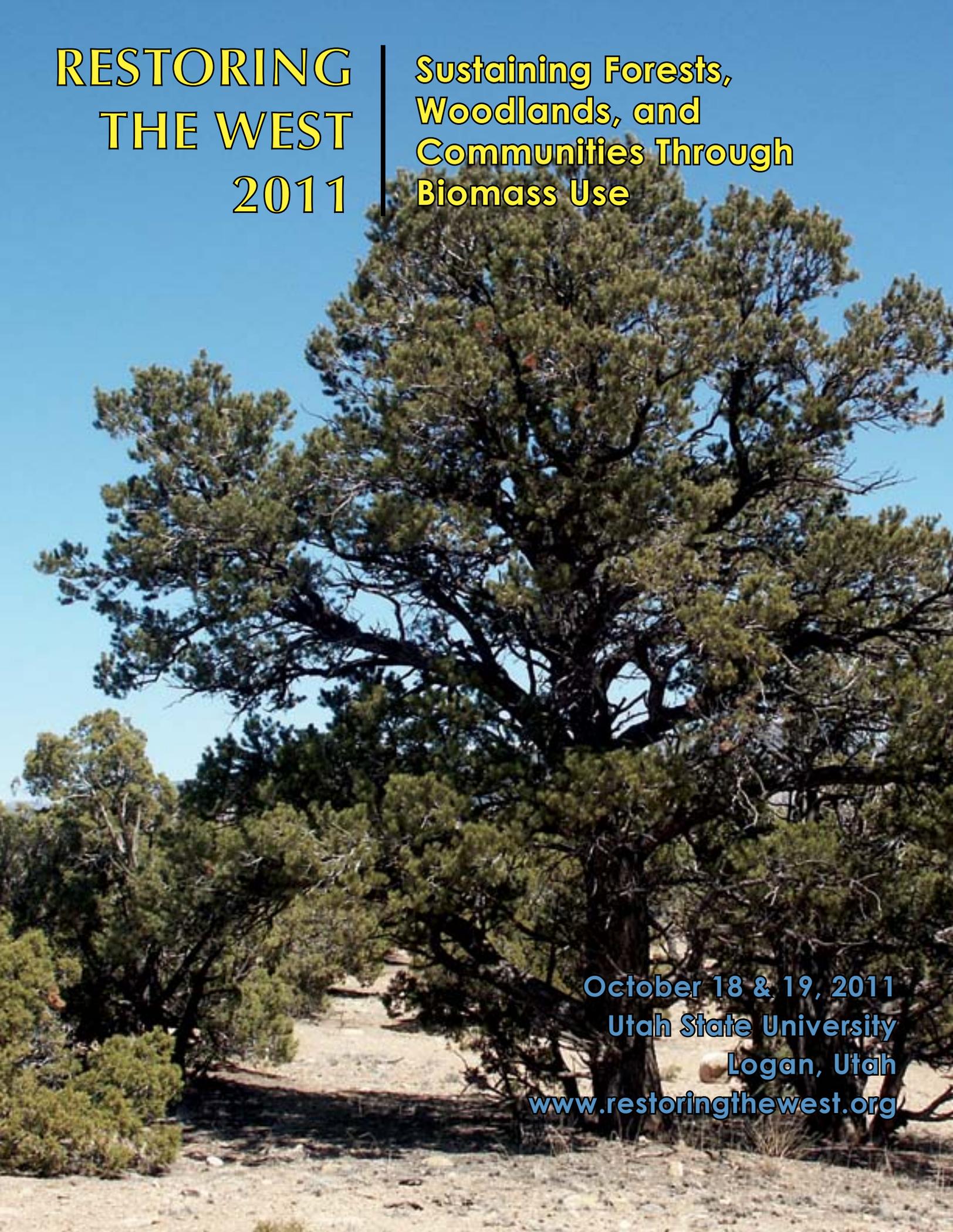


RESTORING THE WEST 2011

Sustaining Forests,
Woodlands, and
Communities Through
Biomass Use

October 18 & 19, 2011
Utah State University
Logan, Utah
www.restoringthewest.org



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Agenda

Tuesday, October 18 USU Eccles Conference Center	
7:30 to 9:00 am	Registration Open
8:30 am to 12:10 pm	Plenary Sessions
8:30 to 8:40 am	Welcome, Conference Overview, Darren McAvoy , Extension Forestry Associate, Utah State University, Logan, Utah
8:40 to 9:10 am	Biomass Utilization: A Tool for Forest Restoration , Mike Dudley, Director of State and Private Forestry, Regions One and Four, USDA Forest Service, Ogden, Utah
9:10 to 9:50 am	The History of Biomass Utilization in the West: From Tee Pee Burners to Woody Biomass Derived Aviation Fuel , Craig Rawlings, Forest Business Network, Missoula, Montana
9:50 to 10:30 am	Towards a Cohesive Federal Policy on Wood Bioenergy , Jay O’Laughlin, Professor of Forestry and Policy Sciences, University of Idaho, Moscow, Idaho
10:30 to 11:00 am	Break
11:00 to 11:30 am	Energy Regulatory Policies Encouraging Biomass Power in the West , Daniel R. Simon, Partner, Ballard Spahr, Washington D.C.
11:30 to 12:10 am	Woody Biomass Utilization Update for Natural Resource Managers , Mark Knaebe, Natural Resource Specialist, State and Private Forestry Technology Marketing Unit, USFS Forest Products Laboratory, Madison, Wisconsin
12:10 to 1:30 pm	Posters and Lunch
1:30 pm to 4:30 pm	Afternoon Break-out Sessions (2): Ecology and Utilization
	Session 1: Ecological Considerations (Room 201/203) , Moderator Ron Ryel, Associate Professor, Department of Wildland Resources, Utah State University, Logan, Utah
1:30 to 2:00 pm	Can Biomass Use in Pinyon Juniper Woodlands be Considered Ecological Restoration? , Peter Weisberg, Associate Professor Landscape Ecology, Department of Natural Resources and Environmental Science, University of Nevada, Reno, Nevada
2:00 to 2:30 pm	Pinyon Juniper Restoration Ecology: Compatibilities and Incompatibilities of Biomass Harvesting in the Southwest , Douglas Shinneman, Supervisory Research Fire Ecologist, Forest and Rangeland Ecosystems Science Center, USGS, Boise, Idaho
2:30 to 3:00 pm	Silviculture for Pinyon Juniper Ecosystems , Douglas H. Page, Southwest Utah Zone Forester, BLM, Cedar City, Utah
3:00 to 3:30 pm	Break

Agenda, continued

Tuesday, October 18 USU Eccles Conference Center	
3:30 to 4:00 pm	Climate Change, Genetic Variability, and Associated Great Basin Woodland Dynamics: Implications for Long-Term Biomass Production , Robin Tausch, Science Leader, Rocky Mountain Research Station, Reno, Nevada
4:00 to 4:30 pm	Questions and Discussion with Session 1 Speakers
	Session 2: Woody Biomass Utilization – Is it feasible? (Room 303/305) , Moderator Scott Bell, Woody Biomass Utilization Coordinator, Regions 1 and 4, State and Private Forestry, USDA Forest Service, Ogden, Utah
1:30 to 2:00 pm	The Economics of Biomass , Jared Abodeely, Research Engineer, Idaho National Laboratory, Idaho Falls, Idaho
2:00 to 2:30 pm	Biomass Business Principles of Success , Gil Miller, President, Economic Associates of Utah, Board Member Rural Life Foundation, Corinne, Utah
2:30 to 3:00 pm	Marketing Strategies for Biomass Utilization , Dusty Moller, Wood Utilization Manager, Business Environmental Program, Small Business Development Center, University of Nevada, Reno, Nevada
3:00 to 3:30 pm	Break
3:30 to 4:00 pm	New Developments in the World of Biomass Utilization , Christopher Wright, Senior Research Engineer, Biofuels and Renewable Energy, Idaho National Laboratory, Idaho Falls, Idaho
4:00 to 4:30 pm	Questions and Discussion with Session 2 Speakers
4:30 pm	Adjourn
5:00 to 7:00 pm	Reception, Logan Country Club, Hors d’Oeuvres, Cash Bar

Agenda

Wednesday, October 19 USU Eccles Conference Center	
8:30 to 8:35 am	Welcome , Darren McAvoy, Extension Forestry Associate, Utah State University, Logan, Utah
8:35 to 10:00 am	Plenary Sessions
8:35 to 9:05 pm	Collaboration Successes Around the West and Why Collaboration is Important , Mary Mitsos, Vice President for Conservation Programs, National Forest Foundation, Missoula, Montana
9:05 to 9:35am	What Works for Biomass Harvesting in Pinyon Juniper , Lance Lindbloom, Owner, Bloomin Ranch Services, Beaver, Utah
9:35 to 10:05 am	The Need for PJ Restoration in Eastern Nevada , Jeremy Drew, Resource Specialist, Resource Concepts Inc., Carson City, Nevada
10:05 to 10:30 am	Break
10:30 am to 12:00 pm	Morning Break-out Sessions (3): Ecology, Bioenergy, Biochar
10:30 am to 12:00 pm	Session 1: Ecological Considerations (Room 201/203) , Moderator Marcella Campione, Graduate Research Assistant, Department of Wildland Resources, Utah State University, Logan, Utah
10:30 to 11:00 am	Biomass Energy: Seeing the Forest Through the Trees , Chad Davis, Forest Stewardship Program Director, Sustainable Northwest, University of Oregon, Eugene, Oregon
11:00 to 11:30 am	Native Utah Grasses for Biomass , Steve Larson, Research Geneticist, Forage and Range Research Laboratory, USDA Agricultural Research Service, Logan, Utah
11:30 am to 12:00 pm	Modeling Biomass and Canopy Fuel Attributes Using LIDAR Technology , Brent Mitchell, Remote Sensing Analyst, USDA Forest Service, Remote Sensing Applications Center (RSAC), Salt Lake City, Utah
10:30 am to 12:00 pm	Session 2: Bioenergy (Room 303/305) , Moderator John Nowoslawski, Alternative Energy Manager, Utah Office of Energy Development, Salt Lake City, Utah
10:30 to 11:00 am	Billion Ton Report , Anthony Turhollow, Economist, Oak Ridge National Laboratory, Logan, Utah
11:00 to 11:30 am	Bioenergy 101 , Dallas Hanks, Director, Center for Agronomic and Woody Biomass, Utah State University Extension, Salt Lake City, Utah
11:30 am to 12:00 pm	Viable Bioenergy Options , Mark Knaebe, Natural Resource Specialist, State and Private Forestry Technology Marketing Unit, USFS Forest Products Laboratory, Madison, Wisconsin
10:30 am to 12:00 pm	Session 3: Biochar (Main ECC) , Moderator Jay Mashburn, Rural Development Specialist, Rural Community Assistance Corporation (RCAC), Grand Junction, Colorado
10:30 to 11:00 am	Biochar Basics , David Shearer, CEO/Co-founder, Full Circle Solutions, San Francisco, California
11:00 to 11:30 am	Land Reclamation and Restoration , John Gaunt, Director, Keysoil Ltd.
11:30 am to 12:00 pm	Biochar and Forest Ecology , Mark Coleman, Associate Professor of Forest Resources, University of Idaho, Moscow, Idaho

Agenda, continued

Wednesday, October 19 USU Eccles Conference Center	
12:00 to 1:00 pm	Lunch
1:00 to 2:30 pm	Afternoon Breakout Sessions (3): Ecology, Bioenergy, Bio-products
1:00 to 2:30 pm	Session 1: Ecology (Room 201/203) , Moderator Ken Sterling, Graduate Research Assistant, Department of Wildland Resources, Utah State University, Logan, Utah
1:00 to 1:30pm	Exploring the Biomass Accumulation Possibilities from Active Forest Management in Utah Forest Types , Justin DeRose, Research Ecologist, Rocky Mountain Research Station, USDA Forest Service, Ogden, Utah
1:30 to 2:00 pm	Regional Trends in Biomass Volumes , Sara Goeking, Biological Scientist, Rocky Mountain Research Station, USDA Forest Service, Ogden, Utah
2:00 to 2:30 pm	Restoring Fire and People to the Land: The 2010 South Umpqua Study , Bob Zybach, Program Manager, Oregon Websites and Watersheds Project, Inc., Eugene, Oregon
1:00 to 2:30 pm	Session 2: Bioenergy (Room 303/305) , Moderator John Nowoslawski, Alternative Energy Manager, Utah Office of Energy Development, Salt Lake City, Utah
1:00 to 1:30 pm	Fuels for Schools , Angela Farr, Regional Biomass Utilization Coordinator, Regions 1 and 4, USDA Forest Service, Missoula, Montana
1:30 to 2:00 pm	Thermochemical Conversion of Biomass to Fuels and Chemicals - Pyrolysis and Gasification , Ofei Mante, Visiting Research Scholar, Synthetic Bio-Manufacturing, Utah State University, Logan, Utah
2:00 to 2:30 pm	Q & A and Panel Discussion
1:00 to 2:30 pm	Session 3: Challenges of Funding New Technologies (Main ECC) , Moderator Jay Mashburn, Rural Development Specialist, Rural Community Assistance Corporation (RCAC), Grand Junction, Colorado
1:00 to 1:30pm	Biochar: Financial Perspectives , Tom Etzel, Senior Vice President, Zions Bank, Salt Lake City, Utah
1:30 to 2:00 pm	Federal Funding Opportunities , Dave Conine, Utah Director, USDA Rural Development, Salt Lake City, Utah and Perry Mathews, Business Programs Director, USDA Rural Development, Salt Lake City, Utah
2:00 to 2:30 pm	Q & A and Panel Discussion
2:30 to 2:45 pm	Afternoon Break
2:45 to 4:00 pm	Collaboration Panel , Moderator Ellen Drew Mary Mitsos, National Forest Foundation Mary O'Brien, Grand Canyon Trust Bob Swandby, Payette Forest Coalition and Wood Utilization Partnership Doug Martin, Nevada Tahoe Conservation District
4:00 to 5:00 pm	The Forestry/Bioenergy/Carbon Connection , Jay O'Laughlin, Professor of Forestry and Policy Sciences, University of Idaho, Moscow, Idaho
5:00 pm	Adjourn

