

RESTORING THE WEST 2012

Balancing Energy Development
and Biodiversity

October 30 & 31, 2012
Utah State University
Logan, Utah
www.restoringthewest.org

2012 Restoring the West Conference Planning Committee Roster

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Terry Messmer, USU Department of Wildland Resources & Wildlife Extension

Paul Rogers, Western Aspen Alliance

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USU Cooperative Extension, USU Department of Wildland Resources, USU Quinney College of Natural Resources, USU Ecology Center, USDA Forest Service State & Private Forestry, Western Aspen Alliance, Juniper Systems, DRIWATER

Agenda

Tuesday, October 30, 2012
 USU Eccles Conference Center

7:30 to 9:00 a.m.	Registration Open
8:00 to 8:10 a.m.	Welcome , Chris Luecke, Dean, Quinney College of Natural Resources, Utah State University, Logan, Utah
8:10 to 8:20 a.m.	There are No Civilians: Species-at-Risk and Energy Development , Terry Messmer, Professor and Wildlife Extension Specialist, Utah State University, Logan, Utah
8:20 to 8:40 a.m.	Utah's Leadership in Balancing Energy Development and Conservation , Cody Stewart, Energy Advisor to Governor Gary Herbert, Salt Lake City, Utah
8:40 to 9:20 a.m.	Wearing Four Hats – Finding Balance while being a Rancher, Mineral/Energy Developer, County Councilman, and Conservationist , Chris Robinson, Summit County Council Member, Landowner, Park City, Utah
9:20 to 10:00 a.m.	Strategies and Metrics for Mitigating Impacts of Energy Development on Biodiversity , Jonathan Haufler, Executive Director, Ecosystem Management Research Institute, Seeley, Montana
10:00 to 10:30 a.m.	Break
10:30 to 11:00 a.m.	Energy and Wildlife – Investments in Conservation , Scott A. Donato, Manager, Governmental Affairs, Bill Barrett Corporation, Denver, Colorado
11:00 to 11:30 a.m.	Speak to me Lichen, how Stable is the Soil? Tell me its Disturbance History , Roger Rosentreter, State Botanist, BLM Idaho, Boise, Idaho
11:30 a.m. to 12:00 p.m.	Overview of Best Management Practices used to Mitigate Environmental Impacts from Large-Scale Oil and Gas and Renewable Energy Development Projects on Public Lands Managed by the Bureau of Land Management , Jim Gazewood, Renewable Energy Program Coordinator, BLM Utah, Salt Lake City, Utah
12:00 to 1:30 p.m.	Poster Session and Lunch

Tuesday, October 30, 2012
USU Eccles Conference Center

1:30 to 2:00 p.m.	Research Provides Answers to Mitigate Impacts of Energy Development to Wildlife , Jeffrey L. Beck, Rangeland Wildlife Habitat Restoration Ecologist, University of Wyoming, Laramie, Wyoming
2:00 to 2:30 p.m.	Phased Energy Development and the Precautionary Principle: Good for Critters and Communities , Pete Morton, Former Director of Economic Research, The Wilderness Society, Denver, Colorado
2:30 to 3:00 p.m.	Human-mediated Shifts in Animal Habitat Use: Sequential Changes in Pronghorn use of a Natural Gas Field in Greater Yellowstone , Jon Beckmann, Conservation Ecologist, Wildlife Conservation Society, Bozeman, Montana
3:00 to 3:30 p.m.	Break
3:30 to 4:00 p.m.	Energy Development and Wilderness Preservation as Compatible Goals , Steve Bloch, Conservation Director, Southern Utah Wilderness Alliance, Salt Lake City, Utah
4:00 to 4:30 p.m.	Projecting Wildlife Impacts <i>Before</i> Oil and Gas Development , Janice Thomson, Assistant Vice President for Landscape Analysis, The Wilderness Society, Seattle, Washington
4:30 p.m.	Adjourn
5:30 to 7:30 p.m.	Reception at Cafe Sabor

Agenda

Wednesday, October 31, 2012
USU Eccles Conference Center

8:30 to 8:35 a.m.	Welcome , Darren McAvoy, Forestry Extension Associate, Utah State University, Logan, Utah
8:35 to 9:20 a.m.	Sage Grouse and Energy Development , Bob Budd, Executive Director, Wyoming Wildlife and Natural Resource Trust, Lander, Wyoming
9:20 to 10:00 a.m.	High Lonesome Ranch – a Compatible Use Private Landscape with Conservation and Biodiversity Based Goals and its Interactions with Public Lands , Paul Vahldiek, Chairman of the Board, President and CEO of The High Lonesome Ranch, De Beque, Colorado
10:00 to 10:30 a.m.	Break
10:30 to 11:00 a.m.	The Energy Footprint on the Landscape and What this Means for Plants, Animals, and Ecosystems , Jayne Belnap, Research Ecologist, US Geological Service, Moab, Utah
11:00 to 11:30 a.m.	Utah Division of Wildlife Resources’ Approach to Impact Analysis and Mitigation , Bill James, Energy Development / NEPA Coordinator, Utah Division of Wildlife Resources, Salt Lake City, Utah
11:30 a.m. to 12:00 p.m.	Towards a West Wide Crucial Habitat Assessment Tool (CHAT) , Greg Servheen, Wildlife Program Coordinator, Idaho Department of Game and Fish, Boise, Idaho
12:00 to 1:00 p.m.	Lunch

Wednesday, October 31, 2012
USU Eccles Conference Center

1:00 to 1:30 p.m.	Up-and-coming Research Presentations
1:00 to 1:10 p.m.	The Effect of Energy Development on Rare Plant Fecundity in the Piceance Basin, Colorado , Sarah Clark, MS Candidate, Department of Biology, Utah State University, Logan, Utah
1:10 to 1:20 p.m.	Unique Habitat Use in a Fringe Greater Sage-Grouse Population , A. Cheyenne Burnett, MS Candidate, Department of Wildland Resources, Utah State University, Logan, Utah
1:20 to 1:30 p.m.	Dust Deposition from Unpaved Roads is Correlated with Decreased Reproduction of an Endangered Utah Endemic Shrub , Matthew B. Lewis, MS Candidate, Department of Wildland Resources, Utah State University, Logan, Utah
1:30 to 2:00 p.m.	Greater Natural Buttes: One Model for Stakeholder Cooperation , Brooke Bell, Regulatory Affairs Manager, Anadarko Petroleum, Denver, Colorado
2:00 to 2:30 p.m.	Responsible Use of Public Lands , Mark Raymond, Uintah County Commissioner, Vernal, Utah
2:30 to 2:45 p.m.	Break
2:45 to 3:15 p.m.	Mixing Oil Shale and Water Rights: A Case Study in Western Colorado , Temis Taylor, PhD Candidate, Department of Environment and Society, Utah State University, Logan, Utah
3:15 to 3:45 p.m.	Best Management Practices for Solar and Wind Energy Development: A Conservationist's Guide , Allison Jones, Conservation Biologist, Wild Utah Project, Salt Lake City, Utah
3:45 to 4:00 p.m.	Wrap up , Darren McAvoy, Forestry Extension Associate, Utah State University, Logan, Utah
4:00 p.m.	Adjourn

Speaker Abstracts

In order of presentation,
presenting author in italics

There are No Civilians: Species-at-Risk and Energy Development

Terry Messmer, Professor and Extension Wildlife Specialist, Utah State University, Logan, Utah

Under the traditional laws of war, a civilian was defined as someone not a member of their countries armed forces or armed militia. Essentially, they were the non-combatants, the innocents; afforded legal protection from the effects of war, and/or military occupation. The 1949 Geneva defined the term combatants to encompass “civilians directly engaged in hostilities and that such persons should be “considered ‘unlawful’ or ‘unprivileged’ combatants.” In 1977 the caveat, “in case of doubt whether a person is a civilian, that person shall be considered to be a civilian” was added. After 10 years at-wars, what constitutes a civilian to the US and Coalition forces remains problematic largely because of the emergence of acts of terrorism where combatants adopt the civilian mantra to muddle the rules-of-engagement. Concomitantly, if species conservation and energy development constitute the Endangered Species Act battleground; can a US public that continues to demand cheap energy and species conservation still be considered a passive on-looker – a civilian?

