

Welcome to the 58th Annual
Summer Meeting



Hunter Conference Center
August 13th – 15th, 2013
Cedar City, Utah



Tuesday August 13th

8am- 4pm Field Trip
 Meet at the Best Western Town and Country

530 pm-700pm Opening Social and Poster Session
 Hunter Conference Center

700pm-730pm Green Show
 Adams Theatre Green

Poster Presentations

Craig Fackrell	Wildlife and energy development: observations from a third party compliance inspection contractor
Lily Glidden	Heterospecific response to migrant, resident, and north American resident bird species alarm calls in lowland forests of Costa Rica
Alex Hancock	Population genetics of cannibalistic vs. Non-cannibalistic tiger salamanders
Patrick Jackson	Comparing folding and nonfolding sherman capture rates
Allison Jones	Best management practices for solar and wind energy development: a conservationist's guide
Lisa Nordstrom	Movement of Baja California golden eagles into California
Russell Norvell	20-year trends for riparian birds in Utah
Kirstin Ranson	Gene flow and disease transmission in jackrabbit populations in southern Utah
Riley Taylor	Population biology and genetics of invasive turtles in the virgin river basin

**THE SILENT AUCTION WILL BEGIN TUESDAY AT 6PM
AND CONTINUE THROUGH WEDNESDAY AT 5PM
CASH OR CHECK ACCEPTED**

Wednesday August 14th

Morning Session 1

Opening Remarks

- 815-830 Hunter Conference Center, Charles Hunter Room
- 830-850 Lisa Nordstrom *EVALUATING POTENTIAL IMPACTS OF WIND ENERGY DEVELOPMENT ON SENSITIVE WILDLIFE SPECIES IN NORTHERN BAJA CALIFORNIA, MEXICO*
- 850-910 Cody Richardson *EFFECTS OF TERRESTRIAL INVERTEBRATES ON DEER MOUSE POPULATIONS*
- 910-930 TBD
- 930-950 David Dahlgren *EFFECTS OF LANDSCAPE-SCALE ENVIRONMENTAL VARIATION ON GREATER SAGE-GROUSE CHICK SURVIVAL*
- 950-1010 David Stoner *PREDATION-FORAGE TRADE-OFFS IN ANTHROPOGENIC LANDSCAPES: BEHAVIORAL RESPONSE OF AN OBLIGATE CARNIVORE TO HUMAN ACTIVITIES*

1010-1030 **Morning Break- Poster Session 1**

1030-1230 **Business Meeting**
Awards Presentation

1230-1330 **Lunch on your own**

Afternoon Session 1

- 1330-1350 Scott Mabray *ANTHROPOGENIC RESOURCES USE BY COMMON RAVENS IN SOUTHWESTERN WYOMING*
- 1350-1410 Patrick Jackson *COMPARING FOLDING AND NONFOLDING SHERMAN LIVE TRAP CAPTURE RATES*
- 1410-1430 Sherry Liguori *EFFECTIVENESS OF PERCH DISCOURAGERS ON ELECTRIC UTILITY POLES*
- 1430-1450 Tess Gingery *POPULATION FITNESS OF ELK (CERVUS CANADENSIS) LOCATED IN CUSTER STATE PARK*
- 1450-1510 Terry Messmer *CONTEMPORARY KNOWLEDGE NEEDS REGARDING THE EFFECTS OF TALL STRUCTURES ON SAGE-GROUSE*
- 1510-1530 **Afternoon Break - Poster Session 2**

Afternoon Session 2

- 1530-1550 Anthony Roberts *WATERBIRD RESEARCH ON GREAT SALT LAKE*
- 1550-1610 Dustin Schaible *SEASONAL MOVEMENTS OF ELK ON MT. DUTTON IN SOUTHERN UTAH*
- 1610-1630 Adrian Roadman *USING DERMATOGLYPHICS FOR NONINVASIVE MARK-RECAPTURE ABUNDANCE ESTIMATES OF RINGTAILS IN ZION NATIONAL PARK, UTAH*
- 1630-1650 Maureen Frank *IT'S A BIRD, IT'S A PLANE, IT'S... AN ENORMOUS MIGRATION! RADAR DATA SHOW WINTER DEPARTURE OF EARED GREBES FROM THE GREAT SALT LAKE*
- 1650-1710 Mike Conover *CAN BIRDS HIDE FROM OLFACTORY PREDATORS?*
- 1800-2030 **Closing Social at Toadz**
Live Auction at Toadz
Heavy Appetizers and Drinks Provided