Speaker Abstracts

In order of presentation,
presenting author in italics

Biomass Utilization: A Tool for Forest Restoration

Mike Dudley, Director of State and Private Forestry, Regions One and Four, USDA Forest Service, Ogden, UT

The Forest Service mission is to sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations. In this century, our forests and grasslands face serious threats to their sustainability from a variety of stresses and pressures. Foremost are climate change, altered disturbance regimes, non-native invasive species, and increasing pressures and impacts from an expanding human population. These diverse threats affect aquatic and terrestrial ecosystems in virtually every region of the country. Utilization of woody biomass generated from forest treatments can provide jobs, stimulate the local economy and ultimately reduce the cost of forest treatments.

Mike Dudley, Director State and Private Forestry, USDA Forest Service, Intermountain / Northern Regions, 324 25th St., Ogden, UT 84401, mdudley@fs.fed.us.

Mike began his Forest Service career as a seasonal firefighter on the Descanso Ranger District of the Cleveland National Forest, CA in 1977. Mike worked seasonally on various national forests in California before receiving his career conditional appointment on the Inyo National Forest, CA in 1980. In 1981 he moved to the Willamette National Forest, Oregon and worked in various fire/fuel positions including District Fire Management Officer. In 1997 he moved to the National Office, Washington, DC and during his 4 years there filled a number of positions in aviation, planning, and ending as the Assistant Director of Fire Ecology including National Fire Plan Key Point 3 Coordinator (Hazardous Fuels) for the US Forest Service. He moved to the Intermountain Regional Office as Director Fire, Aviation, Air Management in October, 2001. In September 2009 he moved into his current position as Director State and Private Forestry for the Northern and Intermountain Regions of the US Forest Service. He recently completed a detail as Acting Director Northeast Area State and Private Forestry in Newtown Square, Pennsylvania. Mike received a B.S. in Forest Management from Oregon State University in 1986.

The History of Biomass Utilization in the West: From Tee Pee Burners to Woody Biomass Derived Aviation Fuel

Craig Rawlings, Forest Business Network, Missoula, MT

Presentation will cover the history of woody biomass in the Rocky Mountain West (including Alaska), spanning a period of time from the late 60's to 2011 and beyond. Two primary sources of woody biomass covered in this presentation will be "mill residue" (sawdust, shavings, and bark) and "in-woods" (generated from commercial logging operations and forest restoration activities).

Craig Rawlings, President & CEO, Forest Business Network LLC, P.O. Box 2220, Missoula, MT 59806, craig@forestbusinessnetwork.com.

Craig is the president and one of three principles of Forest Business Network (FBN), a consultancy that also provides creative and communication services to the forest products industry. As FBN's lead consultant, Craig analyzes client business plans and provides advice on positioning, distribution, operations, and the pursuit of funding sources such as loans and grants. Craig also serves as publisher of ForestBusinessNetwork.com,

FBN's popular aggregation website for timber industry news. In addition, Craig edits Forest Business Weekly Newsletter, the company's email newsletter for timber industry news. Craig began his career as manager of a family-owned sawmill construction company. Craig is an active member of more than 20 forest industry associations, the recipient of numerous forest industry awards, and the lead author or co-author of a number of white papers on forest topics such as biomass energy generation, efficient biomass transportation, and long-term forest management strategy.

Towards a Cohesive Federal Policy on Wood Bioenergy

Jay O'Laughlin, Professor of Forestry and Policy Sciences, University of Idaho, Moscow, ID

Renewable energy sources provided eight percent of the energy our nation consumed in 2010. Biomass accounted for half of that, and wood was the largest subcategory of biomass energy ("bioenergy"), followed closely by liquid biofuels—each provided about 2 percent of our total energy needs. We know how to use wood to make energy, and we have been doing it for a long time. We could be doing more of it. Policy objectives for wood bioenergy might include a) reducing fossil energy use and thereby displacing reliance on foreign oil, b) improving forest health and sustainability, in part by creating markets for forestry products, and c) revitalizing rural economies via jobs. Reducing greenhouse gas (GHG) emissions is another potential objective, but dependent on the accounting stance towards sustainable forestry, which is currently a regulatory uncertainty (and addressed in my closing presentation on "The Forestry/Bioenergy/Carbon Connection"). Due to inattention to concerns affecting the western states, the Western Governors' Association (WGA) in August 2010 wrote to President Barack Obama's energy/climate advisor calling for a cohesive federal wood bioenergy policy, and received no response. A cohesive policy would have clearly specified objectives or ends and then focus on providing means to attain ends. The WGA expressed a sense of urgency and suggested that federal agencies actively engage with the states to develop a clear and unambiguous federal policy for wood bioenergy and make a top priority of attaining the multiple goals of healthy forests, clean air, productive economies, and clean energy. Specific areas needing improvement are a) the counterproductive multitude of biomass definitions, b) bias towards liquid biofuels, and c) land management policies that make removal of hazardous fuels difficult at the scale needed to improve wildfire resiliency, which in turn limits potential bioenergy feedstock supplies and other benefits from active land management.

Jay O'Laughlin, Ph.D., Professor of Forestry and Policy Sciences, Director of the Policy Analysis Group, College of Natural Resources, P.O. Box 441134. University of Idaho, Moscow, ID 83844-1134, jayo@uidaho.edu

Jay O'Laughlin has served as full-time Director of the Policy Analysis Group (PAG) at the University of Idaho's College of Natural Resources since 1989, a position created and funded by the Idaho Legislature to provide objective analysis of natural resource issues important to Idaho citizens, as suggested by an advisory committee of the state's natural resource leaders. Before moving to Idaho Jay was a tenured associate professor specializing in forest policy and economics in the Dept. of Forest Science at Texas A&M University. He earned M.S. and Ph.D. degrees in forestry from the University of Minnesota and a business finance degree from the University of Denver. Before enrolling in forestry school he was a U.S. Army artillery officer in Vietnam and spent three years with a manufacturing company in Chicago, Illinois.

*Policy analysis publications (available at the Website address above) cover a wide variety of issues, including public land management policies, endangered species conservation, sustainable forest management, risk analysis, water quality best management practices, and air quality and prescribed fire emissions policies. Recent analyses have focused on wildfire policy, wood bioenergy opportunities and challenges, and forest carbon management. Jay works on these issues in several off-campus roles, including the Forest Health Advisory Committee of the Western Governors' Association, and for Governor Otter, the Idaho Strategic Energy Alliance, serving as a member of its Carbon Issues Task Force and chairing its Forestry/Biomass Task Force. In 2009 he authored a report on the opportunities and challenges of using wood as an energy resource in Idaho.**

The University of Idaho gave Jay its Award of Excellence for Outreach in 2000, and in that same year he was elected a Fellow of the Society of American Foresters (SAF). In 2010 he received the SAF Award in Forest Science, a prestigious national award recognizing distinguished individual research in the application of managerial and social sciences leading to the advancement of forestry.

*http://www.energy.idaho.gov/energyalliance/d/forest_packet.pdf

Energy Regulatory Policies Encouraging Biomass Power in the West

Daniel R. Simon, Partner, Ballard Spahr, Washington D.C.

Abstract not available.

Daniel R. Simon, Partner, Daniel, Ballard, Spahr LLP, 601 13th St. NW, Ste 1000, South Washington DC, 20005, simond@ballardspahr.com.

Daniel R. Simon is a partner in the Washington, D.C. office of Ballard Spahr LLP, serving as a member of the Energy and Project Finance Group and the Climate Change and Sustainability Initiative. Mr. Simon's practice focuses on a wide range of energy regulatory issues, primarily in the electricity sector. He represents regional transmission organizations (RTOs) and independent system operators (ISOs), vertically integrated electric utilities, independent power producers (including qualifying facilities), and renewable energy project developers, frequently for projects in the Southwest. Mr. Simon has been involved with biomass projects that are operating or under development in three southwestern states. Mr. Simon currently serves on the Board of Directors of the Biomass Power Association.

Woody Biomass Utilization Update for Natural Resource Managers

Mark Knaebe, Natural Resource Specialist, State and Private Forestry Technology Marketing Unit, USFS Forest Products Laboratory, Madison, WI

Since WWII we have worked hard to stop forest fires. These efforts have resulted in more extreme fires today because of all the available ladder fuels. Thinning can reduce or even eliminate the catastrophic aspect of a fire but can the thinning's pay their way out of the forest? Uses from water filters to wood/plastic composites will be discussed. Unfortunately energy is the least valuable use.

Mark Knaebe, USDA Forest Service, State & Private Forestry, Technology Marketing Unit, One Gifford Pinchot Dr., Madison WI, 53726-2398, mknaebe@fs.fed.us.

Mark Knaebe is from the USDA Forest Service, State & Private Forestry, Technology Marketing Unit, located at the Forest Products Laboratory in Madison, WI. He is considered a technical expert in roundwood engineering design and wood finishing systems. Bioenergy is also a focus of his work, being the alpha tester for a new wood gasifier—the BioMax 5, which generates electricity from wood pellets. Recently, he has been working with rural communities in South America on technical issues involving wood utilization. He markets forest products technology for sustainable rural/economic development by identifying problems and needs and linking them to available solutions as well as searching out new technologies. Mark has been with the Forest Service since 1987. He has a B.S. from Carroll College and an M.S. from the University of Wisconsin-Madison. He has authored numerous articles in the Journal of Coatings Technology, Journal of Testing and Evaluation, Journal of Fine Home Building, and the Forest Products Journal. As an expert in his field, Mark is regularly invited to speak at universities, trade organizations, as well as rural communities and other informational meetings. The National Park Service also frequently turns to Mark for his expertise regarding historical

structure preventative maintenance. Mark has a broad base knowledge in construction and maintenance practices. Since coming to the Forest Products Laboratory, he has designed and fabricated several experimental structures and laboratory instruments.

Can Biomass Use in Pinyon Juniper Woodlands be Considered Ecological Restoration?

Peter Weisberg, Associate Professor Landscape Ecology, Department of Natural Resources and Environmental Science, University of Nevada, Reno, NV

It is widely generalized that pinyon and juniper trees in the Great Basin have increased due to over-grazing and fire exclusion, with resulting negative impacts to the environment and rural economies. It is logical then to further generalize that removal of trees constitutes ecological restoration, and therefore that biomass utilization of tree materials for renewable energy constitutes a way forward for making labor-intensive restoration activity self-supporting and economically feasible. However, effective restoration requires going beyond simple generalizations toward clear ecological targets and necessitates specific knowledge as to historical context, causes of ecological change, and likely ecosystem responses into the future.

The historical context of pinyon-juniper woodland dynamics in the Great Basin is reviewed with particular emphasis on implications for biomass utilization. Separation of “persistent” from “expansion” woodlands provides an initial landscape classification for informing restoration planning. Much of the current woodland area can be considered persistent, in that: (a) mixed-age woodland (including old trees) currently occupies areas of low fire risk where trees have long been present; (b) woodland in an early- to mid-successional stage occupies area that burned within past decades; or (c) woodland in an early- to mid-successional stage occupies area that was deforested during the late 19th Century. The second and third types are often erroneously considered expansion woodland. Guidelines are provided for field identification of the three types of persistent woodland. Biomass use for ecological restoration of persistent woodlands could include thinning or fuelbreak construction for reduction of fire spread and risk of subsequent conversion to non-native species dominance.

