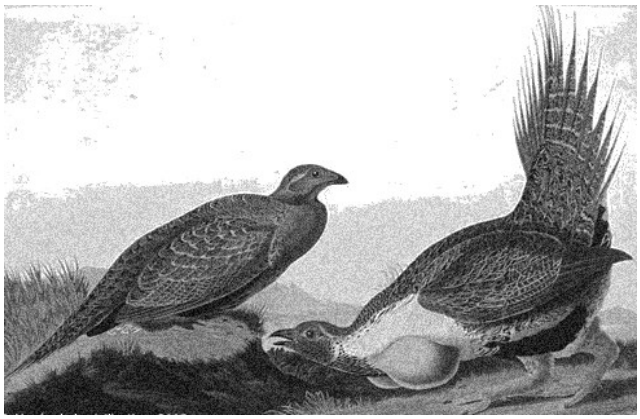
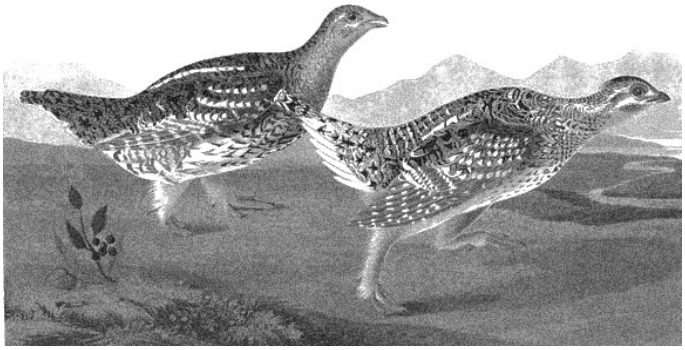
28th Western Agencies Sage and Columbian Sharp-tailed Grouse Workshop





Steamboat Springs, Colorado
June 19 - 22, 2012

Program

28th Western Agencies Sage and Columbian Sharp-tailed Grouse Workshop

Steamboat Springs, Colorado
June 19-22, 2012

Table of Contents

Steamboat Springs, Colorado
June 19-22, 2012

Meeting Locations

Technical Committee Meeting (By Invitation Only) – Twilight Room, Sheraton

General Sessions (Tues., Thur. & Friday A.M.) – Storm Peak/Mt. Werner Room, Sheraton

Monday Night Welcome Social – Villa Gallery, Sheraton

Tuesday Night Mixer Social – Villa Gallery, Sheraton

Lunch on Tuesday & Thursday – Pool Deck, Sheraton

Thursday Banquet – Champagne Powder Room, Steamboat Resort via the gondola

THANK YOU TO OUR SPONSORS

COLOWYO COAL COMPANY, L.P.

General Program

Steamboat Springs, Colorado
June 19-22, 2012

Monday, June 18th
Technical Committee Meeting (Invitation Only) (8:00 AM – 5:00 PM)
Registration (4:00 – 7:00 PM) Sheraton Registration Booth
Welcome Social 5:00 – 7:00

Tuesday, June 19th
Registration (starts at 7:00 AM)
Workshop Presentations 8:00 AM – 5:00 PM (lunch provided)
Mixer Social 5:00-7:00

Wednesday, June 20th
Field Trip to Moffat and Routt Counties (7:30 – 6:30) (lunch, snacks, restrooms & water provided) (Sponsored by Bill Barrett, Corp.)

Thursday, June 21st
Workshop Presentations 8:00 AM – 5:00 PM (lunch provided)
Evening Banquet (6:00 – 9:00 PM)

Friday, June 22nd
Workshop Presentations 8:00 – 12:00

SAFE TRAVELS HOME!

Program
Monday, June 18th

8:00-12:00 **SAGE AND COLUMBIAN SHARP-TAILED GROUSE TECHNICAL COMMITTEE MEETING** (By Invitation Only) – Twilight Room

12:00-1:00 **LUNCH** – (Committee Members and Invited Guests) -Twilight Room

1:00-5:00 **SAGE AND COLUMBIAN SHARP-TAILED GROUSE TECHNICAL COMMITTEE MEETING** (by Invitation Only) – Twilight Room

4:00-9:00 **REGISTRATION OPEN**

5:00-7:00 **WELCOME SOCIAL** – Villa Gallery (Sponsored by the Avian Power Line Interaction Committee)

DINNER ON YOUR OWN

Technical Committee Members

Kathy Griffin – Colorado (Chair)

Shawn Espinosa – Nevada (Vice-Chair)

Don Kemner – Idaho (Past Chair)

Dale Eslinger – Alberta

Alicia Goddard – British Columbia

Doug Jury – British Columbia

Scott Gardner - California

Jeff Knetter – Idaho

Rick Northrup - Montana

Aaron Robinson - North Dakota

Dave Budeau - Oregon

Autumn Larkin – Oregon

Sue McAdam - Saskatchewan

Travis Runia - South Dakota

Jason Robinson - Utah

Mike Schroeder – Washington

Joe Bohne - Wyoming

Tom Christiansen - Wyoming

Robin Sell - BLM

Clint McCarthy - USFS

Patricia Deibert – USFWS

Program
Tuesday, June 19th

7:00 **REGISTRATION OPEN**

8:00 **INTRODUCTIONS**—Kathy Griffin

8:05 **WELCOME**— Lisa Dale, Assistant Director Parks, Wildlife, and Lands, Department of Natural Resources

SPECIAL SESSION – GENETICS AND GROUSE MANAGEMENT –Storm Peak/Mt. Werner Rooms - Moderator – Kathy Griffin

8:30-9:15 **A BRIEF PRIMER ON MOLECULAR GENETIC TECHNIQUES AND THEIR USE IN WILDLIFE STUDIES -** SARA OYLER-MCCANCE

9:15-10:00 **SPECIES, SUBSPECIES, AND OTHER UNITS OF BIOLOGICAL DIVERSITY: HOW THEY ARE DEFINED AND RECOGNIZED, USING SHARP-TAILED GROUSE AS AN EXAMPLE -** KEN WARHEIT

10:00-10:30 **BREAK** (Sponsored by Encana Corp.)

10:30-11:15 **FROM INDIVIDUALS TO FAMILIES TO POPULATIONS: USING MOLECULAR TECHNIQUES TO HELP GUIDE WILDLIFE MANAGEMENT –** SARA OYLER-MCCANCE

11:15-12:00 **GENETICS AND WILDLIFE MANAGEMENT: THE RELEVANCE OF POPULATION AND LANDSCAPE GENETICS -** BRAD FEDY

12:00-1:00 **LUNCH** – Pool Deck (Sponsored by Colowyo Coal Company, LLC)

HABITAT PRIORITIZATION – Joe Bohne

1:00-1:20 **MODELING ECOLOGICAL MINIMUM REQUIREMENTS FOR GREATER SAGE-GROUSE ACROSS THEIR WESTERN RANGE, U.S.A.** – STEVEN T. KNICK, Kristine L. Preston, and Steven E. Hanser

1:20-1:40 **HABITAT PRIORITIZATION ACROSS LARGE LANSCAPES, MULTIPLE SEASONS, AND NOVEL AREAS: AN EXAMPLE USING GREATER SAGE-GROUSE IN WYOMING -** BRAD FEDY, Kevin E. Doherty, Cameron L. Aldridge, Micheal O'Donnell, Jeffrey L. Beck, Bryan Bedrosian, Matthew J. Holloran, Gregory D. Johnson, Nicholas W. Kaczor, Christopher P. Kirol, Cheryl A. Mandich ,David Marshall, Gwyn McKee, Chad Olson, Aaron Pratt, Christopher C. Swanson, and Brett L. Walker

1:40-2:00 **LANDSCAPE CONNECTIVITY FOR GREATER SAGE-GROUSE IN THE COLUMBIA PLATEAU, WASHINGTON STATE -** MICHAEL A. SCHROEDER, Leslie A. Robb, Andrew J. Shirk, Brian Cosentino, and Brad H. McRae

2:00-2:20 **IDENTIFYING GREATER SAGE-GROUSE PRELIMINARY PRIORITY AND PRELIMINARY GENERAL HABITATS IN IDAHO –** DONALD J. MAJOR, and Paul D. Makela

2:20-2:40 **THE CONSERVATION OF SAGEBRUSH OBLIGATE BIRDS AT MULTIPLE SCALES –** DAVID C. PAVLACKY, Laura Quattrini, Seth W. Gallagher, Jennifer A. Blakesley, David J. Hanni, and Tammy L. Vercauteren

SAGE-GROUSE INITIATIVE – Brad Petch

2:40-3:00 **NRCS SAGE-GROUSE INITIATIVE OVERVIEW: ACHIEVING WILDLIFE CONSERVATION THROUGH SUSTAINABLE RANCHING -** TIM GRIFFITHS, and David Naugle

3:00-3:30 **BREAK**

3:30-3:50 **CONFERENCE REPORT ON THE SAGE-GROUSE INITIATIVE; PROACTIVE CANDIDATE SPECIES CONSERVATION -** PAT DEIBERT

3:50-4:10 **A STRATEGIC APPROACH TO TACKLING CONIFER ENCROACHMENT AND QUANTIFYING OUTCOMES FOR SAGE-GROUSE -** JEREMY MAESTAS, Christian A. Hagen, David Naugle, John P. Severson, Jeffrey S. Evans, and Autumn Larkins

4:10-4:30 **QUANTIFYING THE BENEFITS OF THE CORE AREA POLICY AND CONSERVATION EASEMENTS TO SAGE-GROUSE IN WYOMING –** HOLLY E. COPELAND, Amy Pocewicz, David Naugle, Tim Griffiths, Doug Keinath, Jeffrey S. Evans, and Jim Platt

4:30-4:50 **MAPPING SAGE-GROUSE FENCE-COLLISION RISK: SPATIALLY-EXPLICIT MODELS TO EFFICIENTLY TARGET CONSERVATION IMPLEMENTATION –** Bryan S. Stevens, DAVID NAUGLE, Brian Dennis, John W. Connelly, Tim Griffiths, and Kerry P. Reese

4:50-5:00 **OVERVIEW OF WEDNESDAY FIELD TRIP** – LIZA ROSSI, BRANDON MILLER, and BRAD PETCH

5:00-7:00 **TUESDAY NIGHT RECEPTION** – Villa Gallery (Sponsored by Noble Energy)

DINNER ON YOUR OWN

Field Tour Program
Wednesday, June 20th

7:00-7:30 **BUSES ARRIVE – START BOARDING** (Sponsored by Bill Barrett, Corp.)

7:30 **BUSES DEPART SHERATON**

STOP 1 **MOFFAT COUNTY, COLORADO**
GREATER SAGE-GROUSE HABITAT ENHANCEMENT PROJECT ON PRIVATE LAND

STOP 2 **MOFFAT COUNTY, COLORADO**
2008 MAYBERRY WILDFIRE FIRE
BLM GREATER SAGE-GROUSE RECLAMATION/RESTORATION EFFORTS

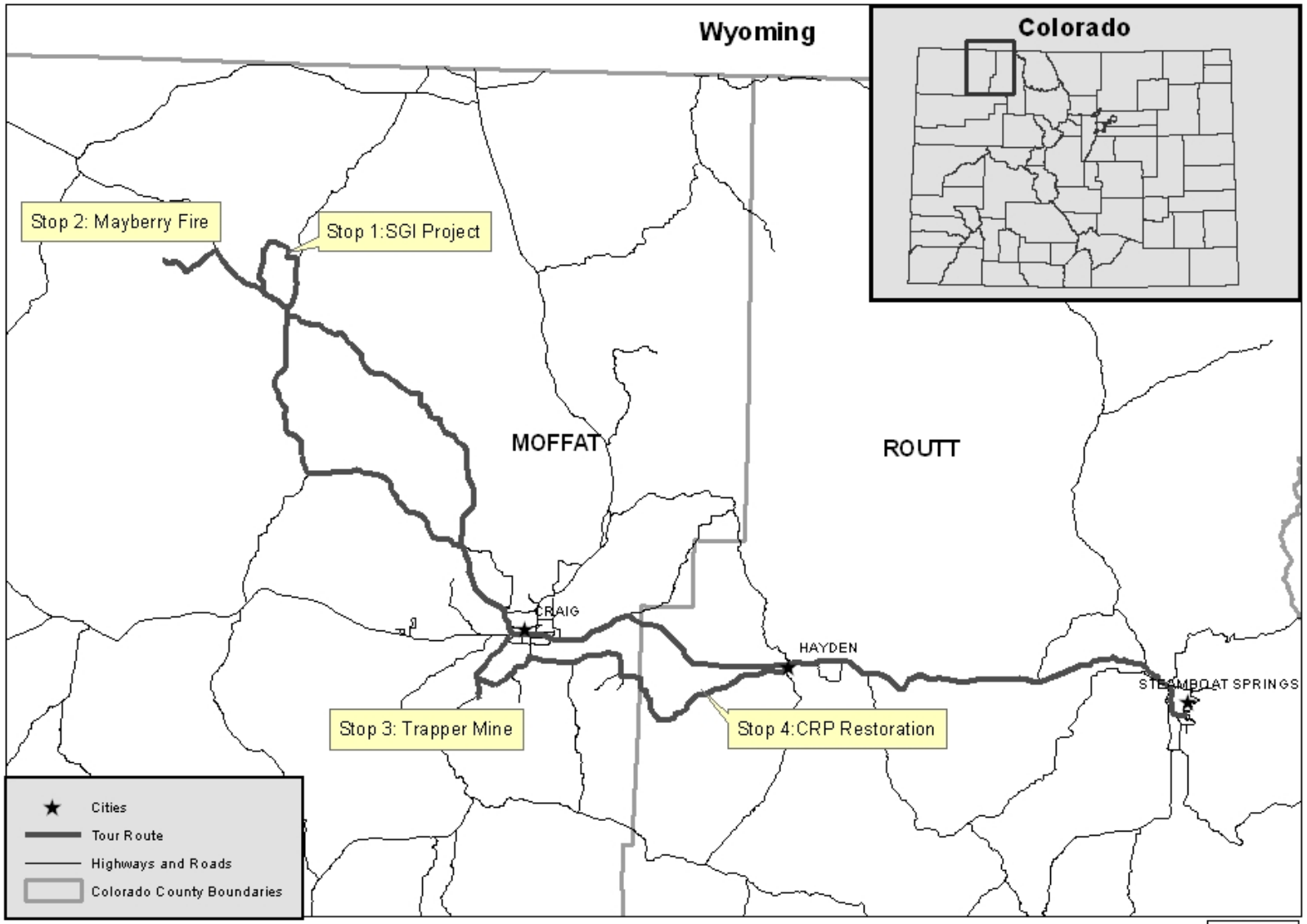
STOP 3 **MOFFAT COUNTY, COLORADO**
TRAPPER MINE MINELAND RECLAMATION – COLUMBIAN SHARP-TAILED GROUSE RE-ESTABLISHMENT FOLLOWING RECLAMATION AND RECLAMATION SEED MIXES

STOP 4 **ROUTT COUNTY, COLORADO**
COLUMBIAN SHARP-TAILED GROUSE CONSERVATION RESERVE PROGRAM – OVERVIEW OF CRP RESTORATION AND COLORADO PARKS AND WILDLIFE EASEMENT PROGRAM

6:30 – 7:30 **RETURN TO MOTEL**

DINNER ON YOUR OWN

Tour Route for WAFWA Sage and Columbian Sharp-tailed Grouse Meeting 2012



Produced for WAFWA Sage and Columbian Sharp-tailed Grouse Meeting Tour 2012, LGR, 6/7/2012

Program
Thursday, June 21st

GROUSE & HABITAT MANAGEMENT – Todd Black

8:00-8:20 **TESTING DEVICES TO MINIMIZE FREQUENCY AND DURATION OF RAPTOR AND CORVID PERCHING ON UTILITY POLES IN GROUSE HABITAT -** JAMES F. DWYER, and Kerrin Doloughan

8:20-8:40 **RESTORING SAGE-GROUSE HABITAT USING CHEATGRASS-SUPPRESSIVE BACTERIA –** Ann C. Kennedy, MICHAEL A. GREGG, Jeremy C. Hansen, and Tami L. Stubbs

8:40-9:00 **POPULATION DYNAMICS OF TRANSLOCATED AND RESIDENTGREATER SAGE-GROUSE (CENTROCERCUS UROPHASIANUS), ANTHRO MOUNTAIN, UTAH –** NATASHA W. GRUBER, Brian D. Maxfield, Terry A. Messmer, Michael R. Guttery, and Dave N. Koons

9:00-9:20 **COMPARISON OF PRESCRIBED BURNING AND MOWING TO ENHANCE GREATER SAGE-GROUSE NESTING AND BROOD-REARING HABITAT IN THE BIGHORN BASIN, WYOMING –** JENNIFER E. HESS and Jeffrey L. Beck

9:20-9:40 **COMING FULL CIRCLE: PROVIDING NATIVE SEED FOR GROUSE HABITAT IMPROVEMENT –** LEIGH ROBERTSON

9:40-10:00 **GUNNISON SAGE-GROUSE SEASONAL HABITAT SELCTION: A SPATIALLY EXPLICIT HIERARCHICAL APPROACH TO IDENTIFY CRUCIAL HABITAT –** CAMERON L. ALDRIDGE, D. Joanne Saher, Theresa M. Childers, Kenneth E. Stahlnecker, and Zachary H. Bowen

10:00-10:30 **BREAK** (Sponsored by Shell Corporation)

GROUSE ECOLOGY & MANAGEMENT – Pat Deibert

10:30-10:50 **GUNNISON SAGE-GROUSE HABITAT USE AND MOVEMENT STUDY: THE CRAWFORD POPULATION -** DOUGLAS S. OUREN, Melissa Siders, Theresa Childers, and Karen Tucker

10:50-11:10 **A PARTNERSHIP TO RESTORE GUNNISON SAGE GROUSE HABITAT IN COLORADO –** DOUG HOMAN and Brandon J. Houck

11:10-11:30 **GREATER SAGE-GROUSE CRUCIAL HABITAT, MOVEMENT, AND SURVIVAL IN A SOUTHWESTERN UTAH FRINGE POPULATION –** CHEYENNE BURNETT**,** and S. Nicole Frey

11:30-11:50 **GREATER SAGE-GROUSE SELECT NEST-SITES AND BROOD-SITES AWAY FROM AVIAN PREDATORS –** JONATHAN B. DINKINS, Michael R. Conover, Christopher P. Kirol, and Jeffrey L. Beck

11:50-12:00 **WELCOME TO NEVADA FOR THE 2014 WORKSHOP –** SHAWN ESPINOSA

12:00-1:00 **LUNCH** – Pool Deck (Sponsored by Quicksilver Resources Inc.)

