SFWS SEMINAR SERIES

FALL 2012

Date	Speaker	Organization	Topic
Aug 28	Brian Kittler	Sustainable Solutions	Ecosystem services, how they work, and what is required to make them successful
Sept 4*	Dr. Guangsheng Chen	SFWS	Modeling effects of multiple environmental changes on terrestrial ecosystem greenhouse gas balance in North America
Sept 11	Dr. Scott Phipps	Weeks Bay National Estuary Reserve	An Overview of Research at the Weeks Bay National Estuarine Research Reserve
Sept 18	Dr. Clint Moore	US Geological Survey, Georgia Coop Fish and Wildlife Research Unit	E pluribus lumen: A multi-partner, learning-focused design for habitat management decision making under uncertainty
Sept 25	Dr. Ned Nikolov	USDA Forest Service	Environmental Pollution in carbon, water, ozone to atmosphere
Oct 2	Mr. John Gilbert	SFWS	Geographic Information System (GIS) Opportunities for Stand Dynamics
Oct 9	Dr. Mary Cablk	Desert Research Institute	The Mojave Desert Tortoise: Harbinger or beacon of the western US deserts?
Oct 16	Dr. Mary Ann Sword Sayer	United States Forest Service, Pineville	Interaction between Mn and roots—Are there pine vigor consequences?
Oct 23	Dr. Brian Via	SFWS	The development of vibration spectroscopy for rapid wood characterization & subsequent opportunities for the SFWS.
Oct 30	Dr. David Hyink	Retired from Weyerhaeuser	Planting density and tree-size relations observed in young spacing studies
Nov 6	Dr. Wei Ren	SFWS	Impacts of climate change and air pollution on terrestrial productivity and carbon storage
Nov 13	Mi Li	SFWS	Effects of Lignin and Xylan on the Initial Enzymatic Hydrolysis Rate of Organosolv Pretreated Biomass

Tuesday 11:00-12:00, SFWS Room 1101 unless noted

(*Will be held in Room 1223)

Coffee and Cookies will be served!

CFEs available

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Brian Kittler is the Project Director at the Pinchot Institute for Conservation and focuses primarily on the Institute's work on bioenergy and community-based natural resource management and policy. His current work examines the extent to which various approaches to wood-biomass utilization can support renewable energy development, sustainable natural resource-based communities, and the improved management and conservation of forest resources. Brian has helped lead a broad-based multi-sector policy dialogue to identify appropriate mechanisms to help ensure that as markets for wood-based energy develop, they remain closely aligned with principles of sustainable forest management. In addition to this work on bioenergy, Brian manages a process to monitor and evaluate the role communities play in the conceptual development, design, and implementation of stewardship contracts and agreements on National Forest System and Bureau of Land Management lands. Before his work at the Institute, Brian managed programs for the National Fish and Wildlife Foundation and also worked on wilderness management issues in the Mt. Hood National Forest. He holds a Bachelor of Arts in Environmental Policy from Colby College and a Master of Science in Environmental Science and Policy from the Johns Hopkins University.

Title: Ecosystem services, how they work, and what is required to make them successful

Abstract: The Pinchot Institute and partners have been developing partnerships and tools to facilitate the development of payment for ecosystem service programs in the Chesapeake Bay, Delaware River watershed and Northwestern U.S. Brian Kittler will discuss the basics of PES programs and demonstrate available tools to facilitate their development. These tools include LandServer and Ecosystem Crediting Platform. LandServer, www.landserver.org, is an online tool that helps farm and woodland owners discover the ecosystem services provided by their land and estimates their potential to enter into a variety of payment for ecosystem service programs. The Ecosystem Crediting Platform, baybank.ecosystemcredits.org, helps users design and implement PES projects.

Dr. Guangsheng Chen completed his PhD degree in the School of Forestry and Wildlife Sciences at the end of 2010 and then continued his research career in the same research group as a postdoctoral research fellow. Dr. Chen is a systems ecologist and modeler with a strong background in systems integration and modeling. His primary research focuses are to understand terrestrial ecosystem dynamics and biogeochemical cycles under multiple environmental changes in the past, present and future, and to provide a scientific basis for ecosystem management and policy-making. His PhD work is to study effects of land management and disturbance on carbon, water and nitrogen dynamics in the southern United States, while his postdoctoral work

is to model ecosystem dynamics and greenhouse gas balance in North America. During his research career, he has published over 40 papers in peer-reviewed journals.