Expansion woodland, defined as locations where trees have recently invaded plant community types that had been in a nonforested state for multiple centuries, can be of at least two types: (a) tree invasion into adjacent plant communities as a result of over-grazing and/or fire exclusion; and (b) range expansion of pinyon and juniper species in response to climate change of recent decades. The first case seems a reasonable target for ecological restoration in the form of conversion from woodland to other vegetation types, whereas removal of trees in the second case would counter the direction of managing for adaptation to future climate change. The state of current research is reviewed for distinguishing these two cases.

With clear targets set at appropriate spatial and temporal scales, biomass use of pinyon-juniper woodlands can possibly help to satisfy multiple landscape restoration objectives. These might include diverse goals that go beyond reduction of fire risk and invasive plant dominance, including the maintenance of a diverse habitat mosaic comprised of various successional stages, fostering of landscapes resilient to disturbance and climate change, and supporting local economies. Doing so effectively requires careful consideration of the ecological context for what has caused changes in tree population processes and distribution in the past, and for understanding the likely trend of such changes in the future. This ecological context varies across the landscape with land-use history and site environment. Yet without an effort to grapple with this complexity, we risk repeating the mistakes of the past: rampant deforestation, environmental degradation leading to weed infestation, and widespread chainings that met neither the goals of long-term tree removal nor establishment of resilient plant communities. To maintain public trust, ecological restoration should incorporate pinyon-juniper woodlands as a valued landscape component to be managed sustainably at the level of landscape planning, providing essential context for site-specific projects aimed at tree removal.

Peter J. Weisberg, Associate Professor, Landscape Ecology, Department of Natural Resources and Environmental Science, University of Nevada, Reno Mail Stop 186; 1000 Valley Road Reno, NV 89557, pweisberg@cabnr.unr.edu.

Peter Weisberg is an Associate Professor with the Department of Natural Resources and Environmental Science, University of Nevada at Reno. Peter received a B.S. in Forest Biology from the SUNY College of Environmental Science and Forestry in 1992, an M.A. in Biogeography from the University of Wyoming in 1994 and a PhD in Forest Ecology from Oregon State University in 1998, followed by postdoctoral stints at the Natural Resource Ecology Laboratory in Fort Collins and the Swiss Federal Institute of Technology in Zurich, prior to joining the faculty at UNR in 2003. His research focuses on broad-scale vegetation dynamics, including effects of altered fire and flood regimes, climate change, invasive plants, and plant community response to disturbance and resource management practices. Landscape changes of pinyon-juniper woodland and sagebrush ecosystems in the Great Basin have been a major emphasis.

Pinyon Juniper Restoration Ecology: Compatibilities and Incompatibilities of Biomass Harvesting in the Southwest

Douglas Shinneman, Supervisory Research Fire Ecologist, Forest and Rangeland Ecosystems Science Center, USGS, Boise, ID

Piñon-juniper ecosystems in the western U.S. are often targeted for restoration due to concerns that past land uses have contributed to dense stand structures and invasion of trees into adjacent community types, resulting in diminished biotic and abiotic resources and increased vulnerability to severe disturbance events. Where stands have become more dense in recent decades, biomass removal may be compatible with restoration objectives, and biomass use (e.g., harvesting for fuel) may provide economic incentives for restoration. However, there is tremendous range of natural variability among piñon-juniper communities, resulting in substantial differences in stand-age structure, species diversity, disturbance regimes, and population dynamics across landscapes. While land use (e.g., livestock grazing) and non-native species have influenced piñon-juniper conditions and dynamics, effects vary depending on environmental susceptibility to specific land-use histories. Climate variability is also a key driver of piñon-juniper dynamics; yet, this influence has largely been under-appreciated compared to land use. Recently, drought-induced dieback events have dramatically altered piñon-juniper ecosystems over large landscapes in the Southwest, and may provide insights into potential effects of future climate change, as well as potentially redefining the role of restoration.

Restoration projects based on meeting ecological objectives should consider natural variability, different land use histories, and recent mortality events, and avoid applying a uniform approach. Effective restoration strategies (both passive and active) are more likely when based on identification of specific restoration needs (e.g., age structure alteration, invasive species control) for a given landscape, and when validated by scientific evidence that: a) elucidates key differences between historical and contemporary conditions; and b) identifies underlying causes of those differences. Restoration efficacy may be further enhanced when potential future interactions among land use, invasive species, and climate are considered. In this presentation, I discuss these topics in light of biomass harvest potential in piñon-juniper ecosystems, with a focus on the Colorado Plateau and the Four-Corners region.

Doug Shinneman, Research Fire Ecologist, USGS Forest & Rangeland Ecosystem Science Center, Snake River Field Station, 970 Lusk St., Boise, ID 83706.

Douglas Shinneman is a Research Fire Ecologist with the U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center in Boise, Idaho. Doug received a B.S. from Michigan State University, and an M.A. in Geography and Ph.D. in Botany (2006) from the University of Wyoming. Doug's research focuses on developing

a better understanding of how natural communities and natural disturbances regimes (especially fire), are influenced by land use, nonnative species, and climate. His Ph.D. work focused on fire and restoration needs for piñon-juniper woodlands in western Colorado. His current research projects include studies on: the influence of disturbance and climate change on aspen woodlands and associated avian communities in the northern Great Basin, potential influence of climate change on forest fire regimes in the northern Rockies and southern boreal forests, and changes in community structures and fuels loads in sagebrush ecosystems affected by fire and invasive species.

Silviculture for Pinyon Juniper Ecosystems

Douglas H. Page, Southwest Utah Zone Forester, BLM, Cedar City, UT

Pinyon-juniper woodlands and forests cover well over 100 million acres of the western US. The cover type has generally received little attention from professional foresters, but is highly important due to its extent, its proximity to many communities, and its importance in providing wildlife habitat. The type is highly variable across its range with a variety of pinyon and/or juniper species, a variety of other tree and shrub species, a wide range of potential understory species, a diversity of age classes, and a wide range of geologic/soil substrates. Management objectives can vary widely and may include fuels modification, wildlife habitat improvement, improvement for livestock, forest and ecosystem health and sustainability, and landscape aesthetics. Non-silvicultural methods have commonly been applied where management has been for the primary purpose of eliminating pinyon and juniper in favor of other vegetation types. Silvicultural methods are increasingly being applied to manage pinyon and juniper cover types for sustained tree cover as well as for other multiple-use goals. Both even and uneven-aged silvicultural methods can be used in pinyon-juniper ecosystems to manipulate stand density, structure, and composition to meet various resource objectives. No one prescription will fit all stands; and silvicultural prescriptions must be based upon current and predicted stand conditions, the silvics of the species on the site, and the ecological, economic, and social goals of the land owner/manager. This paper discusses various silvicultural and non-silvicultural methods that have been applied to the management of pinyon and juniper cover types. It presents a method of using Reineke's Stand Density Index to determine residual stocking levels, which can be applied to even or uneven-aged stands.

Douglas H. Page, Southwest Utah Zone Forester, BLM, 176 East DL Sargent Drive, Cedar City, UT 84721, dhpage@blm.gov.

Doug is currently the Southwest Utah Zone Forester for the Bureau of Land Management in Cedar City, Utah. His technician and professional forestry experience includes three state forestry agencies (TX, UT, and CO) and two federal agencies (U.S. Forest Service and BLM in UT, AZ, WY, ID, and OR). Doug received his Bachelor of Arts from the University of Southwestern Louisiana and Masters of Forestry from Utah State University. Doug has been a practicing forester (not a researcher) since graduation from USU, including such jobs as timber sale preparation forester, forest silviculturist, timber sale contracting officer, district fire management officer, etc. He currently serves as BLM's forester for six field offices in Southwest Utah. Doug is a member of the Society of American Foresters for 30 years and have served in various leadership positions in the Utah Chapter and Intermountain Section, including chair for both. He is currently the Intermountain SAF's Communications Chair and manages the web page.

Climate Change, Genetic Variability, and Associated Great Basin Woodland Dynamics: Implications for Long-Term Biomass Production

Robin Tausch, Science Leader, Rocky Mountain Research Station, Reno, NV

The last 150 years has seen major increases in the spatial extent and in the biomass levels of all Great Basin woodlands. This has generated interest in using these woodlands for biomass harvest. Important to the success

of such utilization is the long-term stability in the available biomass needed to make such commercial harvest financially viable. The present and projected future rate of climate change, in particular, has implications for such sustainability. Information now available on woodland responses to climate changes occurring over the past 30,000 years is used to estimate what the responses to future climate change might be. Two important sources of information needed for this estimation of future woodland changes that are focused on here are first, are there possible relationships between the recent woodland expansion and associated climate change? Second, how are the differences in the strategies by which pinyon and juniper have responded to past climate changes, and how the different strategies are apparently related to differences in the genetic makeup of the species, likely to affect future woodland responses.

Robin J. Tausch, USDA Forest Service, Rocky Mountain Research Station, Grasslands, Shrublands and Deserts Program, Reno, NV 89512, rtausch@fs.fed.us.

Dr. Tausch has a B.S. degree in Wildlife Management from Humboldt State University, an M.S. degree in Range Management from the University of Nevada, Reno, and a Ph.D. in Range Ecology from Utah State University. Research experience in the Great Basin has centered on the ecology and paleoecology of pinyon-juniper woodlands and associated sagebrush ecosystems with a particular emphasis on how these ecosystems have changed in the past, are currently changing, and can be expected to change in the future. Research focus is currently on how these ongoing changes can affect ecosystem health, affect fire frequency and fire patterns, and determine potential short- and long-term responses to treatment. This information is also being used to better anticipate how potential future changes will be altered in response to climate change.

The Economics of Biomass

Jared Abodeely, Research Engineer, Idaho National Laboratory, Idaho Falls, ID

Biomass feedstock supply chain logistics and the associated costs are key to building a sustainable biofuels industry, as biomass conversion facilities that rely on an unsustainable biomass supply quickly become unsustainable to operate. The US Department of Energy (DOE) has developed cost and quantity targets for biofuels production, requiring large quantities of biomass that meet aggressive cost targets. Analyses performed at the Idaho National Laboratory (INL) have shown that these targets cannot be met with conventional biomass logistics systems. Therefore, INL has developed an advanced, commodity-based Uniform Format biomass feedstock logistics system that addresses barriers to meeting these goals and enables DOE targets to be met. This presentation will present some analyses performed by INL to support the development of an advanced biomass logistics system.

Jared Abodeely, Biofuels and Renewable Energy Technologies, Idaho National Laboratory, P.O. Box 1625, Idaho Falls, ID 83415.

Jared Abodeely is a Research Engineer with the Biofuels and Renewable Energy Technologies group at the Idaho National Laboratory. His background includes computational and numerical modeling along with software development for virtual environments. Past work at the INL includes supporting the development of a design and analysis software framework that enables integration and coupling of models into a decision-making environment. Jared's current work includes development an algae supply system model, design and management of the Biomass R&D Resource Library, and the integration and coupling of existing agronomic modeling tools to address sustainability issues relevant today. Jared holds B.S. and M.S. degrees in Mechanical Engineering from Iowa State University and is currently pursuing a Ph.D. through Iowa State University.

Biomass Business Principles of Success

Gil Miller, President, Economic Associates of Utah, Board Member Rural Life Foundation, Corinne, UT

The Biomass Industry has many characteristics of an infant industry but unlike an infant industry its products are primarily energy commodities that can be obtained from many sources. These characteristics create a multitude of risks. Risks are in three main areas. The first set of risks are market risks. The second set of risks are technology risks. The third set of risks are public policy risks. Market risks include prices received, prices paid and price volatility. Technology risks include current densification technology costly. Most biomass technology was developed in the late 19th and early 20th centuries. Technology is changing with renewed interest in biomass. Therefore, there is the risk of stranded investment as new technologies displace current technologies. Public policy risks are in three areas. First is withdrawal of public funding for biomass. Second is policy changes effecting harvesting biomass on public lands. Third is changes in environmental policies including CO² regulation. Risk management is key to success in the biomass industry. Market risks can be reduced through forward contracting. Technology risks can be reduced by investing in technologies that have multiple uses and spreading costs over many shareholders on single use technologies. Public policy risks are difficult to manage but must be evaluated in every business plan. Sensitivity analysis is essential in determining the magnitude of risk associated with changes in any element of the biomass enterprise.

Gil Miller, Economic Associates of Utah, Inc., 550 N Main Ste 317, Logan UT 84321, eau@pcu.net.