Thursday August 15th

- 830-500 Field Trip to Bryce Canyon
Meet at Best Western Town and Country, north side of 200 N
Drinks and snacks provided
Guided tour of a popular trail
Shuttle system allows individual adventures

ORAL PRESENTATION ABSTRACTS

CAN BIRDS HIDE FROM OLFACTORY PREDATORS?

Michael R. Conover¹

¹Department of Wildland Resources, Utah State University, Logan, Utah

Humans are visual predators because we use our eyesight to locate prey. Consequently, we are well aware of how animals hide from predators that also use vision to locate prey. However, olfactory predators use olfaction to find prey when environmental conditions favor its use. This raises the question of whether it is possible for a bird to hide from olfactory predators, and if so, how is this feat accomplished.

EFFECTS OF LANDSCAPE-SCALE ENVIRONMENTAL VARIATION ON GREATER SAGE-GROUSE CHICK SURVIVAL

Michael R. Guttery¹, David K. Dahlgren², Terry A. Messmer³, John W. Connelly⁴, Kerry P. Reese⁵, Pat A. Terletzky³, Nathan Burkepille⁶, David N. Koons⁷

¹Department of Forest and Wildlife Ecology, University of Wisconsin, Madison, WI, ²Kansas Department of Wildlife and Parks, Hays, KS, ³Department of Wildland Resources, Utah State University, Logan, UT, ⁴Idaho Department of Fish and Game, Blackfoot, ID, ⁵Department of Fish and Wildlife Sciences, University of Idaho, Moscow, ID, ⁶Northland Fish and Game, Whangarei, New Zealand, ⁷Department of Wildland Resources and the Ecology Center, Utah State University, Logan, UT

Conservation planning for a species must be guided by information about population vital rates at multiple scales. Greater sage-grouse (*Centrocercus urophasianus*) require large landscapes of sagebrush (*Artemisia* sp.) to meet their seasonal habitat needs. The environmental factors influencing sage-grouse vital rates, especially at various scales, are relatively unknown. Research has shown that sage-grouse are particularly sensitive to hen and chick survival rates. While hen survival rates have been well studied, chick survival information has been limited to date, and currently there is no reported data considering factors affecting this vital rate across large spatial and temporal scales. We analyzed sage-grouse chick survival rates calculated from radio-marked chicks (~1-day old) in 2 geographically distinct populations (Idaho and Utah) over a 9-year period (1999-2001 and 2005-2009, respectively). We evaluated landscape-scale effects of climate, drought, and vegetation greenness (NDVI). Models with NDVI performed poorly, possibly due to sagebrush canopy masking forb and grass production. The top drought model resulted in a substantial increase in model fit, indicating chick survival was negatively associated with winter drought. Our overall top model included effects of chick age, hen age, minimum May temperature, and precipitation in July. Survival increased with chick age, yearling hens, and minimum May temperature, and decreased with increased July precipitation. Our results provide important insights into possible effects of climate variability on sage-grouse recruitment.

IT'S A BIRD, IT'S A PLANE, IT'S... AN ENORMOUS MIGRATION!

RADAR DATA SHOW WINTER DEPARTURE OF EARED GREBES FROM THE GREAT SALT LAKE

Maureen G. Frank and Michael R. Conover¹

¹Department of Wildland Resources, Utah State University, Logan, UT

Although biological targets have been detected on radar data for years, ornithologists, entomologists, and mammalogists have only recently begun to use that data to track birds, insects, and bats. Typically, a flock of birds passing over a radar station is recorded as a “donut” pattern of color. Using radar data can be difficult, however, because insect swarms can be confused with bird migrations and different species of birds are challenging to differentiate. Tracking the winter migration of eared grebes (*Podiceps nigricollis*) from the Great Salt Lake is possible because there are no insects flying during their migration period (December), and there are no other species of birds migrating through this area at this time. Eared grebes do not show up on the radar in the typical donut pattern because they take off south of the radar station and do not pass over it. Rather, they are seen on radar as a line that moves from the south part of the Great Salt Lake to the south. Publically available radar data has been recorded since 1995. This study is still in progress and only presents data for the past three winter migrations. When all the data have been examined, we will be able to observe variations in the main dates on which grebe migration takes place and whether these dates correlate with photoperiod, temperature, or food supply.