Terry A. Messmer, Professor and Extension Wildlife Specialist, Utah State University Department of Wildland Resources, 5230 Old Main Hill, Logan, UT, 84322, terry.messmer@usu.edu

Terry A. Messmer is a Professor and Extension Wildlife Specialist in the Department of Wildland Resources, Utah State University, Logan. He also is the Director of the Jack H. Berryman Institute, holds the Quinney Professorship of Wildlife Conflict Management in the College of Natural Resources, and is the director of the Utah Community-Based Conservation Program at Utah State University. He received B.S. degrees in Fisheries and Wildlife Management and in Biology from the University of North Dakota, Grand Forks; M.S. degrees in Natural Resource Management/Botany and in Regional and Community Planning; and a Ph.D. in Animal and Range Science from North Dakota State University, Fargo. His research, teaching, and extension activities include identification, implementation, and evaluation of conservation strategies, technologies, and partnerships that can benefit agriculture, wildlife, and resource stakeholders. He is particularly interested in the reevaluation of contemporary fisheries and wildlife management policies and paradigms regarding the contributions private lands to natural resource conservation, wildlife and livestock interactions, and the abatement of human-wildlife conflicts.

Utah's Leadership in Balancing Energy Development and Conservation

Cody Stewart, Energy Advisor to Utah Governor Gary Herbert, Salt Lake City

In his 10-Year Strategic Energy Plan released in 2011, Governor Gary R. Herbert established a goal of promoting “Responsible Energy Development” that makes use of all of Utah’s energy resources, including conventional and alternative, in an environmentally responsible way. Already, energy resource developers are compelled to operate within a comprehensive environmental regulatory framework which they often perceive as onerous. Yet even with such laws in place the conflicts between resource development and conservation values routinely lead to anxiety and recrimination. In addition to an implicit potential for environmental harm, the development of natural resources at any significant scale may reshape communities and fray delicate social structures. Despite these dynamics and concerns, the critical importance of energy development, both to our

economies and to our very way of life, cannot be downplayed. Therefore, it is contingent upon us to balance this development with the environmental goods that we all hold so dear. Utah has a knack for leadership, and it is our duty to add value and meaning to ideas like “responsible energy development.” The path forward must involve long-term community planning, honest science, creative technologies, and a willingness for a variety of unlikely stakeholders to create partnerships guided by pragmatism and a shared love for Utah’s many breathtaking and delicate ecosystems.

Cody Stewart, Energy Advisor to Governor Gary Herbert, 324 South State Street, Suite 500, Salt Lake City, UT 84111, CodyStewart@utah.gov

Cody Stewart has more than a decade of experience in government and public policy with a special focus on energy and western natural resource policy. Mr. Stewart has worked in a number of capacities focusing on both Utah and national energy and natural resource policy, including as the Communications Coordinator for the House Committee on Natural Resources under Chairman Jim Hansen (UT-01), as a senior Legislative Assistant on Energy and Public Lands Policy to Congressman Chris Cannon (UT-03), as Executive Director of the Congressional Western Caucus, as a Legislative Director for Congressman Rob Bishop (UT-01), and most recently as Chief-of-Staff to Lt. Governor Greg Bell. Stewart was born and raised in Utah. He graduated from Utah State University where he received bachelor’s degrees in both History and Political Science. Cody also received a joint MBA/Masters degree in Government from Johns Hopkins University. Stewart lives with his wife, Mary, and their five children in Farmington, Utah.

Wearing Four Hats – Finding Balance while being a Rancher, Mineral/Energy Developer, County Councilman, and Conservationist

Chris Robinson, Summit County Council Member, Landowner, Park City, Utah

Christopher Robinson, The Ensign Group, P.O. Box 540478, North Salt Lake, UT, 84054, crobinson@theensigngroup.com

Christopher F. Robinson, CEO and co-owner of The Ensign Group, L.C., which (through its affiliates) owns, operates, leases, and/or manages approximately 750,000 acres of private and public land located in Utah, Idaho, Montana, and Wyoming, and used for production agriculture, mineral and resource development, wildlife values, water resources, environmental values, real estate investment, and/or real estate development; currently (2012) candidate for Utah House of Representatives District 54 (Wasatch County and Park City); elected Member, Summit County Council (2009 through present); Trustee (1999 to 2002) of the Salt Lake Organizing Committee for the 2002 Winter Olympic Games and Vice-Chairman of Audit Committee; currently Vice-Chair and Trustee (1990 to present), The Nature Conservancy of Utah; married to Rochelle Allen Robinson, and they are the parents of four children; received Honors B.A. in Accountancy from the University of Utah (1986); resides in Park City, Utah.

Energy and Wildlife – Investments in Conservation

Scot Donato, Manager of Governmental Affairs, Bill Barrett Corporation, Denver, Colorado

The ‘easy’ oil & gas is gone and energy companies must seek their resources in harder to get to locations. This can cause conflicts with various other resources including wildlife. Energy companies want to be good neighbors and are motivated to peacefully coexist. Progressive companies are interested in working with real conservation groups and wildlife agencies to help conserve and propagate species of concern in operations

areas. Intensive pre-project & operational planning is required more than ever. Companies should meet with the appropriate conservation stakeholders and agencies to identify resources and species of concern and the known threats to the same. Comprehensive science is typically lacking and thus adaptive management for wildlife issues is critical. This requires commitment and flexibility from both the energy companies and the wildlife agencies. Companies need to utilize, “low-impact” methods where appropriate and practicable - e.g. 3-D seismic, directional drilling (multi-well pads), low visibility equipment, remote telemetry, etc. Energy companies can bring financial and equipment resources to the table that may otherwise be unavailable or limited for helping with conservation efforts. We are ‘results-oriented’ companies made up of scientists, engineers and businessmen. Operators prefer to work with legitimate conservation groups and wildlife agencies for on-the-ground projects that increase, enhance, or conserve wildlife habitat. We also understand the need for both up front and after the fact science whether surveys, or monitoring, or audits of projects, it’s all important. Litigation doesn’t help enhance or create habitat or forage for wildlife. The West Tavaputs EIS-Record of Decision Wildlife Mitigation Plan and the Colorado Molina Habitat Restoration Project are two great examples of energy companies working with agencies and wildlife/sportsmen groups to get things done on the ground to improve habitat and forage as well as to educate the public.

Scot A. Donato, Manager, Governmental Affairs, Bill Barrett Corporation, 1099 18th Street, Suite 2300, Denver, CO 80202, sdonato@billbarretcorp.com

Scot Donato is the Manager of Governmental Affairs for Bill Barrett Corporation, a Colorado-based oil and natural gas producer with operations in the Rocky Mountains. Mr. Donato is responsible for environmental and governmental affairs matters in this multi-state area. Scot is responsible for developing mitigation plans in association with BBC’s energy development. He has worked with multiple state and federal agencies and sportsmen/conservation groups to accomplish the goal of conserving wildlife while responsibly developing energy resources. Scot has a Bachelors degree in Geology from Western State College in Gunnison, Colorado and a Masters of Environmental Policy & Management from the University of Denver, and his professional experience includes over 30 years in the environmental, regulatory, and oil & gas industry working on a wide variety of challenges.

Strategies and Metrics for Mitigating Impacts of Energy Development on Biodiversity

Jonathan Haufler, Executive Director, Ecosystem Management Research Institute, Seeley Lake, Montana

Energy developments impact wildlife and biodiversity through their direct footprints including associated roads, powerlines, and other structures and through additional impacts to wildlife caused by behavioral avoidance of animals to structures or activities. Off-site mitigation offers a means of compensating for impacts, but will only be effective if benefits can be quantified and shown to be equivalent to the impacts. EMRI has been evaluating various programs and metrics for assessing off-site mitigation. NRCS ecological sites provide a classification tool that can be used to evaluate equivalency in ecosystem conditions, and can form the basis of measuring mitigation uplift through habitat improvements at off-site locations measured in comparison to site capabilities. Wildlife impacts and mitigation benefits can be evaluated through changes in habitat quality evaluated using habitat-based species viability assessments at appropriate landscape scales. A mitigation metric system using these methods was evaluated at 7 different locations throughout the sagebrush biome and shown to be an effective tool for quantifying impacts and benefits. These metrics can form an evaluation foundation for use in conservation banking, voluntary offset programs, or similar initiatives. Additional policy questions related to weighting of impacts and transferability of mitigation benefits must be considered before the metrics can be

properly applied.

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Jonathan Haufler is the Executive Director of the Ecosystem Management Research Institute, an independent non-profit institute located in Montana. Previous positions have included Professor of Wildlife Ecology at Michigan State University and Manger of Wildlife and Ecology Programs for Boise Cascade Corporation. Jon earned a B.S. from the University of New Hampshire, M.S. from Virginia Tech, and a Ph.D. from Colorado State University, all in wildlife biology. He is a certified wildlife biologist and is President-Elect of The Wildlife Society.