Dr. Miller received his Ph.D. from Utah State University in Economics in 1991. He has been President and CEO of Economic Associates of Utah, Inc. since 1994. He has served as CFO for Skyline Forest Resources Inc., Skyline Renewable Resources, LLC., Rural Life Foundation, and Wagon Land Adventures Foundation. Other business interests include Managing Partner Workman-Miller Enterprises, LLC., Progressive Solutions, LLC., Promontory Wind Energy, LLC. Dr. Miller has served on many local and State of Utah committees and boards including Governor's Rural Partnership Board, Mayor of Bear River City, Utah and Board Member of the Utah League of Cities and Towns. Dr. Miller has been married to Lyle Ann Miller for 31 years. They have lived in Corrine, UT for all of their married life.

Marketing Strategies for Biomass Utilization

Dusty Moller, Wood Utilization Manager, Business Environmental Program, Small Business Development Center, University of Nevada, Reno, NV

The key marketing strategy for improving Pinyon/Juniper biomass utilization is to discover the customer value propositions (CVPs) that offer the greatest return and then finding the lowest cost production processes that will deliver that return. PJ, bless its heart, is a non-timber forest resource—apparently lacking a high-value component to offset the high cost to fell and remove the biomass called for in the prescription. But, there are “bright spots”—products and bi-products that can go a long way to provide the land managers revenue that can drive the restoration costs to acceptable levels. Those CVPs can be shown as symbiotic relationships and marketed as such. When relationship marketing is effective, people, processes, and technology work in synergy to increase profitability, and reduce costs.

Moller Dusty, University of Nevada Reno, 10094 Tanner Rapids Court, Las Vegas, NV, 89148, dmoller@unr.edu.

Dusty Moller is a forest industry utilization and marketing specialist working for University of Nevada Reno. He develops, transfers and implements forest products technology especially oriented to the use of forest biomass and small diameter trees. He brings more than 40 years of total enterprise experience to the Southwest, assisting community-based entrepreneurs as they build their restoration forestry businesses. Moller holds a B.A. from Idaho State University and a M.B.A. from University of Arizona. His experience applications include tours

as an industrial engineer for Weyerhaeuser, Plum Creek and Bohemia lumber companies and as sales manager for Lucidyne Technologies. An authorized OSHA General Industry 10 and 30 hour safety trainer, Dusty adds a strong sense of safety awareness to the best forest industry management practices he imparts. Dusty and his wife Annette make their home in Las Vegas, Nevada and enjoy discovering the wonders of the Southwest desert area.

New Developments in the World of Biomass Utilization

Christopher Wright, Senior Research Engineer, Biofuels and Renewable Energy, Idaho National Laboratory, Idaho Falls, ID

The economic competitiveness of cellulosic biofuels is highly dependent on feedstock cost, which constitutes 35–50% of the total fuel production cost, depending on geographical factors and equipment selection for harvesting, collecting, preprocessing, transporting, and handling the material. Consequently, feedstock cost and availability are the driving factors that influence near-term biorefinery locations and will largely control the rate at which this industry grows. Initial model-based supply scenarios postulate a dry feedstock supply system design case as a demonstration of the current state of technology. Based on this near-term design, advanced scenarios were developed to determine key cost barriers, needed supply improvements, and technology advancements to achieve long-term cost targets. Near-term supply systems will start by using current infrastructure and technologies and be individually designed for biorefineries using specific feedstock types and varieties based on local geographic conditions. However, as the industry develops, cost barriers are addressed, and risks associated with large scale biomass utilization are considered, the supply systems will incorporate advanced technologies that will eliminate downstream diversity and provide a uniform, tailored feedstock for multiple biorefineries located in different regions. This advanced supply system will utilize current handling infrastructure to move a quality controlled, desified, and stable cellulosic feedstocks to biorefineries as a commodity material similar to current grain and emerging wood commodities.

Chris Wright, Ph.D., Sr. Research Engineer, Biofuels & Renewable Energy Technologies Department, Energy & Environment S&T Directorate, Idaho National Laboratory, P.O. Box 1625, Idaho Falls, ID 83415-2210, christopher.wright@inl.gov.

Chris Wright is a senior research engineer and group lead for the Idaho National Laboratory's Biofuels and Renewable Energy Department. His work supports the Department of Energy Biomass Program in developing analysis tools and technology for feedstock supply logistics and conversion of biomass to valuable fuels, chemicals, materials and power. His knowledge of DOE's Biomass Program includes an emphasis on lignocellulosic feedstock supply systems, which includes feedstock characterization, development, preprocessing, handling and transportation issues associated with biorefining biomass into fuels and chemicals. Wright holds Doctorate, Masters, and Bachelor degrees in Mechanical Engineering from Utah State University. His professional career has focused on researching applied fluid dynamics, thermal hydraulics, two-phase flow, and solid mechanics. Wright has applied this expertise to investigate biomass preprocessing and handling which includes evaluating the performance of engineering- and full-scale size reduction and thermal treatment equipment to better understand and improve physical characterization, fundamental deconstruction, and advanced densification techniques for lignocellulosic feedstocks. His work also includes biomass feedstock supply system modeling and analysis to provide state-of-technology assessments of the feedstock assembly system. This has led to the development of feedstock techno-economic models to assess current and advanced feedstock assembly system designs and technology barriers to guide R&D. He has authored or co-authored papers covering topics ranging from thermal hydraulic behavior of nuclear reactors to lignocellulosic bioenergy—in areas of flow visualization techniques, computational fluid dynamics simulations, biomechanical properties of biomass materials, and feedstock supply system logistics and design.

Collaboration Successes Around the West and Why Collaboration is Important

Mary Mitsos, Vice President for Conservation Programs, National Forest Foundation, Missoula, MT

The use of collaboration as a tool to achieve lasting results has exploded across the country. Nowhere is this more apparent than in the West, especially in regards to public land management issues. This presentation will focus on the roots of collaboration, the importance to public land management and forestry in particular, why it is important and what lessons have been learned.

Mary Mitsos, Vice President, National Forest Foundation, Building 27, Suite 3, Fort Missoula Rd, Missoula, MT 59804, mmitsos@nationalforests.org.

Mary Mitsos joined the National Forest Foundation in 2001 and serves as Vice President. She brings expertise in a range of topics relating to the protection and sustainable management of forest ecosystems and sustainable development. Her specialized interests are in collaborative stewardship, contracting mechanisms on public forestlands, conservation-based development and strengthening the working relationship between local communities and forestland managers. Mary holds a Bachelor of Arts in International Business from the University of Colorado-Denver. In addition, she earned a Master of Science in Natural Resources, and a Masters of Arts in Applied Economics, from the University of Michigan. She served on the steering committee of the Seventh American Forest Congress Communities Committee, as a Board member of the National Network of Forest Practitioners, as a Board member for Northwest Connections, and on the advisory board for the College of Forestry and Conservation at the University of Montana.

What Works for Biomass Harvesting in Pinyon Juniper

Lance Lindbloom, Owner, Bloomin Ranch Services, Beaver, UT

Eastern Redcedar which covers millions of acres in the mid section of the continental US, shares common management, harvesting and utilization challenges as the Utah Juniper.

Southern Utah Biomass, a loosely knit organization of private individuals and government personnel has come together to promote development of harvesting and utilization of Pinyon and Juniper. In the last 12 months, two field days have been hosted in Southern Utah. Over \$4.5 million in equipment has been brought out to demonstrate and exhibit. People from 18 states, Washington DC, Canada and China have attended these field days.

A direct result that attention from the first field day brought has been the ongoing equipment trials summer of 2011. Dr. Bob Rummer an equipment researcher with the Forest Service initiated a grant proposal that was funded to run in the field trials on Pinyon/Juniper harvesting. Equipment from Canada, Ohio, Oregon, Kansas and Utah have participated in the just completed equipment trials which were funded by a grant received by the Forest Service.

Traditional equipment for harvesting and utilizing is geared to much larger, higher volume stands of forest. Junipers are notorious for their uncharacteristically bushy formation. Pinyons, although a pine, are much smaller and higher branch to stem ratio. Equipment that has been used has either been modified from large timber equipment or equipment that was used for private small scale acreage type harvesting. Currently, there is strong interest in not only the utilization of Pinyon/Juniper but as seen by the two field days and equipment trials, equipment harvesting companies are making the effort to research and develop equipment specifically designed for these type trees. There is a strong interest bringing both individuals and corporations to Utah to be involved.

Lance Lindbloom, Owner, Bloomin Ranch Services, P.O. Box 968, Beaver, UT 84713, lance@utahbiomass.com.

Lance Lindbloom graduated from Montana State University-Bozeman in 1992 with degrees in both Range Management and Animal Science. He has been employed on large commercial and registered cattle operations in Montana and Nebraska. The Midwest has seen an increase in the Eastern Red Cedar, a close cousin to the Utah Juniper. Using both fire and mechanical means, landowners are attempting control of this invasive woody species. Lance was one of the founding members and the first President of the Niobrara Valley Prescribed Fire Association located in North Central Nebraska. Currently, Lance is the organizer for Southern Utah Biomass, as well as, a steering committee member of the UBRG (Utah Biomass Resource Group). Southern Utah Biomass involves private individuals and government agency personnel in promoting the development of harvesting and utilization of Pinyon and Juniper. Lance is the owner of Bloomin Ranch Service (BRS), a company specializing in woody species management issues. In 2009, BRS was awarded one of the largest BLM stewardship contracts in Utah. Lance has since moved his family to Beaver, Utah to pursue this opportunity. After 11 years in the midwest, Lance enjoys skiing with his family as well as taking them on recreational adventures in the mountains.

The Need for PJ Restoration in Eastern Nevada

Jeremy Drew, Resource Specialist, Resource Concepts Inc., Carson City, NV

The purpose of a PJ Demonstration Area was to designate a location where funding, agency operations, professional expertise, and private-public partnerships could focus on restoring ecosystem health and resilience of sagebrush and pinyon-juniper (PJ) woodland ecosystems by actively treating pinyon and juniper. RCI was tasked with identifying at least one landscape-level demonstration area within the State of Nevada for the Nevada Pinyon-Juniper Partnership. That Area was designated in eastern Nevada along the Utah border.

To do so, RCI developed mapping of statewide PJ distributions¹ and found that there are approximately 9.16 million acres of PJ dominated vegetation in Nevada. In order to determine which of those areas would be suitable for a demonstration area, RCI developed a set of priorities that included:

1. Identification of areas with an ecological need for treatment of PJ to achieve multiple resource values.
2. Identification of areas that were ready for action from a land-management agency standpoint.
3. Identify areas that maximize the potential for multiple positive resource outcomes as a result of restoration treatment of pinyon and juniper.
4. Identify areas that maximized the potential for partnership between Federal and State agencies as well as non-governmental and private organizations.
5. Identify areas that may present an opportunity for utilization of PJ biomass dictated by and generated from restoration treatments.

RCI solicited input from the two major federal land management agencies within the state: the Forest Service and the Bureau of Land Management (BLM). RCI requested each BLM District Office identify PJ restoration areas and identify the restoration objectives for each area. All six Nevada BLM Districts provided input. The Ely District was the only BLM District with significant PJ distributions that had a comprehensive district-wide RMP in place that included the need for restoration of PJ treatment for a variety of resource values. As a result, the Ely District showed the highest potential for planning PJ restoration projects across the largest area.

The State Office of the Forest Service provided a list of potential PJ projects for the entire Humboldt-Toiyabe Forest scheduled for the next five years². RCI mapped the projects slated for mechanical treatments, as they tend to be the most expensive and offer to greatest opportunity for cost sharing and private-public partnerships. The Ely Ranger District had by far the most PJ projects slated for planning and implementation over the next five years. The Ely Ranger District also indicated that it was already working with the Ely BLM District to

implement joint PJ projects in the Ward Mountain Area. This provided a prime opportunity for both major federal land management agencies to implement projects across the same landscape areas.

RCI collected data from the Nevada Department of Wildlife (NDOW) and the Nevada Division of Forestry (NDF). This included:

- The 2004 Greater Sage-Grouse Conservation Plan for Nevada and Eastern California (Sage-grouse Plan)
- The 2006 Nevada Wildlife Action Plan (WAP), and
- The 2010 the Nevada Division of Forestry (NDF) State Natural Resource Assessment and the State Natural Resource Strategy

Many of the high priority treatment areas identified in these reports, specifically in regards to PJ restoration, fell within the eastern portion of Nevada.

In collecting the available data and inputs from key federal and state agencies, it became clear that there are many areas throughout Nevada in need of restoration treatment of PJ. However, based on the criteria of identifying a large landscape-scale area that is ready for action from an agency-planning standpoint the Ely BLM District and Ely Ranger District proved to be the most advanced opportunity.

1. Data Sources for Mapping included: Southwest Re-GAP Landcover Data, 2004 and California GAP Landcover Data, 1998
2. Humboldt-Toiyabe Forest 5-year Integrated Vegetation Management Plan

Jeremy Drew, E.I.T., Resource Specialist, Resource Concepts, Inc., 340 N. Minnesota St., Carson City, NV 89703-4152.