POPULATION FITNESS OF ELK (*CERVUS CANADENSIS*) LOCATED IN CUSTER STATE PARK

Tess Gingery¹

¹Department of Biology, Southern Utah University, Cedar City, UT

A recent decline in population levels of elk (*Cervus elaphus*) has prompted a three year study in Custer State Park located in the Black Hills of South Dakota. The primary objectives of this study were to study the fitness and pregnancy rates of cow elk as well as the survival and predation rates of elk calves. This is achieved by measuring fat percentage and palpating cow elk to determine fitness and pregnancy status, inserting a vaginal implantation device, taking tissue and blood samples, and radio collaring of cow and calves. Vegetation surveys were conducted of both parturition and death sites of calves in part to assess the site's level of protection from predators and vegetation variety. Preliminary data shows that puma and coyote predation have a significant affect on survival rates of calves in the test area. An increase in hunting permits of pumas after year two of the study did not reduce the puma's impact on elk calves. The studies final data will influence changes to hunting regulations, and directly impact wildlife and public interactions.

ADVANCES IN THE MODERN SNARE

Patrick J. Jackson¹

¹Department of Wildland Resources, Utah State University, Logan, UT

Snares are arguably one of the most simple and effective tools for animal restraint, capable of capturing many terrestrial mammals. Referred to as a snare, foot snare, neck snare or cable restraint; all are designed to restrain an animal by the neck, foot, leg, or body and are made out of rope, twine, wire, webbing, or cable. Modern innovations in snaring technology have markedly improved ease of use, cost, and humaneness, and yet snares are arguably underrepresented in the current animal capture literature. Many approaches to snaring have been developed, with much of this innovation based on available materials, previous knowledge, and through collaboration with other trappers. My presentation will: 1) identify common snare applications and techniques for capturing mammals, 2) address improvements to snare designs and snare materials, and who is making these improvements, 3) explain how snares have been made more efficient and non-lethal in some situations, and 4) summarize the most up to date literature and documents. My goal is to provide wildlife conservationists, managers, and researchers with a new view of an old tool, with the hope they can use snares efficiently, safely, and humanely within the variety of biological and social contexts found within in our field.

NEBRASKANS' VIEWS OF WIND ENERGY DEVELOPMENT AND WILDLIFE: RESULTS OF THE 2012 NEBRASKA ANNUAL SOCIAL INDICATORS SURVEY

Caroline Jezierski¹, Craig Allen², Michelle Koch³, Tim McCoy³, Joseph Fontaine², Rick Schneider³

¹Nebraska Cooperative Fish & Wildlife Research Unit, University of Nebraska – Lincoln, Lincoln, NE,

²U.S. Geological Survey - Nebraska Cooperative Fish and Wildlife Research Unit, University of Nebraska - Lincoln, ³Nebraska Game and Parks Commission, Lincoln, NE

Wind power is a renewable energy that has been used for more than 30 years in the United States, yet the impacts on wildlife and their habitats are not fully understood and vary greatly upon the location of the wind energy facility. Nebraska has enormous wind energy potential and is also used year-round or during migration by hundreds species of wildlife, several which may be sensitive to wind energy development. In the summer of 2012, the Nebraska Wind Energy and Wildlife Project contributed fourteen wind - wildlife questions with a Likert-type scale to the Nebraska Annual Social Indicators Survey. More than 950 Nebraskans completed the survey for a response rate of 27.2%. Results indicate the majority of Nebraskans support wind energy development. Residents in metropolitan areas and females in rural areas are more concerned that birds and bats can be killed as a result of wind energy development, more strongly agree that wind energy development and operation should take precautions to reduce impacts on wildlife, and are more likely to pay more on their electricity bill for wind energy than residents in rural areas and males in rural areas, respectively. Results also indicate that Nebraskans are more likely to recreate within sight of a wind turbine than within one mile of a wind turbine and are more likely to pay \$2 more a month on their electric bill for wind energy development

that was planned in a manner that reduced impacts on wildlife resources than for other wind energy developments. Understanding Nebraskan's views on wind energy and wildlife will be a useful tool in a Nebraska where wind energy development is expanding.

