changes in timber growth rates.
   Key Words: planted forests, projections, markets, supply, demand

2. Perfect Assumptions in an Imperfect World: Managing Timberland in an Oligopoly Market (Bruno Kanieski da Silva, Mississippi State University)
   Authors:
   Bruno Kanieski da Silva, Department of Forestry – Mississippi State University
   Shaun Tanger, Coastal Research and Extension Center – Mississippi State University
   Mohammad Marufsuzzaman, Department of Industrial and Systems Engineering – Mississippi State University
   Frederick W. Cubbage, Department of Forestry and Environmental Resources – North Carolina State University
   Abstract:
   We built a game-theoretic supply model where forest landowners respond to each other's decisions using two market assumptions: (i) Cournot competition (simultaneous moves) and (ii) Stackelberg competition (sequential moves). Our findings indicate that the initial forest structure is instrumental in determining forest composition outcomes among suppliers. The solutions in the Cournot model, landowners with the same initial forest structure have uniform outcomes with increased variation in financial performance arising with different initial endowments of pulpwood and sawtimber and establishment costs. Alternatively, Stackelberg leadership has profound financial benefits even under similar initial conditions, that remain regardless of scenario. However, while terminal overall forest composition was similar regardless of scenario under Cournot outcomes, the same is not true under Stackelberg. We find that Stackelberg outcomes led to the follower being unable to harvest younger age classes over

time, which resulted in accumulation of older age class stands. Our results elucidate the importance of diversification and policies that reduce landownership concentration.
Keywords: Regulated Forest, Forest Management, Game Theory, Market Competition

3. Analysis of trade policies on forest products within the US forest supply chain (Xufang Zhang, Texas A&M Forest Service)
   Authors:
   Xufang Zhang, Forest Economist, Forest Analytics Department, Texas A&M Forest Service, Adjunct Faculty, Arthur Temple College of Forestry & Agriculture, Stephen F. Austin State University
   Changyou Sun, Professor of Forest Policy and Economics, Department of Forestry, Mississippi State University
   Ian A Munn, Professor of Forest Policy and Economics, Department of Forestry, Mississippi State University
   Jason Gordon, Assistant Professor of Community Forestry, Warnell School of Forestry and Natural Resources, University of Georgia
   Abstract:
   With the accelerating globalization, many industries have faced continuous pressure from increasing importation. To protect the domestic industries from potential injury by unfair trade actions, trade policies such as uniform tariffs have been widely used in recent years. In this study, the interaction between uniform tariffs on the primary roundwood and secondary wood and paper products within the U.S. forest supply chain was assessed. A two-stage partial equilibrium displacement model is firstly developed within a two-inputs and two-outputs system, estimating both the vertical and horizontal linkage between primary and secondary forest products. Four scenarios are assessed: single-tariffs separately imposed on roundwood/paper/wood products, and simultaneously imposed on all of them. To test the parameter uncertainty, stochastic simulations are employed by randomly changing elasticities under a triangular distribution. The results show that the impacts of U.S. export tariffs on different categories of forest products vary through the forest supply chain. Although the U.S. consumers of wood and paper products will in general benefit from its export tariffs, timber landowners will suffer losses in all tariffed scenarios. In designing policies to protect the U.S. forest products industry, tariffs on roundwood and paper products are encouraged, compared with tariffs other forest products.
   Keywords: economics, tariffs, forest sector, trade, stochastic simulation

Session 2b (1.5 HOURS) **CLICK HERE TO ENTER Room 2**
Meeting ID: 938 6049 7972 Passcode: 157889
3 scientific presentations
Moderator: Marc Measells, Mississippi State University

1. Supply Elasticity for Softwood Plywood: A primal Approach (Noel Perceval Assogba, Auburn University)
   Authors:
   Noel Perceval Assogba, PhD Candidate, Auburn University
   Daowei Zhang, George Peake Professor of Forest Economics and Policy, Auburn University
   Abstract:

This study estimates U.S., Southern U.S., and Western U.S. supply functions for softwood plywood using a profit maximization framework. Sample period covers 1995-2019. Each supply function is specified using a dynamic two-stage least square model in log-log form using quarterly data. Estimated short-run supply elasticities are 0.25, 0.38, and 0.47 for U.S., Southern U.S., and Western U.S., respectively. The estimates of the long-run price elasticities suggest that producers of softwood plywood are more sensitive to price change.
Keywords: Economics, U.S. softwood plywood, supply elasticity, integration

2. Forest to Mill Timber Price Trends and Volatility for Mississippi, USA Timber Products (Eric McConnell, Mississippi State University)
Authors:
T. Eric McConnell, Department of Forestry, Mississippi State University
Bruno Kanieski da Silva, Department of Forestry, Mississippi State University
Changyou Sun, Department of Forestry, Mississippi State University
Shaun M. Tanger, Coastal Research and Extension Center, Mississippi State University
Abstract:
We examined timber price trends along the Mississippi roundwood supply chain. Quarterly statewide data from Timber Mart-South for pine sawtimber, pine pulpwood, hardwood sawtimber, and pulpwood were obtained covering 1992 to 2018. Prices for stumpage, delivered logs, and timber conversion□measured as the difference between delivered wood and stumpage□were analyzed across products for the 27-year series as well as three, equally spaced 9-year periods (Period 1: 1992 to 2000, Period 2: 2001 to 2009, Period 3: 2010 to 2018). delivered wood prices did not significantly change over the long term, but declining pine sawtimber and pulpwood stumpage prices did occur. Hardwood product prices, however, increased across their supply chains. Prices have generally become less volatile, particularly from Period 2 to Period 3, indicating an increasing degree of homogeneity within each product's market. The exception to this was pine sawtimber, suggesting resource, locational, and/or market differences may have emerged for this product. The hardwood price trends supported the longer time horizon required for this resource's management. Declining price expectations for pine products question any strictly financial rationale for extending rotation length.
Keywords: Economics; hardwood; logging; pine; pulpwood; sawtimber; stumpage