Jeremy Drew holds two Bachelors in Science degrees, one in Civil Engineering and one in Natural Resources and Environmental Sciences, from the University of Nevada, Reno. During college Mr. Drew worked seasonally for four summers with the Nevada Division of Wildlife and one summer with the Congressional Sportsmen's Foundation in Washington D.C. Over the past ten years Mr. Drew has worked throughout the State of Nevada on public land and resource issues and projects. Mr. Drew has been employed at Resource Concepts, Inc. (RCI) for six years. In that time Mr. Drew has worked on a multitude of projects in eastern Nevada and has worked with all forms of government including county, state and federal. Many of the projects he has worked on have included pinyon-juniper woodlands on public lands. Work includes identifying a potential biomass restoration and utilization demonstration area for the Nevada Pinyon-Juniper Partnership in 2010.

Biomass Energy: Seeing the Forest Through the Trees

Chad Davis, Forest Stewardship Program Director, Sustainable Northwest, University of Oregon, Eugene, OR

Most interest regarding the generation of energy from woody biomass is focused either on producing electricity or liquid fuels for transportation. Current policy incentives at the Federal and state level drive this interest in energy developers. However, one-third of national energy consumption is in the thermal (heat) sector that includes both space and process heat. In the case of the West, many forested ecosystems need near-term restoration to reduce the potential of uncharacteristic wildfire yet the US Forest Service is severely underfunded to accomplish this end and current markets for the byproducts of restoration largely do not exist. A redesign of national and regional energy policy related to woody biomass could produce multiple objectives. The increased energy output in thermal-led energy production yields a higher value per ton for the biomass feedstock that can be used to fund landscape-scale forest restoration efforts. At the same time, wood-based thermal energy can significantly reduce energy costs at facilities currently using petroleum-based fuels such as heating oil or propane. This presentation will explore these concepts and provide a case study example from eastern Oregon.

Chad Davis, Forest Stewardship Program, Sustainable Northwest, 813 SW Alder, Suite 500, Portland, OR 97205.

Chad works with Forest Stewardship Program partners and communities to link them to opportunities that strengthen market channels for the byproducts of ecologically-based forest stewardship. Chad's interest in market-based conservation strategies that create opportunity for individuals at the community level drew him to Sustainable Northwest. He also works to affect Federal and state policy, striving to ensure that rural entrepreneurs and leaders have equitable access to developing appropriately scaled renewable energy projects. In addition to his work at SNW, Chad co-chairs the Oregon Forest Biomass Working Group convened under the direction of the state legislature and the Biomass and Energy Working Group of the Rural Voices for Conservation Coalition. In his spare time Chad enjoys strapping on his backpack to survey the alpine flora of the Northwest and pedaling past the hopfields and vineyards throughout the Willamette Valley.

Native Utah Grasses for Biomass

Steve Larson, Research Geneticist, Forage and Range Research Laboratory, USDA Agricultural Research Service, Logan, UT

Considerable breeding and genetic research is currently dedicated to the development of warm-season perennial grasses, such as switchgrass (*Panicum virgatum*), as dedicated biomass crops. However, the Great Basin and other large regions of the western United States and World are dominated by cool-season grasses with special adaptations to salinity, drought, and other harsh conditions. A project was initiated to identify perennial grass species, genes, and traits needed for low-input biomass production in the West. Growing up to 3 m tall, Basin wildrye (*Leymus cinereus*) is considered one the largest native perennial grasses in western North America, but it's elevated growing point is easily damaged by grazing or cutting. Creeping wildrye (*Leymus triticoides*) is relatively short statured (less than 1.3 m) but strongly rhizomatous grass that is recovers well following grazing, cutting, or other disturbances. Creeping x basin wildrye hybrids display a combination of plant height and rhizome traits that are useful in a low-input biomass crop and provide a model system for genetic research in perennial grasses.

The seasonal biomass yields and composition quality of creeping x basin wildrye species, hybrids, and experimental families were compared to other potentially useful grasses including tall wheatgrass (*Thinopyrum ponticum*), intermediate wheatgrass (*Thinopyrum intermedium*), reed canarygrass (Phalaris arundinaceae), and switchgrass (*Panicum virgatum*) over four years, with no irrigation or fertilizer, at research farms near Logan, UT and Tetonia, ID. Tall and intermediate wheatgrasses were top entries in the first two evaluation years, averaging more than 8 Mg/ha over both sites, and up to 13 Mg/ha in the second (2009) Utah harvest. However, the single best entry in the third and fourth harvest years was a creeping x basin wildrye hybrid that averaged about 6 Mg/ha in 2010 and up to 14 Mg/ha in 2011. Genetic map analysis of the experimental creeping x basin wildrye families showed that genes controlling plant height, rhizomes, flowering, and stem thickness all contributed to biomass production. The caffeic acid O-methyltransferase lignin biosynthesis gene was associated with genetic variation fiber and lignin content among progeny of the creeping x basin wildrye hybrids.

Steven R. Larson, Research Geneticist, USDA Agriculture Research Service, Forage and Range Research Laboratory, Utah State University, Logan, UT 84341-6300.

Steve did his graduate research on the genetics, breeding, and evolution of major cereal crops, including maize and barley, and their wild grass relatives at the University of Minnesota and Montana State University. Steve has worked as a Research Geneticist at the USDA Forage and Range Research Laboratory and adjunct faculty in the USU Plants, Soils, and Biometeorology Department for nearly 14 years, after postdoctoral research at the USDA National Small Grains Germplasm lab in Aberdeen, Idaho. Steve continues to work on the genetics,

breeding, and domestication of perennial wheatgrass and wildrye, with particular emphasis on inter-specific hybrids of basin wildrye, the largest native grass of western North America. His current research objectives include identification of perennial grass species, genes, and traits needed for low-input biomass production in this region.

Modeling Biomass and Canopy Fuel Attributes Using LIDAR Technology

Brent Mitchell, Remote Sensing Analyst, USDA Forest Service, Remote Sensing Applications Center (RSAC), Salt Lake City, UT

Within the last decade lidar technology has been increasingly utilized as a tool for resource management by the U.S. Forest Service. The agency has been engaged in a wide variety of lidar projects and applications ranging from the development and exploration of basic lidar derivatives to pursuing advanced modeling of forest inventory parameters based on lidar canopy metrics. This presentation will provide an overview of how lidar technology can be used for modeling forest biomass and canopy fuel attributes using lidar technology.

Brent Mitchell, Remote Sensing Analyst, Remote Sensing Applications Center (RSAC), USDA Forest Service, 2222 W. 2300 S., Salt Lake City, UT 84119-2020, brentmitchell@fs.fed.us.

Brent obtained a BS in Forest Science from the University of Georgia in 1998 and a Masters in Remote Sensing at the University of New South Wales, Sydney, Australia in 2006. He is currently a Remote Sensing Analyst, specializing in Lidar Technology, at the US Forest Service's Remote Sensing Applications Center located in Salt Lake City, UT.

Billion Ton Report

Anthony Turhollow, Economist, Oak Ridge National Laboratory, Logan, UT

The 2011 Billion-Ton Update (BTU) found that in 2030 between 1.0 and 1.5 million dry metric tons of biomass would potentially be available in the United States at \$66 per dry metric ton or less, with 70 to 80% of this biomass available for new uses. The BTU revises the 2005 Billion-Ton Study (BTS), which found between 0.9 and 1.2 million dry metric tons potentially available. The BTU includes presently used resources, and forest resources, agricultural residues, and energy crops. The BTU contains county level supply inventories of primary feedstocks, supply curves for the individual resources, and a more rigorous and explicit modeling of sustainability. The BTU has two scenarios, Baseline and High-Yield.

Anthony Turhollow, 1511 E. 2050 N., North Logan, UT 84341, turhollowaf@ornl.gov.

Anthony Turhollow is a staff economist at the Oak Ridge National Laboratory in Oak Ridge, Tennessee. He has a PhD in Agricultural Economics from Iowa State University and has been working in the field of biomass for energy since 1980. He was one of the authors on the 2005 Billion Ton Study and also an author on the recently released update of the Billion Ton Study.

Bioenergy 101

Dallas Hanks, Director, Center for Agronomic and Woody Biomass, Utah State University Extension, Salt Lake City, UT

Biomass conversion to energy is a relatively new topic in Utah. The Utah Biomass Resources Group (UBRG) is interested in supporting the use of Utah's woody biomass for energy production. The UBRG's mission is

to promote healthy forests and woody products in Utah. The UBRG is engaged with other partners in Utah and the surrounding region to investigate how to utilize woody biomass for energy production. The group includes participation from stewards of federal land, state land and private individuals as well. The main woody biomass focus right now is on a species of pinyon pine and juniper that is considered to be either an invasive or aggressive species. Local, federal and state agencies are very interested in managing these species and in restoring effected habitat.

Dallas Hanks, Utah State University, 2001 South State St., Ste 1200, Salt Lake City, UT 84190, dallas.hanks@aggiemail.usu.edu.

Dallas Hanks is a bioenergy agronomist at Utah State University investigating sustainable feedstock growth for biofuel production. Dallas is also the director of the Center for Agronomic and Woody Biofuels at Utah State University which includes the FreeWays to Fuel Project, the Utah Biomass Resources Group, the Urban Farming and Fuel Effort and Bases to Biofuels. All of these projects include national efforts to utilize non-traditional agronomic lands in sustainable biomass production for bioenergy. Dallas holds a B.S. from Brigham Young University in Agronomy, an M.S. in Plant Science from Utah State University and a Ph.D. (Fall 2011) in Plant Soils and Climate from Utah State University. He has 15+ years of experience in academia, government and private industry involving teaching, research and business. He has developed and instructed college courses in biology, environmental biology, soil, ecology and environmental technology. Published works include patents, refereed and non-refereed articles, audio, and video media dealing with agronomic and environmental issues.

Viable Bioenergy Options

Mark Knaebe, Natural Resource Specialist, State and Private Forestry Technology Marketing Unit, USFS Forest Products Laboratory, Madison, WI

- Did you know that if you pay \$2.00 a gallon for propane, you could afford to pay \$426 per cord of wood or \$378 per ton of wood pellets to get the same energy? You have access to this simple calculator to learn more.
- If you know how much biomass you have access to (tons/year), you'll learn what size electrical power generator you should get and what the economics would be.
- Should you make wood pellets?
- What is far better than those smoky outdoor wood burners?
- How much money could you save if you switched your school to wood heat?
- What's the future of liquid fuels from biomass?

Mark Knaebe, USDA Forest Service, State & Private Forestry, Technology Marketing Unit, One Gifford Pinchot Dr., Madison WI, 53726-2398, mknaebe@fs.fed.us.

Mark Knaebe is from the USDA Forest Service, State & Private Forestry, Technology Marketing Unit, located at the Forest Products Laboratory in Madison, WI. He is considered a technical expert in roundwood engineering design and wood finishing systems. Bioenergy is also a focus of his work, being the alpha tester for a new wood gasifier—the BioMax 5, which generates electricity from wood pellets. Recently, he has been working with rural communities in South America on technical issues involving wood utilization. He markets forest products technology for sustainable rural/economic development by identifying problems and needs and

linking them to available solutions as well as searching out new technologies. Mark has been with the Forest Service since 1987. He has a B.S. from Carroll College and an M.S. from the University of Wisconsin-Madison. He has authored numerous articles in the Journal of Coatings Technology, Journal of Testing and Evaluation, Journal of Fine Home Building, and the Forest Products Journal. As an expert in his field, Mark is regularly invited to speak at universities, trade organizations, as well as rural communities and other informational meetings. The National Park Service also frequently turns to Mark for his expertise regarding historical structure preventative maintenance. Mark has a broad base knowledge in construction and maintenance practices. Since coming to the Forest Products Laboratory, he has designed and fabricated several experimental structures and laboratory instruments.

Biochar Basics

David Shearer, CEO/Co-founder, Full Circle Solutions, San Francisco, CA

Society is faced with the significant challenge of meeting growing demands for food and energy while adapting to the impacts of climate change, loss of agricultural land, degraded soil quality and limited water supplies. Biochar is a critical path technology that addresses pressing food/water security needs while simultaneously mitigating the climate crisis by transferring existing atmospheric carbon stocks to a new soil carbon sink capable of gigaton scale carbon storage. Discovered in the late 19th century as a constituent of the 1000+ year old Amazonia Terra Preta soils, biochar was engineered by indigenous peoples as part of soil management practices. Biochar is a highly porous, soil amendment charcoal that is produced by heating organic material such as crop residues, forest residues, and manures in a low oxygen environment using a well established process called pyrolysis. In addition to generating biochar, pyrolysis produces heat, and gases that can be used to produce renewable heat or power. Biochar helps food producers improve the profitability of their enterprises and adapt to the impacts of climate change by conditioning soils, improving soil structure and chemistry while stimulating natural microbial activity that improves soil health. When applied to soil, biochar delivers increased crop yields and productivity, reduces risks of yield loss in adverse situations, reduces input costs, provides water savings, addresses pH amelioration and lowers nutrient losses. Because of its soil conditioning properties, biochar offers an important solution for increasing the area of cultivable land by recapitalizing degraded soils worldwide.