Title: Modeling effects of multiple environmental changes on terrestrial ecosystem greenhouse gas balance in North America

Abstract: Terrestrial ecosystems in North America have been greatly influenced by multiple environmental changes (e.g., land use, atmospheric composition, climate, and natural & human disturbances) during the past century, resulting in significant disruptions to the terrestrial biogeochemical cycles. Many studies have been conducted to investigate regional carbon balance under multiple environmental changes in this region; however, less attention has been paid to other impotent greenhouse gases (GHGs) such as CH4 and N2O. In this study, we introduced the modeling approaches for simulating the dynamics of these three GHGs (i.e., CO2, CH4 and N2O). Then, we estimated the full budget of these gases. Finally, the changes of these GHGs were attributed to environmental factors including land use, atmospheric CO2, tropospheric ozone, nitrogen deposition, climate, land management, and major disturbance events.

Dr. Scott W. Phipps received a BS in Bioscience and an MS in Plant Science from Eastern Illinois University. He received a Ph.D. in Bioscience from Mississippi State University. His research has concentrated on algal ecology and water quality. Dr. Phipps has been the Research Coordinator at the Weeks Bay National Estuarine Research Reserve since the fall of 1999.

Title: An Overview of Research at the Weeks Bay National Estuarine Research Reserve

Abstract: The Weeks Bay National Estuarine Research Reserve (WBNERR) was designated in 1986 as the 16th National Estuarine Research Reserve. It is managed as a partnership between the Alabama Department of Conservation and Natural Resources and the National Oceanic and Atmospheric Administration. The mission of WBNERR is to provide leadership to promote informed management of estuarine and coastal habitats through scientific understanding and encourage good stewardship practices through partnerships, public education, and outreach programs. The Goal of WBNERR Research Program is to provide current scientific knowledge for the management of our estuaries.

WBNERR research focus areas include:
*Eutrophication/Non Point-Source Pollution
*Habitat Conservation and Restoration
*Biological Diversity and Effects of Invasive Exotic Species
*Mechanisms for Sustaining Resources
*Economic, Sociological and/or Anthropological Research Applicable to Estuarine Ecosystem Management

In support of research at Weeks Bay, the Reserve staff maintains an extensive monitoring program. The System-Wide Monitoring Program (SWMP) consists of abiotic and biotic monitoring and analysis of land use, habitat mapping and change.

Dr. Clint Moore, a USGS Wildlife Biologist, is Assistant Unit Leader of the Georgia Cooperative Fish and Wildlife Research Unit at the University of Georgia, where he also serves as Adjunct Assistant Professor of Wildlife Ecology and Management. He earned degrees in wildlife management at the University of Georgia and in statistics at North Carolina State University. He has conducted applied research and data analysis services in previous appointments at Patuxent Wildlife Research Center, U.S. Fish and Wildlife Service, National Biological Service, and Florida Fish and Wildlife Conservation Commission. His research interest is in providing approaches to the understanding and scientific management of wildlife populations and their habitats, with a focus on the development and application of statistical, biological modeling, and decision analytic tools.

Title: E pluribus lumen: A multi-partner, learning-focused design for habitat management decision making under uncertainty.

Abstract: Across a landscape, land managers traditionally approach habitat management decisions independently of one another, despite similarity among management units in terms of objectives, options, and uncertainties that hamper progress. Linking individual efforts in a structured way permits land managers to benefit from shared learning that they and their colleagues acquire, and it contributes to collective improvement in conservation delivery across the landscape. In this talk, I will describe an adaptive management framework that integrates the efforts of managers to counter invasions of native prairies by exotic grasses on national wildlife refuges in the northern Great Plains. The framework rests on a set of models that predict vegetation response to management actions under competing biological hypotheses and on an annual monitoring program to assess those predictions. For each management unit under control of a land manager, a treatment recommendation is provided that is optimal for the unit's current condition and for the current state of belief in each of the hypotheses. Managers use a web-based environment to contribute information about the actions they implement and the responses they observe. Automated analytical tools process the data, update knowledge about the hypotheses, and distribute the next round of treatment recommendations to complete the cycle. By carefully structuring the decision problem, we developed a product that has committed ownership by the participating managers and gives them a sense of common purpose. Consequently, the framework has a good prospect of being institutionalized as a routine approach to management decision making that will allow learning to unfold over time.