Speak to me Lichen, How Stable is the Soil? Tell me its Disturbance History

Roger Rosentreter, State Botanist, BLM Idaho, Boise, Idaho

Biological soil crusts hold the soil surface together in all arid ecosystems of the world. These biological soil crusts are damaged by compressional and shear forces applied to the soil surface. Damaged soil surfaces are slow to heal. Energy exploration and development as well as livestock grazing repeatedly damage the soil surface. Loss of biological soil crusts leads to soil and wind erosion, lower nitrogen production, and an increase in invasive annual grasses. This change in species composition often goes unnoticed by the public and by rangeland managers. Such environmental modification cascades thru the ecosystem, simplifying plant and animal communities. Biological soil crust cover limits the germination and establishment of invasive annual grasses.

Roger Rosentreter, State Office Botanist, 1387 S. Vinnell Way, Boise, ID 83709, rrosentreter@blm.gov

Roger has a PhD in Botany from the University of Montana and has worked for the Bureau of Land Management in Idaho since 1978. He started as a member of a soil & vegetation crew, mapping the soils of Owyhee County, ID. He has worked on several large scale landscape projects such as the President's Forest Plan and on the Interior Columbia Basin project. Roger has been an instructor and done field sampling for the National Forest Health Monitoring in both the eastern and western portions of the U.S. He is interested in: sagebrush-steppe habitats, the role of biological soil crusts, plant taxonomy, rangeland health monitoring, and plant palatability.

Overview of Best Management Practices used to Mitigate Environmental Impacts from Large-Scale Oil and Gas and Renewable Energy Development Projects on Public Lands Managed by the Bureau of Land Management

James Gazewood, Renewable Energy Program Coordinator, BLM Utah, Salt Lake City, Utah

Since 2009, the Bureau of Land Management (BLM) has approved 17,830 applications for permit to drill oil and gas wells and approximately 5,085 associated pipeline, power and production facility rights-of-way. During this same timeframe, BLM authorized 33 renewable energy projects capable of producing over 10,000 megawatts of power or enough energy to power 3.5 million homes. The approved renewable energy projects include 18 utility-scale solar facilities, seven wind farms and eight geothermal plants, with associated transmission corridors and infrastructure enabling these projects to provide power to nearby transmission grids. In Fiscal Year 2011, over 117 million barrels of oil were produced from public and Indian lands. In addition,

the nearly 3 trillion cubic feet of natural gas produced from public lands made 2011 the second-most productive year for natural gas on record. Renewable energy production from wind, solar, geothermal and biomass that – together with conventional oil and gas energy resources – contribute to the Nation’s energy security and to the clean energy economy of the future. These resources are a significant source of economic development and employment. While the oil and gas industry and BLM are working together to address environmental impacts of development and to achieve higher standards, renewable energy developers are working to create a new energy industry, incorporating clean, safe standards from the outset. In delivering new energy to America, BLM is working with Federal partners, States, and local communities guided by the belief that energy development where promoted and sited in a thoughtful way, can fully contribute to conservation and protection of the environment. This presentation will briefly touch on best management practices (BMPs) that have been used to mitigate environmental impacts from large-scale oil and gas and renewable energy development projects on public lands administered by BLM. These BMP approaches are based upon comprehensive master project planning concepts which include: reduction in initial and interim surface disturbance areas; consolidation of linear infrastructure into well designed corridors; consolidation of development and operational infrastructure to a limited number of sites; elimination of hazards to wildlife, noise reduction, and use of remote operations and monitoring technology.

James Gazewood, Renewable Energy Program Coordinator, BLM Utah, 440 West 200 South, Suite 500, Salt Lake City, UT, 84101, jim_gazewood@blm.gov

Jim Gazewood serves as BLM Utah’s Renewable Energy Program Coordinator overseeing wind, solar, geothermal and biomass energy development. Jim has B.S. in Petroleum Engineering from the University of Wyoming and a Master’s Certificate in Project Management from George Washington University. During the past 29 years, Jim has held various petroleum engineering, project and program management positions with BLM. Among his accomplishments include serving as the Acting Oil and Gas Program Deputy Manager in Washington; as a project manager overseeing the development of a large bureau-wide automated oil and gas well permitting and field inspection and enforcement system; serving as a Co-chairman on the American Petroleum Institute’s - Petroleum Industry Data Interchange (API-PIDX) Regulatory User’s Group (REGS) to develop an electronic well permitting data exchange standard for use by industry with MMS Offshore, BLM Onshore, and state oil and gas commissions; as BLM Wyoming’s Powder River Basin Coal Bed Methane Program Coordinator working on BLM’s largest oil and gas project approval to date; and the completion of a Report to Congress for the Energy Policy Act of 2005, Section 365, Federal Oil and Gas Permit Streamlining Pilot Project that encompassed seven major oil and gas permitting offices located in Colorado, Montana, New Mexico, Wyoming, and Utah. Prior to joining BLM, Jim worked seven years in natural gas well drilling and production operations throughout the Rockies with Santa Fe Energy and Mountain Fuel Supply Companies.

Research Provides Answers to Mitigate Impacts of Energy Development to Wildlife

Jeffrey L. Beck, University of Wyoming Department of Ecosystem Science and Management, Laramie, Wyoming

Energy development and other anthropogenic disturbances have resulted in lost, degraded, and fragmented wildlife habitats in many portions of the western United States and Canada. These compromised habitats have in turn led to declines in some wildlife populations. Furthermore, conservation of wildlife populations in the West is very challenging given that populations of many species migrate across large landscapes to access seasonal resources. Research that seeks to identify the direct and indirect impacts of energy development to wildlife habitats and populations plays a critical role in identifying potential steps to mitigate these impacts. The

purpose of my presentation is to showcase findings from studies that have yielded information that can be used to make energy development more harmonious with wildlife populations. The case studies I will present include examples from elk (*Cervus elaphus*), greater sage-grouse (*Centrocercus urophasianus*), and other focal taxa that inhabit the western North American landscape. Findings from research that can be applied to form beneficial mitigation steps are particularly important given the rapid pace of energy development across the West and the need to provide industry and natural resource managers with useful information to restore the quality and effectiveness of wildlife habitats in disturbed systems.

Jeffrey L. Beck, Rangeland Wildlife Habitat Restoration Ecologist, Department of Ecosystem Science and Management, University of Wyoming, Dept. 3354, 1000 E. University Ave, Laramie, WY, 82071, jlbeck@uwyo.edu

Jeffrey L. Beck is an assistant professor of wildlife habitat restoration ecology in the Department of Ecosystem Science and Management at the University of Wyoming. His research interests focus on restoring the quality and effectiveness of wildlife habitats in disturbed systems, particularly sagebrush habitats. The research questions that Dr. Beck's lab addresses are guided by ecological concepts that are used as a framework to evaluate conservation questions. Two general areas of emphasis that Dr. Beck's lab is pursuing include: (1) evaluating the direct and indirect impacts of anthropogenic disturbance on vertebrates (greater sage-grouse and ungulates as model taxa), and (2) assessing the efficacy of mitigation techniques and conservation practices intended to enhance habitat conditions or mitigate effects of anthropogenic development in sagebrush habitats. Dr. Beck and his students seek to understand responses of habitat restoration efforts across a range of spatial and temporal scales to better inform conservation practices.

Phased Energy Development and the Precautionary Principle: Good for Critters and Communities

Pete Morton, Former Director of Economic Research, The Wilderness Society, Denver, Colorado

High quality outdoor recreation, open space and scenic vistas, clean air, clean water, abundant wildlife and biodiversity are representative of the “natural amenities” that have been major drivers of economic development in the Rockies over the last 30 years. While the economic role of natural amenities varies across the “new western” landscape, in many communities protecting the environment is a prerequisite for sustainable economic success. In Colorado and other western states, public concerns are increasing about oil and natural gas drilling generally and hydraulic fracturing specifically. While oil and natural gas development does generate economic benefits, as the pace and scale of drilling increases so do the cumulative risks. While Colorado has some of the strongest laws in the U.S. – many residents and local elected officials do not believe they go far enough – as evidenced by the intra-jurisdictional legal battles currently brewing. One strategy for moving forward is to implement phased energy development guided by the precautionary principle and backed by a suite of economic instruments.