EFFECTIVENESS OF PERCH DISCOURAGERS ON ELECTRIC UTILITY POLES

Sherry Liguori¹

¹PacifiCorp, Salt Lake City, UT

Early efforts to prevent raptor electrocutions on electric utility poles used perch discouragers to manage where birds perched on a power line, dissuading them from perching on poles or parts of poles that posed an electrocution risk while offering sites on the same or nearby poles that did not pose an electrocution risk. More recently, perch discouragers are often stipulated as a mechanism to reduce raptor or corvid perching on entire segments of line in areas with sensitive prey species. Pedestrian surveys have been conducted by PacifiCorp since 2001 to assess avian electrocution and collision risks, identify poles for proactive retrofitting, and evaluate the effectiveness of various retrofit techniques. This paper details results specifically related to perch discourager effectiveness. Poles with perch discouragers had greater rates of raptor use, electrocution mortality, and raptor/corvid nesting than poles without discouragers. In addition, poles adjacent to perch discourager poles had higher electrocution mortality rates than poles without perch discouragers. Because perch discouragers can result in unintended negative consequences, their use is cautioned against in areas with raptor populations or where nests of raptors or ravens may be a concern.

ANTHROPOGENIC RESOURCES USE BY COMMON RAVENS IN SOUTHWESTERN WYOMING

Scott Mabray and Michael Conover¹

¹Department of Wildland Resources, Utah State University, Logan, UT

Common ravens (*Corvus corax*) have a long history of living near human development and thriving in human altered landscapes. Anthropogenic development and land use provides roosting and foraging opportunities for ravens in southwestern Wyoming. It is unclear if ravens use landfills as a foraging source at all times of the year or even during a given day. Daily point counts were used to determine the numbers of ravens foraging at landfills at different times throughout a given day and variation in use during different seasons of the year. Ravens may select different anthropogenic food sources based on factors such as weather, snow depth, distance to a major road, distance to a roost, or time of the day. Data obtained during point counts led to a better understanding of raven behavior and use of anthropogenic resources. This understanding can be used by management agencies such as Wildlife

Services to determine the most cost and time efficient way to settle human wildlife conflicts that have developed with common ravens.

CONTEMPORARY KNOWLEDGE NEEDS REGARDING THE EFFECTS OF TALL STRUCTURES ON SAGE-GROUSE

Terry A. Messmer¹, Robert Hasenyager², and James Burrus³

¹Jack H. Berryman Institute, Department of Wildland Resources, Utah State University, Logan, UT ,

²Utah Wildlife-In-Need Foundation, Salt Lake City, UT, ³PacifiCorp Energy - Hydro Resources, Salt Lake City, UT

The Energy Policy Act of 2005 required all state and federal agencies to grant utilities access permits to promote reliable, renewable energy production and transmission. Contemporary transmission of energy relies largely on above ground electric-utility structures and transmission lines. The construction, operation, and maintenance of these tall structures (e.g. power lines) and the associated activities in sage-grouse (*Centrocercus* spp.) habitats was identified as a conservation threat by the U.S. Fish and Wildlife Service in their decision to designate greater sage-grouse (*C. urophasianus*; sage-grouse) as the candidate species for protection under the Endangered Species Act of 1973. The Greater Sage-grouse Range-wide Comprehensive Strategy identified a need to synthesize the research on the effects of tall structures on sage-grouse as the first step in a process to develop effective best management practices (BMPs) to minimize potential negative impacts on the species. The Utah Wildlife in Need Foundation facilitated a public input process to assess stakeholder contemporary knowledge regarding the effects of tall structures (e.g., power lines, communication towers, wind turbines, and other installations) on sage-grouse. Stakeholders reviewed published information to evaluate the scientific basis for the potential impacts of tall structures on sage-grouse. There were no peer-reviewed, experimental studies reported in the scientific literature that specifically documented increased avoidance or predation in sage-grouse because of the construction, operation, and maintenance of tall structures. These findings demonstrated that additional knowledge must be acquired before effective BMP's can be developed to mitigate the potential impacts of tall structures on sage-grouse. Stakeholders were concerned the science upon which tall structure siting decisions are based was lacking. Because the science is lacking, "effective" temporal and spatial setbacks and buffers, siting policies and requirements policies may differ by governmental agency. Stakeholders recommended that research implemented to address their concerns include experimental designs that simultaneously addresses multiple knowledge gaps, include metrics assessing individual and cumulative impacts of each tall structure type, a collaborative process that allow preliminary results to be implemented in an adaptive management approach leading dynamic BMPs refinements. Lastly, they recommended that industry be provided mitigation incentives as part of a comprehensive strategy to fund desired research.