GROUSE ECOLOGY & ENERGY DEVELOPMENT – Mike Phillips

1:00-1:20 **RECONSTRUCTING TIME-SPECIFIC DIET COMPOSITION IN GREATER SAGE-GROUSE CHICKS USING FEATHER STABLE ISOTOPES –** ERIK J. BLOMBERG, Simon R. Poulson, James S. Sedinger, and Dan V. Nonne

1:20-1:40 **HUNGRY GROUSE IN A WARMING WORLD. HOW PLANT CHEMISTRY AND CLIMATE COULD IMPACT HABITAT USE BY GREATER SAGE-GROUSE** – JENNIFER S. FORBEY, Graham. G. Frye, Kristina Gehlken, and John. W. Connelly

1:40-2:00 **IDENTIFYING AND PRIORITIZING GREATER SAGE-GROUSE NESTING AND BROOD-REARING HABITAT FOR CONSERVATION IN HUMAN-MODIFIED LANDSCAPES –** JENNIFER E. HESS, Matthew Dzialak, Chad Olson, Seth Harju, Stephen Webb, James Mudd, Jeffrey Winstead, and Larry Haydenwing

2:00-2:20 **SPATIALLY QUANTIFYING GREATER SAGE-GROUSE HABITAT VALUE IN AN ENERGY DEVELOPMENT LANDSCAPE** - CHRISTOPHER P. KIROL, Jeffrey L. Beck, and Snehalata V. Huzurbazar

2:20-2:40 **MULTI-SCALE HABITAT SELECTION AND SEASONAL HABITAT MAPPING FOR GREATER SAGE-GROUSE IN THE PARACHUTE-PICEANCE-ROAN POPULATION IN WESTERN COLORADO -** BRETT L. WALKER and Anthony D. Apa

2:40-3:00 **THE IMPACTS OF NOISE ON GREATER SAGE-GROUSE: RESULTS AND IMPLICATIONS FOR CONSERVATION POLICY –** GAIL L. PATRICELLI, Jessica L. Blickley, and Stacie L. Hopper

3:00-3:30 **BREAK** (Sponsored by Shell Corporation)

GROUSE ECOLOGY AND ENERGY DEVELOPMENT – Brett Walker

3:30-3:50 **ECOLOGY OF MALE GREATER SAGE-GROUSE BEFORE WIND ENERGY DEVELOPMENT IN SOUTH-CENTRAL WYOMING –** JOSHUA J. MILLSPAUGH, Mark A. Rumble, Christopher P. Hansen, R. Scott Gamo, Jon Kehmeier, and Nathan Wojcik

3:50-4:10 **SAGE-GROUSE AND WIND ENERGY DEVELOPMENT: AN OVERVIEW OF THREE CURRENT RESEARCH PROJECTS –** Joshua J. Millspaugh, DAVID MUSIL, and Matt Holloran

4:10-4:30 **GREATER SAGE-GROUSE MIGRATION ECOLOGY AND RESPONSE TO BENTONITE MINING IN THE BIGHORN BASIN, WYOMING: AN INTRODUCTION -** AARON C. PRATT and Jeffrey L. Beck

4:30-4:50 **SHORT-TERM IMPACTS TO GREATER SAGE-GROUSE FITNESS FROM WIND ENERGY DEVELOPMENT –** CHAD W. LEBEAU, Jeffrey L. Beck, Gregory D. Johnson, and Matthew J. Holloran

6:00-9:00 **WORKSHOP BANQUET** – Steamboat Ski Resort – Champagne Powder Room On The Mountain via the Gondola

Program
Friday, June 22nd

GROUSE ECOLOGY & MANAGEMENT – Tony Gurzick

8:00-8:20 **OBSERVATIONS OF SUMMER DIURNAL AND NOCTURNAL HABITAT USE AND MOVEMENT PATTERNS OF FEMALE GREATER-SAGE GROUSE IN SOUTH-CENTRAL WYOMING –** JON KEHMEIER, Nathan Wojcik, Joshua J. Millspaugh, R. Scott Gamo, Mark A. Rumble, and Christopher P. Hansen

8:20-8:40 **HABITAT SELECTION BY SYMPATRIC, TRANSLOCATED COLUMBIAN SHARP-TAILED AND GREATER SAGE GROUSE IN EASTERN WASHINGTON –** KOURTNEY F. STONEHOUSE and Lisa A. Shipley

8:40-9:00 **ASSESSING THE QUALITY OF CONSERVATION RESERVE PROGRAM LANDS AS HABITAT FOR COLUMBIAN SHARP-TAILED GROUSE AND THE ACCURACY OF LEK COUNTS OBTAINED WITH AERIAL INFRARED IMAGERY –** GIFFORD L. GILLETTE, Kerry P. Reese, Jeffrey M. Knetter, and John W. Connelly

9:00-9:20 **GUNNISON SAGE-GROUSE CAPTIVE REARING TECHNIQUES: DOMESTICALLY-REARED CHICKS FOR BROOD AUGMENTATION –** LIEF A. WIECHMAN, Anthony D. Apa, and Michael L. Phillips

9:20-9:40 **SURVIVAL OF GUNNISON SAGE-GROUSE CHICKS AND JUVENILES IN COLORADO –** Amy J. Davis, MIKE PHILLIPS, Phillip A. Street, and Paul F. Doherty, Jr.

9:40-10:00 **EVALUATING THE EFFECTS OF TREATMENTS WITHIN A ROTATIONAL GRAZING SYSTEM ON GREATER SAGE-GROUSE -** LORELLE I. BERKELEY and Joe Smith

10:00-10:30 **BREAK**

GROUSE MONITORING – Kathy Griffin

10:30-10:50 **IMPORTANCE OF WITHIN YEAR REPEATED LEK COUNTS AND HIGHLY CORRELATED POPULATION CYCLES –** BRAD FEDY, Cameron Aldridge, and Kevin E. Doherty

10:50-11:10 **A PILOT STUDY TO DETERMINE THE EFFECTIVENESS OF AERIAL THERMAL VIDEOGRAPHY FOR IDENTIFYING SAGE GROUSE IN SOUTH-CENTRAL WYOMING** – TERRY E. CREEKMORE, John Romero, Will Schultz, and Bruce Greenhalgh

11:10-11:30 **QUANTIFYING OBSERVER EFFECTS ON GREATER SAGE-GROUSE NEST SURVIVAL -** Daniel V. Nonne, Erik J. Blomberg, Michael T. Atamian, and James S. Sedinger

11:30-11:50 **WRAP-UP AND THANK YOU'S –** KATHY GRIFFIN

Abstracts

ABSTRACTS
TUESDAY JUNE 19TH, 2012

A BRIEF PRIMER ON MOLECULAR GENETIC TECHNIQUES AND THEIR USE IN WILDLIFE STUDIES

SARA OYLER-MCCANCE, U.S. Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Building C, Fort Collins, CO 80526, USA. E-mail: soyler@usgs.gov, phone: 970-226-9197

Abstract: The use of molecular genetics has become increasingly important in the fields of wildlife biology, conservation biology, restoration ecology, and ecosystem science. Genetic diversity, the amount of genetic variability within a species, is an important aspect of biological diversity and plays an essential role in the conservation of species and ecosystem diversity. Prior to the 1980s, molecular genetic techniques were not typically used in wildlife biology. Since the advent of the Polymerase Chain Reaction (PCR) and other technical improvements, molecular genetic methods have become straightforward and relatively inexpensive. These improvements have made the use of molecular techniques in wildlife management widespread. In this presentation, I will introduce basic concepts, techniques, and analytical tools, and provide examples of applications of genetic techniques to wildlife management.

SPECIES, SUBSPECIES, AND OTHER UNITS OF BIOLOGICAL DIVERSITY: HOW THEY ARE DEFINED AND RECOGNIZED, USING SHARP-TAILED GROUSE AS AN EXAMPLE

KENNETH I. WARHEIT Washington Department of Fish and Wildlife, 600 Capitol Way N., Olympia, WA 98501. E-mail kenneth.warheit@dfw.wa.gov. phone 360-902-2595.

Abstract: There is a plethora of terms associated with units of biological diversity (e.g., species, subspecies, population, distinct population segment [DPS], evolutionarily significant unit [ESU]). Since management actions are directed at these units, it is essential that resource managers have a clear understanding as to how these units are defined, and operationally how they are recognized. Species is perhaps the most intuitive of all these units, but has engendered an extensive debate in both the biological and philosophical literature, and there is no one species-concept that is universally accepted. The debate here generally centers on whether to define species as a biological (e.g., reproductive) or genealogical (e.g., evolutionary) entity, and the data used to differentiate species, such as reproductive isolation and genetic identity, can be ambiguous (e.g., hybrids and incomplete lineage sorting of alleles). Other units of biological diversity are less inclusive as species, and are frequently defined based on some mix of species-level properties. For example, the AOU does not require conspecific subspecies to be reproductively isolated from each other, but does consider them to be nascent independent lineages that may or may not be recognized genetically. In contrast, an ESU has been defined as population(s) reproductively isolated from other populations, and representing a significant part of the species' evolutionary legacy. In this presentation, I will review these units of biological diversity, outline why it is important to understand how these units are defined and recognized, and provide examples from our work on Sharp-tailed Grouse.

FROM INDIVIDUALS TO FAMILIES TO POPULATIONS: USING MOLECULAR TECHNIQUES TO HELP GUIDE WILDLIFE MANAGEMENT

SARA OYLER-MCCANCE, U.S. Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Building C, Fort Collins, CO 80526, USA. E-mail: soyler@usgs.gov, phone: 970-226-9197

Abstract: Recent advances in molecular biology allow us to develop and apply the tools and concepts of molecular genetics to the conservation of biological resources. In many cases, single or multiple genes are targeted for understanding the status and dynamics of wildlife populations. In this presentation, I will review applications of molecular techniques to wildlife issues ranging from individuals to populations. At the individual level, DNA from non-invasively sampled individuals (using feathers, feces, or hair, for example) can be used as a molecular tag and analyzed with traditional mark-recapture techniques to estimate population size and survival rates. By examining genetic variation among individuals within a population, mating systems and parentage can be investigated, providing insight into how this may influence effective population size, the number of individuals in a population that actually contribute genes to succeeding generations. Genetic data can also be used to determine the level of genetic variation within and between populations and, consequently, the level of gene flow and movement among populations throughout a species' range. This information can be particularly relevant in identifying and differentiating discrete populations that may warrant special protection (Distinct Population Segment) or specific management strategies (management unit). Molecular techniques can also be used to inform captive breeding, reintroduction, and translocation programs to ensure that genetic diversity is maximized, or to ensure that when moving animals from one location to another, the genetic makeup of the individual or the population is considered. Other applications include identifying the gender of an individual when morphological or behavioral characteristics between males and females are indistinguishable and identifying the species and sometimes even the population of origin from a sample (feather, tissue, feces, hair) of unknown origin.

GENETICS AND WILDLIFE MANAGEMENT: THE RELEVANCE OF POPULATION AND LANDSCAPE GENETICS

BRAD FEDY, Natural Resource Ecology Laboratory, Colorado State University, in cooperation with U.S. Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Bldg. C, Fort Collins, CO 80526, USA. E-mail: bcfedy@gmail.com, phone: 970-226-9456, fax: 970-226-9230.

Abstract: The field of Landscape genetics represents an integration of population genetics and landscape ecology. I will introduce the concepts and theoretical underpinnings of both population and landscape genetics and then focus on the application of landscape genetic approaches to priority wildlife management issues. The identification of demographically independent populations is a fundamental component of managing wildlife species and biological planning. This information can be used to delineate management units and regulate the effects of human activity on the abundance of individuals within populations. The movement of individuals among subdivided populations is often essential for population persistence. However, movement among populations can be hindered by various landscape components. For example, for several grouse species, the presence of unsuitable/poor habitat above a particular threshold distance can prevent the movement of individuals from one population to the other. The resulting population isolation and increased inbreeding can have serious negative impacts on population persistence. Thus, identification of populations and connectivity levels among them can inform the prioritization of habitats for conservation and identify habitat and anthropogenic features that impair the connectivity of populations. In addition to defining populations and measuring dispersal, genetic approaches also address many other relevant questions including the conservation of genetic diversity, the impacts of inbreeding, and the association between habitats and genetics.

MODELING ECOLOGICAL MINIMUM REQUIREMENTS FOR GREATER SAGE-GROUSE ACROSS THEIR WESTERN RANGE, U.S.A.

STEVEN T. KNICK U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center, 970 Lusk Street, Boise, ID 83706. E-mail steve_knick@usgs.gov, phone 208-426-5208, fax 208-426-5210

KRISTINE L. PRESTON, Center for Conservation Biology, University of California, Riverside, 1303 Webber Hall, Riverside, CA 92521

STEVEN E. HANSER, U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center, 970 Lusk Street, Boise, ID 83706

Abstract: Modeling greater sage-grouse (*Centrocercus urophasianus*) habitat is challenging because their widespread distribution encompasses highly variable environments. Numerous site-specific models of habitat selection have been developed. However, translating these models into regional or range-wide maps of suitable habitat has been challenging because models based on ecological means or correlational relationships often fail when applied to novel environmental characteristics outside the inference space of the original data. A more promising approach might be to model a set of ecological minimums that remain consistent across the range. We used Mahalanobis D^2 models, partitioned into separate components representing independent environmental relationships, to identify the multivariate vector describing ecological minimums required by sage-grouse. Using abiotic, land cover, and anthropogenic variables for the lek location (breeding area) and surrounding areas within 5- and 18-km, we evaluated alternative models and partitions using historic locations and a random subset of leks. We model-averaged the best performing model-partitions to develop the predictive set of ecological minimums required by sage-grouse, which included abiotic, land cover, and anthropogenic variables. We delineated suitable habitat across the western portion of the sage-grouse range based on probability of similarity to the ecological minimum vector. Suitable habitat means that the minimum set of environmental requirements are present, not that sage-grouse currently occupy those locations. Finally, we mapped connectivity among currently defined subpopulations in the western region. Based our preliminary results, models based on ecological minimum requirements can provide information important for land use decisions and conservation planning.

HABITAT PRIORITIZATION ACROSS LARGE LANDSCAPES, MULTIPLE SEASONS, AND NOVEL AREAS: AN EXAMPLE USING GREATER SAGE-GROUSE IN WYOMING.

BRAD FEDY, Natural Resource Ecology Laboratory, Colorado State University, in cooperation with U.S. Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Bldg. C, Fort Collins, CO 80526, USA.

KEVIN E. DOHERTY, United States Fish and Wildlife Service, Bismarck, ND 58501, USA.

CAMERON L. ALDRIDGE, Department of Ecosystem Sciences and Natural Resource Ecology Laboratory, Colorado State University, in cooperation with U.S. Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Bldg. C, Fort Collins, CO 80526, USA.

MICHEAL O'DONNELL, U.S. Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Bldg. C, Fort Collins, CO 80526, USA.

JEFFREY L. BECK, Department of Renewable Resources, University of Wyoming, Dept 3354, 1000 East University Ave., Laramie, WY 82071, USA.

BRYAN BEDROSIAN, Craighead Beringia South, PO Box 147, 6955 E. 3rd St., Kelly, WY 83011, USA.

MATTHEW J. HOLLORAN, Wyoming Wildlife Consultants, LLC, 201 West Pine St., Pinedale, WY 82941, USA.

GREGORY D. JOHNSON, Western EcoSystems Technology, Inc., 2003 Central Avenue, Cheyenne, WY 82001, USA.

NICHOLAS W. KACZOR, U.S. Fish and Wildlife Service, 134 Union Blvd., Suite 300, Lakewood, CO 80228, USA.

CHRISTOPHER P. KIROL, Department of Renewable Resources, University of Wyoming, Dept 3354, 1000 East University Ave., Laramie, WY 82071, USA.

CHERYL A. MANDICH, University of Wyoming, Casper Center, 125 College Drive, Casper WY 82601, USA.

DAVID MARSHALL, KC Harvey Environmental, LLC, 376 Gallatin Park Drive, Bozeman, MT 59715, USA.

GWYN MCKEE, Thunderbird Wildlife Consulting, Inc., 5303 Van Ripper St., Gillette, WY 82718, USA.
Chad Olson, Hayden-Wing Associates, LLC., 2308 South 8th Street, Laramie, WY 82070, USA.

AARON PRATT, Department of Renewable Resources, University of Wyoming, Dept 3354, 1000 East University Ave., Laramie, WY 82071, USA.

CHRISTOPHER C. SWANSON, Kulm Wetland Management District, U.S. Fish and Wildlife Service, Kulm, ND 58456, USA.

BRETT L. WALKER, Avian Research Program, Colorado Parks and Wildlife, 711 Independent Ave., Grand Junction, CO 81505, USA.

Abstract: Defining and understanding animal–habitat relationships is a fundamental concept in ecology and important to the implementation of conservation practices. Habitat relationships are often described for animal species during a single life stage and within a single region. However, animals typically require different habitats throughout their annual cycles and relationships may vary across landscapes. Greater sage-grouse (*Centrocercus urophasianus* hereafter sage-grouse) have been extirpated from nearly half of their original range in western North America, and Wyoming is predicted to remain one of the strongholds for populations. Sage-grouse require an adequate amount, configuration, and juxtaposition of all seasonal habitats for populations to persist. We developed state-wide seasonally explicit habitat selection models to help identify and delineate suitable seasonal habitats. We also quantified regional variation in habitat selection behavior. We compiled extensive radio-telemetry data from 11 sites across Wyoming (n ≈ 3,000 individuals). We used these telemetry data, in combination with high-quality GIS data, to develop seasonal habitat selection models for sage-grouse across Wyoming. We developed models at patch and landscape extents for three separate life stages: 1) nesting, 2) summer/late brood-rearing, and 3) winter habitat. The state-wide models performed well; however, we also assessed regional variation in habitat selection behavior. We divided Wyoming into three regions and developed all seasonal models on a regional basis. We quantified variation in model form and the strength of selection for certain habitat components. Furthermore, we quantified the variation in model accuracy and precision between the state-wide and regional models to assess the value added by the regional approach.

LANDSCAPE CONNECTIVITY FOR GREATER SAGE-GROUSE IN THE COLUMBIA PLATEAU, WASHINGTON STATE

MICHAEL A. SCHROEDER, Washington Department of Fish and Wildlife, P.O. Box 1077, Bridgeport, WA 98813. E-mail michael.schroeder@dfw.wa.gov, phone 509-686-2692

LESLIE A. ROBB, P.O. Box 1077, Bridgeport, WA, 98813

ANDREW J. SHIRK, Joint Institute for the Study of the Atmosphere and Ocean, University of Washington, Box 355672, 3737 Brooklyn Ave NE, Seattle, WA 98105

BRIAN COSENTINO, Washington Department of Fish and Wildlife, 600 Capitol Way North, Olympia, WA 98501

BRAD H. MCRAE, The Nature Conservancy, 1917 1st Avenue, Seattle, WA 98101

Abstract: Connectivity of greater sage-grouse (*Centrocercus urophasianus*) populations is a key conservation issue for their persistence in Washington State. We recently completed a connectivity analysis of the Columbia Plateau Ecoregion in Washington that identified habitat linkage patterns for greater sage-grouse among four habitat concentration areas (HCAs). We assembled spatial data on land cover, roads, energy infrastructure, and other landscape features and developed models of resistance of these features to grouse movement. We used these models to develop maps of (1) resistance to movement across the Columbia Plateau; (2) cost-weighted distance— the ease and extent of movement outward from HCAs; and (3) linkage zones— highlighting the "easiest" movement pathways between HCAs. Overall, opportunities for movement outside the HCAs appear to be limited and none of the linkages provide ideal connectivity for greater sage-grouse in the Columbia Plateau. Preliminary efforts to validate the connectivity model suggest that existing linkages may not be adequate to maintain genetic exchange between the two primary sage-grouse populations in the state. Conservation efforts to enhance connectivity in Washington should consider expanding current HCAs, developing new HCAs, and improving linkage quality.

IDENTIFYING GREATER SAGE-GROUSE PRELIMINARY PRIORITY AND PRELIMINARY GENERAL HABITATS IN IDAHO

DONALD J. MAJOR, U.S. Bureau of Land Management, Branch of Resources and Science and Great Basin Restoration Initiative, Idaho State Office, 1387 S. Vinnell Way, Boise, Idaho 83709. E-mail dmajor@blm.gov, phone 208-373-4049, fax 208-373-3805.

PAUL D. MAKELA, U.S. Bureau of Land Management, Branch of Resources and Science, Idaho State Office, 1387 S. Vinnell Way, Boise, Idaho 83709.