Pete Morton, Environmental Consultant, Boulder, CO, 80301, peteinboulder@gmail.com, 303-993-3727

Pete Morton has a BA in Accounting and Business Administration, a Masters of Forestry with an emphasis on quantitative modeling, and a PhD in Natural Resource Economics. Pete has 20 years of professional work experience in the private, academic, and non-profit sectors, most recently as the Director of Economic Research at The Wilderness Society. In addition to publishing numerous academic and legal papers, Pete has testified

before the United States Congress and in Federal Court on economic, energy and environmental issues. When he's not skiing or hiking, Pete works as a consultant in Boulder, Colorado.

Human-mediated Shifts in Animal Habitat Use: Sequential Changes in Pronghorn Use of a Natural Gas Field in Greater Yellowstone

Jon P. Beckmann, Conservation Ecologist, Wildlife Conservation Society, Bozeman, Montana

Among Earth's most stunning, yet imperiled, biological phenomenon is Long Distance Migration. Of 17 terrestrial mammals in North America for which migration data exist, pronghorn (*Antilocapra americana*) of the Upper Green River Basin of western Wyoming have the most extreme movements between Argentina and central Canada and the second longest migration in the entire western hemisphere. This extensive migration approaches 400-500 km on an annual, round-trip basis, and necessitates crossing multiple jurisdictional/political boundaries and the use of four historically narrow bottlenecks (0.2 – 0.8 km) that have existed for almost 6000 years. The impressive movements by pronghorn from relatively xeric areas of the Upper Green River Basin to Grand Teton National Park are comparable with the well-known migratory treks of African wildebeest, zebras, and elephants. To manage America's 991,479 km² (245 million acres) of public BLM lands for such mixed uses as natural resource extraction, wildlife, and recreation requires knowledge about effects of habitat alterations. Two of North America's largest natural gas fields occur in the southern region of the Greater Yellowstone Ecosystem (Wyoming), an area that contains >100,000 wintering ungulates, including crucial winter range for pronghorn of Grand Teton National Park. During a 5-year period (2005–2009), we concentrated on patterns of habitat selection of pronghorn to understand how winter weather and increasing habitat loss due to gas field development impact habitat selection. Since this population is held below a food ceiling (i.e., carrying capacity) by human harvest, we expected few habitat constraints on animal movements – hence we examined fine-scale habitat use in relationship to progressive energy footprints. We used mixed-effects resource selection function models on 125 GPS-collared female pronghorn, and analyzed a comprehensive set of factors that included habitat (e.g., slope, plant cover type) and variables examining the impact of gas field infrastructure and human activity (e.g., distance to nearest road and well pad, amount of habitat loss due to conversion to a road or well pad) inside gas fields. Our RSF models demonstrate: (1) a five-fold sequential decrease in habitat patches predicted to be of high use and (2) sequential fine-scale abandonment by pronghorn of areas with the greatest habitat loss and greatest industrial footprint. The ability to detect behavioral impacts may be a better sentinel and earlier warning for burgeoning impacts of resource extraction on wildlife populations than studies focused solely on demography. Nevertheless disentangling cause and effect through the use of behavior warrants further investigation.

Jon P. Beckmann, Wildlife Conservation Society, North America Program, 301 N Willson Ave., Bozeman, MT 59715, jbeckmann@wcs.org

As a Conservation Scientist at WCS, Jon is the Connectivity Initiative Coordinator for the North America Program. He is also Principle Investigator on several projects in the Greater Yellowstone Ecosystem (GYE) and in other regions of North America. Jon's current research projects include: 1) examining the impacts of natural gas development on pronghorn of western Wyoming; 2) protecting ungulate migrations in the northern Rockies by understanding and reducing wildlife-vehicle collisions; 3) an on-going 15-year study investigating and reducing human-bear conflicts along the wildland-urban interface in the Lake Tahoe Basin; 4) using detection dogs, resource selection and circuit theory modeling to examine connectivity for large carnivores in the GYE; 5) examining the impacts of the US-Mexico border fence on carnivore connectivity; and 6) understanding how human-altered environments impact mountain lion ecology in the Great Basin. Along with numerous

publications, Dr. Beckmann is lead editor on a book titled Safe Passages: highways, wildlife and habitat connectivity.

Energy Development and Wilderness Preservation as Compatible Goals

Steve Bloch, Energy Director, Southern Utah Wilderness Alliance, Salt Lake City, Utah

Energy development and wilderness preservation are often thought of as competing and incompatible goals. Recent agreements in Utah between conservation groups, industry, and federal and state governments provide real world examples that this does not have to be the case. Mr. Bloch will discuss those agreements and the potential for similar win-win solutions.

Stephen Bloch, Energy Director, Southern Utah Wilderness Alliance, 425 East 100 South, Salt Lake City, UT, 84111, steve@suwa.org

Stephen Bloch is an attorney and the energy program director for the Southern Utah Wilderness Alliance (SUWA). Steve represents SUWA and other national, regional and local conservation organizations in litigation and administrative appeals related to public land management in Utah. In the past two years he has also forged agreements with several companies – including the Bill Barrett Corporation and Anadarko Petroleum Corporation – and the Interior Department regarding energy development on public lands in Utah.

Projecting Wildlife Impacts Before Oil and Gas Development

Janice Thomson, Assistant Vice President for Landscape Analysis, The Wilderness Society, Seattle, Washington

Planning and decision making for oil and gas development are typically done without a landscape level spatial assessment of wildlife impacts. Yet readily available GIS technology can simulate alternative infrastructure development scenarios prior to development on the ground. To illustrate its application in a decision making process, spatial build-out scenarios of roads and well pads were used during three phases of the Resource Management Plan revision for the Bureau of Land Management's Little Snake Resource Area in northwest Colorado. The latest field literature on the impacts of development on Greater Sage-grouse (*Centrocercus urophasianus*), sagebrush-obligate bird species generally, pronghorn (*Antilocapra americana*), elk (*Cervus elaphus*), and mule deer (*Odocoileus hemionus*) were used to project impacts from different build-out scenarios. Sample results include projected risk of: 1) 19% decline in sagebrush-obligate bird species under an early cooperating agency development proposal due to proximity to oil and gas access roads, 2) habitat abandonment on 18% of pronghorn winter range under the preferred alternative in the BLM Draft Resource Management Plan due to reduced habitat patch size, and 3) double the rate of decline of activity of Greater Sage-grouse on 28 of 132 total leks under the near final management plan due to proximity to well pads. Quantitative data and illustrative maps were presented to agency planners and stakeholders throughout the process to focus discussions on science-based rationale for development configuration. Results contributed to final decisions on well pad densities and areas to avoid development.

Janice Thomson, Assistant Vice President for Landscape Analysis, The Wilderness Society, 720 3rd Ave., Suite 1800, Seattle, WA, 98104, janice_thomson@twc.org

Dr. Janice Thomson is the Director of the Center for Landscape Analysis at The Wilderness Society. With 19 years at the organization, she manages the work of the Center and strives to expand the application and

effectiveness of GIS for conservation science. In her own research, Dr. Thomson evaluates the indirect and cumulative impacts human infrastructure on wildlife. She uses the spatial pattern analysis of oil and gas development and transportation plans to link academic wildlife research to practical land management considerations. She has conducted this work on BLM and Forest Service land management plans in the Rocky Mountain states. The work contributes to a variety of science and advocacy products to improve the use of wildlife research and spatial analysis in land management decision making on federal public lands.

Sage-Grouse and Energy Development

Bob Budd, Executive Director, Wyoming Wildlife and Natural Resource Trust, Lander, Wyoming

Conservation efforts surrounding Sage-grouse began at the turn of the century, with generally broad-based efforts to determine the threats and challenges to the species. Since that time, Sage-grouse have become a commonly litigated species, ultimately landing on the candidate species list for endangerment by the U.S. Fish and Wildlife Service. Simply listing the species may not have the intended benefits for the bird, and may cause considerable economic harm, particularly to energy development and ranching. Using community based approaches and sound science, conservation on the ground may be enhanced and maintained over long periods of time. This requires commitment from all parties involved, and will generally require a solutions-based approach to both conservation and development of natural resources. Comprehensive evaluation of realities associated with long-term conservation is the cornerstone to effective communication and problem-solving on the ground. Application of effective conservation strategies is a responsibility of all affected parties.