3. An Equilibrium Displacement Model of Log and Lumber Markets in Oregon (Jun Zhai, Oregon State University)
Authors:
Jun Zhai, PhD candidate, Department of Forest Engineering, Resources & Management, College of Forestry, Oregon State University
Olli-Pekka Kuusela, Assistant Professor, Department of Forest Engineering, Resources & Management, College of Forestry, Oregon State University
Abstract:
A significant share of softwood logs harvested from Oregon's private forests have been exported to the Pacific Rim countries (Japan, South Korea, and China) during the past several decades. In the recent record year of 2013, Oregon exported nearly 17% of the total timber harvest volume. While landowners benefit from access to overseas markets, domestic mills face

tougher competition in their input market. This has led to periodic calls for policies that would encourage domestic processing of timber into higher value products. The objective of this study is to quantify and compare the market implications and welfare effects of hypothetical export taxes and domestic subsidies in log and lumber markets in Oregon. To compute the welfare effects in the context of vertically linked log and lumber markets, we employ an equilibrium displacement model that incorporates the feedback effects from the two markets. We use as the base year 2018 and model the market impacts from three different policies and compute the resulting changes in economic returns, prices, production volumes, and additional carbon stored in lumber produced in Oregon. Our results show that the subsidy paid to lumber consumers in Oregon could have a positive net impact on Oregon's economy while also increasing the amount of carbon stored in wood products. We also find that the log export tax is the least cost-effective policy to promote the storage of additional carbon in wood products, whereas the subsidy on mills would have the largest impact in terms of additional jobs.
Keywords: economics, forest products, international trade, timber supply, welfare, carbon, rural development

2:10 to 4:10 Concurrent Sessions (25-minute presentations with 5 minutes for questions)

Session 3a (2 HOURS) **CLICK HERE TO ENTER Main Room**
Meeting ID: 937 0560 7808 Passcode: 120102
4 scientific presentations
Moderator: Eric McConnel, Mississippi State University

1. The Length and Determinants of Forestland Ownerships (Mahesha K. Kuluppuarachchi, The Ohio State University)
Authors:
Mahesha K. Kuluppuarachchi, Graduate Research Assistant, School of Environment and Natural Resources, Ohio State University
Changyou Sun, Professor, Department of Forestry, Mississippi State University
Jason S. Gordon, Assistant professor, Warnell School of Forestry & Natural Resources, University of Georgia
Donald L. Grebner, Professor, Department of Forestry, Mississippi State University
Ian A. Munn, Professor, Department of Forestry, Mississippi State University
Jia Yang, Assistant professor, Department of Forestry, Mississippi State University
Abstract:
More than half of the United States' forestland is owned by millions of private forest landowners with small parcels. Their decisions are critical to the sustainable supply of both timber products and ecosystem services to society. As more people become forest landowners and the total amount of forestland grows slowly, the physical size per owner has been continuously declining. In this study, this dynamic phenomenon is examined from the perspective of ownership duration. A unique sample of data is collected from the tax roll database of eight counties in Mississippi from 1999 to 2019. A total of 18,783 parcels with at least 10 acres of forestland each are identified and included in the sample. A set of techniques from duration analysis are employed to analyze the data, including nonparametric survival rates and the Cox hazard model. The analyses generate several impressive outcomes with clear policy implications. Frequent ownership changes with lower durations decrease the average parcel size. The length of forestland ownerships and its determinants are examined using

duration analysis on a sample of parcels in Mississippi from 1999 to 2019. Overall, forestland ownership duration is short. About 46% of the parcels have been sold at least once over the study period, and their average duration is 5.4 years. The forest acreage of a parcel, the residence location of an owner, and several socioeconomic variables have influenced land ownership duration.
Keywords: duration analysis, economics, ownership duration, private forestland owners, small parcels

2. Willingness to pay for testing game: Implications for user-paid system for wildlife disease surveillance (Ram Adhikari, University of Tennessee)
Authors:
Ram Adhikari, Postdoctoral Research Associate, Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville
Neelam Poudyal, Associate Professor, Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville
Abstract:
The spread of wildlife diseases causes billions of dollars of conservation spending every year for its surveillance and management, while decreasing substantial hunting benefits including revenues from hunting permit sales. Although cost-effective disease monitoring among game species benefits both hunters and general public, hunter cooperation is crucial in detecting disease presence, decrease its prevalence and control from spreading in new locations. Therefore, the objective of this study was to estimate hunter willingness-to-pay for wildlife disease testing and determine how their risk perception and trust and confidence on wildlife agency affect the participation in ongoing disease surveillance. This study presented the case of chronic wasting disease (CWD) and employed mixed-mode survey to elicit the opinions of Tennessee hunters who reside or hunted in CWD affected areas. Tobit models were constructed to estimate hunter willingness-to-pay for laboratory fee for CWD testing of harvested deer and identify factors affecting their willingness-to-pay. Majority of hunters were interested to pay full laboratory fee i.e. $18 per deer for CWD testing. Average willingness-to-pay of a hunter for CWD testing was $12 per deer. This study indicated that hunter willingness to pay for CWD testing were positively related to hunting in CWD positive counties, their risk perception about disease spread and deer population decline, and trust and confidence on wildlife agency. These findings imply that arranging cost-share provisions based on disease risk level and implementing active outreach programs about CWD management can improve hunter participation in user-paid system for CWD surveillance.
Keywords: chronic wasting disease, economics, game hunting, laboratory fee, tobit model, white-tailed deer

3. Allocation versus Reimbursement: Factors Explaining the Distribution of the Forest Development Program Fund in North Carolina (Stephanie Chizmar, North Carolina State University)
Authors:
Stephanie Chizmar, Department of Forestry and Environmental Resources, North Carolina State University

Rajan Parajuli, Department of Forestry and Environmental Resources, North Carolina State University
Gregory Frey, USDA Forest Service, Southern Research Station
Robert Bardon, Department of Forestry and Environmental Resources, North Carolina State University
Erin Sills, Department of Forestry and Environmental Resources, North Carolina State University
Abstract:
The Forest Development Program (FDP) is the primary state-administered cost-share assistance program for forest landowners in North Carolina. The demand for FDP cost-share funds often exceeds available resources, leading to a fund allocation dilemma for the program administrator, the North Carolina Forest Service (NCFS). Allocating limited funds for reimbursements on the most acres and to the most applicants while accounting for multiple objectives and constraints is a primary issue in administering any public assistance program. While the demand for FDP cost-share funds often exceeds available resources, actual cost-share reimbursements are generally lower than the initially allocated amount, and frequently, applicants cancel their projects entirely. Additionally, implementation rates of completed applications vary due to actual costs that are different from the prevailing rates established by the NCFS and the number of acres to actually receive the cost-share funded treatment. This study evaluates various factors related to the utilization of allocated funds based on actual cost-share fund usage data from the years 2015 to 2020. Results suggest that FDP applications associated with chemical release treatments (site preparation), pine hand-planting activities, and larger applied acreage values are more likely to be completed and implemented as defined in the initial application. The methods and findings of this study provide useful insight to administrators of public incentive programs.
Keywords: Economics; allocation of public funds; cost-share program; landowner assistance; forest management practices; regression