Abstract: Planning for the conservation of greater sage-grouse (GSG) populations and habitats necessitates a landscape approach. We used a combination of GSG breeding density and lek connectivity models as a foundation for delineating preliminary priority habitat (PPH) for Idaho. We used Western Association of Fish and Wildlife Agencies (WAFWA) Sage-grouse Management Zone IV (MZ IV) boundary to provide important regional context. The MZ IV area encompasses the majority of GSG habitat in Idaho and also encompasses important habitats in adjoining portions of southeastern Oregon, northern Nevada, northern Utah and southwestern Montana. We clipped results of the intersected MZ IV BBD/ Connectivity model to the state of Idaho boundary, and incorporated additional available spatial data or expert opinion for seasonal habitats, movement and connectivity corridors, and local GSG priority areas. A final step involved filtering agricultural and conifer lands. Sage-grouse preliminary general habitats were defined as GSG habitats outside of preliminary priority habitat, and were defined using a habitat-based population persistence model, informed with additional map information. We also developed a model incorporating normalized BBD, lek connectivity and population persistence values, resulting in a map surface displaying apparent relative conservation value of areas at finer scales based on those three factors. Results provide spatial context for implementation of BLM national interim sage-grouse policy on public lands in Idaho, and for further refinements anticipated to occur during BLM land use plan amendment efforts currently underway.

THE CONSERVATION OF SAGEBRUSH OBLIGATE BIRDS AT MULTIPLE SCALES

DAVID C. PAVLACKY, JR., Rocky Mountain Bird Observatory, P. O. Box 1232, Brighton, CO 80601. E-mail david.pavlacky@rmbo.org, phone 970-482-1707 x11, fax 970-472-9031

LAURA QUATTRINI, SETH W. GALLAGHER, JENNIFER A. BLAKESLEY, DAVID J. HANNI, and TAMMY L. VERCAUTEREN, Rocky Mountain Bird Observatory, P. O. Box 1232, Brighton, CO 80601.

Abstract: The recovery of sagebrush avifauna has become one of the highest conservation priorities in North America. The Greater Sage-grouse (*Centrocercus urophasianus*) is in need of urgent conservation action. Other sagebrush obligates, such as the Brewer's Sparrow (*Spizella breweri*), Sage Sparrow (*Amphispiza belli*) and Sage Thrasher (*Oreoscoptes montanus*), are also species of conservation concern. Sage-grouse recovery efforts are underway to prioritize the location of habitat management at large scales and to implement conservation actions at local scales. Considering the habitat requirements of additional sagebrush obligate species may broaden the benefits of these conservation actions to the suite of species that are dependent on the sagebrush ecosystem. Our objectives were to 1) estimate population sizes of Brewer's Sparrows, Sage Sparrows and Sage Thrashers, 2) predict species distributions to help prioritize sagebrush management at large scales and 3) quantify habitat relationships to inform habitat management at local scales. We used data collected in the Integrated Monitoring in Bird Conservation Regions program to estimate population sizes, and occupancy rates at landscape and local scales. We estimated 2011 breeding season population sizes for Brewer's Sparrows, Sage Sparrows and Sage Thrashers for a three state area including Colorado, Montana and Wyoming. The large-scale predicted distributions were useful for prioritizing conservation efforts on the landscape. We used the local-scale habitat relationships to predict the effects of conservation actions on sagebrush obligate birds. We propose a multi-species framework to determine the most cost effective management actions for the proactive conservation of Sage-grouse and other sagebrush obligate birds.

NRCS SAGE-GROUSE INITIATIVE OVERVIEW: ACHIEVING WILDLIFE CONSERVATION THROUGH SUSTAINABLE RANCHING

TIM GRIFFITHS, USDA-NRCS, Federal Bldg, 10 E. Babcock St, Rm 443, Bozeman, MT 59715. Email: tim.griffiths@mt.nrcs.gov, phone: (406) 587-6812.

DAVID NAUGLE, Wildlife Biology Program, University of Montana, Missoula, MT 59812. Email: dave.naugle@cfc.umt.edu, phone: 406-243-5364.

Abstract: NRCS's Sage-Grouse Initiative (SGI) is a highly targeted and science-based landscape approach that delivers enough of the right conservation practices in the right places to elicit positive responses in sage-grouse populations. Capitalizing on the strong link between conditions required for sustainable ranching and healthy wildlife populations, SGI marshals existing Farm Bill resources to remove threats to sage-grouse while improving working ranches. NRCS structured SGI to be a collaborative effort to implement conservation practices with its conservation partners throughout the West. This initiative builds off state wildlife agency sage-grouse strategies by addressing known threats in each state and focusing resources on core areas to maximize the biological benefits of conservation investments. SGI includes science-based evaluations carried out by reputable, independent scientists to measure the biological response of sage-grouse populations to conservation practices, to assess SGI effectiveness, and to adaptively improve the program. Additional collaboration with the US Fish and Wildlife Service (FWS) ensures that listing decisions are well informed and landowners are given certainty that they will be able to continue with practice implementation regardless of listing determinations. SGI exemplifies how NRCS is evolving its practices for the 21st century and merging science with program delivery to achieve wildlife conservation through sustainable ranching— all while reducing the need for an Endangered Species Act listing.

CONFERENCE REPORT ON THE SAGE-GROUSE INITIATIVE; PROACTIVE CANDIDATE SPECIES CONSERVATION

NRCS Staff – Presented by Pat Deibert, National Sage-Grouse Coordinator, U.S. Fish and Wildlife Service, 5353 Yellowstone Road, Suite 308A, Cheyenne, WY 82009. Phone: (307) 772-2374. Email: Pat_Deibert@fws.gov

Abstract: The goal of the Natural Resources Conservation Service's (NRCS) Sage Grouse Initiative (SGI) is to conserve the species on private lands using both regulatory and financial incentives within a targeted and strategic framework. This presentation will review the Endangered Species Act compliance strategy used by SGI and the two essential features of the effort: (1) the incorporation of the best available scientific information in support of the SGI to ensure that NRCS cost share and technical assistance produce the optimal benefit and minimize harm, and (2) the delivery of regulatory certainty for participating private landowners. Additionally, the presentation will review how the SGI components will be used by the U.S. Fish and Wildlife Service in the upcoming listing determination(s) for the affected species.

A STRATEGIC APPROACH TO TACKLING CONIFER ENCROACHMENT AND QUANTIFYING OUTCOMES FOR SAGE-GROUSE

JEREMY MAESTAS, USDA-NRCS, 625 SE Salmon Ave., Redmond, OR 97756. Email: jeremy.maestas@or.usda.gov, phone: 541-923-4358 x109.

CHRISTIAN A. HAGEN, Department of Fisheries and Wildlife, Oregon State University, Bend, OR 97702.

DAVID NAUGLE, Wildlife Biology Program, University of Montana, Missoula, MT 59812.

JOHN P. SEVERSON, Department of Fish and Wildlife Resources, P.O. Box 441136, University of Idaho, Moscow, ID 83844.

JEFFREY S. EVANS, The Nature Conservancy, Central Science/Conservation Lands, Environment and Natural Resources, University of Wyoming, Laramie, WY 82070.

AUTUMN LARKINS, Oregon Department of Fish and Wildlife, P. O. Box 8, Hines, OR 97738.

Abstract: With over 12 million acres of conifer encroachment in the Great Basin alone, efforts to reduce this threat to greater sage-grouse (*Centrocercus urophasianus*) must be highly targeted to maximize biological benefits with limited resources. As conifers such as juniper (*Juniperus* spp.) invade sagebrush ecosystems, the landscape slowly becomes unsuitable for sage-grouse as vertical structure increases, shrub and herbaceous plants decline, and the site transitions to woodland. Fortunately, many encroached areas are still in the early-to-mid stages of succession where simple measures can be taken to prevent damaging ecological thresholds from being crossed and allow birds to re-colonize otherwise suitable habitat. The Oregon Sage-Grouse Initiative (SGI) capitalizes on the nuances of conifer succession, combined with ever-improving geospatial planning data, to strategically focus conifer removal efforts in areas with the highest likelihood of eliciting an immediate biological response from sage-grouse. Using this strategic approach, over $10 million of Farm Bill program funds have been invested to help ranchers remove early successional phase juniper from roughly 95,000 acres in just 3 years. Collaborating scientists and partners are helping improve conservation delivery through development of geospatial data and by quantifying outcomes through rigorous research designed to inform program effectiveness. Spatial Wavelet Analysis, a remote-sensing technique, was used to produce 1-m resolution spatial data estimating individual conifer tree locations and canopy coverage allowing remote targeting of early encroachment sites. Finally, a landscape-scale, Before-After Control-Impact study is underway measuring the effects of juniper removal on sage-grouse resource selection, movement, and vital rates.

QUANTIFYING THE BENEFITS OF THE CORE AREA POLICY AND CONSERVATION EASEMENTS TO SAGE-GROUSE IN WYOMING

HOLLY E. COPELAND, The Nature Conservancy, 258 Main Street, Lander, WY 82520. Email: hcopeland@tnc.org, phone: 307-335-2129.

AMY POCEWICZ, The Nature Conservancy, 258 Main Street, Lander, WY 82520.

DAVID NAUGLE, Wildlife Biology Program, University of Montana, Missoula, MT 59812. Email: dave.naugle@cfc.umt.edu, phone: 406-243-5364.

TIM GRIFFITHS, USDA-NRCS, Federal Bldg, 10 E. Babcock St, Rm 443, Bozeman, MT 59715.

DOUG KEINATH, Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY 82070.

JEFFREY S. EVANS, The Nature Conservancy, Central Science/Conservation Lands, Environment and Natural Resources, University of Wyoming, Laramie, WY 82070.

JIM PLATT, The Nature Conservancy, Minneapolis, MN 55415.

Abstract: New energy and residential development is transforming landscapes of the Intermountain West. Of particular concern is the convergence of development and sage-grouse populations in Wyoming. Bold actions have been taken by federal agencies, states and land trusts to conserve the greater sage-grouse (*Centrocercus urophasianus*) through conservation easements and policy changes that limit development. We developed build-out scenarios to simulate future energy and residential development to measure the efficacy of conservation actions at protecting sage-grouse populations. Our analysis addressed the following questions: (1) How much sage-grouse population loss is averted by conservation easements and/or a sage-grouse core area policy? and (2) What is the return-on-investment for sage-grouse populations associated with these conservation actions? We found that Wyoming sage-grouse populations can be expected to decline statewide by 14-29% over the next 20 or more years without conservation action. Conservation strategies have the potential to abate this loss, with a $250 million investment in easements and Wyoming's core area policy reducing expected declines to 10-17%. Our results provide estimates of the impacts of future fragmentation on sage-grouse and the potential contribution of the Wyoming's core area policy and private conservation easements at varying levels of funding. These estimates can guide the quantity and placement of future conservation work, so that federal and state agencies can work together with land trusts to support enough conservation in the right places to maintain a large and functioning sage-grouse population.

MAPPING SAGE-GROUSE FENCE-COLLISION RISK: SPATIALLY-EXPLICIT MODELS TO EFFICIENTLY TARGET CONSERVATION IMPLEMENTATION

BRYAN S. STEVENS, Department of Fish and Wildlife Resources and Department of Statistics, P.O. Box 441136, University of Idaho, Moscow, ID 83844. Email: stev8930@vandals.uidaho.edu, phone: 419-565-4621.

DAVID NAUGLE, Wildlife Biology Program, University of Montana, Missoula, MT 59812. Email: dave.naugle@cfc.umt.edu, phone: 406-243-5364.

BRIAN DENNIS, Department of Fish and Wildlife Resources and Department of Statistics, P.O. Box 441136, University of Idaho, Moscow, ID 83844.

JOHN W. CONNELLY, Idaho Department of Fish and Game, 1345 Barton Road, Pocatello, ID 83204.

TIM GRIFFITHS, USDA-NRCS, Federal Bldg, 10 E. Babcock St, Rm 443, Bozeman, MT 59715.

KERRY P. REESE, Department of Fish and Wildlife Resources, P.O. Box 441136, University of Idaho, Moscow, ID 83844.

Abstract: Recent research suggested greater sage-grouse (*Centrocercus urophasianus*; hereafter sage-grouse) fence collision may be widespread, and methods such as fence marking have been developed for reducing prairie-grouse collision in sagebrush steppe habitats. However, research also suggested sage-grouse collision was highly variable, and practitioners implementing mitigation strategies desire targeting tools to prioritize fence-marking efforts as a function of risk. We fit collision-risk models using widely available covariates to a sage-grouse fence-collision dataset from Idaho, USA, and developed spatially-explicit versions of the top model for all known sage-grouse lekking areas in 10 of 11 western states where sage-grouse are found. Our models prioritize lekking areas for mitigation as a function of terrain ruggedness and distance to nearest lek, and suggest a relatively small proportion of the total landscape (6–14%) in each state would result in >1 collision over a lekking season. These models bridge the gap between science and implementation, and provide a landscape planning tool to efficiently allocate conservation resources.

ABSTRACTS
THURSDAY JUNE 21ST, 2012

TESTING DEVICES TO MINIMIZE FREQUENCY AND DURATION OF RAPTOR AND CORVID PERCHING ON UTILITY POLES IN GROUSE HABITAT

JAMES F. DWYER, EDM International Inc., 4001 Automation Way, Fort Collins, CO 80525. Email jdwyer@edmlink.com, phone 970-204-4001, fax 970-204-4007.

KERRIN DOLOUGHAN, Bureau of Land Management, Spokane Field Office, 1103 N. Fancher, Spokane Valley, WA 99212.

Abstract: Raptor and corvid use of utility structures in sage-grouse habitat raises questions for grouse management. Perch discouragers may minimize perching, but their effectiveness has not been widely tested. To investigate effectiveness, we deployed discouragers on 5 de-energized power poles near grouse leks when a 33-pole distribution line was removed. We deployed discouragers with insulator covers and pole caps, and compared perching events on crossarms among four treatments and a control. Treatments consisted of BLM-built minarets, Power Line Sentry Raptor Guards (designed to mitigate electrocution risk not perching), angled Pupi fiberglass crossarms, and Prommel Enterprises Mini-Zenas. We rotated discouragers among poles every 15-22 days ($\bar{x}$ =19) so all treatments occurred on all poles, and monitored perching with remote cameras. Eight of twenty rotations have been completed (10 by the time of the conference) generating 272 independent perching records. We tested the null hypothesis that there was no difference in perch frequency or duration among treatments verses control crossarms without discouragers. We used a one dimensional χ^2 to test perch frequency, and ANOVA to test perch duration. Raptors and Corvids perched on control crossarms and minaret crossarms more than expected, and on all other treatments less than expected (χ^2=30.42, df=4, P<0.0001). Compared to control crossarms, raptors and corvids perched for shorter durations only on crossarms fitted with Mini-Zenas (*F*=10.96, df=4, *P*<0.0001). When sufficient data accrue, we will model perch frequency and duration as a function of treatment, perch species, season, and time of day.

RESTORING SAGE-GROUSE HABITAT USING CHEATGRASS-SUPPRESSIVE BACTERIA

ANN C. KENNEDY, USDA-Agricultural Research Service, 215 Johnson Hall, Pullman, WA, 99164

MICHAEL A. GREGG, U.S. Fish and Wildlife Service, Land Management and Research Demonstration Biologist, 64 Maple Street, Burbank, WA 99323, mike_gregg@fws.gov, 509-942-8185 (phone), 509-546-8303 (fax)

JEREMY C. HANSEN, USDA-Agricultural Research Service, 215 Johnson Hall, Pullman, WA 99164

TAMI L. STUBBS, Dept of Crop and Soil Sciences, Washington State University, 221 Johnson Hall, Pullman, WA, 99164

Abstract: Cheatgrass (*Bromus tectorum* L.) is a troublesome exotic annual grass that negatively affects shrub-steppe, increases fire frequency, and ultimately reduces sage grouse habitat. More than 200 million acres of sagebrush steppe existed in North America in the 1880s. Presently, 100 million acres of this habitat in the Intermountain West remain, but over half of these acres are infested with cheatgrass. Cheatgrass alters ecosystem structure and function and limits sage-grouse populations. It is difficult to re-establish native species and the native ecosystem structure and function in areas dominated by cheatgrass. Biological control efforts offer a novel, alternative means of suppressing invasive species. Several naturally occurring pseudomonas bacteria were found that inhibited cheatgrass in the field, but did not harm native plants. The bacteria is applied in the fall and inhibit radicle formation, root growth and tiller initiation of select weeds in the fall and spring. In long-term rangeland field trials in Washington, application of the bacteria resulted in almost complete suppression of cheatgrass three to five years after a single application. In addition, at each site the populations of more desirable plant species increased as cheatgrass becomes less competitive. The bacteria reduced invasive weeds and allowed other plant species to be more competitive. These bacteria provide a novel means to reduce invasive weeds in rangeland while limiting tillage and chemical use. Although the use of cheatgrass biological control is still experimental, they do have the potential to significantly increase success in restoring sage-grouse habitat.

POPULATION DYNAMICS OF TRANSLOCATED AND RESIDENTGREATER SAGE-GROUSE (*CENTROCERCUS UROPHASIANUS*), ANTHRO MOUNTAIN, UTAH

NATASHA W. GRUBER, Jack H. Berryman Institute, Wildland Resources, College of Natural Resources, Utah State University, Logan, UT 84341, USA. E-mail Natasha.gruber@gmail.com, phone 970-629-3197.

BRIAN D. MAXFIELD, Utah Division of Wildlife, Vernal, UT 84078.

TERRY A MESSMER, Wildland Resources, College of Natural Resources, Utah State University, Logan, UT 84341, USA.

MICHAEL R. GUTTERY, Wildland Resources, College of Natural Resources, Utah State University, Logan, UT 84341, USA.

DAVE N. KOONS, Wildland Resources and Environmental Sciences, College of Natural Resources, Utah State University, Logan, UT 84341, USA.

Abstract: Greater sage-grouse (*Centrocercus urophasianus*) populations have declined range wide. Species translocations have been identified as a conservation strategy to augment declining populations. We conducted a translocation study on Anthro Mountain in northeastern Utah and evaluated the success of the translocation using multiple indicators and comparing population dynamics of translocated and resident sage-grouse. We also compared translocation methodologies with a recently successful translocation in northeastern (Strawberry Valley) Utah. We evaluated factors influencing adult and yearling survival, nest success, chick survival up to 50 days old for translocated and resident sage-grouse. Sixty female greater sage-grouse were captured off of Parker Mountain for translocation to Anthro Mountain in the spring of 2009 and 2010. Twenty resident birds were also captured from Anthro Mountain. Each captured grouse was fitted with a necklace radio-transmitter. From each nest that hatched, approximately 4 chicks in every brood were radio-marked and brood vegetation plots were measured until the broods fledged. Our results suggest that translocated birds had similar survival and reproductive success when compared to resident birds on Anthro Mountain. However overall, survival and reproductive success of both translocated and resident birds was low compared to other sage-grouse research. These results may suggest that the translocation took place in a high predation year and in the low part of their population cycle, thus contributing to a limited translocation success. The translocation could be deemed successful because the translocated birds quickly acclimated to the release area, and their survival and reproductive success were similar to the resident birds of Anthro Mountain.

COMPARISON OF PRESCRIBED BURNING AND MOWING TO ENHANCE GREATER SAGE-GROUSE NESTING AND BROOD-REARING HABITAT IN THE BIGHORN BASIN, WYOMING

JENNIFER E. HESS, University of Wyoming, Department of Ecosystem Science and Management, Dept 3354, 1000 East University Avenue, Laramie, WY 82071, USA. Email: jenn@haydenwing.com, phone 307-460-1293.