Bob Budd, Executive Director, Wyoming Wildlife and Natural Resource Trust, Hathaway Building, 1st Floor, 2300 Capitol Avenue, Cheyenne, WY, 82002, bob.budd@wyo.gov

Bob Budd is the founding Executive Director for the Wyoming Wildlife and Natural Resource Trust, a program that funds and assists conservation projects in Wyoming. He is Chairman of the Wyoming Governor's Sage-Grouse Implementation Team, an effort that developed a partner-based strategy for Sage-grouse conservation in Wyoming and the west. Most recently, he helped the states of Utah and Nevada design similar strategies for conservation, and served as a member of the Conservation Objectives Team (COT) for the Fish and Wildlife Service. Budd is a native Wyomingite, and served as president of the international Society for Range Management, and the Wyoming Chapter of the Wildlife Society. He holds an MS degree in Range Management, and BS degrees in Animal Science and Agricultural Business, all from the University of Wyoming. He is a published author, and received the Kurt Bucholz Conservation Award from the Wyoming Stock Growers Ag Land Trust.

High Lonesome Ranch – a Compatible Use Private Landscape with Conservation and Biodiversity Based Goals and its Interactions with Public Lands

Paul R. Vahldiek Jr., Chairman of the Board, President and CEO of The High Lonesome Ranch, De Beque, Colorado

This presentation will focus on a large working western landscape, the High Lonesome Ranch, DeBeque, CO, and how to better develop public and private relationships that foster planned landscape scale mineral development and other compatible land use practices while continually focusing on good science and conservation practices. It will describe motivations and vision for the High Lonesome Ranch providing insight about an extraordinary effort in conservation today.

Paul R. Vahldiek Jr., Chairman of the Board, President and CEO of The High Lonesome Ranch, P.O. Box 88, De Beque, CO, 81630, paul@pvtxlaw.com

Paul R. Vahldiek, Jr. is Chairman, of The High Lonesome Ranch (HLR) and President of Deep Water Cay (DWC). He received his undergraduate degree from Trinity University, San Antonio, Texas in 1977 and a J.D. from St. Mary's University School of Law, San Antonio, Texas in 1979. He began practicing law in 1980 and in 2008 received the Distinguished Graduate Award from the St. Mary's University School of Law. The High Lonesome Ranch comprises approximately 300 square miles of deeded and permitted public lands (BLM), located northeast of Grand Junction, Colorado. The ranch includes lands ranging from approximately 5,000 to 9,200 feet in elevation that have been in agricultural and ranching uses since the mid 1800's. The High Lonesome Ranch's vision is committed to ensuring its lands, waters, and resources are healthy and productive for compatible values and uses, demonstrating how private and public lands can be stewarded in perpetuity for ethical uses and economic vitality. This effort will further and model a land ethic. In addition, Mr. Vahldiek and HLR are actively supporting the development of the High Lonesome Institute (HLI) that is being established to: advance scientific and scholarly knowledge relevant to stewardship of resources on working landscapes in the Intermountain West. It accomplishes these purposes through intentional science, education, and outreach focused (1) on improving land and resource management decisions, and (2) on being a venue for dialogue among diverse groups seeking to find common ground on conservation and sustainable development.

The Energy Footprint on the Landscape and What this Means for Plants, Animals, and Ecosystems

Jayne Belnap, Research Ecologist, U.S. Geological Service, Moab, Utah

Dryland regions of the western U.S. contain abundant energy resources, whether they are traditional oil/gas or alternative sources such as solar or wind. With energy exploration and development comes surface disturbance and other impacts. The impact of energy exploration, such as running seismic lines, is associated with soil surface disruption that can be quite severe at a local level. Energy development brings a host of other concerns that need to be considered and likely mitigated. All energy developments require cleared sites and roads, and most require pipelines and transmission lines as well. Large areas of vegetation are cleared for solar farms. These features result in a loss or fragmentation of habitat, or reduced use of a given habitat (e.g., pronghorn avoiding roads). Surface disturbance can facilitate invasion by exotic plants, which can then spread from the disturbed area. Local hydrologic cycles are altered which can affect downstream vegetation and water sources. Albedo of the soil surface is increased, which can decrease local precipitation. Wind farms are known to directly kill birds and bats, with unknown impacts to invertebrates. Many installations also often have lights, which can attract (insects) or repel wildlife. Dust from energy exploration and development is of huge concern, given its off-site impacts. Wind tunnel data show that most desert surfaces produce little sediment under typical wind speeds until disturbed. However, vehicle-disturbed soils, whether on or off roads, produce much more dust. As surface disturbance, plant invasion, and drought are expected to increase in the future, an increase in dust production can be expected as well. Deposition of dust on the snowpack darkens the surface, increasing snowmelt by 50 days or more and exposing soils to evaporation. Earlier germinating plants increase transpiration of soil water as well. Models suggest this can reduce Colorado River flows by 2-7% annually. In addition, earlier runoff means a reduction in late season water, which affects humans, wildlife and riparian plants.

Jayne Belnap, US Geological Survey, 2290 Resouce Blvd., Moab, UT, 84532, jayne_belnap@usgs.gov

Jayne Belnap has been a scientist with the Department of Interior since 1987. She received her two undergraduate degrees (in biology and natural history) from the University of California, Santa Cruz in 1980; her Masters of Science (Ecology Department) from Stanford University in 1983 and her PhD (Botany and Range Department) from Brigham Young University in 1991. Her dissertation was on the effects of coal-fired power plants on the physiological functioning of biological soil crusts and rock lichens. Over the past 20 years, she has published 105 peer-reviewed articles and books on soil crusts that include a BLM technical reference (coauthored with 3 other BLM scientists) and the only comprehensive book available on the topic. She is recognized by scientists around the globe as one of world's authorities on soil crusts. Dr. Belnap has been invited by many governments to train their scientists in soil crust ecology, including those of South Africa, Kenya, Zimbabwe, Mongolia, China, Siberia, Australia, and Iceland. She travels extensively throughout the U.S., training BLM, NPS, USFS, BIA, DoD, and DOE staff and managers on management of soil crusts. She is past Chair of the Soil Ecology chapter of Ecological Society of America, as well as the President-Elect of the Soil Ecology Society.

Utah Division of Wildlife Resources' Approach to Impact Analysis and Mitigation

Bill James, Energy Development / NEPA Coordinator, Utah Division of Wildlife Resources, Salt Lake City, Utah

Wildlife-oriented mitigation is a sequential process guided (loosely) by a set of general principles and rules. When well carried out, it can be instrumental to achieving broadly desirable outcomes from natural resource development negotiations. Planning mitigation in the right way depends upon having balanced perspectives from the outset. One also needs to have at least some of the right technical information, a functional understanding of applicable regulations, and an awareness of what the other parties to the negotiation need or want. No step-by-step "cookbook" solutions exist for wildlife mitigation: each unique case presents inherent complexities, and situations affected by large numbers of variables tend to vary widely from one instance to the next. There are no simple formulas, but generalized processes can be adapted by skilled, creative professionals, permitting some level of mitigation repeatability. Collaborative approaches employed by the state wildlife agency in Utah will be explained, and exemplified. Discussion of current issues and future options may follow, if time allows.

Bill James, Energy Development / NEPA Coordinator, Utah Division of Wildlife Resources, 1594 West North Temple, Suite 2110, PO Box 146301, Salt Lake City, UT 84114-6301, billjames@utah.gov

Bill began his formal training 30 years ago at Oklahoma State University, where he earned a BS in wildlife ecology. He also holds an MS in forest resources from the University of Georgia, where he and several other researchers reestablished bobcat populations on Cumberland Island, Georgia. He first worked for the Utah Division of Wildlife Resources in 1987, left for a time, then came back in 1991. He has worked in various capacities for Utah DWR ever since. Bill's professional interests revolve around working with different kinds of people to address tough natural resource issues. He lives in Salt Lake City with his wife, and their daughter is now a sophomore at Utah State University in Logan.

Towards a West Wide Crucial Habitat Assessment Tool (CHAT)

Gregg Servheen, Wildlife Program Coordinator, Idaho Department of Fish and Game, Boise, Idaho

The Western Governor's Association and 17 western states are developing an online web application or

CHAT (crucial habitat assessment tool). When completed at the end of 2013, this application will aid energy, transportation and land use development as well as in prioritizing conservation, mitigation, and restoration plans for benefit of wildlife. The tool is intended to make individual state fish and wildlife information seamless across state boundaries while providing for individual state differences in data, management, and policy. The CHAT being developed by the 17 western states is using both a fine and coarse filter for determining crucial area categories at the 1 square mile scale; including empirical data on individual species and mapped habitats and modeled species distribution, habitat fragmentation, and landscape connectivity data layers. Crucial area categorization of a westwide, 1 square mile hexagonal grid will be accomplished in a data roll up of these filters using either an aggregate, hierarchical, or fuzzy sum approach. The WGA effort is funded by individual states, the U.S. Department of Energy and Transportation, USFWS Landscape Conservation Cooperatives, and conservation NGO's such as the Wildlife Conservation Society.