Dr. Ned Nikolov is an Air Resource Scientist in Fort Collins, CO. He and Dr. Karl Zeller conducted a critical review of the Greenhouse Theory. Using a novel analysis of planetary climates across the solar system, they demonstrate that the physical nature of the atmospheric "Greenhouse" Effect is a Pressure-induced Thermal Enhancement (PTE) that is independent of the chemical composition of the atmosphere.

Their paper entitled "Expanding the Concept of Atmospheric Greenhouse Effect Using Thermodynamic Principles: Implications for Predicting Future Climate Change" was presented at the Open Science Conference of the World Climate Research Program on October 24, 2011 in Denver, CO.

Title: Unified Theory of Climate.

Abstract: Recent studies reveal that Global Climate Models (GCMs) significantly overestimated the amount of Earth's warming since 1979 while failing to predict the observed halt of global temperature rise over the past 13 years. No consensus currently exists as to why the warming trend ceased in 1998 despite a continued increase in atmospheric CO2 concentration. In addition, a number of problems have been identified in past GCM projections when compared to satellite observations including incorrect feedback mechanisms and significant underestimation of the rate of Earth's infrared cooling to space. At the same time, a new analysis of the CO2-temperature relationship using empirical data from a wide range of temporal scales suggests that CO2 has not influenced Earth's global climate in the past.
These discrepancies between theory and observations prompted a reexamination of the current concept of the Atmospheric Greenhouse Effect (AGE). Using theoretical analyses and recent Moon temperature observations we show that Earth's AGE is much stronger (larger) than 33K currently assumed. We also demonstrate through analysis of planetary data from our Solar System that AGE is in fact a thermodynamic (pressure) phenomenon, not a radiative phenomenon as presently believed. Specifically, we show that the physical nature of AGE is a Pressure-induced Thermal Enhancement (PTE) which is independent of atmospheric composition and infrared back radiation. These results amount to new paradigm of AGE with far-reaching consequences for our understanding of the climate system. The new paradigm is subsequently combined with findings from other studies on solar magnetic activity, cloud dynamics, Earth's orbital fluctuations, and paleo-climatic variations to develop a new hierarchical framework of climate drivers called Unified Theory of Climate (UTC). We hope that the proposed UTC will help further our understanding of various climate forcings and the time scales of their operation as well as prompt the development of the next generation of climate models to provide more robust and realistic projections of future climate.

John Gilbert is a Research Associate in the School of Forestry and Wildlife Sciences at Auburn University, Alabama. He works in the Longleaf Pine Stand Dynamics Lab on numerous longleaf pine projects. His major areas of interest are longleaf pine stand dynamics and restoration, GPS/GIS applications, and database development. Mr. Gilbert holds a Bachelor of Science in Forestry and a Master of Science in Forest Stand Dynamics with a Graduate Minor in Statistics from the School of Forestry and Wildlife Sciences at Auburn University.

Title: Geographic Information System (GIS) Opportunities for Stand Dynamics
By Gilbert, Kush, and Barlow.

Abstract: From education to application, Geographical Information Systems (GIS) are powerful tools that are important to contemporary natural resource management. The professional fields of forestry, wildlife, and natural resource management are not immune to the rapid expanse of technology. The demand for using GIS and Global Positioning Systems (GPS) technology in field, workplaces, laboratories, and classrooms is constantly growing and is now the norm rather than the exception. Basic mapping skills to create essential stand level maps utilizing aerial photography, soils, and topographic information should be well used tools in any natural resource professional's toolbox. Going beyond basic map making, GIS can be used to design

robust databases at different scales to answer a variety of questions now and into the future by providing key information and for optimized decision making in management. With the power of databases and the current expanse of remote sensing techniques, more opportunities exist for complex calculations and modeling to explore stand dynamics by adding a spatial context. Drawing from almost 10 years of experience, examples of how technology can be used in the classroom and applied in the field will be presented using data from the Escambia Experimental Forest, Flomaton Natural Area, and Donahue Forestry Plots. This presentation will also highlight how databases, tree densities, and gap dynamics, can be used to create two and three dimensional simulations.