JEFFREY L. BECK, University of Wyoming, Department of Ecosystem Science and Management, Dept 3354, 1000 East University Avenue, Laramie, WY 82071, USA.

Abstract: Bureau of Land Management offices in the Bighorn Basin of north-central Wyoming have implemented over 190 km² of prescribed burns since 1980 and over 90 km² of mowing treatments since 2000 in an effort to enhance Wyoming big sagebrush (*Artemisia tridentata wyomingensis*). Objectives of these treatments focused on land health, watershed improvement, and to enhance habitat conditions for livestock, greater sage-grouse (*Centrocercus urophasianus*), and other wildlife. Many studies have reported negative results from burning sagebrush to enhance sage-grouse habitats. Mowing has been suggested as an alternative because mowing leaves young sagebrush plants and residual debris that can reduce soil erosion, increase snow capture, and be used as cover from predators. We collected data in 2008 and 2009 to compare prescribed burning and mowing to enhance sage-grouse nesting and brood-rearing habitats within Wyoming big sagebrush communities in the Basin. Through comparing response variables at 25 treated sites to adjacent, untreated reference sites, we evaluated habitat quality through insect, soil, and vegetation parameters known to influence ecological function and sage-grouse populations. Mowing maintained sagebrush cover and height for late brood-rearing, but not (3 of 4 instances) for nesting or early brood-rearing. Prescribed burning eliminated sagebrush canopy cover and height required by sage-grouse for at least 19 years postburn. Forb nutritional content was not enhanced (i.e., similar to reference sites) by treatments. Total ant and beetle counts and weights did not respond positively to treatments. Although mowing did leave intact sagebrush, responses in other parameters infrequently exceeded levels at reference sites.

COMING FULL CIRCLE: PROVIDING NATIVE SEED FOR GROUSE HABITAT IMPROVEMENT

LEIGH ROBERTSON, Education & Outreach Coordinator, Uncompahgre Com and Coordinator, San Miguel Basin Gunnison Sage-Grouse Working Group, 596 Sabeta Dr., # D, Ridgway, CO 81432, phone 970-708-7131, info@upartnership.org

Abstract: Researchers have completed numerous studies on the habitat and dietary needs of grouse. This information helps land managers determine appropriate projects to improve the availability of forbs, grasses, and shrubs that are needed to provide food and cover. Commercial seed sources for many of the plants favored by grouse are not available, or if they are, the sources are not local, which can affect the plant's ability to grow and thrive. To deal with this issue, the Uncompahgre Partnership started collecting seeds of species preferred by sage-grouse. These seeds were sent to commercial growers, and now a number of species are available for purchase. In this presentation, attendees will learn about the benefits of local seed sources, what species are available, and how to ensure the seed required for projects will be available when its needed. How the UP's Native Plant Program chose the plant species and the grow-out process will also be briefly covered.

GUNNISON SAGE-GROUSE SEASONAL HABITAT SELECTION: A SPATIALLY EXPLICIT HIERARCHICAL APPROACH TO IDENTIFY CRUCIAL HABITAT

CAMERON L. ALDRIDGE, NREL, and Department of Ecosystem Science and Sustainability, *Colorado State University,* in cooperation with *U.S. Geological Survey*, 2150 Centre Avenue, Building C, Fort Collins, CO 80526-8118 USA. E-mail: cameron_aldridge@usgs.gov, phone 970-226-9433, fax 970-226-9298.

D. JOANNE SAHER, NREL, Colorado State University, in cooperation with U.S. Geological Survey, 2150 Centre Avenue, Building C, Fort Collins, CO 80526-8118 USA

THERESA M. CHILDERS, National Park Service, Black Canyon of the Gunnison National Park and Curecanti National Recreation, 102 Elk Creek, Gunnison, CO 81230

KENNETH E. STAHLNECKER, National Park Service, Black Canyon of the Gunnison National Park and Curecanti National Recreation, 102 Elk Creek, Gunnison, CO

ZACHARY H. BOWEN, U.S. Geological Survey, 2150 Centre Avenue, Building C, Fort Collins, CO 80526-8118 USA

Abstract: Gunnison sage-grouse (*Centrocercus minimus*) is a species of special concern and is currently considered a candidate species under the Endangered Species Act. Careful management is therefore required to ensure that suitable habitat is maintained, particularly because much of the species' current distribution is faced with exurban development pressures. We assessed hierarchical habitat selection patterns of Gunnison sage-grouse across three life stages (nesting, late-summer, and winter) and at multiple spatial scales, using logistic regression-based resource selection functions. Models were selected using Information Criterion (Akaike or Bayesian) and predictive surfaces were generated using model averaged relative probabilities. Landscape-scale factors such as percent cover of sagebrush and density of roads had the strongest influence on resource selection across all life stages. Crucial habitat identified by landscape models for each life stage was used to define the spatial extent for patch scale modeling efforts. Resource selection at the patch scale was again influenced by local characteristics of sagebrush, but other effects, such as proximity to residential development and high traffic volume roads, and mean habitat productivity also played a role. Our models accurately predicted independent use locations across all three life stages. The unique hierarchical structure of our models more accurately captures the nested nature of habitat selection, and allowed for increased discrimination within larger landscapes of suitable habitat. Identified crucial habitats had strong overlap across all three life stages. We illustrate how these models can be used for conservation planning and initial assessments of connectivity to prioritize management efforts.

GUNNISON SAGE-GROUSE HABITAT USE AND MOVEMENT STUDY: THE CRAWFORD POPULATION

DOUGLAS S. OUREN, USGS Fort Collins Science Center, 2150 Centre Ave. Bldg. C, Fort Collins, Colorado 80526-8118. E-mail ourend@usgs.gov. phone 970-226-9476.

MELISSA SIDERS, Bureau of Land Management, Bureau of Land Management, Uncompahgre Field Office, 2465 S. Townsend Ave., Montrose, CO 81401. E-mail Melissa_Siders@blm.gov, phone 970-240-5332.

THERESA CHILDERS, National Park Service, Curecanti National Recreation Area, Black Canyon of the Gunnison National Park, 102 Elk Creek Gunnison, CO, 81230. E-mail Theresa_Childers@nps.gov, phone: 970-641-2337 ext. 250.

KAREN TUCKER, Bureau of Land Management, Bureau of Land Management, Uncompahgre Field Office, 2465 S. Townsend Ave., Montrose, CO 81401. E-mail karen_tucker@blm.gov, phone 970-240-5309.

Abstract: Loss and alteration of sage-steppe habitat, due to many factors, has been identified as a primary reason for declines in Gunnison Sage-grouse (Centrocercus minimus) populations. The Gunnison Sage-grouse is a species of special concern for all federal and state natural resource management agencies throughout its range. One of the remaining 7 populations, the Crawford population, exists in Gunnison Gorge National Conservation Area and the Black Canyon of the Gunnison National Park. While the Crawford population is small, it is still considered a self-sustaining population; the persistence and growth of this population directly contributes to genetic diversity conservation of this declining species. There is very little factual information available about the movements and habitat use of the Crawford population. The objective for this project is to use GPS-marking techniques to examine the habitat use and seasonal movements of the Crawford population. The GPS technology used for this project are 22g solar powered GPS PPT backpack units that attempt at an hourly location from 6 a.m. to 6 p.m. and at midnight. To date we have collected over 6800 locations which have been used to identify new potential lekking areas and to develop initial resource selection models. This information will be used to model and test models for development of decision making tools for wildlife managers who are trying to increase or preserve GUSG population and habitat. Collaborators include National Park Service, Bureau of Land Management, United States Geological Survey and Colorado Division of Parks and Wildlife.

A PARTNERSHIP TO RESTORE GUNNISON SAGE GROUSE HABITAT IN COLORADO

DOUG HOMAN, Crawford Area Gunnison Sage Grouse Working Group Coordinator, 8896 Cottonwood Lane, Hotchkiss, CO 81419. E-mail doug.homan3@gmail.com , phone 970-872-2175, fax 970-872-2175.

BRANDON J. HOUCK, National Wild Turkey Federation, 3869 Rd E, Allen, KS 66833.

Abstract: Partners including National Wild Turkey Federation (NWTF), Bureau of Land Management (BLM), Colorado Parks and Wildlife's Habitat Partnership Program (HPP), and Natural Resources Conservation Service (NRCS) restored 2,385 acres of Gunnison sage-grouse (GUSG) habitat near Crawford, Colorado. Destruction and fragmentation of sagebrush habitat is among the primary factors contributing to the long-term decline in GUSG populations. The Crawford population of GUSG occupies 35,000 acres consisting primarily of BLM and private lands. Encroachment by pinyon and juniper (PJ) trees is a major threat to sagebrush habitats critical to the Crawford population. The NWTF was awarded nearly $200,000 from the National Fish and Wildlife Foundation (NFWF) to deliver habitat restoration treatments to BLM's GUSG Area of Critical Environmental Concern, an area managed with special emphasis on GUSG. Two underground water storage tanks and drip lines were installed to develop 4 wet meadow sites for additional brood rearing habitat. Using mechanical tree grinding equipment, along with hand crews using chainsaws, contractors cleared PJ from more than 1,500 acres of sagebrush. In addition to work completed under the NFWF grant, 400 acres of PJ were cleared using HPP funds and 485 acres of adjacent private lands were cleared using NRCS funds. Within two weeks of PJ treatments we located radiomarked GUSG using treatment units that they had avoided prior to tree removal. Native forb seed was broadcast by airplane over much of the treated area to enhance the herbaceous plant community. The project was coordinated locally by the Crawford area GUSG working group.

GREATER SAGE-GROUSE CRUCIAL HABITAT, MOVEMENT, AND SURVIVAL IN A SOUTHWESTERN UTAH FRINGE POPULATION

A. CHEYENNE BURNETT Wildland Resources, College of Natural Resources, Utah State University, 5230 Old Main Hill, Logan UT 84322. E-mail cheyburnett@gmail.com, phone 415-717-6597, fax 435-797-3796.

S. NICOLE FREY, Wildland Resources, College of Natural Resources, Utah State University, Logan, UT 84322.

Abstract: The Bald Hills population of Greater sage-grouse (*Centrocercus urophasianus*) 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 in regards to species persistence. Due to lack of research, basic information about this population's seasonal movements, distribution, survival, and habitat preferences are unknown. This is of particular relevance because of the high potential for wind energy development in the area. One objective of this study is to develop a habitat selection model to predict and map seasonal habitat use and population distribution using Maximum Entropy. We will use habitat and anthropogenic covariates as predictors of Greater sage-grouse presence. Bird locations collected in 2011 via VHF radio telemetry provide presence-data to create the model. Locations from 2012 will be used to validate the model. Initial telemetry data suggests elevation and proximity to water will be major predictors in our model. Another objective is to quantify this population's survival, movement, and habitat preferences. Preliminary results indicate that this population is semi-migratory and their distribution differs from the Utah Division of Wildlife's Habitat Coverage maps. Hens have higher survival rates than males and winter survival is greater than any other season. Population-specific studies allow us to test the assumptions made about these populations based on studies of other populations. With the use of population-specific distribution models we can make more informed management decisions in the face of energy development and Greater sage-grouse distribution declines.

GREATER SAGE-GROUSE SELECT NEST-SITES AND BROOD-SITES AWAY FROM AVIAN PREDATORS

JONATAN B. DINKINS, Department of Wildland Resources, Utah State University, Logan, UT 84322-5230, USA, Email jon.dinkins@aggiemail.usu.edu, phone 406-600-4746.

MICHAEL R. CONOVER, Department of Wildland Resources, Utah State University, Logan, UT 84322-5230, USA

CHRISTOPHER P. KIROL, Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY 82071, USA

JEFFREY L. BECK, Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY 82071, USA

Abstract: Greater Sage-Grouse (*Centrocercus urophasianus*; hereafter "sage-grouse") distribution and abundance in western North America has declined over the last century. Depredation of sage-grouse nests and predation of chicks can be one of the most influential factors limiting their productivity. Prey species utilize anti-predation behaviors, such as predator avoidance, to reduce the risk of predation. Birds in general balance the dual necessity of selecting cover to hide from visual and olfactory predators to optimize their survival and reproductive success, which may also be achieved by selecting habitat with relatively fewer predators. We compared avian predator densities at sage-grouse nests and brood locations to random locations within available sage-grouse habitat. This comparison allowed us to assess the ability of sage-grouse to avoid avian predators during nesting and early brood-rearing. During 2008–2010, we conducted 10-min point-count surveys at 218 sage-grouse nests, 249 sage-grouse brood locations from 83 sage-grouse broods, and 496 random locations. We found that random locations had higher densities of avian predators relative to sage-grouse nest and brood locations. Sage-grouse nested in areas where there were lower densities of Common Ravens (*Corvus corax*), Black-billed Magpies (*Pica hudsonia*), Golden Eagles (*Aquila chrysaetos*), and *Buteo* hawks compared to random locations. Additionally, sage-grouse selected brood-rearing locations that had lower densities of the same avian predators as during nesting plus American Kestrels (*Falco sparverius*) compared to random. By selecting nest and brood-rearing locations with lower avian predator densities, sage-grouse may reduce the risk of nest depredation and predation on eggs, chicks, and hens.

RECONSTRUCTING TIME-SPECIFIC DIET COMPOSITION IN GREATER SAGE-GROUSE CHICKS USING FEATHER STABLE ISOTOPES

ERIK J. BLOMBERG. Program in Ecology, Evolution and Conservation Biology. University of Nevada, Reno. Mail Stop 186, Reno, NV, 89557. Email: EJBlomberg@gmail.com phone: 775-622-2137.

SIMON R. POULSON. Nevada Stable Isotope Laboratory. Department of Geological Sciences and Engineering. University of Nevada, Reno. MS 172, Reno, NV, 89557.

JAMES S. SEDINGER. Department of Natural Resources and Environmental Sciences. University of Nevada, Reno. Mail Stop 186, Reno, NV, 89557.

DAN V. NONNE. Program in Ecology, Evolution and Conservation Biology. University of Nevada, Reno. Mail Stop 186, Reno, NV, 89557.

Abstract: Most diet studies of sage-grouse chicks have relied on sampling crop contents; an approach that is limited because it is lethal to the animal and only provides a snapshot of diet that cannot be connected to other values of interest (e.g., survival). We developed a novel method for analyzing chick diet using stable isotope composition of feather tissue, which allowed us to quantify contributions of diet items and reconstruct a post-hatch dietary timeline. We collected secondary feathers from greater sage-grouse chicks in Eureka County, Nevada, at 28 days of age. Feathers were sectioned into subsamples that corresponded to sequential multiday periods, isotopic composition of carbon (δ13C) and nitrogen (δ15N) was analyzed for each subsample, and Bayesian mixing models were used to estimate the relative contributions of invertebrate versus plant materials to diet. We found δ15N to be a robust predictor of diet composition, whereas results for δ13C were more ambiguous. Bayesian mixing models using δ15N estimated the mean contribution of invertebrates to chick diet as 33 ±6% for week 1, 23 ±3% for week 2, 17 ±3% for week 3, and 14 ±0.3% for week 4, consistent with previous studies that suggest a shift to a greater herbivory as individuals age. We also show individuals that maintained a more intermediate diet were larger at 28 days, compared to individuals that consumed greater proportions of plants or invertebrates throughout growth. These methods are well-suited to dietary assessment for grouse, and provide a new tool for evaluating sage-grouse response to habitat management.

HUNGRY GROUSE IN A WARMING WORLD – HOW PLANT CHEMISTRY AND CLIMATE COULD IMPACT HABITAT USE BY GREATER SAGE-GROUSE

JENNIFER S. FORBEY. Department of Biological Sciences, Boise State University, Boise, ID 83725

GRAHAM. G. FRYE. Department of Biological Sciences, Boise State University, Boise, ID 83725

KRISTINA. GEHLKEN. Department of Biological Sciences, Boise State University, Boise, ID 83725

JOHN. W. CONNELLY. Idaho Department of Fish and Game, Blackfoot, ID 83221

Abstract. The toxic consequences of defensive chemicals in plants can constrain diet selection and habitat use by herbivores. Moreover, increases in fire, drought, and CO^2 can increase chemical defenses in plants and herbivores may be less tolerant to those chemicals as temperatures rise. Herbivores that specialize on chemically defended plants for food may be particularly sensitive to variation in plant chemistry and changes in climate. Sagebrush contains many toxic compounds (e.g. monoterpenes), yet is the primary diet of Greater sage-grouse (*Centrocercus urophasianus*) throughout much of the year. We investigated how sagebrush chemistry influenced the behavior and physiology of greater sage-grouse and suggest how climate change may alter grouse-sagebrush interactions. We hypothesized that concentrations of chemical defenses would influence habitat use on multiple spatial scales. In addition, we hypothesized that sage-grouse have mechanisms to minimize exposure to defensive chemicals in sagebrush. Our research supported both hypotheses. Sage-grouse minimize exposure to toxins by selecting species of sagebrush within landscapes, patches of plants within the selected species, and individual plants within selected patches with the lowest concentration of monoterpenes. In addition, sage-grouse have physiological mechanisms to limit the absorption of ingested monoterpenes. We describe why understanding plant chemistry can benefit the conservation and management of sage-grouse. Specifically, we describe how remote sensing could be used to map the distribution of palatable plants to better predict quality habitats for sage-grouse. In addition, we offer an overview of how climate change may alter the chemical interactions between sage-grouse and sagebrush in the future.

IDENTIFYING AND PRIORITIZING GREATER SAGE-GROUSE NESTING AND BROOD-REARING HABITAT FOR CONSERVATION IN HUMAN-MODIFIED LANDSCAPES

JENNIFER E. HESS , Hayden-Wing Associates, LLC, 2308 South 8th St, Laramie, WY 82070, USA. Email: jenn@haydenwing.com, phone 307-460-1293.

MATTHEW DZIALAK, Hayden-Wing Associates, LLC, 2308 South 8th St, Laramie, WY 82070, USA.

CHAD OLSON, Hayden-Wing Associates, LLC, 2308 South 8th St, Laramie, WY 82070, USA.

SETH HARJU, Hayden-Wing Associates, LLC, 2308 South 8th St, Laramie, WY 82070, USA.

STEPHEN WEBB, Hayden-Wing Associates, LLC, 2308 South 8th St, Laramie, WY 82070, USA.

JAMES MUDD, Hayden-Wing Associates, LLC, 2308 South 8th St, Laramie, WY 82070, USA.

JEFFREY WINSTEAD, Hayden-Wing Associates, LLC, 2308 South 8th St, Laramie, WY 82070, USA.

LARRY HAYDENWING, Hayden-Wing Associates, LLC, 2308 South 8th St, Laramie, WY 82070, USA.

Abstract: We investigated reproductive success in female greater sage-grouse (*Centrocercus urophasianus*) relative to seasonal patterns of resource selection, with the larger goal of developing a spatially-explicit framework for managing human activity and sage-grouse conservation at the landscape level. We integrated field-observation, Global Positioning Systems telemetry, and statistical modeling to quantify the spatial pattern of occurrence and risk during nesting and brood-rearing. We linked occurrence and risk models to provide spatially-explicit indices of habitat-performance relationships. As part of the analysis, we offer novel biological information on resource selection during egg-laying, incubation, and night. The spatial pattern of occurrence during all reproductive phases was driven largely by selection or avoidance of terrain features and vegetation, with little variation explained by anthropogenic features. Specifically, sage-grouse consistently avoided rough terrain, selected for moderate shrub cover at the patch level (within 90 m^2), and selected for mesic habitat in mid and late brood-rearing phases. In contrast, risk of nest and brood failure was structured by proximity to anthropogenic features including natural gas wells and human-created mesic areas, as well as vegetation features such as shrub cover. Working under the hypothesis that industrial activity structures risk by enhancing predator abundance or effectiveness, we offer specific recommendations for maintaining high- performance habitat and reducing low-performance habitat, particularly relative to the nesting phase, by managing key high-risk anthropogenic features such as industrial infrastructure and water developments.