Gregg Servheen, Wildlife Program Coordinator, Idaho Department of Fish and Game, P.O. Box 25, Boise, ID, 83707, gregg.servheen@idfg.idaho.gov

Gregg Servheen is a wildlife program coordinator with the Idaho Department of Fish and Game in Boise, Idaho. He is responsible for habitat-related conservation, mitigation, acquisition, technical assistance and strategic planning within the agency. Gregg has worked for the Department more than 25 years in 6 different research and management positions across the state. He is a wildlife biologist by education through the University of Massachusetts and Texas A&M University. Gregg is past President of the Idaho Chapter of the Wildlife Society, an active member of the Executive Committee of the Idaho Association of Land Trusts and University of Idaho Rangeland Center task force, was Chair of the 2006 Idaho Land Use Summit, and has received recognition for his work on behalf of wildlife from the BLM, the Idaho Wildlife Federation, and Federal Highways Administration.

The Effect of Energy Development on Rare Plant Fecundity in the Piceance Basin, Colorado

Sarah L. Clark, James P. Pitts, Utah State University Department of Biology, Logan, Utah

Natural gas and oil production in the Piceance Basin has rapidly increased over the last two decades. Concerns over the impact this development may have on the Piceance biota have intensified, specifically regarding effects on the rare plant community and their respective pollinators. We investigated the potential effects of dispersed development on two rare mustards, *Physaria congesta* and *Physaria obcordata*. Both species of *Physaria* are listed as threatened by the US Fish and Wildlife Service, and require pollination services for adequate reproduction. Development may potentially change the pollinator community important to these rare plants through habitat fragmentation and suitable habitat declination. These changes could include modification in diversity, abundance, or pollinator functional type. These changes in pollinator community may impact rare plant pollination, which would influence fecundity rates. During the spring of 2010 and 2011, plant fecundity was monitored at selected distances from road sides. For these experiments, roads were considered the major type of development. Differences in plant fecundity were analyzed for multiple covariance parameters to determine if there was any significant effect due to the development. Analysis determined that the effects of development on rare plant fecundity were minimal.

Sarah Clark, Utah State University Department of Biology, 5305 Old Main Hill, Logan, UT, 84322, scoot.c@aggiemail.usu.edu

Sarah Clark is a Masters student in the Biology Department at Utah State University. She has always been

interested in entomology and natural sciences, with recent emphasis in pollination biology and ecology. She received her BS in Biology at Utah State University, and decided to stay on for a MS under the tutelage of Dr. James P. Pitts in the terrestrial entomology lab. Her research followed her interests, where she studied plant-pollinator networks on rare plants in Colorado. She enjoys kayaking, running, small dog agility, and knitting outfits for her four legged friends.

Unique Habitat Use in a Fringe Greater Sage-Grouse Population

A. Cheyenne Burnett, S. Nicole Frey, Utah State University Department of Wildland Resources, Logan, Utah

Greater sage-grouse (*Centrocercus urophasianus*) populations have been declining range-wide since the 1930s. The Bald Hills population in Utah is an isolated population at the southern edge of the species' range. This peripheral population may provide intra-species diversity and therefore be of increased conservation importance. Due to lack of research, basic information about this population's seasonal movements, distribution, and habitat preferences are unknown. Our objective is to fill this knowledge gap. This is of particular relevance because of the high potential for wind, solar, and geothermal energy development in the area. We are developing a species distribution model to predict and map habitat use and population distribution using MaxEnt. We are using readily available habitat and anthropogenic covariates as predictors of sage-grouse presence. We tracked 66 birds (17 females & 49 males) via VHF telemetry in 2011 and 2012. Preliminary results indicate that this population is primarily 1-stage migratory. These birds occupy marginal habitat range-wide leading to unique behavioral adaptations such as roosting under juniper trees and extensive use of agricultural fields. These habitat use patterns are contrary to expectations. For example, juniper encroachment and agriculture development have been indicated as major threats to Greater sage-grouse. The climatic differences between southern Utah and the northern portions of the Greater sage-grouse range could explain these local adaptations. Assumptions based on studies of other populations are therefore not always applicable to this fringe population. Understanding this population's habitat use patterns is vital for the persistence of this population if renewable energy resources are developed in the area. Equipped with our species distribution model, managers will be able to make more informed management decisions in terms of energy development and mitigation efforts in southern Utah.

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Cheyenne Burnett is a MS student in the department of Wildland Resources at Utah State University. She received her BS degree in Zoology from the University of California at Santa Barbara in 2007. She studied field biology abroad at the University of Western Australia. Before studying wildlife biology, she worked as a horse trainer and veterinarian technician. After obtaining her BS degree, she became a wildlife field technician for a variety of field research projects ranging from the Mexican border in Arizona to the Canadian Rocky Mountains in Alberta, Canada and many places in between. After working mainly with carnivores and ungulates, she has expanded her research scope by studying a fringe population of Greater sage-grouse in Southern Utah. Her current interests include behavioral ecology, inter-species interactions, threatened and endangered species conservation and management and wildlife education.

Dust Deposition from Unpaved Roads is Correlated with Decreased Reproduction of an Endangered Utah Endemic Shrub

Matthew B. Lewis, Eugene W. Schupp, and Thomas A. Monaco, Utah State University Department of Wildland Resources, Logan, Utah

Energy development on the Colorado Plateau has led to increased fragmentation of open space by roads with negative consequences for native plant species. Roads reduce available habitat, spread exotic species, and create barriers to dispersal. In addition, unpaved roads also increase dust loads on leaves and floral structures, which may significantly reduce the growth and reproduction of nearby plants. We studied the effects of an unpaved road on the successful reproduction of the endangered Utah endemic shrub *Hesperidanthus suffrutescens* (shrubby reed-mustard). We measured the size and reproductive output of 156 plants and dust deposition at increasing distances from the road. We hand outcrossed 240 flowers on 80 plants to determine whether reduced reproduction, if any, is due to pre or post-pollination mechanisms. Additionally, we experimentally dusted 3 leaves on 30 plants (n=90) and measured stomatal conductance pre-dust, post-dust, and after washing. We also dusted 3 flowers on 10 plants (n=30) prior to hand pollination and measured fruit set. Differences were analyzed using generalized linear mixed models to determine significant correlations between reproduction, proximity to the road, and dust. When controlling for plant size and distance, fruit set decreased with increasing proximity to the road and was negatively correlated with increasing levels of dust deposition ($f_{1,15} = 5.26$, $p = 0.0366$). The number of seeds per plant, the mean plant seed weight, and the proportion of hand-pollinated flowers that set fruit were also negatively correlated with dust, although not significantly. Although correlated with dust, the observed pattern of reduced reproduction could be due to other factors. Roads have been shown to interrupt complex plant-pollinator interactions, resulting in reduced reproduction. Stomatal conductance was significantly reduced ($f_{1,58} = 87.56$, $p < 0.001$) by the application of road dust. Eighty percent (24/30) of hand pollinated flowers set fruit after dusting, suggesting that dust did not prevent pollination. However, the process of applying pollen by hand could have removed any dust on the stigma. Overall, these results suggest that dust may impact fruit set through reduced physiological processes. The results also highlight the need for further research into the effects that roads and dust have on nearby plants while suggesting negative consequences for the conservation of an endangered shrub in Utah's Uinta Basin.

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Matthew Lewis is a Graduate Research Assistant working towards his Master's degree in Ecology through the Department of Wildland Resources and the Ecology Center at Utah State University. He completed his Bachelor's Degree in Conservation and Restoration Ecology at Utah State University.

Greater Natural Buttes: One Model for Stakeholder Cooperation

Brooke Bell, Regulatory Affairs Manager, Anadarko Petroleum, Denver, Colorado

The presentation will discuss the recently approved Greater Natural Buttes Environmental Impact Statement and the path of stakeholder involvement that brought the NEPA process to a successful conclusion. Brooke will briefly touch on the keys to project success and the "effective" management practices that allow Anadarko to minimize the development footprint and coexist with wildlife, threatened plants, recreationalists, and the community.