EVALUATING POTENTIAL IMPACTS OF WIND ENERGY DEVELOPMENT ON SENSITIVE WILDLIFE SPECIES IN NORTHERN BAJA CALIFORNIA, MEXICO

Lisa A. Nordstrom¹

¹San Diego Zoo Institute for Conservation Research, Escondido, CA

Renewable energy development has rapidly expanded worldwide over the last decade. Wind energy in particular has increased dramatically, with the US ranking first in newly added generating capacity in 2012. While wind energy is considered to have a smaller ecological footprint, it can also have unintended biological impacts, both direct and indirect. In addition, the increased number of wind energy facilities in terms of size and scale poses challenges to wildlife conservation, including habitat quality and population connectivity. Proper planning, monitoring, and mitigation measures are needed to ensure that sensitive species and habitats are protected. Golden eagles (*Aquila chrysaetos*), California condors (*Gymnogyps californianus*), as well as Peninsular bighorn sheep (*Ovis canadensis nelsoni*) are of special concern for a proposed wind energy facility in northern Baja California, Mexico. We have conducted pre-construction monitoring to better understand the distribution and movement patterns of these species and help identify ways to minimize or avoid potential impacts. By evaluating the factors associated with high use, we are able to delineate areas of higher risk and provide a more accurate risk assessment prior to construction. Monitoring and mitigation efforts, such as this, are needed not only to help assess the effects of wind energy development, but to help achieve wildlife conservation goals.

EFFECTS OF TERRESTRIAL INVERTEBRATES ON DEER MOUSE POPULATIONS

Cody E. Richardson¹

¹Biological Sciences Department, Montana Tech of the University of Montana, Butte, MT

The purpose of this study is to determine invertebrate availability during a five month span (June through Oct) at two study sites (Cascade, MT and Polson, MT) that support persistent deer mice (*Peromyscus maniculatus*) populations and populations of other small rodents. It was found that there was not a strong relationship between invertebrate abundance and deer mouse abundance for most orders of invertebrates. At Cascade, significant negative correlations were found between mouse abundance and invertebrate orders Araneida, Hymenoptera, and Isoptera. Positive relationships were shown with invertebrate orders Lepidoptera (Adult) and Polydesmida. In Polson, there were significant negative correlations between mouse abundance and invertebrate orders Coleoptera, Hymenoptera, and Lepidoptera (juvenile). There were no significant positive correlations at the Polson site between mouse abundance and invertebrate orders. This study is part of a larger study of the behavior of deer mice and the transmission of Hantavirus within these populations.

USING DERMATOGLYPHICS FOR NONINVASIVE MARK-RECAPTURE ABUNDANCE ESTIMATES OF RINGTAILS IN ZION NATIONAL PARK, UTAH

Adrian A. Roadman and Shandra Nicole Frey¹

¹Department of Wildland Resources, Utah State University, Logan, UT

When individuals are uniquely identifiable via a physical characteristic, abundance can be estimated using noninvasive survey methods. If the pelage of the animal is not sufficient for individual identification, other characteristics must be assessed. The epithelial ridges (dermatoglyphics) and papillae patterning of the metacarpal pads of ringtails (*Bassariscus astutus*) are shown here to identify unique individuals. These epithelial formations create the pattern of lines and dots collected in fine detail using charcoal track plates. Using photogrammetric software, the prints are digitized into an XY plane and print-matched with previously collected prints for mark recapture analysis with each individual identification acting as a capture. Preliminary results suggest that with the level of detail possible through passive charcoal print collection, an individual animal can be identified and matched to a growing database of animals within the study area. This novel approach to identification nearly eliminates animal stress, greatly reduces field labor required, and allows for a wider sampling area for mark recapture sampling.