Dr. Mary Cablk is an Associate Research Professor at the Desert Research Institute in Reno, NV. She holds degrees from Virginia Polytechnic Institute and State University, Duke University and Oregon State University. Upon completing her Ph.D. in 1997 she was awarded two consecutive National Research Council Postdoctoral Fellowships to study the potential impacts of urban expansion in and on the California Mojave Desert using alternative future scenario modeling and image processing change detection. Since that time she has come to know the Mojave and Great Basin landscapes well through her work on listed and 'watched' species on federal lands. It is her appreciation of biodiversity and the scales at which life unfolds that inspires her to solve complexity. Over the past decade Dr. Cablk has focused on developing innovative methods for improving our understanding of natural systems through animal and machine remote sensors, particularly applied to the interplay of humans and their environment. Dr. Cablk directed the Desert Tortoise K9 Program from 2002-2011, pioneering the use of working dogs trained to find the threatened Mojave Desert tortoise. She currently studies detection dog capabilities and consults to the DOD on issues of encroachment.

Title: The Mojave Desert Tortoise: Harbinger or beacon of the western US deserts?

Abstract: The Mojave Desert tortoise was first federally listed as endangered in 1989 by way of temporary emergency listing due to high mortality and disease. Further examination resulted in the final federal listing of 'threatened' in 1990 and 22 years later its status remains the same. In 2011 the USFWS produced a revised Recovery Plan that "is a high-quality blueprint for the recovery of the Mojave population of the desert tortoise." With this recovery plan finalized the western US deserts now face new pressures on its landscapes. These pressures put individuals, agencies, and society as a whole in the position to make choices about not just 'the future' but 'our future'. The footprints of solar, wind, and geothermal energy are the most recent set of challenges facing not only the desert tortoise, but all species in the US western deserts. Coupled with climate change, ongoing western water wars, and many of the same threats that resulted in its original listing, the future of the Mojave Desert tortoise, and other desert natives, remains uncertain. What started as a story about disease in a native reptile became a novel on fragmentation and habitat loss, among other threats from anthropogenic forces. This small, unassuming species has led us down a difficult path of hard science, policy measures, professional disputes, and ultimately into the unknown. This seminar will summarize the journey of conservation efforts for the Mojave Desert tortoise and then trace the present path forward to elucidate those aspects of conservation that cross spatial scale and political will.

Mary Anne Sword Sayer is a Plant Physiologist with the U.S. Forest Service Southern Research Station in Pineville, Louisiana. After receiving her Ph.D. in forestry from the University of Missouri-Columbia in 1991, she joined the SRS forest management research group in Pineville, Louisiana. Through 2005, her research focused on the root system growth and development of plantation loblolly pine. In 2006, Mary Anne became a member of the SRS work unit, "Restoring and Managing Longleaf Pine Ecosystems". The overall goal of her research is to understand what is required of the root system to sustain the vigor of longleaf pine ecosystems and other southern pine forests, and what can be done by forest managers to aid root system function.

Title: Interaction between Mn and roots—Are there pine vigor consequences?

Abstract: An analysis of the nutrition of two groups of longleaf pines at Fort Benning and at Eglin Air Force Base, each characterized by a high and low category of vigor, revealed elevated levels of foliar Mn regardless of vigor category. While pines are tolerant of excess foliar Mn, if the mechanisms that afford Mn tolerance fail then the potential exists for Mn to disrupt photosynthesis. On sites such as these where soil resources are scarce, tree vigor relies on an expansive root system network to supply water and mineral nutrients. It was hypothesized that longleaf pine vigor at these locations was correlated with the effectiveness of Mn tolerance mechanisms that preserve normal levels of photosynthesis and the flow of energy to belowground sinks. In a greenhouse experiment, the effect of elevated foliar Mn on the growth and physiology of potted longleaf seedlings was evaluated. Stem and fine root dry weights were reduced, but foliage and woody root dry weights were unaffected by elevated Mn. Net photosynthesis was reduced by elevated Mn but this effect was only observed during the transition between well-watered and water stress conditions. The implication of these results with regard to southern pine vigor will be discussed.