David F. Shearer Ph.D., CEO/Co-founder, Full Circle Biochar, San Francisco, CA, dshearer@fcsolns.com.

Dr. David Shearer is co-founder and CEO of Full Circle Biochar, a clean technology company developing biochar products for global agricultural and carbon sequestration applications. Prior to launching Full Circle Biochar, Dr. Shearer was Chief Scientist at California Environmental Associates and Principal Environmental Scientist at AeroVironment Inc. where he worked in the next generation transportation, energy, carbon mitigation, and information technology space. In addition to his private sector activities, Dr. Shearer has directed groundbreaking work in both public policy and philanthropic investment for climate change mitigation. Dr. Shearer sits on several non-profit and educational boards including SkyTruth and Black Rock Solar. He has a Ph.D. in Environmental Epidemiology and a M.S. in Environmental Microbiology from the University of California, and B.S. in Biology from the University of Oregon.

Land Reclamation and Restoration

John Gaunt, Director, Keysoil Ltd.

Soil is a vital and undervalued asset. The world is losing soil 10 to 20 times faster than it is replenishing it. At the same time, population is growing exponentially – 9.3 billion by 2050, according to UN projections. Areas of the world – particularly northern China, sub-Saharan Africa, and parts of Australia – are already losing large

tracts of arable land. Peak soil may ultimately offer greater challenges to society than peak oil (<http://www.energybulletin.net/52788>).

Even in situations where soils are regarded as fertile and productive, it has been shown that managing soil quality can lead to significant increase in farm profits (www.keysoil.com). Biochar offers significant opportunity in reclaiming degraded land and increasing the performance of existing cropland, and in the conversion of land to agriculture and other beneficial uses. This presentation will summarize opportunities for biochar with a focus on prospects for “Restoring the West.”

John Gaunt, KeySoil Ltd, 32 Amenbury Lane, Harpenden, Hertfordshire, AL5 2DF, United Kindom, jgaunt@fcsolns.com.

John has more than twenty years of international research and consulting experience. He holds a PhD in Soil Biology from University of London (UK) and a BSc in Soil Science. Before founding KeySoil Ltd and Carbon Consulting LLC, John held a senior research post at Rothamsted Research (UK) from 1994-2003, and between 1989 and 1993 he was based at the International Rice Research Institute, Philippines. John currently holds a courtesy appointment at Cornell University as an adjunct associate professor in the College of Agriculture and Life Sciences. John is a pioneer of biochar. Working with the leading research groups around the world, including Cornell, the UK Biochar Research Center, and Massey University, John helped to establish research programs that will define our understanding of the biochar opportunity. As Executive Vice President at Full Circle Biochar, John is responsible for the development of biochar products for a wide range of applications.

Biochar and Forest Ecology

Mark Coleman, Associate Professor of Forest Resources, University of Idaho, Moscow, ID

Charcoal is a common component temperate forest soils. It results from wildfire events that frequently disturb the structure and function of vegetation and soils. Recent interest in applying biochar (artificially produced charcoal) to forest ecosystems raises both opportunities and concerns. The greatest opportunity for biochar application to forest soils is through the utilization of continuously produced and overabundant forest biomass for the production of bioenergy. Biochar is a co-product of the mobile fast-pyrolysis biofuel production approach. This approach will result in abundant biochar for amendment to forest soils. Biochar amendment has important potential to improve forest soil quality by altering physical, chemical and biological properties. The highly porous and absorbent nature of biochar improves bulk density which allows greater root growth, enhanced water holding capacity and soil porosity. Biochar also enhances retention of nutrients and can neutralize soil acidity. The combination of these physical and chemical alterations results in altered microbial communities and function. Considering that biochar is mostly carbon that is resistant to microbial decay, it can also serve to sequester carbon in the soil; carbon that was recently fixed from the atmosphere.

Thus, forests can act as a natural carbon capture and storage system if excess biomass is utilized for biofuel production using the mobile fast pyrolysis process. However, before large-scale application of biochar is initiated there are numerous concerns that must be addressed. Biochar may initially deplete nutrient availability in forest systems. Forest soils are typically nutrient limited and the absorbant nature may have negative consequences on soil nutrients and tree growth. Biochar may also add organic chemicals to forest soils. Some of the pyrogenic oils are trapped in bochar and the effects of these compounds have not been investigated. Biochar amendments to forests are also known to enhance microbial activity which may accelerate decomposition of native soil organic matter and thus offset the carbon sequestration potential. While the opportunities for biochar appear to far outweigh any negative impacts, it is important to evaluate the effects of biochar amendments on forest ecosystems prior to wholesale applications.

Mark Coleman, Associate Professor of Forest Resources, University of Idaho, Moscow, ID, 83844, mcoleman@uidaho.edu.

Mark received a Doctorate from the University of Washington in Forest Resources in 1988. He was a research scientist for the Forest Service's North-Central and Southern Research Stations. Currently he is the Director of the Intermountain Forest Tree Nutrition Cooperative and is on the Forestry Faculty at University of Idaho, focusing on belowground processes as well as the production and physiology of managed forest ecosystems.

Exploring the Biomass Accumulation Possibilities from Active Forest Management in Utah Forest Types

Justin DeRose, Research Ecologist, Rocky Mountain Research Station, USDA Forest Service, Ogden, UT

Improvements in harvesting technologies, economic incentives, and the potential to control fire behavior have all led to an increased interest in harvesting woody biomass in Utah and other western states. Elevation, climate, and substrate are hugely variable in the west resulting in differing forest types, potential productivity, and large variations of possible biomass yield. Studies to determine biomass harvesting efficacy often include estimates of current growing stock by forest type, which helps answer questions regarding utilization potential and possible yield. However, projections of biomass yield, and the potential influence of active management on increasing yields, is rarely evaluated. Using Forest Inventory and Analysis data collected in Utah between 2000 and 2009, we compared potential biomass yield of managed and unmanaged stands for the major forest types in Utah. We used the Forest Vegetation Simulator to make 100 year projections of standing biomass by forest type and potential productivity classes. Results showed that management resulted in increased growth of residual stands which translated into modest increases in total standing biomass over time. Increased residual growth as a result of management was more pronounced in productive forest types (e.g., spruce-fir or aspen) than less productive forest types (e.g., common pinyon or Utah juniper). Within forest type, sites with higher potential productivity had higher biomass yield projections than sites with lower potential productivity. However, the absolute differences in yield between potential productivity classes among forest types decreased with decreasing forest type productivity. These results have strong management implications for production of woody biomass, especially for operations where multiple entries are planned.

Justin DeRose, Research Ecologist, USDA Forest Service, Forest Inventory & Analysis, Rocky Mountain Research Station, rjderose@fs.fed.us.

Dr. Justin DeRose is a Research Ecologist with the Forest Service, Forest Inventory and Analysis, Rocky Mountain Research Station. His formal training is in forestry and silviculture at Utah State University and the University of Maine.

Regional Trends in Biomass Volumes

Sara Goeking, Biological Scientist, Rocky Mountain Research Station, USDA Forest Service, Ogden, UT

The purpose of this study is to 1) demonstrate the potential for the USDA Forest Service's Forest Inventory and Analysis Program (FIA) to produce forest biomass monitoring data, and 2) to describe the magnitude and distribution of changes in standing forest biomass in the Interior West from the 1980's to the present. This study attempts to reconcile historical forest inventories, dating from the 1980s and 1990s, with more recent FIA data to analyze long-term trends in standing forest biomass. The FIA dataset includes information about forest type, age, growth, health, disease, mortality, disturbance, tree volume, and biomass, and thereby presents opportunities to investigate large-scale trends. Overall trends include an increase in total standing biomass in nearly every state in the Interior West. In most states, the increase in total biomass is due to an increase in standing dead biomass, while changes in live standing biomass varied geographically. Additional long-term comparisons by forest type and by land management group reveal more specific patterns. The standing biomass

within most juniper and mixed pinyon-juniper woodlands in the Interior West showed increases in both live and dead biomass. Standing biomass on Rocky Mountain juniper stands was generally greater than in mixed pinyon-juniper stands, and both of these forest types had more biomass per acre standing stands of Utah juniper. In aspen stands, the changes in total standing biomass varied by state, while live standing biomass either decreased or did not change. When different land management groups, such as federal, state, and private lands, were considered separately, trends in standing biomass varied widely among both management group and state.

Sara Goeking, Biological Scientist, Forest Inventory & Analysis Program. Rocky Mountain Research Station, USDA Forest Service, 507 25TH St., Ste 301, Ogden, UT 84401, sgoeking@fs.fed.us.

Sara is an analyst with the Forest Inventory and Analysis program in Ogden, Utah. Her main emphasis areas are spatial analysis and modeling of vegetation patterns. She recently implemented a photo-based protocol to assess land use and tree canopy cover at all FIA plots across the U.S., and she has also led FIA field crews in Arizona, Idaho, Montana, Nevada, and Utah. Prior to joining the FIA program, she was a research associate with the Fluvial Geomorphology Lab at Utah State University, where she studied the dynamics of riparian vegetation and sediment storage on the Green and Colorado Rivers. Sara holds Bachelor's and Master's of Science degrees from the Forest Resources program at USU.

Restoring Fire and People to the Land: The 2010 South Umpqua Study

Bob Zybach, Program Manager, Oregon Websites and Watersheds Project, Inc., Eugene, OR

The year-long South Umpqua Headwaters Precontact Reference Conditions Study focused on landscape-scale changes in forest species composition, populations, and biomass from late precontact time (pre-1826; ca. 1800) to the present. The study area is 230,000 acres in size and is located in the headwater forests of the South Umpqua River in the western Cascade Range of Douglas County, Oregon. Most of the study area is contained within the Tiller Ranger District of the Umpqua National Forest. The purpose of the study was to produce a reliable landscape-scale description of late precontact reference forest conditions for the intended use of helping to update Community Wildfire Protection Plans. Research was conducted by the “method of multiple hypotheses.” Significant findings were: 200 years ago, vegetation types in the study area headwaters consisted of prairie and meadow grasslands, oak savannas, park-like pine woodlands, brakes, berry patches, stands and patches of Douglas-fir forestlands, and high elevation shrublands and patches of mixed conifers; since 1825, the measured density (trees per acre) and basal area of representative forested areas have increased more than five-fold -- in these same stands, tree biomass has accumulated from 10 to 20 times more than they had held 200 years earlier; relative proportions of tree species have also changed significantly during that time, from pines and oak being the dominant tree species to Douglas-fir, grand fir, and incense-cedar as the most prevalent current species; there has been a significant decrease in daily and seasonal occupation and use of the study area by people from late precontact time to the present; precontact human influences on the vegetation were significant, with the elimination of anthropogenic fire over the past 200 years being a key factor in the alteration of forest conditions during that time; and the introduction of large, infrequent, a-historical, wildfires having replaced regular, low-severity anthropogenic fires in the study area, due in large part to the massive build-up of biomass that has resulted in increased wildfire, insect, and disease risk, and in measurable changes to native wildlife habitats and populations.

Bob Zybach, 332 E. Madison Ave., Cottage Grove, OR 97424, zybachb@nwmapsco.com.

Bob Zybach is a forester and forest scientist with a long career in the woods of the Pacific Northwest. From the mid-1960s until the late 1980s he was employed in the forest industry, including 20 years as owner and manager of a successful reforestation business, Phoenix Reforestation, Inc. He has a PhD in Environmental Sciences from Oregon State University, with the focus of his research in reforestation, wildfire, and Indian

burning history of western US forests. Dr. Zybach is owner of NW Maps Co. (www.NWMapsCo.com), and has been Program Manager for Oregon Websites and Watersheds Project, Inc. (www.ORWW.org) since its founding. ORWW is a nonprofit internet-based educational organization that maintains a YouTube video channel (www.youtube.com/ORWWmedia) and has had more than two million unique student and teacher visitors to its website since it was launched in January, 1997.

Fuels for Schools

Angela Farr, Regional Biomass Utilization Coordinator, Regions 1 and 4, USDA Forest Service, Missoula, MT

This presentation will provide an in-depth look at the challenges and opportunities associated with installing small-to-medium scale biomass heating systems in rural communities. The Northern and Intermountain Regions of the USFS partnered with six State Foresters nearly a decade ago, to implement a vision of small, distributed biomass systems in forested areas, thereby creating renewable energy, reducing open pile burning, and adding value to waste wood from fire hazard reduction and forest restoration. Through 17 installations in five states, Fuels for Schools gained a national reputation and has been a resource for numerous other states, as well as internationally. We have learned a tremendous amount about what works, where and why, and developed strategies to promote success. This unvarnished look at challenges overcome will include specific advice on developing and communicating fuel specifications, working with engineers, boiler manufacturers, and energy services corporations, locating alternative funding sources for projects, and working with air quality professionals on permitting.