Brooke Bell, Regulatory Affairs Manager, Anadarko Petroleum Corporation, P.O. Box 173779, Denver, CO, 80217-3779, brooke.bell@anadarko.com

Brooke Bell is a Project Manager for Anadarko Petroleum Corporation with over 25 years of experience in the oil and gas industry as a Petroleum Engineer and Regulatory Manager. She currently manages a diverse team of wildlife and project management experts focused on regulatory long-range planning and exploration

support for Anadarko's federal acreage holdings in the Rocky Mountain Region. With Brooke's dedication and leadership, Anadarko recently received approval of the Greater Natural Buttes EIS, supporting the development of 3700 natural gas wells in the Uinta Basin. Brooke has also work in the public sector as a Budget and Finance supervisor for the City of Aurora in Colorado, during which time she lead a \$70 million bond financing effort to build the City of Aurora Municipal Center. Brooke has a B.S. in Petroleum Engineering from the Colorado School of Mines. Anadarko Petroleum Corporation is among the world's largest independent oil and natural-gas exploration and production companies, employing over 4,900 men and women dedicated to safely finding and producing essential energy resources.

Responsible Use of Public Lands

Mark Raymond, Uintah County Commissioner, Vernal, Utah

What are your 'Public Lands?' How are they used and how does local leadership fit into the administration of these lands? Who is responsible for impacts and what are the mitigation measures necessary for responsible use of our Public Lands?

Mark Raymond, County Commissioner, Uintah County, 152 E 100 N, Vernal, UT, 84078, mraymond@uintah.utah.gov

Mark Raymond is currently serving as a County Commissioner in Uintah County. He is very passionate about multiple land use issues and is very aggressive in protecting those rights. He serves as the Vice-President of the Utah Association of County's Public Lands Committee. He is a board member of the Utah Dept. of Transportation Joint Highways and serves on the Technical Non-Urban sub-committee. He is also an active member of the Institute for Clean and Secure Energy Board at the University of Utah. Commissioner Raymond is also a board member for the Environmental, Energy, and Land Use Committee with the National Association of Counties. Before life as a Commissioner, Mark was the Associate Director for the Eastern Region with USTAR. He is married to MaryAnn Raymond, the father of four grown children and Grandfather to six and a half grandchildren.

Mixing Oil Shale and Water Rights: A Case Study in Western Colorado

Temis Taylor, PhD Candidate, Department of Environment and Society, Utah State University, Logan, Utah

In December 2008, Shell Frontier Oil and Gas Inc. filed for rights to withdraw water from the Yampa River in northwestern Colorado. The water required to produce oil from shale is a significant public and environmental issue in commercial development. To explore the intersections among energy, water, economic, and cultural issues, discourse analysis was employed in a qualitative, descriptive case study of 40 articles published from the application's initiation until it was withdrawn by Shell in February 2010. The economic, historical, and cultural background of both the region and oil shale exploration are important factors in evaluating local understanding and reactions to Shell's filing as an environmentally and politically significant event. Content of news articles, editorials, and letters to the editor demonstrate the construction and framing of information, use of rhetorical devices, use of units of measure (e.g., barrels of water per barrel of oil), and change over time, and helps to reveal the public's levels of understanding and knowledge of the issues of concern. Results provide insight into regional attitudes about biophysical, economic, and cultural issues surrounding water and oil shale development.

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Temis Taylor earned her BS in Communications with a minor in Women's Studies at the University of Utah and her MS in Bioregional Planning at Utah State University. She is pursuing a PhD in Human Dimensions of Ecosystem Science and Management under the direction of Dr. Joseph Tainter. Her Master's thesis was supported by the U.S. Fish and Wildlife Service and described alternative futures for biodiversity conservation in the face of energy development in Western Colorado. Continuing interest in the biophysical limits, perceptions of risk, and construction of knowledge in relation to energy development drives her current research.

Best Management Practices for Solar and Wind Energy Development: A Conservationist's Guide

Allison Jones, Emanuel Vasquez and Amy O'Connor, Wild Utah Project, Salt Lake City, Utah

Best Management Practices provide science-based criteria and standards that land managers and conservation planners follow in making and implementing decisions about human uses and projects that affect our natural resources. BMPs are usually developed based on legal obligations, pragmatic experience, and institutional practices, and should be supported by the best available scientific knowledge. Up to now, conservation advocates lacked a comprehensive set of science-based Best Management Practices they could systematically bring to land managers, renewable energy developers and the public process that are designed to minimize the adverse impacts of wind and solar energy development projects on wildlife and wildlife habitat. This document draws from over one hundred other scientific studies, renewable energy development guidance documents and other published BMPs in order to bring the best conservation science to the process of wisely choosing wind and solar energy sites, as well as permitting, construction and operation of renewable facilities destined for wild places. These BMPs are organized according to the needs of sage grouse, raptors, other birds, bats, general wildlife (not covered by the first 5 categories), and soil/vegetation/site hydrology. Within each of these categories the BMPs are broken down into siting BMPs, pre-construction/planning BMPs, construction BMPs, and monitoring BMPs. These BMPs also offer guidance on how to address renewable energy development within the context of public land-use planning. This document should offer sound guidance for all stages of wind and solar energy development in the West, and offer pathways for development that are "smart from the start" for wildlife and their habitat.

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Allison Jones, after completing her graduate work in Conservation Biology at the University of Nevada, is now the staff conservation biologist for the Wild Utah Project (a non-profit conservation science research group and the Wildlands Network affiliate for Utah). In addition to assembling biological data to be used in Conservation Network Design models for areas in and adjacent to Utah, such as the Heart of the West Wildland Network, Allison also provides biological analyses for other Utah conservation groups that do not typically have these services in-house. These include projects such as species' status reviews, and ecological analyses of federal land management plans. Allison is also co-author or editor of two Best Management Practices documents: "Best Management Practices for Off-Road Vehicle Use on Forestlands" (which was initially adopted by the U.S. Forest Service for their use) and "Best Management Practices for siting, developing, operating, and monitoring renewable energy in the Intermountain West."

Poster Abstracts

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

Reclamation of Abandoned Oil and Gas Well Pads in Arid Environments

Paul Grossl, *Shannon Babb*, Utah State University, Logan, Utah and Steven N. Strong, Bureau of Land Management Vernal Office, Vernal, Utah

The Roosevelt Oil Field region (Duchesne and Uintah Counties, Utah) is the 4th oldest Utah oil field in continuous production. As a result there are a large number of plugged and abandoned (P&A) well sites. While restoration has been attempted at these sites, most attempts have failed. This is problematic because it limits the amount of available habitat for native plant and wildlife species. To identify the factors that were limiting restoration success, several sites of various ages and geology were randomly selected. Y-transects were established at each of the sample sites. Vegetation cover was identified at each every foot along the 200 foot transect, and soil samples were collected every 40 feet. The soil samples were analyzed for salinity, carbon content, bulk density, trace elements, and pH. The primary factors that appear to be limiting restoration success are climate, geology and soil compaction. Secondary factors affecting the success of revegetation include soil salinity and weed invasion. By understanding these limiting factors, we hope to develop improved management practices that will result in effective oil pad reclamation.

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Accessing Information about Plants in the Region's Herbaria

Mary Barkworth, Intermountain Herbarium, Department of Biology, Utah State University, Logan, Utah, and the Consortium of Intermountain Herbaria*

Herbaria are working together to providing online access to the information in their collections. The process involves databasing label and annotation data from individual specimens, georeferencing the collection locations, and (often) imaging the specimens themselves. The Intermountain Region portal (<http://intermountainbiota.org>) currently provides access to information from over 2.3 million specimens located in 30+ herbaria. The data can be freely downloaded for use in other programs. The portal can also be used to obtain a species list for a region; view images of living examples of a species; make teaching/training checklists available to field technicians and students; and peruse species descriptions. Teaching checklists are automatically associated with flash card quizzes and games of "hangman." Herbaria are committed to making their specimen information more accessible, the primary limitations being time and money. There is also concern about our ability to provide future generations with verifiable information about what is growing in the region now. If the names of plants are important enough to mention in a report, representative specimens should be deposited in one of the region's herbaria, preferably one committed to contributing to the regional portal. Fortunately, the developments that make providing access to herbarium information possible also make it easier to record and transmit the information associated with specimens. For information on how, go to <http://herbarium.usu.edu/symbiota/default.html>. Help us help you and future generations by depositing specimens from your studies in a participating herbarium and by drawing attention to the regional web site.

Mary Barkworth, Intermountain Herbarium, Department of Biology, Utah State University, 5305 Old Main Hill, Logan, Utah 84322-5305, mary.barkworth@usu.edu

*Members of the Consortium are the three herbaria of Utah State University (at Logan, Price, and Vernal) and the herbaria of Brigham Young University, Natural History Museum of Utah, Snow College, Southern Utah University, Utah Valley University, Idaho Museum of Natural History, Boise State University, College of Idaho, and the University of Nevada – Reno.