WATERBIRD RESEARCH ON GREAT SALT LAKE

Anthony J. Roberts¹, Michael R. Conover¹, John Luft², John Neill², and Kyle Stone²

¹Department of Wildland Resources, Utah State University, Logan, UT, ²Utah Division of Wildlife Resources, Hooper, UT

The Great Salt Lake (GSL) and its associated wetlands is a crucial migration and wintering site for millions of waterbirds. Brine shrimp cyst harvest within the GSL is an economically important industry in the Salt Lake City area. Commercial activities may reduce food for wintering birds or alter distribution of populations. The primary objectives of this research are to examine the effects of cyst harvest and other variable on distribution and density of waterbirds, and influences on diet and contaminant levels. Past surveys have shown that northern shovelers (*Anas clypeata*), green-winged teal (*Anas crecca*), and eared grebes (*Podiceps nigricollis*) are the most abundant waterbird species during winter; therefore our research focused on these species. We conducted aerial surveys of waterbirds from October through April to examine population size and temporal and spatial distribution of birds on the GSL. We collected birds to examine diets and body condition. Waterfowl populations were highest in October, with over 650,000 birds present. Populations dropped throughout winter months, reaching a low of around 21,000 birds in February. Brine shrimp cysts occurred in diets of all species during every month of the study period. Waterfowl and eared grebe use of brine shrimp cysts as a food source during the commercial harvest season may result in conflict between harvesters and wildlife. Spatial use of GSL by waterbirds may mitigate this conflict. Birds congregate in areas where harvesters are sparse such as near freshwater inflows and in areas too shallow for commercial fishing boats. Knowledge of waterbird distribution and diets will help manage avian populations in the face of a changing ecosystem.

SEASONAL MOVEMENTS OF ELK ON MT. DUTTON IN SOUTHERN UTAH

Dustin Schaible¹

¹Utah Division of Wildlife Resources, Southern Region, Cedar City, UT

Rocky Mountain elk (*Cervus elaphus nelsoni*) have increased in numbers throughout Mt Dutton in southern Utah. This is likely due to an increase in habitat created by the 78,000-acre Sanford fire in summer 2002. Increasing population trend counts of the wintering elk herd have generated concerns from local stakeholders about summer habitat utilization (e.g., aspen habitats) and possible competition with livestock. Additionally, the remote nature and limited vehicle access of Mt Dutton make it difficult for hunters to harvest the number of antlerless elk needed for effective population control. Observations of elk spring migrations from Mt Dutton to adjacent areas suggest a lower summering population, but empirical evidence of elk migration patterns were lacking. Our objectives for this project were; 1) to evaluate the migratory behaviors of elk wintering on Mt Dutton including the spatial and temporal components of their movements, and 2) document seasonal habitat use. Since January 2011, we used GPS and VHF collars to monitor movements of 53 adult cow elk captured on winter range across Mt Dutton. We placed collars on elk wintering at all elevations and distributed them in proportion to relative densities on the unit based on previous aerial trend counts. Telemetry show 35% of elk captured on Mt Dutton winter range summered on Mt Dutton, 31% migrated north to the Monroe Unit, 22% migrated east to the Boulder Unit, and the remaining 12% migrated to other adjacent units including the Paunsaugunt, Panguitch Lake, and Fishlake. Based on these findings we modified the 2013 aerial trend count survey to estimate population level on a larger scale and to develop antlerless harvest strategies to effectively harvest elk on that scale.