Angela K. Farr, USDA Forest Service, Region 1, Regional Office, State & Private Forestry, Missoula, MT 59804-3199, afarr@fs.fed.us.

Angela Farr is a Biomass Utilization Coordinator for State & Private Forestry in the Northern and Intermountain Regions. She holds an M.S. in Environmental Studies from the University of Montana and a bachelor's degree from Whitman College. As part of the nationally recognized Fuels for Schools Initiative, Angela has facilitated a dozen woody biomass heating projects in the state of Montana, and shared her expertise in presentations at regional and national conferences.

Thermochemical Conversion of Biomass to Fuels and Chemicals - Pyrolysis and Gasification

Nii Ofei Mante, Visiting Research Scholar, Synthetic Bio-Manufacturing, Utah State University, Logan, UT

The development of advance thermochemical technologies is critical for sustainable production of affordable biofuel, biopower and bioproduct from biomass. Thermochemical conversion processes are flexible and independent of feedstock. Currently, pyrolysis and gasification are promising thermochemical conversion processes that use heat and chemistry to produce bio-oil, syngas, bio-char and chemicals from a wide spectrum of biomass feedstocks, varying from woody and herbaceous biomass to agricultural and forest residues, oilseed crops, animal solid waste and urban residues. The biomass derived intermediates can further be processed in an existing infrastructure into drop-in fuels, blendstocks, and chemicals. The study presents an overview of these technologies and assesses the opportunities and obstacles in the current state of the thermochemical conversion technology.

Nii Ofei Mante, Visiting Research Scholar, Utah State University, Logan, UT, omante@aggiemail.usu.edu.

Nii Ofei Mante is currently a graduate student of Virginia Tech and pursuing a doctorate degree under the

supervision of Dr. Foster Agblevor, who is a professor in the Biological Engineering Department at Utah State University. His research focuses on the development of a catalytic upgrading technology for the production of stable bio-oils. He earned a master's in Bioprocess Engineering and a bachelor's degree in Chemical Engineering.

Biochar: Financial Perspectives

Tom Etzel, Senior Vice President, Zions Bank, Salt Lake City, UT

Abstract not available.

Federal Funding Opportunities

Dave Conine, Utah Director, USDA Rural Development, Salt Lake City, UT, Perry Mathews, Business Programs Director, USDA Rural Development, Salt Lake City, UT

This presentation will cover USDA Rural Development energy and biomass funding opportunities, including specifics about loans and grants, application deadlines, funding eligibility and funding amounts available in various programs. This will be a detailed discussion including Q & A with the audience.

Dave Conine, State Director, Rural Development, U.S. Department of Agriculture, 125 South State St., Salt Lake City, UT 84138, dave.conine@ut.usda.gov. Perry Mathews, USDA Rural Development, P.O. Box 11350, Salt Lake City, UT 84147-0350, perry.mathews@ut.usda.gov.

Dave Conine began his appointment as USDA Rural Development Director for Utah in September 2009. Prior to joining Rural Development Dave worked as a rural development specialist for Rural Community Assistance Corporation (RCAC). His work with RCAC focused primarily on community development and affordable housing in rural Utah and Montana. Conine also worked as the Economic Development Director for the Paiute Indian Tribe of Utah, served as Community Development Director for North Bend, Washington and spent nearly a decade operating a land use-planning consultancy. During the administration of Utah's Governor Matheson Dave worked in the Governor's Office of Planning and Budget where he specialized in housing, land use, and agricultural policy. Near the end of Governor Matheson's second term Conine served as the Director of Planning and Management for the Utah Department of Agriculture where he planned and helped implement the establishment of conservation and development programs and a revolving loan fund. Dave studied architecture at Cooper Union in New York City, then moved to Salt Lake City where he completed degrees in fine arts and geology. His graduate work at the University of Utah was in urban and regional planning. Dave lives in Draper, Utah with his wife Suzanne and son Alex.

Perry Mathews was born and reared in Miami, Oklahoma (home town), and is an enrolled member of the Quapaw Tribe of Oklahoma, and the Seneca-Cayuga Tribe of Oklahoma. He graduated from Oklahoma State University (OSU) with a Bachelor of Science (B.S.) degree in Business Administration, along with a minor in Business Law; and subsequently attended the University of Wyoming pursuing graduate studies. Perry serves as the Business & Cooperative Program Director, since his selection in May 2008; and as the American Indian Coordinator since joining the agency. Perry joined the USDA, Rural Development team in May 2004 as an Area Specialist and has worked in several programs: Rural Utilities Service – Water & Environmental Programs; Rural Housing Service – Community Facilities Programs; Rural Housing Programs; and Rural Business Service – Business & Cooperative Programs. Prior to joining USDA, Perry spent 3 years in the foundation & non-profit sector, 11 years in Indian Affairs for two State governments (Utah & Wyoming), and 9 years in the corporate industry and private sector.

Collaboration Panel

History, Structure and Successes of the Montana Forest Restoration Committee

Mary Mitsos, National Forest Foundation

Mary Mitsos joined the National Forest Foundation in 2001 and serves as Vice President. She brings expertise in a range of topics relating to the protection and sustainable management of forest ecosystems and sustainable development. Her specialized interests are in collaborative stewardship, contracting mechanisms on public forestlands, conservation-based development and strengthening the working relationship between local communities and forestland managers. Mary holds a Bachelor of Arts in International Business from the University of Colorado-Denver. In addition, she earned a Master of Science in Natural Resources, and a Masters of Arts in Applied Economics, from the University of Michigan. She served on the steering committee of the Seventh American Forest Congress Communities Committee, as a Board member of the National Network of Forest Practitioners, as a Board member for Northwest Connections, and on the advisory board for the College of Forestry and Conservation at the University of Montana.

Mary O'Brien, Grand Canyon Trust

Mary O'Brien (Ph.D., botany) has been working for Grand Canyon Trust since 2003 as Utah Forests Program Manager, joining with other organizations to encourage the Forest Service to conserve wildlife habitat and native ecosystem processes on southern Utah's three national forests (Dixie, Fishlake, and Manti-La Sal). She is currently engaged in a number of collaborations regarding management of these three forests. For 21 years previously, she served as a staff scientist and organizer for toxics reform and conservation organizations including Northwest Coalition for Alternatives to Pesticides, Environmental Law Alliance Worldwide, Environmental Research Foundation, Science and Environmental Health Network, and Hells Canyon Preservation Council. From 1992-1994, she was an Assistant Professor (Public Interest Science and Environmental Advocacy) in the graduate U. of Montana Environmental Studies Program.

Bob Swandby, Payette Forest Coalition and Wood Utilization Partnership

Bob graduated from the University of Minnesota with BA and MA degrees in International Relations. He served as an Army Intelligence officer during the Vietnam War and later as Legislative Assistant to Congressman Clark McGregor of Minnesota. During the Arab Oil Embargo he worked to develop crude oil pricing and allocation regulations for the Federal Energy Administration. After the Embargo he moved to the International Division of the U.S. Department of Energy to help negotiate trilateral research agreements with the Venezuelan, Canadian and U.S. governments. He did international energy consulting for Los Alamos National Laboratory and later worked for the Idaho Department of Commerce as an economic development specialist. In that position he worked with the Woody Biomass Utilization Partnership and other organizations to promote woody biomass utilization in rural communities. He currently serves on its Board. He is a founding member of the Payette Forest Coalition.

Doug Martin, Nevada Tahoe Conservation District

Doug is the District Manager for the Nevada Tahoe Conservation District. Doug earned a Bachelors of Science in Renewable Natural Resources from the University of Nevada, Reno. He has held multiple technical and managerial positions within Nevada spanning a 35 year career. Career highlights include program development and management at the Nevada Division of Environmental Protect in the areas of hazardous and solid waste management; project management and permitting duties for an internationally based geotechnical engineering firm with solid waste and mining projects in Asia, South America and the Southwest US; managing principal for an international environmental and engineering company; and, District Manager for the Nevada Tahoe Conservation District. Representative projects include development of the hazardous and solid waste programs

for the State of Nevada, environmental mitigation of soil and groundwater throughout Nevada, municipal solid waste landfilling, composting and material recovery project management and permitting, development of the battery reclamation processing plant for the US Navy in Hawthorne, Nevada and management of the largest conservation district in the State of Nevada with projects in the Lake Tahoe Basin addressing sediment and erosion treatment, healthy forests and watersheds and biomass utilization. Volunteer positions include serving on the Carson City Wildlife Advisory Board, the Nevada Firesafe Council Board of Directors and Chair of the Nevada Biomass Working Group. Doug currently is the co-chair of the Nevada Pinyon Juniper Partnership.

The Forestry/Bioenergy/Carbon Connection

Jay O'Laughlin, Professor of Forestry and Policy Sciences, University of Idaho, Moscow, ID

The increase in western wildfires over recent decades past can be attributed to accumulations of fuels and climate change that dries fuels and extends fire seasons. Silvicultural designed to reduce fuels while restoring other desirable conditions and providing a range of ecosystem services is an effective strategy for mitigating climate change. Fuel reduction treatments at a scale large enough to modify wildfire behavior will produce not only substantial quantities of wood to make consumer products and substitute for fossil energy but also additions to the workforce that will help revitalize rural economies. Forests also play a key role in the global carbon cycle by capturing, storing, and cycling carbon, functions that can be enhanced by active management. In addition to federal energy policy ambiguity (discussed earlier in "Towards a Cohesive Federal Policy for Wood Bionergy") regulatory uncertainty for biomass energy production arises from the "carbon neutrality" debate about accounting for "biogenic" greenhouse gas emissions. A narrow focus on Clean Air Act implementation may overlook the carbon balance effect of sustainable forest management. Biomass utilization faces two economic challenges; neither is insurmountable. First, high costs of harvesting and transporting low-value biomass can be reduced with public subsidies. Benefits from avoided costs of wildfire suppression and site rehabilitation may exceed fuel treatment costs and create a rationale for subsidies. A policy choice is whether the subsidy should be merchantable timber, cash payments, or tax credits. The second challenge is long-term supply. Unless entrepreneurs can demonstrate reliable biomass supplies for 10 or 20 years, private capital is unlikely. On federal lands biomass supply planning is problematic, as are long-term contract mechanisms. Changes in agency policies could improve both problems. Large-scale restoration treatments in the short term provide a "triple win": improved forest conditions, renewable energy feedstocks, and revitalized rural communities. The reduction of carbon emissions from burning wood in a boiler to make energy instead of open burning, whether in wildfires or slash piles, is a bonus. The long-term payoff from large-scale restoration treatments will be enhanced energy security, along with other benefits to society that ought to be mentioned in the same breath as treatment costs.

Jay O'Laughlin, Ph.D., Professor of Forestry and Policy Sciences, Director of the Policy Analysis Group, College of Natural Resources, P.O. Box 441134, University of Idaho, Moscow, ID 83844-1134, jayo@uidaho.edu.

Jay O'Laughlin has served as full-time Director of the Policy Analysis Group (PAG) at the University of Idaho's College of Natural Resources since 1989, a position created and funded by the Idaho Legislature to provide objective analysis of natural resource issues important to Idaho citizens, as suggested by an advisory committee of the state's natural resource leaders. Before moving to Idaho Jay was a tenured associate professor specializing in forest policy and economics in the Dept. of Forest Science at Texas A&M University. He earned M.S. and Ph.D. degrees in forestry from the University of Minnesota and a business finance degree from the University of Denver. Before enrolling in forestry school he was a U.S. Army artillery officer in Vietnam and spent three years with a manufacturing company in Chicago, Illinois.

Policy analysis publications (available at the Website address above) cover a wide variety of issues, including public land management policies, endangered species conservation, sustainable forest management, risk

*analysis, water quality best management practices, and air quality and prescribed fire emissions policies. Recent analyses have focused on wildfire policy, wood bioenergy opportunities and challenges, and forest carbon management. Jay works on these issues in several off-campus roles, including the Forest Health Advisory Committee of the Western Governors' Association, and for Governor Otter, the Idaho Strategic Energy Alliance, serving as a member of its Carbon Issues Task Force and chairing its Forestry/Biomass Task Force. In 2009 he authored a report on the opportunities and challenges of using wood as an energy resource in Idaho.**

The University of Idaho gave Jay its Award of Excellence for Outreach in 2000, and in that same year he was elected a Fellow of the Society of American Foresters (SAF). In 2010 he received the SAF Award in Forest Science, a prestigious national award recognizing distinguished individual research in the application of managerial and social sciences leading to the advancement of forestry.