Dr. Brian Via has 7 years industrial R&D experience at both International Paper and Louisiana Pacific and 4 years of experience at Auburn University. At International Paper he was a Wood Quality Project Leader where he characterized the morphology and chemistry of loblolly pine for genetics and silvicultural based studies and he worked with both lumber and pulp and paper manufacturers to determine the effects of different families and silvicultural treatments on product performance. At Louisiana Pacific he was a Research Engineer where he worked to design new products, lower recipe costs and/or improved the performance of composites and adhesives, performed experimental designs at the manufacturing plants, and assisted the plants with statistical quality control issues. Dr. Via earned his B.S. in Forest Products Marketing discipline (Forestry and Wildlife Major) and his M.S. in Wood Engineering/Mechanics discipline (Forestry and Forest Products Major) at Virginia Tech and his Ph.D. in Wood Characterization/Wood Quality discipline at Louisiana State University (Agricultural and Mechanical College). He is currently an Assistant Professor in the School of Forestry and Wildlife Sciences but also has a joint appointment in Biosystems Engineering. Dr. Via is married with no children but loves and owns cattle dogs, loves to grow vegetables, and has grown fond of learning the art of barbequing/smoking since moving to the southern region.

Title: The development of vibration spectroscopy for rapid wood characterization & subsequent opportunities for the SFWS.

Abstract: A summary of applications of near infrared reflectance (NIR) and fourier transform infrared reflectance (FTIR) spectroscopy for rapid wood characterization (in particular the southern pines) will be discussed. NIR generally performed better than FTIR for most applications however both can be used to collect high quality data and in most cases can be combined to improve precision. Because techniques will produce a spectra which represents the molecular absorption (and consequently reflectance) resulting in a molecular fingerprint for the woody sample, it is possible to build multiple/independent models for multiple traits from the same spectra/signal. This ability to independently monitor multiple traits with one signal is important because one can make an array of quality control decisions in the lab, field, or manufacturing environment. Multivariate statistical analysis was utilized to build models and interpret the underlying wood chemistry that impacts the calibration for each wood trait of interest. Metrics and/or disciplines that were successfully calibrated for includes the fundamental wood chemistry (lignin, cellulose, hemicellulose, and extractives), an index of cellulose crystallinity, mechanical properties, and bio-energy. Within the SFWS, we have been working closely with the Forest Health Cooperative to rapidly characterize the wood chemistry and crystallinity index of loblolly pine genetic families. We are also currently trying to leverage this technology to recruit industrial partners to form a Forest Products Development Cooperative.

After earning his Bachelor of Science in Forest Management and Master of Science in Forest Biometrics at Stephen F. Austin State University, **Dr. David Hyink** began his professional career as a Research Associate in Forest Nutrition in the Department of Forestry at Auburn University in February 1973. In July 1975, he left to attend Purdue University where he earned his Ph.D. in Forest Biometrics in 1979. He then joined the faculty at Virginia Tech as an Assistant Professor of Forest Biometrics. In 1980 he accepted a position as a biometrician with the Western Forestry Research group at Weyerhaeuser Company. During his 27-year career at Weyerhaeuser, Dr. Hyink was engaged in all aspects of forest growth and yield research and was the principal architect of the Company's forest growth models. In addition, he managed outside Company cooperative research in growth and yield and held the position of Affiliate Full Professor at both the University of Washington and the University of Idaho. In 1994 Dr. Hyink was the Weaver Lecturer at Auburn University, which led to his 15-year membership on the Auburn University Research Advisory Council. Dr. Hyink retired from Weyerhaeuser in 2007 and currently owns Deerfield Consulting LLC in Rapid City, South Dakota. In retirement, Dr. Hyink spends much of his time in the non-profit sector – serving on various boards of the Boy Scouts of America, Habitat for Humanity and is a founding director of the Center for Business and Economics of the Northern Plains. He and his wife, Stephanie, also maintain a home in Auburn, AL where his son Jon (AU, 2003) and his family reside.