PREDATION-FORAGE TRADE-OFFS IN ANTHROPOGENIC LANDSCAPES: BEHAVIORAL RESPONSE OF AN OBLIGATE CARNIVORE TO HUMAN ACTIVITIES

David C. Stoner and Michael L. Wolfe¹

¹ Department of Wildland Resources, Utah State University, Logan, UT

Recent research on carnivore habitat selection has elucidated the tenuous balance between the benefits of prey acquisition and the risk of mortality. Cougars (*Puma concolor*) are behaviorally adapted to exploit ungulate prey, and despite a long history of persecution, still occur in many near-urban habitats. Although anthropogenically altered landscapes can offer predictable foraging opportunities, several investigators have hypothesized that cougars avoid these potentially lucrative but risky habitats. We evaluated this hypothesis by: 1) characterizing the behavioral response of cougars to human landscapes, and 2) assessing cougar mortality patterns within the urban-wildland interface (UWI). From 1997-2011 we studied cougar movement and predation behavior in the Oquirrh Mountains near Salt Lake City, Utah, USA. From a sample of 93 animals, we instrumented 33 individuals with Global Positioning Systems collars and measured their response to anthropogenic activities and landscapes at two scales. At the scale of the study area, cougar response was defined by avoidance, but

within the UWI response varied by demographic class and land-use type. Most human-caused mortality affected inefficient hunters capitalizing on anthropogenic food resources, exemplified by dispersing males and senescent females. Maternal females used risky habitats at greater frequencies than their non-maternal counterparts, suggesting that they were not making trade-offs in response to human activity *per se*, but to potential interactions with conspecifics. Cougars are a behaviorally plastic species whose general response to anthropogenic landscapes is most accurately characterized not as one of fear, but ambivalence.

POSTER ABSTRACTS

WILDLIFE AND ENERGY DEVELOPMENT: OBSERVATIONS FROM A THIRD PARTY COMPLIANCE INSPECTION CONTRACTOR

Craig J. Fackrell¹, Tim Green¹, Osmer Beck², Stephanie Graham²

¹Transcon Environmental, Cedar City, UT, ²Transcon Environmental, Sandy, UT

Wildlife often plays a major role in determining when and where energy development projects occur in the United States. Particularly during the construction phase, many projects are restricted—spatially and seasonally—in order to protect wildlife and their habitat. Wildlife biologists representing the construction contractor and the lead federal agency work together on such projects to minimize its impact on wildlife and ensure compliance with environmental regulations throughout the project. Transcon Environmental (Transcon) has acted as the Compliance Inspection Contractor (CIC) on several major energy development projects throughout Utah in recent years. During construction of a 345kV/500kV transmission line in the 2011 breeding season, 46 structure work areas along a 100-mile long corridor were closed to entry by project personnel due to spatial buffers surrounding nesting birds. Consequently, the contractor made an attempt to passively relocate birds nesting on or near the right-of-way (ROW) by placing nest deterrents in raptor (*Buteo* spp.) nests and burrowing owl (*Athene cunicularia*) burrows. Artificial nesting platforms were also erected in some locations away from the ROW. Through the variance process the construction contractor was able to obtain approval from the Bureau of Land Management (BLM), in some instances, to access buffered areas for construction activities. The construction phase of the project was completed in May 2013, and was deemed successful by both environmental compliance and construction managers.

HETEROSPECIFIC RESPONSE TO MIGRANT, RESIDENT, AND NORTH AMERICAN RESIDENT BIRD SPECIES ALARM CALLS IN LOWLAND FORESTS OF COSTA RICA

Lily K. T. Glidden and Brynna S. Bolger¹

¹Department of Biology, Tufts University, Medford, MA

Alarm call recognition and response can be beneficial to the receiving individual, and may affect the sender through mate protection and flock antipredator dynamics. Heterospecific response to alarm

calls has been demonstrated in a number of species. Research suggests this response is based on learning due to sympatry, which suggests a difference in responsiveness to the alarm calls of migrant and resident species. We examined heterospecific response to alarm calls in Neotropical birds and tested the hypothesis that they are consistent with the hypothesis of learning through sympatry. We compared the responses of migrant and resident birds to playbacks of alarm calls of a Costa Rican resident (*Thraupis episcopus*), a migrant winter resident (*Icterus galbula*), and a north-temperate year round resident (*Parus atricapillus*) in lowland Costa Rican wet forests. The Costa Rican resident and migrant elicited responses; the North American resident did not. Community makeup did not affect response. In contrast to year round residents, migrants in the trials were observed leaving the playback area more often as a response to the alarm rather than moving towards the call and alarming as well. These results show a heterospecific response in Neotropical communities and support the idea of learning alarm calls through sympatry. Migrants may have fled rather than responding because they were not invested in the site as a breeding ground.