*http://www.energy.idaho.gov/energyalliance/d/forest_packet.pdf

Poster Abstracts

In alphabetical order by presenting author's last name,
presenting author in italics

CROP - Coordinated Resource Offering Protocol - Making Wood Supply Coordination Easy

Scott Bell, Woody Biomass Utilization Coordinator, USFS, Region 1 & 4 - S&PF, Ogden, UT

CROP is a protocol that identifies forest resource offerings within a geographic landscape and is accessible on an interactive website. It provides quick access to planned wood offerings from a variety of search options, invites investment for forest products businesses, helps plan forest treatments, facilitates coordination between suppliers and provides a forum for collaboration.

Scott Bell, Woody Biomass Utilization Coordinator, USFS, Region 1 & 4 - S&PF, 324 25th St., Ogden, Utah 84401, sbell@fs.fed.us.

U.S. Billion-Ton Update

Laurence Eaton¹, *Craig Brandt¹*, *Matthew Langholtz¹*, *Robert Perlack¹*, *Bryce Stokes²*, and *Anthony Turhollow¹*

¹Oak Ridge National Laboratory, Oak Ridge, TN and ²CNJV, Golden, CO

The 2011 U.S. Billion-Ton Update (BTU) revised the 2005 Billion-Ton Study (BTS). The BTU found similar quantities of potential biomass resources as the 2005 BTS, with somewhat lower amounts of forest resources and agricultural residues, but higher amounts of energy crops. A number of improvements were made to the methodology used in the BTU, including more strict sustainability constraints, county-level supply curves, and land use change modeling for energy crops. Baseline and High-Yield scenarios were estimated, with potential resources increasing over time (from 2012 to 2030). In the Baseline total resources ranged from 450 (in 2012) to 1,100 (in 2030) million dry tons, at \$60 per dry ton or less, with 70% of the total available for new bioenergy uses. In the High-Yield Scenario total resources ranged from 450 (in 2012) to over 1,600 (in 2030) million dry tons, at \$60 per dry ton or less, with 80% available for new bioenergy uses. Forest resources are greatest in the Southeast while agricultural resources are greatest in the Plains, Midwest, and Southeast.

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Biochar: Sustainable Use of Biomass

Gloria Flora, US Biochar Initiative, Helena, MT

Biofuels and biomass-based energy have the potential to become major contributors to the global primary energy supply over the next century, expanding significantly in both developed and developing nations. However, unchecked, overzealous establishment of plantations for biomass production and excessive removal of biomass from agricultural systems and natural ecosystems can cause a plethora of social, cultural, environmental and economic ills. Genetic modification of plant species for expediting biomass growth can likewise lead to a range of problems, from perceptions of danger to actual environmental chaos from unintended consequences. Given these potential pitfalls and the intensifying interest in all forms of bio-energy and biomass utilization, agencies and conservation organizations are scrambling to develop sustainability standards.

Sustainability standards and guidelines are therefore not only timely but also essential. Fortunately, the call to action has been heeded by a broad spectrum of government and non-governmental organizations at international, national and regional levels. This section of the report will outline the current thinking on biomass sustainability as it relates to biochar production from industries to small community operations, through partnerships and collaborations to single providers. Primarily, this section provides a brief bibliographic review of the current leading reports on biomass sustainability and certification. This review will look at biomass sustainability through the lens of biochar production. ...

Berndes, Göran, et al.. "The Contribution of Biomass in the Future Global Energy Supply: a Review of 17 Studies". *Biomass and Bioenergy*, Vol. 25, Issue 1, July 2003, pages 1-28. <http://www.chem.uu.nl/nws/www/publica/Publicaties2003/E2003-40.pdf>

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Pinon and Junipers Distribution Forecast Under 21st Century Climate Change

Jacob R. Gibson¹, Thomas C. Edwards, Jr.², Tracey Frescino³, Gretchen G. Moisen³

¹Utah State University, Department of Wildland Resources, Logan, UT and ²U.S. Geological Survey, and Utah State University, Department of Wildland Resources, Logan, UT and ³USDA Forest Service, Rocky Mountain Research Station, Ogden, UT

Piñon and juniper woodlands form an altitudinal life zone that covers 10% of the landscape in the Great Basin and 20% in the Colorado Plateau. Two piñons (*Pinus edulis*, *P. monophylla*) and four junipers (*Juniperus deppeana* var. *deppeana*, *J. monosperma*, *J. occidentalis*, *J. osteosperma*) collectively span these regions in a mosaic of distributions partitioned along seasonal moisture gradients within a latitudinal belt across western North America's arid interior. Management of piñon-juniper woodlands is challenged by species-specific life histories and regional variation in demographic drivers. Populations of piñons and junipers have been highly active over the last century, with both their altitudinal and continental distributions in varying states of expansion, contraction, and persistence. Although species respond individually, this common distinction, e.g. expanding vs. core woodlands, categorizes the primary variation in ecological and hydrological properties of their emergent woodlands and can provide context for extrapolating management practices. The utility of this distinction has driven the development of field-based classifications of woodlands into these primary stages of expansion, persistence and contraction. Continental distribution maps of each respective species have the potential to bridge the gap between field-based woodland classifications and forecasted global climate change, linking specific landscapes to their region. We develop climate-based distribution forecasts for piñon and juniper species which delineate distributions into zones under tension of expansion, contraction, and persistence based on multidecadal climate variation around forecast 21st century climate change.

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Effects of Long Term Changes In Precipitation and Vegetation Type on Nutrient Dynamics

Shleace Hardenbrook¹, Kathleen A. Lohse¹, David Huber¹, Keith Reinhardt¹, and Matt Germino²

¹Department of Biological Sciences, Idaho State University and ²U.S. Geological Survey

Climate is changing and climate models predict potentially increased spring/winter precipitation or increased summer rainfall in the Intermountain West. In this region, sagebrush steppe ecosystems are also threatened by invasive plant species. However, it is unclear how sagebrush steppe ecosystems will respond to these stressors. Cold desert ecosystems are typically limited by water. After water, nitrogen is often thought to be limiting to sagebrush steppe ecosystems. Changes in precipitation and/or vegetation may alter nutrient dynamics through changes in water availability or litter quality. The objective of this study was to examine the effects of precipitation and vegetation type on nutrient dynamics. We expected to find differences in nitrogen cycling with water additions, and differences between cover types. We also expected large difference between canopy and intercanopy spaces so that we collected soils in these two different positions

Our research site is located within the long-term Protective Cap Biobarrier Experiment (PCBE) at the Idaho National Laboratory (INL). Three Precipitation regimes are used at the PCBE to mimic current and predicted precipitation patterns. These consist of 3 irrigation treatments: Ambient which receives no addition of water, summer water additions and winter/spring additions, and have plantings of either Big Sagebrush or Crested Wheatgrass. We measured: gravimetric soil moisture, Soil organic matter (SOM), inorganic forms of nitrogen, and rates of mineralization and nitrification. Our results showed that changes in plant type to grasses with higher C:N ratios altered nutrient dynamics. Those effects were different between plant type, and canopy vs intercanopy (P,IP). Water additions also changed nutrient dynamics between cover type and canopy type.

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Modeling A Stable Aspen Niche and Its Application to Aspen Restoration

Cody Mittanck, Utah State University, Logan, UT, Ron Ryel, Utah State University, Logan, UT, Paul Rogers, Utah State University, Logan, UT, Doug Ramsey, Utah State University, Logan, UT and Dale Bartos, Rocky Mountain Research Station, Logan, UT

Quaking aspen (*Populus tremuloides* Michx.) is the most widespread broadleaf tree species of North America, and as such, plays a crucial ecological role; however, there is increasing evidence that aspen does not fulfill the same ecological role across its expansive range. Many studies show evidence for both "seral" and "stable" aspen community types leading us to believe that the successional pathway of aspen may not always lead to a climax conifer sere, but may in some cases consist of persisting stands of pure aspen. Factors influencing aspen-conifer succession have not been fully explored at the landscape or regional level. This study is an attempt to understand the relationship of aspen community types to climatic, physical, and biophysical variables by modeling patterns of aspen and conifer distribution across large scales using remote sensing and GIS technology. Study methodologies and results were specifically designed to aid land managers in identifying extent and status of aspen populations as well as prioritizing aspen restoration projects. Four separate study sites were chosen within Utah in order to capture the geographic and climatic range in which aspen inhabits. Photointerpretation of NAIP CIR imagery and linear unmixing of Landsat TM imagery were used to classify dominant forest cover at approximately 250 plots within each site. A Kappa analysis indicates photointerpretation methods to be more accurate (Khat=92.07%, N=85) than linear unmixing (Khat=51.05%,

N=85). At each plot, variables were calculated and derived from DAYMET data, digital elevation models, and soil surveys. A generalized linear model was used to assess habitat overlap between aspen and conifer and predict areas where “stable” aspen communities are likely to occur. Results do not provide evidence for a realized aspen niche, however the model predicts higher probabilities for aspen than conifer based on scale-dependent interactions between topography and moisture. We show how model predictions can be interpreted and applied to various management scenarios using ROC curves and GIS-based mapping techniques.

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Southern Utah Woody Biomass Field Days

Mark Nelson, Utah State University Extension, Beaver County, UT

Currently there are nearly 50 million acres of Pinyon/Juniper woodlands across the West and more acres are being invaded each year. The risks presented by expanding and overstocked Pinyon/Juniper woodlands and the associated impacts on ecosystem biodiversity, wildlife habitat, and water quantity and quality are cause for major concern. Recently the BLM and Forest Service are renewing its efforts to control this problem. Proactive management can provide positive use of Pinyon/Juniper fuels while reducing fire suppression and restoration costs. In order to make it possible to clear more ground, many groups are trying to find ways to use the pinyon/ juniper to recoup some of the costs of the harvesting. Thanks to the work of Lance and Michelle Lindbloom of Bloomin Ranch Service, a private contractor currently working in Beaver County, we were able to hold two field days. The field days demonstrated different methods of harvesting the pinyon/juniper and looked at ways of adding value to the harvested trees. During the field days, harvesting, handling and processing equipment were demonstrated. Leading experts in the woody biomass and forestry industry addressed the importance of restoring the woodlands and ways for industry and government to partner together to address the problem. A total of over 450 people have attended the two field days and plans are being made to make this an annual event.

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Mixed Aspen-Conifer Post-Fire Succession: The Twitchell Canyon Fire as a Long-term, Variable-Severity Case Study

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Drivers of post-fire succession for mixed aspen-conifer landscapes of the North American Interior West are poorly understood, thus studies that examine vegetation patterns across a range of fire severity classes are needed to better guide management decisions. In 2010, the Twitchell Canyon Fire burned 18,160 ha (44,874 acre) on the Fishlake National Forest (Tushar Mountains) in southwest Utah. The fire burned for 90 days, creating a spatially-variable fire severity mosaic. Fire severity was estimated at 20, 34, and 33% for low-, moderate-, and high-severity, respectively. In 2011 we measured pre-and post-fire vegetation attributes on 47 permanent plots in two small watersheds. Plots were randomly located within 1,600 m of usable roads and stratified by vegetation type and fire severity using Forest Service GIS-based data layers. Attributes were measured for all trees within 15 m of plot centers (≈ 0.07 ha). Within each plot, understory species frequency and aspen shoot density were determined using three circular subplots (64-m^2). Across all forest types, low, moderate and high frequency fire caused 36, 65, and 100% mortality of mature ($\text{DBH} \geq 10$ cm) live trees, respectively. Mean post-fire live tree density was 435 (low), 171 (moderate), and 0 (high) trees per ha (176, 69, and 0 trees/ acre). Aspen shoots were counted on 38 of 47 plots with 72% of plots having shoot densities \geq

1,000 shoots per ha (405/acre). Across all plots, mean shoot density was 20,193/ha (8,172/acre). As expected, understory species were dominated by root sprouters and disturbance-adapted herbs. Conifer seedlings were common but not abundant. We anticipate that in time this study will inform improved trajectory and rate predictions for post-fire succession in mixed aspen-conifer communities of the North American Interior West.

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Piñon Juniper Forest Expansion: Is this Encroachment or Recovery?

Emanuel Vásquez, Wild Utah Project, Salt Lake City, UT and Jim Catlin, Wild Utah Project, Salt Lake City, UT

Tens of thousands of acres of piñon and juniper forests in Utah have or are now proposed for treatment. One of the justifications is a need to respond to encroachment in many areas over the past hundred years. Looking even further back in time, extensive wood use occurred to support mining and other uses that consumed large parts of piñon juniper forests that surrounded the communities in this study area, Beaver and Iron Counties Utah. Our analysis found that in most cases, today’s piñon forests occupy expected habitat and that the increase seen in past decades may be in part a recovery from past piñon juniper extraction.

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