4. Potential Economy-Wide Impacts of Increased Intermediate Demand of Forest Sector Products in Kentucky (Domena Agyeman, University of Kentucky)
Authors:
Domena A. Agyeman, Graduate Student, Department of Agricultural Economics, University of Kentucky
Thomas O. Ochuodho, Assistant Professor, Department of Forestry and Natural Resources, University of Kentucky
Abstract:
Kentucky forest sector is projected to experience increase in outputs due to anticipated increase in demand for wood products. Through inter-industry linkages, expansion of the forest sector could have substantial economy-wide impacts. Understanding the economy-wide impacts resulting from demand changes in the forest sector is critical for holistically assessing the contribution and impacts of the sector. Kentucky's aggregate wood and paper product manufacturing industries have experienced output growth in recent years and expected to continue due to growing demand for the state's forest products. This study applies a computable general equilibrium model to provide a snapshot of the economy-wide impacts of increase in forest sector intermediate demand in Kentucky. Two counterfactual scenarios of intermediate

supply increase in the forest sector are simulated. Results show an increase in welfare of high-income households, whereas welfare of low-income households declines marginally due to increase in producer supply prices. Both federal government and state government revenues and expenditures increase. Output of most industries in the economy are positively impacted through inter-industry linkages, and gross regional product also increases. The study provides insights into the economic impacts of increased demand of forest sector products and valuable policy-relevant information for sustainable Kentucky forest sector.
Key words: Economics, Computable general equilibrium, Economy-wide impacts, Kentucky forest sector

Session 3b (1.5 HOURS) **CLICK HERE TO ENTER Room 2**
Meeting ID: 938 6049 7972 Passcode: 157889
3 scientific presentations
Moderator: John Auel, Mississippi State University

1. Conservation Easement Landowners' Willingness to Thin the Forest (Ana L Gutierrez Castillo, Louisiana State University)
   Authors:
   Ana Gutierrez, Louisiana State University
   Jerrod Penn, Louisiana State University
   Shaun Tanger, Mississippi State University
   Michel Blazier, Louisiana State University
   Abstract:
   The use of conservation easements as a tool for conservation on private lands is increasing; however, the evidence of easement landowners' adoption of forest management practices to ensure that long-term conservation goals are met remains limited. Landscape-scale reforestation through easement programs has occurred in the Lower Mississippi Alluvial Valley (LMAV). As reforested stands within the LMAV easements mature, they are expected to exhibit stand densities and closed canopies that can diminish the wildlife habitat quality these easements intend to provide warranting the adoption of forest management. Using the data obtained from a contingent valuation (CV) survey of forest landowners enrolled in easement programs, we explore both landowners' willingness to adopt thinning, as well as the minimum willingness to accept (WTA) to thin forested easements within the LMAV of Louisiana. Preliminary results indicate that easement landowners' willingness to adopt thinning is influenced by the total land and forest land owned. The model suggests that landowners with large acreage are more likely to implement thinning. Average WTA among easement landowners willing to thin is $11.55 per ton of pulpwood, varying with several ownership characteristics, involvement in nontimber activities, management characteristics, and ownership objectives. Findings from this study provide a better understanding of the extent of the market for thinning among easement landowners to achieve the long-term conservation goals of the easement programs.
   Key words: Economics, Conservation Easement, Forest management, Willingness to thin, Willingness to accept

2. Spatial dependence and determinants of conservation easements adoption in the United States (Sabhyata Lamichhane, University of Georgia)
Authors:
Sabhyata Lamichhane, Warnell School of Forestry and Natural Resources, University of Georgia
Changyou Sun, Department of Forestry, Mississippi State University
Jason Gordon, Warnell School of Forestry and Natural Resources, University of Georgia
Stephen C. Grado, Department of Forestry, Mississippi State University
Krishna Poudel, Department of Forestry, Mississippi State University
Abstract:
A conservation easement is a market-based instrument for environmental protection. It has achieved rapid growth in the United States over the past few decades; however, the patterns of growth are different across states over time. The determinants of conservation easements within the United States have not been systematically measured at the state level. In this study, spatial dependence in adopting conservation easements in the United States and the underlying determinants are examined through a spatial econometric model. The spatial panel data covers 50 individual states and six five-year intervals from 1990 to 2015. The findings reveal that spatial correlation in adopting conservation easements across individual states has become stronger over the study period. In addition, conservation easements have been utilized to protect threatened or strained natural resources. Populations with higher income or better education generally help in the development of conservation easements. Government programs and policies favoring conservation easements also have positive impacts on easement adoption. These results can aid policymakers, landowners, and easement holders to efficiently allocate resources in acquiring conservation easements and managing currently eased land.
Keywords: easement holders; economics; random effect; spatial error; spatial lag; spatial panel; spillover effect

3. Economy-wide Impacts of Projected White Oak (Quercus alba) Timber Supply in Kentucky (Gaurav Dhungel, University of Kentucky)
Authors:
Gaurav Dhungel, Graduate Student, Department of Forestry and Natural Resources, University of Kentucky
Thomas O. Ochuodho, Assistant Professor, Department of Forestry and Natural Resources, University of Kentucky

Abstract:
The demand for high-quality white oak sawlogs in Kentucky has been increasing for decades, which implies that sustainable forest management is a desirable goal. Kentucky is also witnessing ecological shifts in the historically white oak-dominated forests mirroring the structural changes in oak forests in Eastern U.S. This augments growing concern among stakeholders on long-term sustainability of white oak timber supply and its economic implications. Thus, novel studies capturing the economy-wide impacts of potential white oak timber supply in the state, where sustained supply of high-quality white oak sawlogs is critical to dependent industries, are critical. The objective of this study was to assess potential economic impacts of projected white oak timber supply due to increased supply of white oak

sawlogs for wood product manufacturing and reduced supply of high-quality white oak sawlogs for cooperage industry. A dynamic computable general equilibrium (CGE) modelling framework was applied to assess economy-wide impacts of simulated projected levels of white oak sawlogs supply in Kentucky. Results indicate a cumulative present value GDP reduction of $2.93 billion (-0.068%), $1.79 billion (-1.195%) decline in consumer welfare, and other sectoral contractions over the 40 year horizon (2018-2058). These results can be used to advocate for more proactive and targeted forest management practices to stabilize and streamline a sustainable long-term supply of high-quality white oak timber.
Keywords: economics, white oak, timber supply, CGE modelling, economic impacts.