SPATIALLY QUANTIFYING GREATER SAGE-GROUSE HABITAT VALUE IN AN ENERGY DEVELOPMENT LANDSCAPE

CHRISTOPHER P. KIROL Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY 82071. E-mail: ckirol@uwyo.edu, fax 307-766-6403.

JEFFREY L. BECK Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY 82071.

SNEHALATA V. HUZURBAZAR Department of Statistics, University of Wyoming, Laramie, WY 82071.

Abstract: Our objective was to model source and sink habitats for greater sage-grouse (*Centrocercus urophasianus*) in the 1,093 km^2 Atlantic Rim Project Area (ARPA) of south-central, Wyoming, which is being developed for coalbed natural gas (CBNG). We coupled habitat selection and survival models using data from *n* = 167 female grouse in 2008 and 2009. To predict habitat selection, we evaluated relationships between environmental and anthropogenic covariates at 0.25-km, 1-km, and 5-km scales using binary logistic regression to develop resource selection functions (RSFs) for nesting, early and late brood-rearing, and for broodless hens. We combined the RSF's for each life-stage to form an occurrence layer that spatially identified areas with the highest and lowest relative probability of use. We used proportional hazards modeling to identify the most predictive models for nest, brood, and adult female summer survival to predict survival that we termed survival probability functions (SPFs). We combined SPF's into a lambda equation that was mapped on the ARPA to predict habitats that contributed to population sources or sinks. Finally, the occurrence and lambda layers were combined to predict selected and non-selected source and sink habitats. Our analysis indicated that 40% of the ARPA was selected-source, whereas 4% was selected-sink habitat. Our results suggest that the primary concern for CBNG development on sage-grouse population persistence in the ARPA was avoidance of otherwise productive habitats. Through predicting sink and source habitats we identified areas that should take conservation priority during development to maintain a viable sage-grouse population in an energy development landscape.

MULTI-SCALE HABITAT SELECTION AND SEASONAL HABITAT MAPPING FOR GREATER SAGE-GROUSE IN THE PARACHUTE-PICEANCE-ROAN POPULATION IN WESTERN COLORADO

BRETT L. WALKER, Colorado Parks and Wildlife (CPW), 711 Independent Ave., Grand Junction, CO 81505. brett.walker@state.co.us (e-mail); 970-255-6125 (office); 970-255-6111 (FAX).

ANTHONY D. APA, Colorado Parks and Wildlife (CPW), 711 Independent Ave., Grand Junction, CO 81505. tony.apa@state.co.us (e-mail); 970-255-6196 (office); 970-255-6111 (FAX).

Abstract: The Parachute-Piceance-Roan (PPR) region of western Colorado supports an isolated, resident population of greater sage-grouse subject to increasing energy development and pinyon-juniper encroachment. We used locations of VHF-marked females from 2006-2010 to generate and validate breeding and summer-fall seasonal use maps to inform planning for energy development, quantify mitigation needs, and guide on-the-ground conservation strategies. We conducted multi-scale habitat selection analyses using 1130 breeding-season locations (n = 102) and 1367 summer-fall locations (n = 84). We used logistic regression to test the influence of landscape-level habitat features at six scales (100, 350, 740, 1000, 1600, 3200 m). Sage-grouse selected landscapes with a mosaic of sagebrush, grassland/sparse sagebrush, and mixed sagebrush-mountain shrub habitat types over landscapes with just sagebrush in both seasons. They also selected for flatter local terrain and areas at higher elevation, and they selected against landscapes with greater proportion forest or mountain shrub, and against areas closer to forest. Models validated well against independent locations (R^2 = 0.912-0.984). Although landscapes used in the PPR included a wider diversity of habitat types than in most other parts of sage-grouse range, birds still consistently selected habitats dominated by sagebrush within 100 m, and >95% of used locations had some sagebrush within 30 m. These findings demonstrate the importance of considering seasonal landscape-level habitat requirements and topographic constraints on habitat suitability for sage-grouse in combination with micro-scale habitat requirements for nesting, brood-rearing, and wintering. Modeling results also support ongoing efforts by CPW and BLM to reduce pinyon-juniper encroachment into sagebrush habitats.

THE IMPACTS OF NOISE ON GREATER SAGE-GROUSE: RESULTS AND IMPLICATIONS FOR CONSERVATION POLICY

GAIL L. PATRICELLI, Department of Evolution and Ecology, 2320 Storer Hall, One Shields Ave., University of California, Davis, CA 95616. Email: GPatricelli@ucdavis.edu, phone: 530-754-8310

JESSICA L. BLICKLEY AND STACIE L. HOOPER, Department of Evolution and Ecology, University of California, Davis

Abstract: The impacts of introduced noise on wildlife have been studied less than many other consequences of human activities, but a growing body of literature suggests that noise impacts are significant and widespread. We conducted a noise-introduction experiment to examine the impacts of noise from energy development on Greater Sage-Grouse. We found that noise caused significant declines in male attendance at leks (29% decline from drilling noise and 73% decline from road noise, compared to control leks). We also found impacts on individual males who remained at noise-playback leks, with elevated stress hormones indicating chronic stress, and changes in display behavior consistent with an impact from acoustic masking. We will discuss these results and the adequacy of current noise regulations in Sage-Grouse habitat. Finally, we will discuss a method for predicting the "acoustic footprint" of human activities on the landscape. We have incorporated our noise monitoring data from natural gas developments near Pinedale, WY, into NMSimNORD, a freeware program already used by multiple federal agencies. This program creates predicted noise levels, which are output as a GIS layer. We will discuss our ongoing efforts to use this program to develop noise layers for the Pinedale, WY, region for use in habitat selection models. Designation of the Greater Sage-Grouse as a candidate species under the ESA highlights the need to develop tools that allow wildlife managers to predict the impacts of current and proposed developments on sage-grouse populations; our method will allow noise impacts to be included in these predictions.

ECOLOGY OF MALE GREATER SAGE-GROUSE BEFORE WIND ENERGY DEVELOPMENT IN SOUTH-CENTRAL WYOMING

JOSHUA J. MILLSPAUGH, Department of Fisheries and Wildlife Sciences, 302 Natural Resources Building, University of Missouri, Columbia, MO 65211. E-mail MillspaughJ@missouri.edu, phone 573-882-9423, fax 573-884-5070.

MARK A. RUMBLE, U.S. Forest Service Rocky Mountain Research Station, Forest and Grassland Research Laboratory, 8221 South Highway 16, Rapid City, SD 57702.

CHRISTOPHER P. HANSEN, Department of Fisheries and Wildlife Sciences, 302 Natural Resources Building, University of Missouri, Columbia, MO 65211.

R. SCOTT GAMO, Wyoming Department of Game and Fish, 5400 Bishop Boulevard, Cheyenne, WY 82006.

JON KEHMEIER, SWCA Environmental Consultants, 295 Interlocken Boulevard, Suite 300, Broomfield, CO 80021.

NATHAN WOJCIK, SWCA Environmental Consultants, 295 Interlocken Boulevard, Suite 300, Broomfield, CO 80021.

Abstract: We are studying demography, resource selection, and lek ecology of male greater sage-grouse (*Centrocercus urophasianus*) using a before-after-control impact design on a proposed 1,000-turbine, 2-3,000 megawatt wind farm southwest of Rawlins, WY. In spring 2011, we placed GPS-PTTs on 36 male grouse and 50 VHF transmitters on yearling/adult male sage-grouse. In Fall 2011, we marked 53 juvenile sage-grouse (25 males and 28 females) with VHF transmitters. April to December survival of GPS marked males was 49% (SE= 11); survival of males with VHF transmitters was 51% (SE= 11) and September to December survival of juvenile sage-grouse was 55% (SE= 8). Home ranges averaged 65 (SE=21) ha in spring, 422 (SE=21) ha in summer, and 233 (SE= 51) ha in early winter. Spatial overlap of seasonal ranges was 7% between spring/summer, 3% between summer/winter, and 29% between winter/spring. Resource selection by male sage-grouse suggested positive associations with canopy cover of forbs and sagebrush height, but negative associations with sagebrush density and sagebrush canopy cover. Sightability of male grouse on leks averaged 54% (SE= 14) and was negatively influenced by sagebrush canopy cover, vegetation height-density, and distance from observer. Hourly lek attendance averaged 32% (SE= 1) which declined steadily throughout the morning. Daily lek attendance averaged 56% (SE= 3) with peak attendance in early May. Probability of male sage-grouse transitioning leks was 0.14 (SE=0.03), and 0.26 (SE= 0.05) for returning to the originating lek. Probability of lek transitions increased later in the breeding season.

SAGE-GROUSE AND WIND ENERGY DEVELOPMENT: AN OVERVIEW OF THREE CURRENT RESEARCH PROJECTS

JOSHUA J. MILLSPAUGH**,** Department of Fisheries and Wildlife Sciences, 302 Natural Resources Building, University of Missouri, Columbia, MO 65211. E-mail MillspaughJ@missouri.edu, phone 573-882-9423, fax 573-884-5070.

DAVID MUSIL, Senior Wildlife Research Biologist, Idaho Department of Fish and Game, 324 South 417 East, Jerome, ID 83338.

MATT HOLLORAN, Principal and Senior Ecologist, Wyoming Wildlife Consultants LLC, 201 West Pine Street, Pinedale, WY 82941.

Abstract: We present an overview of research being conducted through the Sage-Grouse Research Collaborative formed under the National Wind Coordinating Collaborative (NWCC) Grassland and Shrub Steppe Species Subgroup. The NWCC Sage-Grouse Research Collaborative was formed to coordinate studies examining the potential impacts of wind energy development on sage-grouse to gain a comprehensive understanding of the impacts of wind power across the species' range with the goal of informing wind development and sage-grouse management strategies. Through a competitive process, the Collaborative selected three research projects to support: (1) *Ecology of male Greater Sage-Grouse in relation to wind energy development in Wyoming* led by Joshua Millspaugh (University of Missouri) and centered around Power Company of Wyoming LLC's proposed Chokecherry and Sierra Madre Wind Energy Projects located south of Rawlins, Wyoming; (2) *Response of Greater Sage-Grouse to wind power development* led by David Musil (Idaho Department of Fish and Game) and centered around RES Americas' proposed China Mountain Wind Project located in south-central Idaho and northeastern Nevada; and (3) *A study of the impacts of a wind energy development on Greater Sage-Grouse populations in southeastern Wyoming* led by Matt Holloran (Wyoming Wildlife Consultants LLC) and centered around the PacifiCorp Seven Mile Hill wind project located west of Medicine Bow, Wyoming. In addition to conducting individual studies, the researchers have committed to standardizing data collection protocol to ensure that data collected through these studies can be combined and used to inform an overarching analysis on the effects of wind energy development on sage-grouse populations.

GREATER SAGE-GROUSE MIGRATION ECOLOGY AND RESPONSE TO BENTONITE MINING IN THE BIGHORN BASIN, WYOMING: AN INTRODUCTION

AARON C. PRATT, Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY 82071, apratt3@uwyo.edu, phone 361-960-0946

JEFFREY L. BECK, Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY 82071

Abstract: Wyoming contains 70% of the world's bentonite clay deposits and mines in the Bighorn Basin produce >50% of Wyoming's annual supply. Bentonite is extracted by open-pit mining that leads to disturbance, fragmentation, and loss of sagebrush habitat. Plans call for mining to increase in sagebrush communities; therefore, our primary study objective is to monitor (for 3 years; 2011–2013) the demographic rates and habitat selection patterns of sage-grouse in an area with bentonite mining compared to a reference area without mining. We are monitoring female survival, nest success, and brood survival with radio telemetry. For males, we are attaching bands to estimate survival using mark-recapture techniques. To help guide reclamation we are sampling vegetation in microhabitat plots at nests, early-brood locations, and at paired random locations. Preliminary observations during 2011 have revealed some differences between study areas for survival and habitat selection. In the future we will evaluate habitat selection at the landscape scale and compare demographic rates of grouse in the mining study area relative to their exposure to mining. Our second study objective is describing the migration ecology of these populations using GPS-marked grouse. Observations indicate a wide variety of migratory behavior including differences between sex, proportion of each population that is migratory, timing, distance, duration, destination, and differences among seasons. We will compare the survival and reproductive success of grouse expressing different migration behaviors. Our results will help industry and agencies better conserve habitat for sage-grouse in the Bighorn Basin and in areas undergoing bentonite mining.

SHORT-TERM IMPACTS TO GREATER SAGE-GROUSE FITNESS FROM WIND ENERGY DEVELOPMENT

CHAD W. LEBEAU, Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY 82071. E-mail cwlebeau@west-inc.com, phone 307-460-1418

JEFFREY L. BECK, Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY 82071

GREGORY D. JOHNSON, Western EcoSystems Technologies Incorporated, Cheyenne, WY 82001

MATTHEW J. HOLLORAN, Wyoming Wildlife Consultants, LLC, Fort Collins, CO 80521

Abstract: Wind energy development is increasing in rangeland habitats, prompting concerns relative to impacts to avian species including the greater sage-grouse (*Centrocercus urophasianus*). Little information exists about the impacts of wind energy development on sage-grouse; however, wind energy infrastructure is likely to directly and indirectly impact sage-grouse movements because they avoid tall structures and human activities. Changing movements may equate to different habitat selection patterns, which are predicted to lead to reduced population fitness. The purpose of our study was to document fitness parameters associated with sage-grouse inhabiting areas in close proximity to wind turbines. In April 2009 and 2010, we captured *n* = 116 female sage-grouse from an impacted and reference study area Medicine Bow, Wyoming. We monitored these grouse for 2 years to evaluate nest, brood, and female survival. We used Cox proportional hazards regression to model nest, brood and female survival. We considered a suite of environmental and anthropogenic features as predictor variables to model survival. Female survival was not influenced by wind infrastructure, but nest and brood survival were both negatively affected by proximity to wind turbines. This is the first study to evaluate short-term effects of wind energy infrastructure—specifically wind turbines—on sage-grouse fitness parameters. Longer-term studies will assist in better elucidating the relative and individual effects of wind energy development on sage-grouse fitness parameters over longer time scales.

ABSTRACTS
FRIDAY JUNE 22nd, 2012

OBSERVATIONS OF SUMMER DIURNAL AND NOCTURNAL HABITAT USE AND MOVEMENT PATTERNS OF FEMALE GREATER-SAGE GROUSE IN SOUTH-CENTRAL WYOMING

JON KEHMEIER, SWCA Environmental Consultants, 295 Interlocken Boulevard, Suite 300, Broomfield, CO 80021. Email jkehmeier@swca.com, phone 303-487-1183, fax 303-487-1245

NATHAN WOJCIK, SWCA Environmental Consultants, 295 Interlocken Boulevard, Suite 300, Broomfield, CO 80021

JOSHUA J MILLSPAUGH, Department of Fisheries and Wildlife Sciences, 302 Natural Resources Building, University of Missouri, Columbia, MO 65211.

R. SCOTT GAMO, Wyoming Department of Game and Fish, 5400 Bishop Boulevard, Cheyenne, WY 82006.

MARK A. RUMBLE, U.S. Forest Service Rocky Mountain Research Station, Forest and Grassland Research Laboratory, 8221 South Highway 16, Rapid City, SD 57702.

CHRISTOPHER P. HANSEN, Department of Fisheries and Wildlife Sciences, 302 Natural Resources Building, University of Missouri, Columbia, MO 65211.

Abstract: Power Company of Wyoming LLC is developing the Chokecherry and Sierra Madre Wind Energy Project near Rawlins in Carbon County, Wyoming. As part of pre-construction monitoring efforts associated with the Project, we are investigating habitat use and demographics of female greater sage-grouse. Since spring 2010, 144 female grouse have been fitted with 30-g solar Argos/GPS PTT transmitters resulting in more than 150,000 locations. Early observations suggested that diurnal habitat use differed from nocturnal use and that hens traveled substantial distances (up to 2,500 meters) between diurnal and nocturnal use areas. While diurnal habitat use by sage-grouse has been documented, information regarding nocturnal use is lacking. High resolution vegetation data were parsed into four functional groups (sagebrush, upland grassland, mesic lowland/hay, and upland barren/sparsely-vegetated). Diurnal use of upland grassland, barren/sparsely-vegetated and mesic lowland/hay habitats did not differ. However, nocturnal use differed from diurnal use across and within all vegetation classes except sagebrush. Results indicated that use of areas with greater availability of lowland habitats and hay meadows occurred during daylight hours while grasslands and sparsely vegetated areas were used more frequently during nocturnal roosting periods. GPS locations indicated hens using hay meadows moved from several hundred up to 1,000 meters into hay meadows during diurnal foraging activities. Understanding these patterns can be used to inform siting and management decisions to minimize impacts to nocturnal use areas.

HABITAT SELECTION BY SYMPATRIC, TRANSLOCATED COLUMBIAN SHARP-TAILED AND GREATER SAGE GROUSE IN EASTERN WASHINGTON

KOURTNEY F. STONEHOUSE, School of the Environment, Washington State University, Pullman, WA 99164-6410. E-mail kourtney.stonehouse@email.wsu.edu phone 509-335-3673, fax 506-335-7862

LISA A. SHIPLEY, School of the Environment, Washington State University, Pullman, WA 99164-6410

Abstract: Columbian sharp-tailed and greater sage grouse have declined substantially in eastern Washington, primarily because of conversion of native grasslands and shrublands to croplands. In response, state and federal natural resource agencies have acquired tracts of remaining habitat, worked with private landowners to restore plant communities, and augmented and reintroduced grouse to suitable areas. We investigated spring-summer habitat use and selection by 71 sharp-tailed and 57 sage grouse translocated to historic habitat within 150 km^2 of public land. Our preliminary analyses showed that 81% of sharp-tailed grouse nested under grass, and 75% of sage grouse nested under shrubs. Likewise, grass cover was higher within 20 m of sharp-tailed grouse nests, whereas shrub cover was higher around sage grouse nests. However, the home ranges of both species, which overlapped by almost 50%, contained the greatest area of grasslands and scablands, followed by shrublands and wetlands. Home ranges of sharp-tailed grouse contained more grasslands and less scablands than those of sage grouse. However, intensity of use within the home range was similar across the 5 habitat types and between the two grouse species. Within their home ranges both species of grouse selected higher elevations, areas closer to known leks, and had the highest selection for grasslands, and an intermediate selection for both dense and open sagebrush habitats. However, wetlands were selected to a greater degree and scablands to a less degree by sharp-tailed grouse. This study will enable land managers to better plan restoration activities designed to promote sage and sharp-tailed grouse where they occur sympatrically in eastern Washington.

ASSESSING THE QUALITY OF CONSERVATION RESERVE PROGRAM LANDS AS HABITAT FOR COLUMBIAN SHARP-TAILED GROUSE AND THE ACCURACY OF LEK COUNTS OBTAINED WITH AERIAL INFRARED IMAGERY

GIFFORD L. GILLETTE Department of Fish and Wildlife Sciences, College of Natural Resources, University of Idaho, Moscow, ID 83844. E-mail giff33@hotmail.com, phone 208-405-1817.

KERRY P. REESE, Department of Fish and Wildlife Sciences, College of Natural Resources, University of Idaho, Moscow, ID 83844.

JEFFREY M. KNETTER, Idaho Department of Fish and Game, 600 S. Walnut, Boise, ID 83707.

JOHN W. CONNELLY, Idaho Department of Fish and Game, 1345 Barton Road, Pocatello, ID 83209.