Raptor Nest Use in Relation to Coal-bed Methane Development in Wyoming

Lindsey E. Sanders, Jason D. Carlisle, Anna D. Chalfoun, and Ken G. Gerow, University of Wyoming, Laramie, Wyoming

More than 15,000 coal-bed methane (CBM) wells have been constructed over the past ten years in the Powder River Basin of northeastern Wyoming, USA. This development overlaps breeding territories of at least 19 raptor species, with largely unknown consequences to raptor nest use and success. Our objectives were to determine 1) temporal and spatial trends in raptor nest occupancy in relation to CBM development, and 2) local habitat characteristics that may mitigate disturbance caused by energy development. Using nest locations for 19 raptor species and the locations of CBM wells constructed in the Powder River Basin from 2003-2011, we quantified the level of energy development impact to each nest. Then, using associated nest use data, we compared the nest use of impacted and non-impacted nests. Preliminary analysis showed that raptor nest use (for all species pooled) decreased as CBM well development occurred at closer proximities to the nest, and nest use gradually increased with time since initial well construction. At the species level, red-tailed hawks (*Buteo jamaicensis*), great-horned owls (*Bubo virginianus*), golden eagles (*Aquila chrysaetos*) and ferruginous hawks (*Buteo regalis*) exhibited patterns similar to those described above; however, the effect of CBM development may be influenced by local topography and habitat type. Our results will assist land managers seeking to balance the needs of raptor populations with energy extraction activities, and provide insight into species-specific tolerance levels for disturbance associated with energy development.

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Gas Energy Development and Pygmy Rabbit (*Brachylagus idahoensis*) Site Occupancy in Wyoming

Steve Germaine, U.S. Geological Survey, Fort Collins, Colorado, and Drew Ignizio, Cherokee Services Group, Fort Collins, Colorado

More than 2,200 mi² of land in southwestern Wyoming is currently covered by operational gas fields, and further development is projected for at least 25 years. Gas field development fragments landscapes, primarily through conversion of native vegetation to roads, well pads, and pipeline corridors. Pygmy rabbits are a Wyoming Species of Greatest Conservation Need, but little information exists on the relationship between gas field development and pygmy rabbit distributions. In 2011, we began a three year examination into the relationship between gas field development density and pygmy rabbit site occupancy patterns on four major Wyoming gas fields (Creston/Atlantic Rim, Jonah, Moxa Arch, Pinedale Anticline Project Area). In Arc/Info, we overlaid digital gas well, well pad, road data, and NAIP imagery on the Wyoming Natural Diversity Database's (WYNDD) pygmy rabbit habitat map. We constrained our study to areas identified in the WYNDD map as optimal pygmy rabbit habitat, then distributed ≥ 26 survey plots on each gas field in a random-stratified manner such that plots were well distributed across the gas well pad density gradient on each gas field. We surveyed each plot for pygmy rabbit occupancy twice in each summer (2011-12), and are modeling occupancy status as a function of gas well, well pad, and road density. Preliminary analysis of year-one data suggests a negative

relationship between pygmy rabbit site occupancy and gas well pad density, and pygmy rabbit site occupancy and gas field road density. Results using two years of data will be presented.

Steve Germaine, USGS Fort Collins Science Center, 2150 Centre Ave, Bldg. C, Fort Collins, CO, 80526, germaines@usgs.gov

Adaptive Grazing Management Using Surface Cover Change Detection on Shrub-Steppe

Tipton D. Hudson, Rangeland & Livestock Management, Washington State University Extension, Ellensburg, Washington

The Wild Horse Coordinated Resource Management group developed a unified grazing plan designed to maintain or improve rangeland health on the Puget Sound Energy wind facility and adjacent public land. Committed to adaptive management, the group selected two trend monitoring methods for measuring results of grazing: Land EKG® and the line-point intercept as described by Herrick, et al 2005. These would serve as an early warning system for negative trend, as objective documentation of positive changes, and as a guide for adjusting management inputs, primarily grazing timing, intensity, and duration of use, to achieve the landscape goals set by the group during its formation in 2006. WSU Kittitas County Extension has been responsible for collecting and interpreting this long-term monitoring data with the objective of establishing a model approach to sustainable rangeland grazing and rangeland health monitoring for other large grazing areas in the Intermountain West. This poster provides a comparison of the ability of two different monitoring methods, Land EKG and the line-point intercept as described by Herrick, et al, to detect change in surface cover attributes (percent basal area, litter, and bare soil) on high-condition shrub-steppe sites in central Washington. Land EKG relies on an ocular estimate to assign surface cover percentages within two or four 4.8 ft² hoops on a transect line coupled with repeat photography. The line-point intercept uses point sampling at every meter on three 50-meter transect lines per site to collect canopy and surface cover data. Data were collected from 2007 to 2011 on six different sites within two large (~5000-acre) pastures managed with light stocking rates (<20% utilization). We have evaluated the two methods' ability to detect change rather than comparing the absolute values derived from the two methods. The direction of change in basal area was consistent across methods. Although the degree of change was not consistent, this is a notable finding as basal area is notoriously difficult to estimate. Percent litter was relatively inconsistent across methods, we suspect due in part to the high spatial heterogeneity of this plant community, annual changes in litter distribution at the microsite level based on the timing and severity of precipitation events that move litter, and the significant difference between the methodologies for measuring litter. Bare soil values were consistent more often than not; new technology for image analysis could be used to make quantitative measurements from Land EKG photographs. This data will be collected approximately every three years and used to guide grazing plans.

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SER-Great Basin: A new chapter for the Society for Ecological Restoration

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The Society for Ecological Restoration (SER) is the largest professional organization dedicated to restoration, internationally (www.ser.org). SER promotes ecological restoration through establishing regional chapters, biannual conferences, advising international organizations with policy and legislation, and publications such as peer-reviewed journals. Until 2011, there were 12 geographic chapters globally, including 7 chapters in the

continental US alone. The Great Basin contains some of the most endangered ecosystems and restoration factors relatively prominently in land management, and so the need to have representation for the Great Basin in SER was evident. The Great Basin Chapter is focused on the portions of the western states of Idaho, Utah, Nevada, Oregon and California that comprise the Great Basin geographical – ecological province. The Chapter will promote the science of ecological restoration and information exchange among practitioners, researchers and the general public in the Great Basin.

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Development of a Conservation Management Plan for the Idaho National Laboratory Site

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Conservation planning is most likely to have a positive impact on natural resources when the product helps managers take action to ameliorate the root causes of threats and to monitor appropriate indicators that will inform adaptive management. Multiple stakeholders are often involved in plan development, and it can be difficult to achieve consensus in identifying the greatest threats to conservation targets, the drivers of those threats, and the best strategies for ameliorating such. The Wildlife Conservation Society led a multi-stakeholder team in applying a relatively new, yet widely used method known as Open Standards for Conservation (OS) to assist the U.S. Department of Energy, Idaho Operations Office (DOE), in developing a conservation management plan for the Idaho National Laboratory (INL) Site. The INL Site serves as a science-based, applied engineering national laboratory that supports DOE missions in nuclear and energy research, science, and national defense. The planning team identified nine conservation targets and 10 threats that directly impact those targets. Resource experts helped develop conceptual models that explicitly outline drivers of threats (i.e. contributing factors) on the INL Site. Strategies were then developed to address contributing factors and an explicit theory of change (i.e. results chain) was created to show managers the team's hypothesis about how strategy implementation would produce measurable results. The conceptual model and results chain also provided a framework for developing a plan to monitor (1) strategy implementation, (2) threats, and (3) status of conservation targets. I show how this method forms the basis for improved decision making, and share lessons learned while trying to balance DOE mission needs with biodiversity conservation.

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Reclamation Planning for Energy Development Projects

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Successful reclamation of disturbances associated with energy development can lessen the severity and duration of environmental impacts. Challenges to reclamation in the Rocky Mountain west include limited soil resources, lack of precipitation, and invasive plants. Pre-construction reclamation planning, focusing on salvage of soils suitable for plant growth, is the most beneficial component of the reclamation planning process. The reclamation

planning process begins with a pre-disturbance site characterization including an inventory of soil resources and vegetation communities. This information allows development of reclamation plans that specify soil salvage depths, soil treatments, seed mixes, weed management, and monitoring for each site. Implementation of these plans maximizes the amount of suitable soil available for reclamation, which increases re-vegetation success rates. Results from case studies show significant reductions in the time required to meet reclamation goals and restore disturbed land to support prior uses.

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