May 19 (Central Standard Time)
9:30 to 10:10 ISFRE Business Meeting
CLICK HERE TO ENTER Main Room
Meeting ID: 937 0560 7808 Passcode: 120102

10:10 to 12:10 Concurrent Sessions (25-minute presentations with 5 minutes for questions)

Session 4 (2 HOURS) **CLICK HERE TO ENTER Main Room**
4 scientific presentations
Meeting ID: 937 0560 7808 Passcode: 120102
Moderator: Steve Grado, Mississippi State University

1. Renting Forest Carbon: Estimating a Stand Level Short-Run Carbon Supply Curve (Shaun M. Tanger, Mississippi State University)

Authors:
Shaun Tanger, Coastal Research and Extension Center – Mississippi State University
Bruno Kanieski da Silva, Department of Forestry – Mississippi State University
Adam Polinko, Department of Forestry – Mississippi State University
Marc McDill, Department of Ecosystem Science and Management – Penn State University

Abstract:
Carbon sequestration is among the most promising tools to mitigate the effects of climate change in the upcoming decades. Forested ecosystems are a proven low-cost strategy for carbon sequestration. One approach to sequester carbon in forests is to postpone harvesting operations, therefore sequestering carbon for the period delayed and maintaining biomass for an additional period. This postponement alters forest management decision-making, and therefore economic and ecological returns for landowners. Here we estimate the carbon supply curve at the stand level based on the optimal rotation decision and conduct a marginal analysis for necessary payments by postponing harvest for one year. We evaluated the possible carbon payments of two of the most important species in the US: Loblolly Pine and Douglas Fir. We also estimated the effect of different thinning and original spacing on the individual carbon supply curve at the stand level. Our results are crucial to understand the impact of public and private policies that might impact landowner decision, and the core of large-scale ecosystems models.
Keywords: Carbon sequestration, Generalized Faustmann model, Loblolly pine plantations, Carbon rental payments, Site Index, Silviculture treatments

2. Losing A Whole Year: Pandemic Impact on Student Performance (Jason Holderieath, Louisiana Tech University)
   Authors:
   Jason J. Holderieath, Louisiana Tech University
   ichael K. Crosby, Louisiana Tech University
   T. Eric McConnell, Mississippi State University
   D. Paul Jackson, Louisiana Tech University
   Abstract:
   We are approaching the first anniversary of the higher education transitions to online delivery due to the COVID-19 pandemic, and at this time, it feels like a lost year. In our forthcoming paper, Impact of COVID-19 Related Transition to Online Instruction on Student Achievement, we analyzed the grade and completion data for Spring Quarter 2020 at the School of Agricultural Sciences and Forestry at Louisiana Tech University. Counter to our expectation of a shared experience, we found three broad experiences among all students and courses. Some courses experienced no change in grades and completion, some were remarkably better than most years, and some were remarkably worse than most years. This abstract proposes further study across the entire Louisiana Tech University to see if the nonparametrically observed relationships can be parametrically defined with more observations and a broader student base. We expect our forthcoming observation to hold true; however, the two following terms have been characterized by increased experience in this working environment, fatigue, and hostility, much the same as in the country as a whole, on the part of both students and faculty. This compounding factor may be indicated by the worsening of student outcomes from the spring quarter.
   Keywords: COVID-19, educational achievement, fatigue

3. Teasing Out Consulting Foresters' "IMPLAN 19" Contributions to Forest Economies (Eric McConnell, Mississippi State University)
   Authors:
   Thad Webb, Department of Agricultural Economics, Mississippi State University
   Shaun Tanger, Coastal Research and Extension Center, Mississippi State University
   T. Eric McConnell, Department of Forestry, Mississippi State University
   Alan Barefield, Department of Agricultural Economics, Mississippi State University
   Abstract:
   We used three comprehensive datasets to innovatively assess economic activities at as granular a level as possible for Support Activities for Forestry in Mississippi, specifically the Foresters Consulting component for this presentation. EMSI provided the most current employment estimates by 6-digit NAICS and a geographic listing of businesses by NAICS codes that contained employment, earnings, and sales data. ESRI further categorized the 6-digit codes into 8-digits, thus providing a more detailed view of this sub-sector's businesses. However, since business listings do not not comprehensively tabulate all businesses of each classification within a region, we developed an innovative weighting method to estimate output, jobs, and earnings for Foresters Consulting (ESRI-NAICS classification 11531004) using EMSI data. Statewide along with USDA Forest Service Forest Inventory and Analysis (FIA) sub-regional IMPLAN models then determined economic contributions. The North possessed larger estimates for employment, labor income, and value-added, while the South's output was

greatest. The Delta's low levels of activity were expected given the region's dedication to row crop production. Central Mississippi also produced lower activity levels, as its more urban and suburban geography contains less commercial forestland. Foresters Consulting employed 535 direct jobs with earnings of $29,981,000 in Mississippi. These businesses provided $25,409,000 in value added on output of $53,274,000. When added to the indirect and induced effects, total employment was 703 jobs that earned $36,460,000. The contribution to state Gross Domestic Product was $37,756,000 on sales of $76,642,000. Federal and state tax contributions collectively exceeded $13,000,000.
Key Words: Economics; EMSI; ESRI; IMPLAN; NAICS