Abstract: We monitored 45 Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) using VHF radio-telemetry from 8 April until 15 August 2011 in the Rockland and Curlew Valleys of SE Idaho. One of our goals was to quantify the quality of CRP lands and sagebrush (*Artemisia* spp.)-dominated rangeland as sharp-tailed grouse habitat by comparing demographic rates of sharp-tailed grouse occupying CRP lands and shrub steppe. Preliminary data suggests differential demographic rates of sharp-tailed grouse occupying CRP lands and shrub steppe. Survival was 64% (9 of 14) for sharp-tailed grouse occupying CRP lands and 77% (17 of 22) for sharp-tailed grouse occupying shrub steppe. During the nesting season we observed 22 nest attempts, 5 of which were successful (23%). Nest success was 38% in CRP vegetation (3 of 8) and 14% in shrub steppe (2 of 14). Furthermore, we monitored 14 nest attempts with videography and determined 5 nest attempts failed due to badgers, and 1 nest attempt failed due to a coyote, a long-tailed weasel, and a cow each. No nest failures were attributed to corvids during 2011. We also investigated the efficacy of lek counts obtained with aerial infrared thermal imaging. We counted 25 leks simultaneously with observers on the ground and with infrared thermal imagery from a fixed-wing airplane during April 2012. Ground observers counted an average of 13 birds per lek (range: 2-40) while an observer using infrared thermal imagery counted an average of 12 birds per lek (range: 0-33).

GUNNISON SAGE-GROUSE CAPTIVE REARING TECHNIQUES: DOMESTICALLY-REARED CHICKS FOR BROOD AUGMENTATION

LIEF A. WIECHMAN, Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, Colorado 80523. E-mail liefwiechman@hotmail.com, phone 970-232-8919.

ANTHONY D. APA, Colorado Parks and Wildlife, Northwest Region Service Center, 711 Independent Avenue, Grand Junction, Colorado 81505.

MICHAEL L. PHILLIPS, Colorado Parks and Wildlife, 317 West Prospect Road, Fort Collins, Colorado 80526.

Abstract: Gunnison sage-grouse (*Centrocercus minimus*, GUSG) are a species of concern in Colorado. Augmenting small GUSG populations is a potentially useful management tool to address conservation concerns associated with small population sizes. Alternative techniques to transplanting yearling or adult individuals are discussed in the GUSG Rangewide Conservation Plan (RCP), including the use of captive-reared GUSG. Recent Colorado Parks and Wildlife research on Greater sage-grouse (*Centrocercus urophasianus*) has evaluated different aspects of captive-rearing techniques. Our objectives were to examine the feasibility of developing captive breeding techniques for GUSG including collecting GUSG eggs (from both wild and domestically reared females), artificially incubating eggs, raising captive hatched chicks to adulthood, determining if captive GUSG would breed and initiate incubation in captivity, and finally augmenting wild surrogate broods with domestically-reared chicks at 1-, and 5-weeks of age. We collected 40 eggs in 2009, 22 in 2010, and 75 in 2011 from wild radio-marked females in the Gunnison Basin. We collected 37 eggs from our captive females in 2010 and 32 in 2011. We incubated 40 eggs in 2009, 59 in 2010, and 107 in 2011, in addition to another 15 eggs that were incubated by 3 captive females. Hatching success was 90% (36/40) in 2009. Hatching success was 83% (42/52; eggs incubated ≤ 7 days of being laid) and 43% (3/7; eggs incubated more than ≥8 days after being laid) in 2010. Hatching success was 66% (71/107) in 2011. Eleven chicks (8 female, 3 male) from 2009 were raised to adulthood and became our captive breeding flock in 2010. Bacterial infections resulted in the 22 chick mortalities in 2009, 13 in 2010, and 6 in 2011. We have a better understanding of captive breeding techniques, and have protocols in place to develop and implement a successful captive breeding program, if deemed necessary.

SURVIVAL OF GUNNISON SAGE-GROUSE CHICKS AND JUVENILES IN COLORADO

AMY J. DAVIS, Colorado State University, Department of Fish, Wildlife, and Conservation Biology, Ft.Collins, CO 80523, USA

MIKE PHILLIPS, Colorado Division of Parks and Wildlife, 317 West Prospect, Fort Collins, CO 80526, USA

PHILLIP A. STREET, Colorado State University, Department of Fish, Wildlife, and Conservation Biology, Ft.Collins, CO 80523, USA

PAUL F. DOHERTY, JR., Colorado State University, Department of Fish, Wildlife, and Conservation Biology, Ft. Collins, CO 80523, USA

Abstract: Juvenile recruitment is one of the most important vital rates influencing the population growth of many bird species. Understanding trends in juvenile recruitment is fundamental to understanding trends in the population as a whole. Gunnison Sage-grouse (Centrocercus minimus) have declined substantially from their historic range and is currently a candidate species under the U.S. Endangered Species Act. There is currently no species-specific information on juvenile recruitment rates for the Gunnison Sage-grouse. My research focused on establishing baseline juvenile recruitment rates for this species, and testing population-level, individual (i.e., hatch date, age, age of hen) and temporal hypotheses (month, year, trend over year) associated with juvenile recruitment. I compared two populations of Gunnison Sage-grouse juvenile recruitment from 2005-2010 in the Gunnison Basin population and from 2007-2010 in the San Miguel population, both in the southwest of Colorado. I evaluated chick survival (hatch-30 days of age) and juvenile survival (31 days of age to the start of the first breeding season), then combined them to evaluate juvenile recruitment. The difference in the two populations was strong in the chick survival analysis, no chicks survived to 30 days of age in San Miguel (n=8). Chick survival was 0.52 (SE=0.08) in Gunnison Basin (n=282). Thus there was no recruitment in San Miguel. There was a slight negative trend in chick survival and a stronger negative trend in juvenile survival from 2005-2010 in Gunnison Basin. Juvenile survival ranged from 0.60 (SE=0.12) in 2005 to 0.11 (SE=0.06) in 2010 (n=87). The overall juvenile recruitment rate in Gunnison Basin declined from 0.38 (SE=0.09) in 2005 to 0.05 (SE=0.03) in 2010.

EVALUATING THE EFFECTS OF TREATMENTS WITHIN A ROTATIONAL GRAZING SYSTEM ON GREATER SAGE-GROUSE

LORELLE I. BERKELEY, Montana Fish, Wildlife, and Parks, 2300 Lake Elmo Drive, Billings, MT 59105. E-mail lberkeley@mt.gov, phone 406-850-9055, fax: (406) 248-5026.

JOE SMITH, The University of Montana, 32 Campus Drive, Missoula, MT 59812.

Abstract: The determination of endangered species status for greater sage-grouse *Centrocercus urophasianus*) is scheduled to occur in 2015. Private lands in the West contain 30% of the 48 million ha of sage-grouse habitat (including key breeding areas); thus, this decision greatly impacts ranching, the most prominent land use in the world. The Natural Resource Conservation Service has created the Sage-Grouse Initiative (SGI) program to help ranchers implement best known grazing management practices to benefit sage-grouse and attempt to prevent the isting. Although many resources are being funneled into the SGI systems, no study to date has evaluated the direct impacts of these systems on sage-grouse habitat or population dynamics. Our goal is to evaluate the effects of treatments within the SGI rotational grazing system on sage-grouse vital rates and habitats, and inform grazing practices by recommending modifications that can benefit sage-grouse. Recent research shows that hen survival, nest success, and chick survival are the three most important vital rates influencing sage-grouse population growth, and are thus measured in this study using radiotelemetry. The first year of data collection for this long-term study is complete. Hen survival (70% in summer, 90% in fall, 84% in winter) is lower than previously published rates in similar areas. Nest success (28%) is also lower than previously published rates. Out of 23 radio-marked chicks, 3 survived until their radio-mark expired. Rested pastures show increased height and density of vegetation (visual obstruction) and ground cover relative to un-rested pastures.

IMPORTANCE OF WITHIN YEAR REPEATED LEK COUNTS AND HIGHLY CORRELATED POPULATION CYCLES

BRAD FEDY, Natural Resource Ecology Laboratory, Colorado State University, in cooperation with U.S. Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Bldg. C, Fort Collins, CO 80526, USA. E-mail: bcfedy@gmail.com, phone: 970-226-9456, fax: 970-226-9230.

CAMERON ALDRIDGE, Department of Ecosystem Sciences and Natural Resource Ecology Laboratory, Colorado State University, in cooperation with U.S. Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Bldg. C, Fort Collins, CO 80526, USA.

KEVIN DOHERTY, United States Fish and Wildlife Service, Bismarck, ND 58501, USA.

Abstract: Long-term population monitoring is the cornerstone of animal conservation and management. The greater sage-grouse (*Centrocercus urophasianus*) is a species of concern that has been monitored over decades, primarily, by counting the number of males that attend lek sites. Lek count data have been used to assess population trends and for multiple mechanistic studies. However, some studies have questioned the efficacy and accuracy of lek counts. We assessed the influence of counting leks multiple times within a season on model accuracy and precision by applying generalized additive models to describe trends over time. We developed a population trend model for Wyoming greater sage-grouse that captured the cyclic nature of this species. Animal species across multiple taxa demonstrate multi-annual population cycles. Correlated population cycles between species that do not share a predator–prey relationship are particularly intriguing and challenging to explain. We investigated population trends of greater sage-grouse and cottontail rabbits (*Sylvilagus* sp.) to explore the possibility of correlations between unrelated species. We showed that greater sage-grouse and cottontails have highly correlated cycles. The observed level of highly correlated long-term cycling has not previously been documented between two non-related species, over a long time-series, very large spatial scale, and within more southern latitudes. Our results validate the combination of monitoring data collected under different protocols—provided the studies are addressing large-scale questions. We suggest that a larger sample of individual leks is preferable to multiple counts of a smaller sample of leks. Furthermore, we demonstrate the functional value of indices for tracking broad-scale fluctuations in the species.

A PILOT STUDY TO DETERMINE THE EFFECTIVENESS OF AERIAL THERMAL VIDEOGRAPHY FOR IDENTIFYING SAGE GROUSE IN SOUTH-CENTRAL WYOMING

TERRY E. CREEKMORE, Wyoming Game and Fish, 528 South Adams Street, Laramie, WY 82070. E-mail terry.creekmore@wyo.gov, phone 307-745-4046, fax 307-745-8720

JOHN ROMERO, Owyhee Air Research, Inc., 3305 Airport Road, Nampa, ID 83687

WILL SCHULTZ, Wyoming Game and Fish, 10 Antelope Hills, Saratoga, WY 82331

BRUCE GREENHALGH, Owyhee Air Research, Inc., 3305 Airport Road, Nampa, ID 83687

Abstract: We investigated the efficacy of using a thermal imaging FLIR® video camera mounted on a fixed wing aircraft to locate and count sage grouse (*Centrocercus urophasianus*) in south-central Wyoming. During April 2012 we conducted flights to determine the optimal altitude for locating and counting sage grouse, determine if an accurate count of sage grouse on leks can be obtained and evaluate the efficacy of using thermal imagery to locate new or existing leks. We were able to locate sage grouse at a lateral distance of up to 1.2 km and an altitude of 305 meters using the FLIR® thermal camera. Our ability to obtain accurate counts of sage grouse on leks was heavily influenced by the increased thermal loading of the environment during warm sunny mornings. The thermal imaging system was able to effectively locate sage grouse leks when transects were flown on a 0.8 km spacing at an altitude of 305 meters. In its present configuration, thermal imaging has immediate application for identifying new leks or determining the status of unknown leks.

QUANTIFYING OBSERVER EFFECTS ON GREATER SAGE-GROUSE NEST SURVIVAL

DANIEL V. NONNE, Program in Ecology, Evolution and Conservation Biology. Department of Natural Resource and Environmental Sciences. University of Nevada, Reno. Reno, NV, 89557. Email: dnonne@gmail.com

ERIK J. BLOMBERG, Program in Ecology, Evolution and Conservation Biology. Department of Natural Resource and Environmental Sciences. University of Nevada, Reno. Reno, NV, 89557.

MICHAEL T. ATAMIAN, Washington Department of Fish and Wildlife. Spokane, WA, 99216.

JAMES S. SEDINGER, Department of Natural Resource and Environmental Sciences. University of Nevada, Reno. Reno, NV, 89557.

Abstract: Poor nest survival has been implicated in the range-wide declines in greater sage-grouse (*Centrocercus urophasianus)* populations. Previous research has suggested that nest success is influenced by factors including habitat quality, individual heterogeneity, and disturbance. Additionally, there are concerns that observers visiting nests decreases nest survival. Our goal was to quantify the effect of nest visitation and of flushing sage-grouse from nests. We radio-marked female sage-grouse during the spring on leks and in late summer on brood rearing habitat in Eureka County NV, from 2005-2011. Nest survival models were constructed in Program MARK using data from 343 nests, where we considered the impacts of nest visitation while controlling for other sources of temporal and spatial variation. Preliminary results supported a negative interaction between flushing a hen from a nest and when the hen was radio-marked but overall observer impacts on nest survival were minimal. Daily nest survival was lower the day after being flushed compared to days in when hens were not flushed for females captured in the late summer (0.734 vs. 0.941), however we did not find a similar result for females captured during spring (0.944 vs. 0.956). Additionally, overall nest survival probability of a nest flushed once (0.159) was not significantly different than a nest that was not flushed (0.166). Finally, there was little support for an effect of visitation without flushing the female, on nest survival (β: 0.069, 95% C.I.-0.147−0.279). This analysis suggests that observer effects on nest survival are minimal and are potentially correlated with female quality.

ABSTRACTS
POSTERS

FLAT TOP MOUNTAIN GUNNISON SAGE-GROUSE HABITAT MONITORING STUDY

MATT VASQUEZ, USDA Forest Service, Gunnison Ranger District, 216 N. Colorado St., Gunnison, CO 81230. E-mail mgvasquez@fs.fed.us, phone 970-642-4401.

SUZANN PARKER, USDA Forest Service, Gunnison Ranger District, 216 N. Colorado St., Gunnison, CO 81230.

Abstract: The Grand Mesa, Uncompahgre and Gunnison National Forests manage 86,732 acres of occupied Gunnison Sage-Grouse habitat, comprising 11% of the overall occupied habitat throughout the species' range. During the fall of 2007, we conducted prescribed burning within a mesic mountain big sagebrush ecosystem and mountain loam ecological site, on Flat Top Mountain in the Ohio Creek valley northwest of Gunnison, CO. The intent of the burn was to meet multiple use management objectives, with a primary objective of increasing big game and livestock forage and animal distribution on the landscape. In implementing the burn, the Forest Service followed the guidelines from the Gunnison Sage-Grouse Rangewide Conservation Plan. The intent was to increase vegetation structural diversity and composition, thus potentially creating or enhancing brood-rearing habitat by increasing forb and grass cover. Another goal was to maintain and enhance several lek sites. Prescribed burning was implemented in a mosaic, burning approximately 35% of sagebrush habitat within the project area. In May 2010, we began a long-term Gunnison Sage-Grouse habitat monitoring study within this prescribed burned landscape, and within an adjacent unburned landscape (control). Using scientific methods consisting of line transect sampling and Daubenmire plots, we are implementing long-term Gunnison Sage-Grouse habitat monitoring to monitor habitat trends over time and assess habitat conditions as they relate to the habitat guidelines outlined in the Rangewide Conservation Plan. This preliminary report summarizes the first year of baseline data collection.

EFFECTS OF JUNIPER ENCROACHMENT ON SAGE-GROUSE LEK TRENDS AND OCCUPANCY IN EASTERN OREGON

JOHN P. SEVERSON, Department of Fish and Wildlife Resources, P.O. Box 441136, University of Idaho, Moscow, ID 83844. Seve0951@vandals.uidaho.edu , phone 618-559-2955.

JEFFREY S. EVANS, The Nature Conservancy, Central Science/Conservation Lands, Environment and Natural Resources, University of Wyoming, Laramie, WY 82070.

KERRY P. REESE, Department of Fish and Wildlife Resources, P.O. Box 441136, University of Idaho, Moscow, ID 83844.

CHRISTIAN A. HAGEN, Department of Fisheries and Wildlife, Oregon State University, Bend, OR 97702.

DAVID NAUGLE, Wildlife Biology Program, University of Montana, Missoula, MT 59812.

JEREMY MAESTAS, USDA-NRCS, 625 SE Salmon Ave., Redmond, OR 97756.

Abstract: It has been clearly illustrated that greater sage-grouse have experienced range-wide declines due to numerous factors associated with anthropogenic disturbance. However, the distribution of western juniper (*Juniperus occidentalis*) has increased ~10-fold since European settlement, but little is known about how juniper can impact sage-grouse populations. We mapped individual tree locations over 6-million acres in eastern Oregon using 2011 high-resolution imagery and a wavelet convolution model. Utilizing non-parametric and spatial statistical approaches, we analyzed increasing/decreasing trends of lek counts and occupancy. We used canopy density and spatial configuration, disturbance and landform metrics as covariates across several spatial scales to model these responses. Results demonstrate that density and configuration of juniper influence lek counts at a few key spatial-scales. Our results will give managers a better understanding of how juniper distribution can effect sage-grouse populations and provide guidance on the prioritization of habitat restoration.

THE EFFECT OF FENCES ON GREATER SAGE-GROUSE WITHIN TWO SMALL POPULATIONS IN SOUTHWESTERN UTAH

HEATHER H. MCPHERRON, Department of Wildland Resources, Utah State University, 5230 Old Main Hill Logan, UT 84322. Email heather.mcpherron@gmail.com, phone 865.680.4670, fax 435.797.3796.

S. NICKI FREY, Utah State University Extension/J.H. Berryman Institute, Southern Utah University, 351 West Center Cedar City, UT 84720.

Abstract: We investigated how fences might contribute to the mortality of greater sage-grouse (*Centrocercus urophasianus*) during all major seasons for the grouse (breeding, brood-rearing, fall, and winter) in two small populations in southwestern Utah - Hamlin Valley and the Bald Hills. During 2011 and 2012, 100 randomly selected 1-kilometer sections of fences were surveyed once in the brood-rearing, fall, and winter seasons. During these surveys, we located three avian and one bat collision, none of which were identified as sage-grouse. During the breeding season (i.e. lek attendance), all fences within a 2.5-kilometer radius of the lek were surveyed twice with no collisions observed. These results suggest that fence collisions in these two populations of sage-grouse are occurring at rates lower than can be detected in all seasons. While marking fences has been shown to reduce collision in other populations and is not being rejected as a means of conserving sage-grouse in these populations; results from this study indicate that, in an effort to improve grouse populations in southern Utah, it may not be cost effective to focus management efforts on modifying existing fences to reduce grouse fenceline mortality. However, future work to be conducted in summer 2012 will focus on evaluating the characteristics of avian predators (raptors and ravens) use of fences in sage-grouse habitat and the overall habitat usage of sage-grouse within Hamlin Valley. These results will be instrumental in improving location and structure of new and proposed fences in order to reduce avian predator activity in sage-grouse habitat.

FACTORS INFLUENCING THE ECOLOGY OF GREATER SAGE-GROUSE ON THE BEAR LAKE PLATEAU AND VALLEY, IDAHO-UTAH

CASEY J. CARDINAL, Department of Wildland Resources, Utah State University, 5230 Old Main Hill, Logan, UT 84322. E-mail casey.cardinal@gmail.com, phone 715-641-2586.

TERRY A. MESSMER, Department of Wildland Resources, Utah State University, 5230 Old Main Hill, Logan, UT 84322.

JOHN W. CONNELLY, Idaho Department of Fish and Game, Southeast Region, 1345 Barton Road, Pocatello, ID 83204.