Title: Planting density and tree-size relations observed in young spacing studies

Abstract: In the mid-1980's Weyerhaeuser Company's Western Timberlands Production Forestry Research group began planting a series of 5-acre blocks of Douglas-fir seedlings at various densities ranging from 120 to 1200 stems per acre. The early growth and development of these plantings exhibited some remarkable and unexpected results during the first decade after

planting. The rationale behind these studies and those early results will be discussed in this seminar.

Dr. Wei Ren received her Ph.D. from Auburn University in Dec. 2009 and currently works as a Research Fellow in International Center for Climate and Global Change Research (ICCGCR) at Auburn University. Her primary research interest is in the understanding, quantification and assessment of how multifactor global changes in climate, land use/land cover (LU/LC), and atmospheric chemistry have affected and will affect the structure and functioning of terrestrial ecosystems including biogeochemical cycles and water resources, by using an integrated approach – a combination of field study, process modeling and remote sensing/GIS.

Title: I Impacts of climate change and air pollution on terrestrial productivity and carbon storage

Abstract: Climate change and air pollution are among the most challenging environmental problems that threaten the sustainability of terrestrial. Quantifying how these environmental changes have affected carbon (C) fluxes and storage is crucial to understanding the global C cycle and ecosystem sustainability. This study first explored the underlying mechanisms of terrestrial ecosystem carbon dynamics in responses to multifactor global changes with an emphasis on air pollution and climate change. Then by applying an integrated ecosystem model (Dynamic Land Ecosystem Model-DLEM), we quantitatively investigated the terrestrial productivity and C storage in the US and China, and their responses to tropospheric ozone pollution and historical climate variability/ change during 1961-2005. The modeled results show that elevated ozone pollution resulted in terrestrial productivity reduction and C loss and these negative effects could be accelerated by climate extreme events such as drought. This study indicates that although China and the US are facing different environmental problems i.e. different levels of ozone pollution, improved air quality could significantly increase productivity and C storage in terrestrial ecosystems and optimized land management options could help terrestrial ecosystem adapt to future climate change and air pollution in both countries.

Mi Li is from China and he works with Dr. Maobing Tu in Forest Products Lab, Auburn University. He came to AU at Fall 2010 for his doctorate in forestry. Mi Li attended Northeast Forestry University in China where he graduated with Bachelor degree and Master degree in Chemical engineering of forest products. He used to work in Northeast Forestry University Provost office and was in charge of training and improving young faculty on teaching skills. Now he is working on the bioenergy and byproducts production from forestry lignocellulosic feedstock.

Title: Effects of lignin and xylan on the initial enzymatic hydrolysis rate of organosolv pretreated biomass

Abstract: Forestry lignocellulosic feedstock is a great potential source of sustainable materials for biofuels and chemicals. Bioenergy derived from lignocellulosic materials attracts a lot interests and attention due to three main reasons: (1) the fossil fuel is non-renewable; (2) biofuel reduces greenhouse gas; and (3) the source for viable feedstock is abundant and low-cost. Technically, the bioconversion of lignocellulosic feedstock to bioenergy is composed of four steps: pretreatment, hydrolysis, fermentation and recovery. Feedstock pretreatment with steam, acid, alkaline or solvent at high temperature intends to break down the recalcitrant structure of lignocellulosic materials and increase the accessibility of enzyme to cellulose micro-fibrils. Enzymes hydrolyze the glycosidic bonds in the long chain of polymer to monomeric sugars. In the fermentation step, sugars are bio-converted to ethanol by ethanologenic microorganisms. Finally, bioethanol is recovered through distillation. After pretreatment of loblolly pine and sweetgum, the main components (cellulose, hemicellulose and lignin) are fractionated into a water-insoluble fraction and water-soluble fraction. The solid fraction is mainly composed of cellulose and lignin; and the liquid fraction is mainly composed of partially hydrolyzed hemicellulosic sugars and solvent-soluble lignin. For the solid fraction, we studied the roles of xylan in influencing the process of enzymatic hydrolysis. It turned out that the xylan residual in the solid fraction affected the initial hydrolysis rate of cellulase. For the liquid fraction, we investigated the fermentability when it was subject to microorganism fermentation in the downstream. It turned out that the prehydrolysate from the pretreatment showed different fermentability when treated with detoxification.