5. An analysis of Oregon's preferential forest property tax programs: results from a survey study (Ben Rushakoff, Oregon State University)
Authors:
Ben Rushakoff, Master of Science Student, Department of Forest Engineering, Resources, and Management, Oregon State University
Olli-Pekka Kuusela, Assistant Professor of Forest Economics, Department of Forest Engineering, Resources, and Management, Oregon State University
Abstract:
Little is known about non-industrial private forestland (NIPF) owners in relation to Oregon's two primary preferential forest property tax programs: Forestland Program – the default tax program for forestland owners, and Small Tract Forestland Option (STF) – a voluntary program wherein landowners pay reduced annual property taxes and a timber harvest severance tax. This study aims to identify factors associated with landowner enrollment in the STF program, describe landowner management behavior under both tax program, and investigate potential forest management behavioral responses to a hypothetical annual property tax increase. In November 2020, A mail-out questionnaire was distributed to 1,190 Oregon Small Woodlands Association (OSWA) members who own between 10 and 5,000 acres of forestland in western. Survey results were analyzed using econometric methods and indicate that although there are few socio-demographic and management differences between OSWA members in the STF and Forestland programs, landowners who received educational assistance, are knowledgeable about other tax benefits, inherited their forestland, and own their acreage across multiple parcels have a higher likelihood of being enrolled in the STF program. Three additional logistic regression models indicate that respondents are sensitive to increases in annual property taxes; more specifically, tax increases of $5-$20/acre were significantly related to increases in likelihood of clearcutting or selling some forestland and decreases in likelihood of improving wildlife habitat. These results illustrate how OSWA members provide valuable public ecological benefits with little compensation and suggest that an increase in property taxes could yield negative impacts on Oregon's unique NIPF landscape.
Keywords: Economics, preferential forest property taxes, NIPFs, forest policy, small forest landowners

1:10 to 2:20 Lightening Round I (7-minute presentations with 3 minutes for questions)

Session 5 (1 HOUR) **CLICK HERE TO ENTER Main Room**
Meeting ID: 937 0560 7808 Passcode: 120102

7 scientific presentations
Moderator: Gregory E. Frey, USDA Forest Service

1. Assessing the Impact of Forestry and Forest-Products Industries on Rural Welfare in South Carolina (Jarred Sparks, Clemson University)
   Authors:
   Jarred Sparks, Department of Forestry and Environmental Conservation, Clemson University
   Puskar Khanal, Department of Forestry and Environmental Conservation, Clemson University
   Abstract:
   Forestry and forest-products industries contribute several direct and indirect benefits to the rural economy. South Carolina has roughly 13 million acres of forestland across 46 counties, almost all of which is productive timberland, making forestry and forest-products industries a major component of the state's economy. South Carolina's counties vary greatly when it comes to the economic contribution from forestry and forest-products industries due to the factors such as urbanization, the percentage of forestland, and the industries found in those counties. Knowing the economic contribution of the state's forestry sector as a whole is important, but it is also critical to note how each county contributes to that total. This study also analyzes the dependence of county per-capita income with its forestry and forest-products industry attributes. Regression results indicated that total forest acres and economic impact at the county level were negatively related with the dependent variable, but county acres, employment numbers, and forest-products industries have a positive relationship. It suggests the need for a more region-focused forest policy and practices based on the relative contribution of different factors to rural welfare.
   Key Words: IMPLAN, Economic impact, Rural development

2. Estimating the effects of fish quality and size on the economic value of fishing in Oklahoma streams and rivers: a revealed preference and contingent behavior approach (Binod Chapagain, Oklahoma State University)
   Authors:
   Binod Chapagain, Department of Natural Resource Ecology and Management, Oklahoma State University
   Omkar Joshi, Department of Natural Resource Ecology and Management, Oklahoma State University
   Jim Long, US Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University
   Andrew Taylor, Department of Biology, University of Central Oklahoma
   Abstract:
   Fishing is popular in Oklahoma because the rivers and streams in this area provide a unique experience for anglers in the state. Despite its popularity, little is known about total demand and economic benefits associated with stream fishing in the state. Research on the role of site quality indicators, such as fish size and quantity, on recreational fishing has shown mixed results. Whether fish size or quantity plays an important role in determining fishing demand and economic value may have important management implications. Using anglers' responses from hypothetical behavioral questions in Ozark Highland streams and rivers in Oklahoma, such as intended number of trips in the future given increased catch rates of fish, catch rates of trophy-sized fish, and catch rates of preferred fish species, in combination with their trip-

related data, we estimated the demand and economic value of fishing under varying scenarios. Under current conditions, we estimated consumer surplus per person per trip to be $55 and aggregate value across all stream anglers in Oklahoma to be $68.51 million. Changes in marginal benefits varied among hypothetical scenarios of fish size and abundance but was maximized (54% increase) with a 25% increase in catch rates of trophy-sized fish. The study findings contribute to the understanding of the economic benefit of fishing in Oklahoma streams and suggest that fish size, rather than fish quantity, is more important to stream anglers in the state.
Key Words: Economics, Fishing demand, Fish quantity, Revealed preference, Contingent behavior

3. Economic Impact of the Job Losses during the COVID-19 Pandemic: The Case of the Forest Products Industry in West Virginia (Kathryn Gazal, West Virginia University)
Authors:
Kathryn Gazal, Associate Professor, School of Forestry and Natural Resources, West Virginia University
Kathleen Arano, Associate Professor, Department of Economics, Indiana University Southeast.
Joseph F. McNeel, Director, Appalachian Hardwood Center, West Virginia University
Abstract:
The COVID-19 pandemic has had a significant impact in state and local economies due to job losses resulting in the shutting down of businesses during the quarantine period. In West Virginia, the unemployment rate was at 5.1% in February 2020 prior to the pandemic, peaked at 15.6% in April 2020, and stood at 6.7% by the end of the year in December. Between February and April, 115,562 jobs were lost. Although jobs have rebounded since the peak in April, total employment was still lower in December at 742,916 compared to 764,274 in February. The forest products industry (FPI) in the state was significantly affected by the virus – experiencing a loss of 1,242 jobs between March and April. The FPI sector that was mostly impacted is wood products manufacturing sector with a loss of 1,042 jobs. However, the paper manufacturing sector actually gained slightly in terms of total jobs during the pandemic. This study investigates the impact of job losses in employment, labor income, output, and tax revenues (state and local) due to this pandemic.
Keywords: Economics, Economic Impact, COVID-19, Forest Products Industry