Abstract: Greater sage-grouse (*Centrocercus urophasianus*, hereafter sage-grouse) was designated as a candidate species in March 2010 by the U.S. Fish and Wildlife Service. Lack of effective regulatory mechanisms to protect the species across jurisdictional boundaries and habitat loss were singled out as two major range-wide sage-grouse conservation threats. Addressing these concerns may require more information about the ecology of specific meta-populations that inhabitat multiple jurisdictions. Little is known about the ecology, seasonal movements, and cover type use patterns of the sage-grouse populations that inhabit the Bear Lake Plateau and Valley relative to existing or potential land uses for application to management. This meta-population may occupy habitat in Idaho, Utah, and Wyoming. The purpose of this research is to document meta-population vital rates, seasonal distributions and habitat-use patterns; determine if differences observed in movement and habitat-use patterns are related to sex, age class, or land-use; and evaluate if natural and anthropogenic land-use patterns may contribute to habitat loss and fragmentation of sage-grouse habitats. Radio-collared sage-grouse representative of this population will monitored from March 2010 until September 2012 to collect data on habitat use and movements and vital rates relative to land uses, nest and brood sites vegetation structure and potential relationships to success, and mortality factors. This research will define sage-grouse core use areas to mitigate the effects of habitat loss and fragmentation on the Bear Lake Plateau and Valley sage-grouse meta-population. This research will be critical to the development of an interstate sage-grouse plan between Idaho, Utah, and Wyoming.

GREATER SAGE-GROUSE ECOLOGY AND RESPONSE TO GREENSTRIPPING WITH FORAGE KOCHIA IN WEST BOX ELDER COUNTY, UTAH

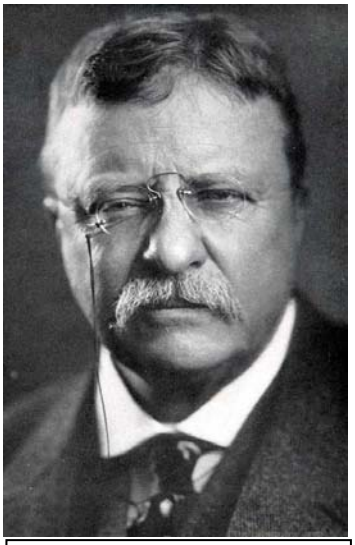
STEPHANIE GRAHAM Department of Wildland Resources, Utah State University, Logan, UT 84322. E-mail stephanie.graham@aggiemail.usu.edu, phone 713-724-6792.

TERRY A. MESSMER, Department of Wildland Resources, Utah State University, Logan, UT 84322.

Abstract: Population declines of Greater sage-grouse (*Centrocercus urophasianus*) have been largely attributed to habitat loss and fragmentation directly related to anthropogenic activities. These activities have increased the risk of habitat loss due to wildfires and subsequent spread of invasive plant species. Vegetation manipulations, including the use of green-stripping, have been identified as potential strategies to mitigate the risks of wildfire and enhance sage-grouse habitat in areas that are susceptible to wildfire. The purpose of this research was to determine the effect of prescribed vegetation manipulations (green-stripping through chain harrowing, juniper mastication, seeding forage kochia, applying Plateau herbicide) on sagebrush steppe plant composition and how these changes affect sage-grouse habitat-use patterns and vital rates. Pre-treatment vegetation and sage-grouse habitat-use and vital rate studies were conducted in spring and summer 2010. Post-treatment studies were conducted in 2011-2012. Sage-grouse were trapped, fitted with radio-collars, and monitored for the duration of the study. Data collected includes vegetation structure and composition at use-sites, random sites, nest and brood sites, and mortality sites. Data was analyzed to determine changes in vegetation and sage-grouse use across treatment and buffer zones. Nest and brood success, as well as survival rates were analyzed. Distance sampling of pellets was conducted to determine grouse use of treatment and control areas. Fecal pellets were chemically analyzed for evidence of grouse incorporating forage kochia into their diet. This research will provide managers with important insights regarding the use of vegetation manipulations to protect and restore sagebrush-steppe habitat for sage-grouse.

Thursday Banquet Speaker
Former President Theodore Roosevelt
(as portrayed by Case Hicks)

Some of Theodore Roosevelt's (TR) greatest accomplishments were in conservation. In 1905, President Roosevelt formed the United States Forestry Service and appointed Gifford Pinchot as the first chief of this new agency. During Roosevelt's time as President, the forest reserves in the U.S. went from approximately 43-million acres to about 194-million acres.



Theodore Roosevelt – 26th President of the United States

As President, he signed legislation that established five national park units: Crater Lake, Oregon; Wind Cave, South Dakota; Sullys Hill, North Dakota (later designated a game preserve); Mesa Verde, Colorado; and Platt, Oklahoma (now part of the Chickasaw National Recreation Area). By the end of 1906, Roosevelt had proclaimed four national monuments: Devil's Tower, Wyoming; El Morro, New Mexico; Montezuma Castle, Arizona; and the Petrified Forest, Arizona. He also protected a large portion of the Grand Canyon as a national monument in 1908.

The Antiquities Act of June 8, 1906 had an even broader effect. Although the Act did not create a single park, it allowed Roosevelt and his successors to proclaim "historic landmarks, historic or prehistoric structures, and other objects of historic or scientific interest" in federal ownership as national monuments. As President he created 150 National Forests, 51 Federal Bird Refuges, 5 National Parks, and 18 National Monuments. (Reproduced in part from http://www.nps.gov/history/logcabin/html/tr3.html)
TR was also an avid sportsman and hunter:

"*In a civilized and cultured country, wild animals only continue to exist at all when preserved by sportsmen. The excellent people who protest against all hunting and consider sportsmen as enemies of wildlife are ignorant of the fact in reality the genuine sportsman is by all odds the most important factor in keeping the larger and more valuable wild creatures from total extermination."*

"I recognize the right and duty of this generation to develop and use the natural resources of our land; but I do not recognize the right to waste them, or to rob, by wasteful use, the generations that come after us."

-Theodore Roosevelt, Osawatomie, Kansas, August 31, 1910

"Defenders of the short-sighted men who in their greed and selfishness will, if permitted, rob our country of half its charm by their reckless extermination of all useful and beautiful wild things sometimes seek to champion them by saying the 'the game belongs to the people.' So it does; and not merely to the people now alive, but to the unborn people. The 'greatest good for the greatest number' applies to the number within the womb of time, compared to which those now alive form but an insignificant fraction. Our duty to the whole, including the unborn generations, bids us restrain an unprincipled present-day minority from wasting the heritage of these unborn generations. The movement for the conservation of wild life and the larger movement for the conservation of all our natural resources are essentially democratic in spirit, purpose, and method."

— Theodore Roosevelt

Case Hicks

Greetings from beautiful Alabama! Since 1996, I have been portraying & educating about "T.R." for various interests & events. My passion & focus as a living historian is two-fold: to celebrate the "Strenuous Life" & "Bully" times of Theodore Roosevelt & to educate about this extraordinary American.

Case Hicks as President Roosevelt

In physical likeness I share an unusual resemblance to "T.R." I have the period accurate clothing for various stages of his adult life including his "Rough Rider" uniform. Authenticity & accuracy are emphasized in my Theodore Roosevelt portrayals. All events are performed in character, in costume and in context of historical accuracy. As a living historian of Theodore Roosevelt, I offer an extensive variety of services including: public/keynote and/or motivational speaker; educator; event host or coordinator. Past events include various museums, schools, historical interests & national parks in Colorado, Texas, New Mexico, Arkansas, Mississippi & South Dakota among others. I have also provided historical interpretation of T.R. for the Menger Hotel at San Antonio, TX & served as historian for the Hotel Colorado at Glenwood Springs, CO

I was born in 1960 at Gunnison, Colorado. Formative years were guided by the influence of my Grandfather Harvey Hicks. "Granddaddy" as we all called him had an affinity for me early on. When occasioned to be together, I was "…the watch in his pocket…". What was good enough for Granddaddy was right by and for me.

During the summer of 1967, while at lunch in Crested Butte, Granddaddy said something akin to "Teddy Roosevelt was a good man". I took an interest at the age of seven and began learning about this man. On my grandparents' porch at Gunnison were stacks of Reader's Digest & National Geographic magazines. The books and magazines about hunting & fishing were gleaned for information about Teddy Roosevelt. From that time forward, throughout the years in Primary school, Jr & Sr. High, all of my book reports & studies had T.R. as a focal point. The interest in T.R. served me well.

Some years later my younger sister, Charlotte, approached me with, "Hey, you've grown up to look like your hero." (verbatim) A comment of compliment with an underlying meaning which I later learned. She asked me to perform for her DAR group at Glenwood Springs at the Hotel Colorado where T.R. based his 1905 Spring bear & cougar hunt from. I spoke for the DAR ladies thinking that this was little more than a lark. At the end of the performance the Hotel Colorado Staff sought me out and asked if I would be interested in performing for special events at the hotel. The rest, to quote Paul Harvey, is history. Within 18 months I was invited to portray T.R. for the Menger Hotel at San Antonio for the Rough Rider Centennial. And the rest is history…

Since 1996, I have performed in most of the states of the West. Additionally throughout the U.S. in Mississippi, Arkansas, West Virginia, Delaware South Dakota, and Missouri. I have had the distinct privilege of performing at Mt. Rushmore National Memorial, Wind Cave National Park, White River NWR, and many other venues.

Truly, I am the most fortunate of men to be a living historian of Theodore Roosevelt.
The above information was extracted from Mr. Hicks' website. If you would like to learn more about Mr. Hicks please visit his website at http://www.roughriderpresident.com/Home_Page.html

Robert L. Patterson Award

The Robert L. Patterson Award was established in honor of his strong commitment to the conservation of sage-grouse and his seminal work, *The Sage Grouse in Wyoming,* published in 1952. The award recognizes outstanding individuals and organizations that have worked to conserve and manage Gunnison and greater sage-grouse and Columbian sharp-tailed grouse. The first Patterson Award was presented to Clait E. Braun (retired from Colorado Division of Wildlife), at the 26th Western Agencies Sage and Colombian Sharp-tailed Grouse Workshop in Mammoth Lakes California, June 2008. The award was presented to Randall B. Smith and John W. Connelly of the Idaho Department of Fish and Game in Twin Falls, Idaho, June 2010.

Acknowledgements

We greatly appreciate everyone who has contributed time and effort into making this workshop a success.

We would like to specifically thank:

All Workshop Speakers

The Workshop Committee

Kathy Griffin, Tony Apa, Mike Phillips, Brett Walker, and Liza Rossi, Colorado Parks and Wildlife; Brandon Miller, Rocky Mountain Bird Observatory/NRCS/Colorado Parks and Wildlife; Robin Sell, Colorado BLM; Julie Sarazin Grode, U.S. Forest Service; Pat Deibert, U.S. Fish and Wildlife Service; and Scott Gardner, California Fish and Game

Field Trip Guides

Kathy Griffin, Colorado Parks and Wildlife
Brad Petch, Colorado Parks and Wildlife
Brandon Miller, Rocky Mountain Bird Observatory/NRCS/Colorado Parks and Wildlife
Jeff Yost, Colorado Parks and Wildlife
Liza Rossi, Colorado Parks and Wildlife
Jim Haskins, Colorado Parks and Wildlife
Brian Holms, Colorado Parks and Wildlife
Forrest Luke, Trapper Mine
Rick Hoffman, Retired, Colorado Parks and Wildlife

Thank you to the landowners that graciously shared their private property on the tours: Ken Adler, Kurt Frentress, Ralph Baird, Tom Gillian, Ranch Manager, Ray Owens, Dean Visintainer, and Trapper Mine.

Artwork

The artwork on the cover are John James Audubon prints of sage grouse and sharp-tailed grouse. All artwork on the registration supplies was graciously provided by Brian Maxfield. Thank you Brian!

Registration/PayPal Management/Typist

Ann Apa

WORKSHOP
REGISTRANTS

James Dwyer
EDM International, Inc.
4001 Automation Way
Fort Collins, CO 80525
970-204-4001 jdwyer@edmlink.com

Steve Abele
U.S. Fish and Wildlife Service
1340 Financial Blvd. Suite 234
Reno, NV 89502
775-861-6325 steve_abele@fws.gov

Gene Abram
Colorado Parks and Wildlife
P.O. Box 523
Kremmling, CO 80459
970-724-3372 gene.abram@state.co.us

Cameron Aldridge
Colorado State University & USGS
2150 Centre Avenue, Bldg C
Fort Collins, CO 80526
970-226-9433 cameron.aldridge@colostate.edu

Anthony Apa
Colorado Parks and Wildlife
711 Independent Ave
Grand Junction, CO 81505
970-255-6196 tony.apa@state.co.us

Michael Atamian
Washington Department of Fish and Wildlife
2315 North Discovery Place
Spokane Valley, WA 99216
509-892-1001 x 327 michael.atamian@dfw.wa.gov

Desa Ausmus
Bureau of Land Management-CO
455 Emerson Street
Craig, CO 81625
970-826-5019 dmausmus@gmail.com

Trevor Balzer
Colorado Parks and Wildlife
711 Independent Ave
Grand Junction, CO 81505
970-255-6141 trevor.balzer@state.co.us

Harry Barber
Bureau of Land Management-UT
6895 HWY 89-A
Kanab, UT 84741
435-691-6630 hbarber@blm.gov

Noah Bates
RMBO, NRCS, PFW, IWJV
P.O. Box 751
Kremmling, CO 80459
970-724-3456 noah.bates@co.usda.gov

Jon Belak
Defenders of Wildlife
355 6th Avenue
Longmont, CO 80501
720-203-1964 j.belak@gmail.com

Lorelle Berkeley
Montana Fish, Wildlife, and Parks
101 11th Aveune W
Roundup, MT 59072
406-850-9055 lberkeley@mt.gov

Chad Bishop
Colorado Parks and Wildlife
317 West Prospect Road
Fort Collins, CO 80526
970-472-4335 chad.bishop@state.co.us

Todd Black
Utah State University
5230 Old Main Hill
Logan, UT 84322
435-770-9302 todd.black@usu.edu

Kurtis Blunt
Colowyo Coal Company L.P.
5731 State Highway 13
Meeker, CO 81641
970-824-1531 kurtis.blunt@riotinto.com

Joe Bohne
Wyoming Game & Fish Department
P.O. Box 3056
Alpine, WY 83128
307-654-7865 joe.bohne@wyo.gov

Jessica Brauch
Colorado State University
Dept. Fish and Wildlife, CSU
Fort Collins, CO 80523
402-202-6865 jbrauch@rams.colostate.edu

Dave Budeau
Oregon Department of Fish and Wildlife
3406 Cherry Avenue NE
Salem, OR 97303
503-947-6323 david.a.budeau@state.or.us

A. Cheyenne Burnett
Utah State University
5230 Old Main Hill
Logan, UT 84322
415-717-6597 cheyburnett@gmail.com

Nicole Byrnes
Encana Oil & Gas
370 17th St, Suite 1700
Denver, CO 80202
303-623-2300 nicole.byrnes@encana.com

Pepper Canterbury
Colorado Parks and Wildlife
P.O. Box 264
Walden, CO 80480
970-819-6741 pepper.canterbury@state.co.us

Casey Cardinal
Utah State University
5230 Old Main Hill
Logan, UT 84322
715-641-2586 casey.cardinal@gmail.com

Reneé Chi
U.S. Fish and Wildlife Service
2369 W Orton Circle, Suite 5
West Valley City, UT 84119
801-975-3330 x 135 renee_chi@fws.gov

Tom Christiansen
Wyoming Game & Fish Dept.
351 Astle Avenue
Green River, WY 82935
307-875-3223 tom.christiansen@wyo.gov

Cam Collins
Bureau of Land Management-NV
3900 East Idaho Street
Elko, NV 89801
775-753-0238 ccollins@blm.gov

Chris Colt
U.S. Forest Service
4350 Cliffs Drive
Pocatello, ID 83204
208-881-1975 ccolt@fs.fed.us

Michelle Commons-Kemner
Idaho Department of Fish and Game
3101 S Powerline Road
Nampa, ID 83686
208-484-6628 michelle.commons@idfg.idaho.gov

Avery Cook
Utah State University
5230 Old Main Hill
Logan, UT 84322
505-681-6095 aacook@gmail.com

Holly Copeland
The Nature Conservancy
60 Juniper Drive
Lander, WY 82520
307-335-2129 hcopeland@tnc.org

Michelle Cowardin
Colorado Parks and Wildlife
P.O. Box 201
Hot Sulphur Springs, CO 80451
970-725-6212 michelle.cowardin@state.co.us

Terry Creekmore
Wyoming Game and Fish Department
528 South Adams
Laramie, WY 82070
307-745-4046 terry.creekmore@wyo.gov

Matt Cummings
Encana Oil & Gas
370 17th St, Suite 1700
Denver, CO 80202
303-623-2300 matt.cummings@encana.com

Jason D. Robinson
Utah Division of Wildlife Resources
1594 West North Temple
Salt Lake City, UT 84114
801-707-1508 jasonrobinson@utah.gov

Jacob Davidson
Colorado Parks and Wildlife
711 Independent Ave
Grand Junction, CO 81505
970-255-6177 jacob.davidson@state.co.us

Patricia Deibert
U.S. Fish & Wildlife Service
5353 Yellowstone Rd Suite 308A
Cheyenne, WY 82009
307-772-2374 x 226 pat_deibert@fws.gov

Jodie Delavan
U.S. Fish and Wildlife Service
2600 SE 98th Ave. Ste. 100
Portland, OR 97266
503-231-6179 jodie_delavan@fws.gov

Jesse D'Elia
U.S. Fish and Wildlife Service
911 NE 11th Avenue
Portland, OR 97232
503-231-2349 jesse_delia@fws.gov

Seth Dettenmaier
Utah State University
5230 Old Main Hill
Logan, UT 84322
435-740-1928 sethd@live.com

Josh Dilley
Colorado Parks and Wildlife
P.O. Box 70
Walden, CO 80480
970-819-6834 josh.dilley@state.co.us

Danielle Domson
Colorado Parks and Wildlife
P.O. Box 775777
Steamboat Springs, CO 80477
970-846-3056 danielle.domson@state.co.us

Lily Douglas
Bureau of Land Management-CA
2800 Cottage Way, W-1623
Sacramento, CA 95825
916-978-4677 ldouglas@blm.gov

Orrin Duvuvuei
Utah State University
5230 Old Main Hill
Logan, UT 84322
614-565-1862 orrin.duvuvuei@gmail.com

Karin Eichhoff
Colorado Parks and Wildlife
317 West Prospect Road
Fort Collins, CO 80526
970-472-4326 karin.eichhoff@state.co.us

Daniel Emmett
Bureau of Land Management-UT
170 S 500 E
Vernal, UT 84078
435-781-3414 demmett@blm.gov

Shawn Espinosa
Nevada Department of Wildlife
1100 Valley Road
Reno, NV 89511
775-688-1523 sespinosa@ndow.org

Brad Fedy
CSU/USGS
2150 Centre Avenue, Bldg C
Fort Collins, CO 80524
970-226-9456 fedyb@usgs.gov

Tonia Folks
Colowyo Coal Company L.P.
5731 State Highway 13
Meeker, CO 81641
970-824-1531 tonia.folks@riotinto.com

Jennifer Forbey
Boise State University
1910 University Drive
Boise, ID 83725
208-426-4426 jenniferforbey@boisestate.edu

Eric Freels
Bureau of Land Management-CO
29211 HWY 184
Dolores, CO 81323
970-882-6853 efreels@blm.gov

Colin G. Leingang
Department of the Army, JBLM Yakima Training Center
8181 North Wenas Road
Selah, WA 98942
509-985-9587 jlein49357@elltel.net

Seth Gallagher
Rocky Mountain Bird Observatory
230 Cherry Street
Fort Collins, CO 80521
970-482-1707 x 12 sethgallagher@rmbo.org

Scott Gamo
Wyoming Game & Fish Department
5400 Bishop Blvd.
Cheyenne, WY 82006
307-777-4509 scott.gamo@wyo.gov

Scott Gardner
California Deparment of Fish and Game
1812 9th Street
Sacramento, CA 95628
916-801-6257 sgardner@dfg.ca.gov

Lynn Gemlo
U.S. Fish and Wildlife Service
5353 Yellowstone Rd., Suite 308A
Cheyenne, WY 82009
307-772-2374 x 228 lynn_gemlo@fws.gov

Gifford Gillette
University of Idaho
2285 Horizon Drive
Pocatello, ID 83201
208-539-0936 giff33@hotmail.com

Jessica Gonzales
U.S. Fish and Wildlife Service
215 Melody Lane, Suite 103
Wenatchee, WA 98801
509-665-3508 x 16 jessica_gonzales@fws.gov

Stephanie Graham
Utah State University
5230 Old Main Hill
Logan, UT 84322
713-724-6792 stephg0809@gmail.com

Michael Gregg
U.S. Fish and Wildlife Service
64 Maple Street
Burbank, WA 99323
509-942-8185 mike_gregg@fws.gov

Kathleen Griffin
Colorado Parks and Wildlife
711 Independent Ave
Grand Junction, CO 81505
970-255-6146 kathy.griffin@state.co.us

Tim Griffiths
Natural Resources Conservation Service
125 Wenkuuni Lane
Three Forks, MT 59752
406-600-3908 tim.griffiths@mt.usda.gov

Natasha Gruber
Utah State University
375 S 350 W
Vernal, UT 84078
970-629-3197 natasha.gruber@gmail.com

Tony Gurzick
Colorado Parks and Wildlife
415 Turner Drive
Durango, CO 81303
970-375-6750 tony.gurzick@state.co.us

James M. Haskins
Colorado Parks and Wildlife
P.O. Box 775777
Steamboat Springs, CO 80477
970-871-2842 jim.haskins@state.co.us

Tom Hemker
Idaho Department of Fish and Game
P.O. Box 25
Boise, ID 83703
208-287-2749 tom.hemker@idfg.idaho.gov

Jennifer Hess
Hayden-Wing Associates
2308 South 8th Street
Laramie, WY 82072
307-742-5440 jenn@haydenwing.com

Rick Hoffman
Colorado Parks and Wildlife - Retired
1804 Wallenberg Drive
Fort Collins, CO 80526
970-484-5154 rick-hoffman@comcast.net

Brian Holmes
Colorado Parks and Wildlife
P.O. Box 1181
Meeker, CO 81641
970-878-6063 brian.homes@state.co.us

Anthonie M. Holthuijzen
Idaho Power Company
1221 West Idaho
Boise, ID 83702
208-388-2352 tholthuijzen@idahopower.com

Doug Homan
Crawford GUSG Working Group
8896 Cottonwood Lane
Hotchkiss, CO 81419
970-872-2175 doug.homan3@gmail.com

Terry Ireland
U.S. Fish and Wildlife Service
764 Horizon Drive Bldg B
Grand Junction, CO 81506
970-243-2778 x 16 terry_ireland@fws.gov

Erik J. Blomberg
University of Nevada, Reno
1415 Lander Street
Reno, NV 89509
775-622-2137 ejblomberg@gmail.com

Aaftab Jain
U.S. Forest Service
P.O. Box 7
Yampa, CO 80483
970-638-4175 lduerksen@fs.fed.us

Wayne Jipsen
Natural Resources Conservation Service
2738 Crossroads Blvd. Suite 104
Grand Junction, CO 81501
970-640-2695 wayne.jipsen@co.usda.gov

Heather Johnson
US Fish & Wildlife Service
134 Union Blvd
Lakewood, CO 80228
303-236-4316 heather_johnson@fws.gov

Becky Jones
U.S. Forest Service
P.O. Box 880615
Steamboat Springs, CO 80488
970-870-2230 beckyjones@fs.fed.us

Chris Keefe
Bureau of Land Management-WY
5353 Yellowstone Rd.
Cheyenne, WY 82009
307-775-6101 ckeefe@blm.gov

Jon Kehmeier
SWCA Environmental Consultants
295 Interlocken Blvd, Suite 300
Broomfield, CO 80021
303-487-1183 jkehmeier@swca.com

Don Kemner
Idaho Department of Fish and Game
P.O. Box 25
Boise, ID 83707
208-287-2748 don.kemner@idfg.idaho.gov

Chris Kirol
University of Wyoming
911 Emerson Street
Sheridan, WY 82801
307-751-5455 ckirol@uwyo.edu

Jeffrey M. Knetter
Idaho Department of Fish and Game
P.O. Box 25, 600 Walnut
Boise, ID 83712
208-608-8196 jeff.knetter@idfg.idaho.gov

Steve Knick
U.S. Geological Survey
970 Lusk Street
Boise, ID 83706
208-426-5208 steve_knick@usgs.gov

Autumn Larkins
Oregon Department of Fish and Wildlife
P.O. Box 8
Hines, OR 97738
541-573-6582 autumn.n.larkins@state.or.us

Chad LeBeau
University of Wyoming
1000 E University Avenue
Laramie, WY 82071
307-460-1418 cwlebeau@west-inc.com

Mike Livingston
Washington Department of Fish and Wildlife
2620 N. Commercial Avenue
Pasco, WA 99301
509-545-2201 michael.livingston@dfw.wa.gov

Jason Lowe
Bureau of Land Management-WA
1103 N. Fancher Road
Spokane Valley, WA 99212
509-536-1244 j3lowe@blm.gov

Forrest Luke
Trapper Mining Inc.
P.O. Box 187
Craig, CO 81626
970-826-6140 forrest@trappermine.com

Johanna M. Munson
Bureau of Land Management-WY
5353 Yellowstone Road
Cheyenne, WY 82009
307-775-6329 jmunson@blm.gov

Tom Maechtle
Big Horn Environmental Consultants
P.O. Box 207
Sheridan, WY 82801
307-673-7571 tom@bighornec.com

Brian Magee
Colorado Parks and Wildlife
515 Turner Drive
Durango, CO 81303
970-759-9587 brian.magee@state.co.us

Don Major
Bureau of Land Management-ID
1387 S. Vinnell Way
Boise, ID 83709
208-373-4049 dmajor@blm.gov

Jennifer Marsden
Shell Oil Corp.
4582 S Ulster St. S #1400
Denver, CO 80202
720-539-6574 jenny.marsden@shell.com

Gail Martinez
Bureau of Land Management-CO
455 Emerson Street
Craig, CO 81625
970-826-5078 gemartin@blm.gov

Brian Maxfield
Utah Division of Wildlife Resources
152 E 100 N Suite 9
Vernal, UT 84078
435-790-5335 brianmaxfield@utah.gov

Clinton McCarthy
U.S. Forest Service
324 25th Street
Ogden, UT
801-625-5671 cmccarthy01@fs.fed.us

Timothy McCracken
U.S. Fish and Wildlife Service
215 Melody Lane, Suite 103
Wenatchee, WA 98801
509-665-3508 x 17 timothy_mccracken@fws.gov

Clark McCreedy
U.S. Forest Service
2468 Jackson Street
Laramie, WY 82078
307-745-2412 cmccreedy@fs.fed.us

Brandon McDonald
Bureau of Land Management-UT
170 South 500 East
Vernal, UT 84078
435-781-4449 bamcdona@blm.gov

Heather McPherron
Utah State University
166 Coventry Place
Logan, UT 84341
865-680-4670 heather.mcpherron@gmail.com

Lauren L. Mermejo
Bureau of Land Management-NV
1340 Financial Boulevard
Reno, NV 89502
775-861-6580 lmermejo@blm.gov

Mike Middleton
Colorado Parks and Wildlife
2827 Honesuckle Lane
Steamboat Springs, CO 80487
970-846-1484 mike.middleton@state.co.us

Elizabeth Miller
Colorado Parks and Wildlife
P.O. Box 776329
Steamboat Springs, CO 80477
970-736-8359 libbie.miller@state.co.us

Brandon Miller
NRCS/CPW/RMBO
1475 Pine Grove Road, Ste 201A
Steamboat Springs, CO 80487
970-980-8349 brandon.miller@co.usda.gov

Sam Milodragovich
NorthWestern Energy
40 E. Broadway
Butte, MT 59701
406-497-3102
sam.milodragovich@northwestern.com

David D. Musil
Idaho Department of Fish and Game
324 South 417 East
Jerome, ID 83338
208-324-4359 david.musil@idfg.idaho.gov

David Naugle
University of Montana, Wildlife Biology
32 Campus Drive, FOR 309
Missoula, MT 59812
406-240-0113 david.naugle@umontana.edu

Lori Nielsen
EDM International, Inc.
4001 Automation Way
Fort Collins, CO 80525
970-204-4001 lnielsen@edmlink.com

Daniel Nonne
University of Nevada, Reno
1664 North Virginia Street, Mailstop 186
Reno, NV 89502
302-345-6168 dnonne@gmail.com

Doug Ouren
U.S. Geological Survey
2150 Centre Avenue, Bldg C
Fort Collins, CO 80256
970-226-9476 ourend@usgs.gov

Sara Oyler-McCance
U.S. Geological Survey
2150 Centre Avenue, Bldg C
Fort Collins, CO 80526
970-226-9197 soyler@usgs.gov

Suzann Parker
U.S. Forest Service
216 N Colorado
Gunnison, CO 81230
970-901-4454 sparker02@fs.fed.us

Gail L. Patricelli
University of California, Davis
2320 Storer Hall, Dept. Evol. And Ecol
Davis, CA 95616
530-754-8310 gpatricelli@ucdavis.edu

David Pavlacky
Rocky Mountain Bird Observatory
230 Cherry Street
Fort Collins, CO 80521
970-482-1707 x 11 david.pavlacky@rmbo.org

Brad Petch
Colorado Parks and Wildlife
711 Independent Avenue
Grand Junction, CO 81505
970-255-6185 brad.petch@state.co.us

Allan R. Pfister
KC Harvey Environmental
1048 Independent Avenue, Suite 111
Grand Junction, CO 81505
970-639-2061 apfister@kcharvey.com

Evan Phillips
Colorado Parks and Wildlife
2300 S. Townsend Avenue
Montrose, CO 81401
970-252-6045 evan.phillips@state.co.us

Michael Phillips
Colorado Parks and Wildlife
317 West Prospect Road
Fort Collins, CO 80526
970-472-4404 mike.phillips@state.co.us

Heidi Plank
Bureau of Land Management-CO
2815 H Road
Grand Junction, CO 81506
970-244-3012 hplank@blm.gov

Christine Pontarolo
Bureau of Land Management-UT
176 East DL Sargent Drive
Cedar City, UT 84721
435-865-3035 cpontaro@blm.gov

Aaron Pratt
University of Wyoming
324 1st Avenue South
Greybull, WY 82426
361-960-0946 aaroncpratt@yahoo.com

Frances Pusateri
Colorado Parks and Wildlife
317 W Prospect Rd
Fort Collins, CO 80526
970-472-4322 francie.pusateri@state.co.us

Jason Pyron
U.S. Fish and Wildlife Service
1387 S. Vinnell Way, Suite 368
Boise, ID 83709
208-559-5604 pyrojaso@gmail.com

Beverly Rave
Idaho State Land Board
1127 Sherman Street, Rm 300
Denver, CO 80203
303-866-3454 x 3325 beverly.rave@state.co.us

Kerry Reese
University of Idaho
P.O. Box 441136
Moscow, ID 83844
208-885-6435 kreese@uidaho.edu

Kent Rider
WPX Energy
1058 County Road 215
Parachute, CO 81635
970-623-8934 kent.rider@wpxenergy.com

Dean Riggs
Colorado Parks and Wildlife
711 Independent Ave
Grand Junction, CO 81505
970-255-6173 dean.riggs@state.co.us

Sylvia Ringer
Bureau of Land Management-CO
2300 River Frontage Road
Silt, CO 81652
970-876-9062 sringer@blm.gov

E. Thomas Rinkes
Bureau of Land Management-ID
1387 S. Vinnell Way
Boise, ID 83709
307-373-4045 erinkes@blm.gov

Leslie A. Robb
P.O. Box 1077
Bridegport, WA 98813
509-686-2692 robblar@homenetnw.net

Leigh Robertson
San Miguel Basin GUSG Working Group
596 Sabeta Drive #D
Ridgway, CO 81432
970-708-7131 info@sanmiguelgrouse.org

Aaron Robinson
North Dakota Game and Fish
225 30th Avenue SW
Dickinson, ND 58601
701-290-1370 acrobinson@nd.gov

John Romero
Owyhee Air Research
17000 ZX Ranch Road
Murphy, ID 83650
208-495-1316 jromero@owyheeair.com

Liza Rossi
Colorado Parks and Wildlife
925 Weiss Dr.
Steamboat Springs, CO 80487
970-871-2861 liza.rossi@state.co.us

Mark Rumble
U.S. Forest Service
8221 South Highway 16
Rapid City, SD 57702
605-716-2174 mrumble@fs.fed.us

Jeremiah Rummel
Colorado Parks and Wildlife
P.O. Box 213
Walden, CO 80480
970-901-6326 jeremiah.rummel@gmail.com

Dixie Sadlier
Bureau of Land Management-UT
170 South 500 East
Vernal, UT 84078
435-781-4458 dsadlier@blm.gov

Alan Sands
Sage Wildlife Consulting Services
4198 Pinerest Way
Boise, ID 83716
208-866-3826 sagewildlife@gmail.com

Julie Sarazin Grode
U. S. Forest Service
2777 Crossroads Blvd. #1
Grand Junction, CO 81506
970-242-8211 jgrode@fs.fed.us

Misti Schriner
Western Area Power Administration
P.O. Box 281213
Lakewood, CO 80228
720-962-7239 mschriner@wapa.gov

Michael A. Schroeder
Washington Department of Fish and Wildlife
P.O. Box 1077
Bridgeport, WA 98813
509-686-2692 michael.schroeder@dfw.wa.gov

Robin Sell
Bureau of Land Management-CO
2850 Youngfield St
Lakewood, CO 80215
303-239-3723 rsell@blm.gov

John Severson
University of Idaho
P.O. Box 8551
Moscow, ID 83844
618-559-2955 seve0951@vandals.uidaho.edu

Nathan W. Seward
Colorado Parks and Wildlife
300 West New York Avenue
Gunnison, CO 81230
970-641-7882 nathan.seward@state.co.us

Lyle Sidener
Colorado Parks and Wildlife
P.O. Box 216
Hot Sulphur Springs, CO 80451
970-725-6210 lyle.sidener@state.co.us

Melissa Siders
Bureau of Land Management-CO
2465 South Townsend Ave
Montrose, CO 81401
970-240-5332 msiders@blm.gov

Angela Sitz
U.S. Fish and Wildlife Service
63095 Deschutes Market Road
Bend, OR 97701
541-383-7146 angela_sitz@fws.gov

Robert Skorkowsky
U.S. Forest Service
925 Weiss Dr
Steamboat Springs, CO 80487
970-870-2146 rskorkowsky@fs.fed.us

Derek Stinson
Washington Department of Fish and Wildlife
4527 Marvin Road NE
Olympia, WA 98516
360-902-2475 derek.stinson@dfw.wa.gov

San Stiver
Western Association of Fish and Wildlife Agencies
2184 Richard St
Prescott, AZ 86301
928-899-3732 stiver@cableone.net

Julie Stiver
Colorado Parks and Wildlife
4255 Sinton Road
Colorado Springs, CO 80908
719-227-5225 julie.stiver@state.co.us

Kelli Stone
Two Birds One Stone, LLC
P.O. Box 1123
Salida, CO 81201
303-681-1526 2birds_1stone@live.com

Kourtney Stonehouse
Washington State University
WSU, 115 Johnson Hall
Pullman, WA 99164
201-452-7252
kourtney.stonehouse@email.wsu.edu

Steven Strong
Bureau of Land Management-UT
170 South 500 East
Vernal, UT 84078
435-781-4472 sstrong@blm.gov

Linette Sutphin
Big Horn Environmental Consultants
P.O. Box 207
Sheridan, WY 82801
307-673-7571 linettesutphin@bighornec.com

Andrew Sutphin
Big Horn Environmental Consultants
P.O. Box 207
Sheridan, WY 82801
307-673-7571 asutphin@bighornec.com

Bob Timberman
U.S. Fish and Wildlife Service - PFW
953 Jackson County Road #32
Walden, CO 80480
970-723-4926 bob_timberman@fws.gov

Pat Tucker
Colorado Parks and Willdife
711 Independent Ave
Grand Junction, CO 81505
970-255-6188 pat.tucker@state.co.us

Carolyn Tucker
Shell Corp.
P.O. Box 676
New Castle, CO 81647
970-948-8407 carolyn.tucker@shell.com

Vicki Van Sickle
Across the Great Divide
P.O. Box 55
Tendoy, ID 83468
208-940-0947 vicki@atgdecologicalservices.com

Matthew G. Vasquez
U.S. Forest Service
216 N Colorado
Gunnison, CO 81230
970-642-4401 mgvasquez@fs.fed.us

Scott Wait
Colorado Parks and Wildlife
415 Turner Drive
Durango, CO 81303
970-375-6745 scott.wait@state.co.us

Brett Walker
Colorado Parks and Wildlife
711 Independent Ave
Grand Junction, CO 81505
970-255-6125 brett.walker@state.co.us

Ken Warheit
Washington Department of Fish and Wildlife
600 Capital Way
Olympia, WA 98501
360-902-2774 kenneth.warheit@dfw.wa.gov

Michael Warren
Colorado Parks and Wildlife
711 Independent Ave
Grand Junction, CO 81505
970-255-6180 michael.warren@state.co.us

Brad Weinmeister
Colorado Parks and Wildlife
151 E 16th Street
Durango, CO 81301
970-375-6714 brad.weinmeister@state.co.us

Lief Wiechman
Colorado Parks and Wildlife
424 Guillemont Street
Fort Collins, CO 80526
970-232-8919 liefwiechman@hotmail.com

Catherine Wightman
Montana Fish, Wildlife, and Parks
P.O. Box 200701
Helena, MT 59602
406-490-2329 cwightman@mt.gov

Nate Wojcik
SWCA Environmental Consultants
295 Interlocken Blvd, Suite 300
Broomfield, CO 80021
303-487-1183 nwojcik@swca.com

David Wood
Bureau of Land Management-MT
5001 Southgate Dr.
Billings, MT 59101
406-896-5246 dwood@blm.gov

Chris Yarbrough
RMEF/NRCS
P.O. Box 773836
Steamboat Spirngs, CO 80477
chris.yarbrough@co.usda.gov

Jeff Yost
Colorado Parks and Wildlife
P.O. Box 775777
Steamboat Springs, CO 80477
970-871-2843 jeff.yost@state.co.us

Tim Zachmeier
Bureau of Land Management-ND
99 23rd Avenue West
Dickinson, ND 58601
701-227-7749 tim_zachmeier@blm.gov

Steve Znamenacek
Colorado Parks and Wildlife
P.O. Box 775777
Steamboat Springs, CO 80477
970-846-3732 steve.znamenacek@state.co.us

Todd Hopkins
U.S. Fish and Wildlife Service
1340 Financial Blvd
Reno, NV 89502
775-770-4936 todd_hopkins@fws.gov