4. Forecasting Wildfire Suppression Costs Using Stochastic Simulation (Junyeong Choi, Texas A&M University)
Authors:
Junyeong Choi, Department of Ecology and Conservation Biology, Texas A&M University
Jianbang Gan, Department of Ecology and Conservation Biology, Texas A&M University
Abstract:
Wildfire suppression costs have been skyrocketing in recent years, which coupled with uncertainty associated with wildfire activity has created a challenge for wildfire suppression budgeting and planning. Funding and planning for wildlife suppression were historically based on the 10-year moving average of past wildfire suppression costs. However, the historical trends may not adequately capture the future trajectories of wildfire risk and suppression needs as wildfire activity is highly uncertain and influenced by unprecedented climate variability and

urbanization, among other factors. We attempted to project federal wildfire suppression costs in the U.S. using stochastic simulations with incorporation of climatic conditions. We found the mean of simulated wildfire suppression costs would reach $5.89 billion by 2030, surpassing the highest historical level and the 10-year moving average projection, with a standard deviation of $2.48 billion. Our results call for more forward looking and responsive strategies for wildfire suppression budgeting and planning.
Keywords: economics, fire-burned area projection, climate factors, Gumbel copular, random draw

5. Simulation approach to evaluate functional zoning to optimize multiple competing objectives on small forest tracts (Bradley Resch, Mississippi State University)
Authors:
Bradley S. Resch, M.S. Student, Department of Forestry, College of Forest Resources, Mississippi State University
Austin Himes, Assistant Professor, Department of Forestry, College of Forest Resources, Mississippi State University
Stephen C. Grado, George L. Switzer Professor, Department of Forestry, College of Forest Resources, Mississippi State University
Abstract:
In the southern United States, approximately 60% of the forest land is owned by nonindustrial private forest (NIPF) landowners. Many NIPFs are held and managed for multiple objectives. These often include economic returns that can come from timber harvesting for pulp, bioenergy, or lumber supply at the same time as aesthetic value and recreation. Existing research has evaluated tradeoffs for different ecosystem service pairs, typically at a regional scale. The smaller acreage of typical NIPF could present challenges not found in larger tracts due to limited acreage to allocate between different objectives. For competing objectives, functional zoning based on site index and other land heterogeneities could offer a solution for NIPF landowners to optimize their multiple objectives. This presentation will describe the background of the problem and discuss a proposed simulation approach to evaluate feasibility and benefits of optimizing land usage for these smaller forested parcels to achieve competing objectives.
Keywords: management; modelling; competing objectives; NIPF; family forests

6. Economic Assessment of "Floodwise" Practices: Natural Infrastructure to Mitigate Flooding in Eastern, Rural North Carolina (Fred Cubbage, North Carolina State University)
Authors:
Meredith Hovis, Frederick Cubbage, Chris Hollinger, Theodore Shear: Dept. of Forestry and Environmental Resources, North Carolina State University
Barbara Doll, Jack Kurki-Fox, Daniel Line, and Jane Harrison: North Carolina SeaGrant and Department of Agriculture and Biological Engineering, North Carolina State University
Michelle Lovejoy: North Carolina Foundation for Soil and Water Conservation
Abstract:
FloodWise is a pilot project that proposes to develop innovative new approaches for flood disaster resilience by applying modified nature-based conservation practices in Eastern North Carolina. We will discuss the estimated costs of the selected natural infrastructure practices

developed via literature reviews, data collection from secondary or primary sources, and use of economic-engineering approaches for cost and benefit estimation. Based on the costs to implement water farming practices, we have estimated the number of payments that would be necessary for farmland owners to break even to consider participating in the FloodWise program.

This presentation will include a summary of the preliminary estimates of natural infrastructure costs and the discounted cash flow and capital budgeting procedures. Small modifications of existing conservation practices, such as stream buffers, cover crops, silvopasture, and tile outlet terracing, had the least costs to install. Major natural infrastructure projects that required substantial earth moving and flood control structures were more expensive and would have more adverse impact on existing farm and forest management. Larger floodwater structure projects could store more water for longer periods, however, which may offset their greater establishment costs. Subsequent analyses will examine landowners' interest in adopting such practices, and with agencies and nongovernment organizations about means to develop FloodWise programs for landowners and communities.

Keywords: Economics, natural infrastructure, hazard mitigation, flood reduction

7. Preventing Further Spread of Eastern Redcedar (Juniperus virginiana) in the Southern Great Plains (Katelyn Jeffries, Oklahoma State University)

Authors:
Katelyn Jeffries, Natural Resources Ecology and Management, Oklahoma State University
Bijesh Mishra, Natural Resources Ecology and Management, Oklahoma State University
Omkar Joshi, Natural Resources Ecology and Management, Oklahoma State University

Abstract:
Eastern redcedar invasion into in the Great Plains Ecosystem has multi-faceted impacts such as reduced forage, altered wildlife habitat, modification of water yield, nutrient cycling, and carbon sequestration. While redcedar encroachment can be minimized through regular use of prescribed fire, there are financial, social, and technical barriers that prevent most landowners from its regular use. The goal of this project is to understand stakeholder's perceptions of the remedial best management practices (BMPs) that can be used to control eastern redcedar (ERC) in the Southern Great Plains. The study used a mixed-mode method including a focus group meeting and a web-based survey to retain requisite data. The data was analyzed using the Strengths, Weaknesses, Opportunities, and Threats (SWOT) – Analytical Hierarchical Process (AHP) platform. The results of this study suggest that there is general agreement among stakeholders representing government agencies and the landowner groups on role of prescribed fire in reducing fuel load and providing necessary wildlife habitat in the forested and the rangeland ecosystems of the Great Plains. However, weather dependency and liability issues were the major obstacles that these groups were concerned about. According to the stakeholders representing the nongovernmental organizations group, reducing fuel load and improving pasture and cattle production provided incentive to burn. However, they cited the cultural stigma against fire and specialized training need as major obstacles. Study results recommend some programmatic and outreach needs to enhance social acceptance of prescribed fire as an ERC management tool in the Great Plains.

Keywords: Management, Eastern Redcedar, Prescribed Fire, SWOT – AHP Platform, Stakeholders

2:30 to 3:50 Lightening Round II (7-minute presentations with 3 minutes for questions)

Session 6 (1.25 HOUR) **CLICK HERE TO ENTER Main Room**
Meeting ID: 937 0560 7808 Passcode: 120102
8 scientific presentations
Moderator: Fred Cubbage, North Carolina State University

1. Wildfire risk and optimal regimes of prescribed burning in southern forest plantations
   Author:
   Andres Susaeta, School of Forest, Fisheries and Geomatics Sciences, University of Florida
   Abstract:
   We examine the optimal timing of prescribed burning and its effect on the optimal forest management of a forest plantation under the risk of wildfires in the southeastern United States. Based on the frequency of prescribed fires and risk of wildfires, we define low, medium, and high intensive management scenarios using a slash pine stand as an example. Our results show that as the slash pine stand is more intensively managed, more prescribed fires and higher costs of prescribed burning occur–6, 12, and 16 prescribed fires with expected costs of $147.4, $165.9, and $246.0 acre-1 are found for low, medium and high intensive forest management scenarios, respectively. On average, the expected increases in net present value (NPV) of timber benefits account for $209.2, $498.6, and $869.3 acre-1 for low, medium and high intensive forest management scenarios. The optimal rotation ages tend to be delayed for these scenarios as well. We find that the prescribed burning plays a little role in the NPV timber benefits, i.e., changes in NPV are primarily given by the reduction of wildfire risk. As such, we discuss other potential silvicultural approaches that can have achieve a similar goal to prescribed burning.
   Keywords: economics, management

2. Determining opportunities and challenges for incorporating biochar life cycles into a sustainable regional bioeconomy (Raju Pokharel, Michigan State University)
   Authors:
   Raju Pokharel, Department of Forestry, Michigan State University
   Jessica Miesel, Department of Plant, Soil and Microbial Sciences, Michigan State University
   Chris Saffron, Department of Biosystems and Agriculture Engineering, Michigan State University
   Abstract:
   Biochar is a charcoal-like byproduct of pyrolysis bioenergy systems that is increasingly emphasized as a sustainable soil amendment. Abundant research shows that biochars can increase soil moisture content and nutrient availability, decrease nutrient loss via leaching, and decrease the need for fertilization. Besides the potential to benefit soil health and plant growth, biochars may have an important role in sustainable bio-economies by providing other environmental and economic benefits – such as decreasing nutrient loss from leaching, improving surface water quality, and supporting biomass energy systems. Our over-arching goal is to improve the sustainability and productivity of Michigan's plant-based agricultural systems by supporting a circular economy in which economic growth is grounded in sustainable, bio-based industries. Here, we propose to conduct the first feasibility assessment

for establishing biochar as a viable component of Michigan's agricultural bioeconomy. This study aims to address the fundamental need to better understand the supply potential and market opportunity of forestry biomass for biochar production and determine potential economic feasibility. We expect to: (1) determine potential biomass source locations; (2) quantify potential competition for biomass-based on various market situations; and (3) characterize resource distribution to guide the establishment of new biochar production facilities. This research study will generate knowledge to address contemporary problems by assessing the preliminary feasibility of biochar to benefit Michigan's agricultural and forestry industries.
Keywords: circular economy, economics, market opportunity, procurement zones

3. Siting suitability assessment and recovery cost analysis of logging residue utilization for bioenergy (Xufeng Zhang, West Virginia University)
Authors:
Xufeng Zhang, Ph.D. Student, Division of Forestry and Natural Resources, Center for Sustainable Biomaterials & Bioenergy, West Virginia University
Jingxin Wang, Professor, Division of Forestry and Natural Resources, Center for Sustainable Biomaterials & Bioenergy, West Virginia University
Abstract:
Forest residue could be utilized as a renewable feedstock for bioenergy products to promote regional bioeconomy and reduce greenhouse gas emission. As a heavily forested state, West Virginia has an ample amount of available logging residue as a by-product of forest harvesting. In this study, a GIS-based suitability model considering both economic and environmental factors was developed to assess the siting suitability across the entire West Virginia. Then the alternative plant candidates located in the high-suitable areas were identified and ranked using compromise programming method. Meanwhile, discounted cash flow method was used to evaluate the recovery cost of logging residue with typical harvesting systems.
The results of the suitability index across the entire state indicate that the high-suitable areas account for 7% with 30 industrial sites located in high-suitable area category as the locations of alternative bioenergy plants. The ranking for all thirty locations is implemented for the reference of bioenergy industry development in the future. In addition, for the harvesting system consisting of cable skidder and loader, the skidding cost is $11.69/tonne and the loading cost is $5.25/tonne. The recovery costs under other alternative machine systems were also evaluated for strategic development of forest residue utilization in West Virginia.
Keywords: Management; Forest Biomass; Bioeconomy; Siting suitability; Recovery Cost

4. Factors Related to the Feasibility of Utilizing Wood Residues as a Fuel Source (Michael Crosby, Louisiana Tech University)
Authors:
Michael K. Crosby, Assistant Professor, School of Agricultural Sciences and Forestry, Louisiana Tech University
T. Eric McConnell, Assistant Professor, Department of Forestry, Mississippi State University
Jason J. Holderieath, Assistant Professor, School of Agricultural Sciences and Forestry, Louisiana Tech University
Abstract:

Seeking alternate and supplemental fuel sources for energy consumption has increased in the last 15 years. Biofuel production frequently uses short-rotation crops (corn, eucalyptus, etc.) but overlooks woody residues that might be converted into a useful energy source (e.g., biofuel) instead of being left in the field as slash or burned for heat at a production facility. In order to assess the potential availability of biomass residues, Forest Inventory and Analysis (FIA) data were queried to obtain dry weight biomass for tops and limbs for one inventory cycle (i.e., 5-year period). The data were summed to the county level and combined with American Community Survey data and presently known mill locations. The locations were utilized as a proxy for any potential mill that may utilize biomass residues for a hypothetical energy/biofuel plant. Parishes were then coded for mill presence (i.e., 1) or absence (i.e., 0). A logistic linear model was fitted to the data for parishes having non-zero biomass availability, with mill presence/absence being the dependent variable. Biomass yield (+), per capita income (-), and poverty rate (-) were significant independent variables ($p < 0.05$). Nineteen parishes possessed at least an 85% chance of containing a mill, while 21 parishes had no more than a 71% chance of a mill's presence. This provides a first approximation for mill locations that could support a wood residues market. Further work is required to determine transportation costs, workforce needs, and other factors that will influence the establishment of such a facility.
Keywords: Economics; Forest Inventory and Analysis; Louisiana; Mill siting

5. Optimal planting densities and rotation ages for longleaf pine plantations in the Western Gulf using LongGulf (Curtis L. VanderSchaaf, Louisiana Tech University)
Author: Curtis L. VanderSchaaf, Assistant Professor, Louisiana Tech University
Abstract:
Longleaf pine (Pinus palustris P. Mill.) is native to the Western Gulf and is commonly planted, particularly in certain parts of the region. Over the past 20 to 25 years there has been substantial effort to restore ecosystems of this species in the Southeastern United States. An easily, freely, and widely available growth and yield modeling system does not exist for this species, particularly in the Western Gulf, and given newer regeneration efforts that can substantially increase survival and growth rates of plantations. However, a Timber Decision Support System (TDSS) entitled LongGulf is being developed. This TDSS largely uses a model system developed using an extensive dataset of plantations from throughout the Gulf region. Although useful, it still suffers from the fact that much of the data used in model development was established using older reforestation methods that included bareroot seedlings, and less intensive site preparation and vegetation control. Nonetheless, it can help managers gain insight into optimal rotation ages and financial returns associated with planting density, stumpage values, and the production of non-timber related products such as pine straw production, grazing, biomass/biofuels, carbon credits, etc. LongGulf was used to conduct financial assessments of the crossing of four planting densities (300, 450, 600, and 750 seedlings per acre), three site indexes (50, 60, and 70 feet, base age 25), and for various stumpage markets and values. This TDSS is still being developed, and will eventually allow users more opportunity to look at the costs and returns associated with non-timber markets.
Keywords: growth and yield, economics, finance, management

6. Attitudes and Intentions of Landowners Towards Active Management for Deer Hunting in the Forest-Grassland Transitional Ecoregion of the South-Central USA (Bijesh Mishra, Oklahoma State University)
   Authors:
   Bijesh Mishra, Oklahoma State University
   Rodney Will, Oklahoma State University
   Omkar Joshi, Oklahoma State University
   Abstract:
   The forest-grassland transitional ecotone of the south-central USA is a mixture of forest, savanna, and prairie. The ecotone is increasing in woody plant dominance due to the exclusion of fire and other anthropogenic factors. Active management, e.g., prescribed fire and thinning, can increase sustainability and resiliency and restore the full suite of ecosystem services, but comes with the cost of management and acceptance of management tools. Deer hunting is a vital source of revenue generation to offset the landowner's management cost in the region. We tested Oklahoma landowners' and hunters' perceptions regarding active and sustainable management of forest and rangeland for deer habitat using two established theories of reasoned action and planned behavior as well as expanded theories adding moral norms. We collected mailed survey data and analyzed the results using structural equation modeling. We found that subjective norms and perceived behavior predict deer hunting intention when moral norms were introduced into the model. Attitudes, however, did not mediate through moral norms, but were able to significantly predict deer hunting intentions independently with negative sign. The study suggests that landowners have positive social pressure, and are interested towards active management but associated financial burden, and risk could be shaping negative attitudes.
   Keywords: Active Management, Deer Hunting, Theory of Planned Behavior, Theory of Reasoned Action, Structural Equation Modeling

7. Exploring Opportunities for Video Conferencing Outreach with Family Forest Owners in a Post-COVID World (Erin Matherne, Louisiana State University)
   Authors:
   Erin Matherne, Louisiana State University
   Jerrod Penn, Louisiana State University
   Michael Blazier, Louisiana State University
   Authors:
   Family forest landowners own about 120 million acres of land in the U.S. Because of the advanced age of many landowners, land is being transferred to younger generations who have higher chances of being absentee owners. Since the COVID-19 pandemic, there has been broader and more frequent use of videoconferencing technologies like Zoom. This technology may be useful in the realm of forest certification for younger forest landowners, who are more familiar with such technology, and absentee owners, who may be attracted to virtual education in lieu of traveling long distances to where their forestland is located. To explore such preferences, we conducted survey with a sample frame of 4,500 family forest landowners in Louisiana and Arkansas. Our hypothesis is that, because more people are acquainted with this technology due to COVID, and because the demographic is shifting towards a younger, more absent group of landowners, then they will be more likely to accept forest certification via videoconference.

Key Words:Forest management, Forest certification, Outreach, Online, Videoconferencing, COVID-19

8. What's in a Consultant's Role? Family forest landowners' preferences towards private versus public forest consultants for forest certification (Erika Largacha, Louisiana State University)
Authors:
Erika Largacha, Louisiana State University
Jerrod Penn, Louisiana State University
Michael Blazier, Louisiana State University
Abstract:
Promoting conservation practices among family forests landowners plays a critical role to enhance forest health and ecosystem services. Several certification programs recognize such efforts, but participation among landowners varies based on their characteristics, program requirements, and incentives. One crucial step of certification is to obtain a forest management plan, but acquisition among landowners remains extremely low. Several studies suggest connecting landowners with foresters as the key element towards the adoption of forest management plans. Because foresters are typically employed by public forestry agencies or as private self-employed consultants, landowners' willingness to work with either may differ. As far as we know, no such study has investigated and compared landowner preference for the two types of foresters. This study aims to determine the factors influencing the family forest landowners' willingness to obtain forest management plans with either a private or public consultant as a precursor to forest certification. This will be evaluated through a survey of family forest landowners from Northeastern Louisiana and Southeastern Arkansas. Results from this study will help determine how public and private foresters may affect landowners' interest in certification, by demonstrating differences in the landowners the two types of foresters can reach and aiding future outreach efforts towards conservation programs.
Keywords: Economics, consultation, certification, family forest, management, public, private

4:00 to 4:30 Happy Hour
CLICK HERE TO ENTER Main Room
Meeting ID: 937 0560 7808 Passcode: 120102
Just an informal session to visit with colleagues that we haven't seen in so long.

ZOOM LINK and PHONE INFORMATION:

Topic: ISFRE Annual Conference - **Main Room**
Time: May 18, 2021 08:00 AM Central Time
Every day, 2 occurrence(s)
May 18, 2021 08:00 AM
May 19, 2021 08:00 AM

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