POPULATION GENETICS OF CANNIBALISTIC VS. NON-CANNIBALISTIC TIGER SALAMANDERS

E. Alex Hancock, Holden Wagstaff, and Laurie Mauger¹

¹Department of Biology, Southern Utah University, Cedar City, UT

Several species are known to exhibit cannibalism and prey on members of their own species. They will, however, avoid preying on members of their families, therefore exhibiting kin selection. Tiger salamanders, *Ambystoma tigrinum*, exist as two morphs, cannibalistic and non-cannibalistic. The cannibalistic individuals exhibit kin selection. The gene that controls this trait has not been isolated. Our objective in this study is to compare the genetic structure of cannibalistic and non-cannibalistic tiger salamanders. This will enable us to determine genetic similarities and differences between these two morphs. We will be using microsatellite loci to determine whether or not there is gene flow between the cannibalistic populations and the non-cannibalistic populations or if these two morphs exist as separate genetic subpopulations. We hypothesize that the two morphs of tiger salamander will be two genetic populations. This study will provide important information for the biology of the tiger salamander.

COMPARING FOLDING AND NONFOLDING SHERMAN CAPTURE RATES

Patrick J. Jackson and Michael R. Conover¹

¹Department of Wildland Resources, Utah State University, Logan, UT

Sherman traps are often used to answer questions regarding small mammal demography, yet type of Sherman trap used is rarely considered an important factor. I tested the hypothesis that folding and non-folding Sherman traps of similar sizes would result in similar detectability and occupancy rates for small mammal species native to central Nevada. I trapped small mammals during one week in spring and one week in fall 2012. All trapping occurred within four sites located in the Toquima and Monitor

mountains of central Nevada. Two trapping webs of 148 traps each were used at all sites. Using program MARK I build occupancy models and used Akaike Information Criterion to determine the best suited model using parameters; night, trap type, season, and species. There was no significant difference in occupancy between folding and non-folding traps during spring, but a significant difference in detectability occurred between nights one, two, and three. There was no significant difference in detectability in night one during fall, but a significant difference was detected for nights two and three. There was a significant difference in occupancy between both trap types during the fall season; non-folding Sherman traps were 17% more likely than folding Sherman traps to capture a small mammal. My results demonstrate the importance of trap type when researchers consider conducting small mammal trapping.

BEST MANAGEMENT PRACTICES FOR SOLAR AND WIND ENERGY DEVELOPMENT: A CONSERVATIONIST'S GUIDE

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¹Wild Utah Project, Salt Lake City, UT

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

MOVEMENT OF BAJA CALIFORNIA GOLDEN EAGLES INTO CALIFORNIA

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Very little is known about the population of golden eagles in Baja California and even less about their movement patterns in this region. We have been studying the golden eagle population in northern Baja California since 2009 and have found relatively few active territories in the Sierra Juarez mountain range. However, the few adult eagles that we have been able to track using GPS have revealed some interesting movement patterns. While most of their movements are concentrated around their core home range territory, these eagles have also displayed longer distance flights, some exceeding 200 km in length. Some of these flights have taken them across the US-Mexico border into California. The northernmost location recorded was made by an adult female who flew to Telegraph Peak in the Cucamonga Wilderness, Angeles National Forest. Unfortunately, after making this long distance flight, the adult female died on her return trip to her territory in the Sierra Juarez. These longer flights can pose considerable risk to the birds, increasing their chance of mortality. Clearly what happens to them in one part of their range may affect another. Consequently, impacts to eagles in California can have a significant impact on the population in Baja California.

20-YEAR TRENDS FOR RIPARIAN BIRDS IN UTAH

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Riparian systems make up <1% of land area in Utah, but riparian systems are arguably the habitat in greatest conservation need. Over 70% of Utah's birds use riparian habitat, yet little was known about population status and trends of these species when Utah DWR initiated a 20-year riparian monitoring project. To get baseline data and evaluate trends, Utah DWR conducted point counts at 37 riparian sites across Utah from 1992 to 2011. We estimated statewide density of approximately 40 species for each year of the study using the Conventional Distance Sampling and Multiple Covariate Distance Sampling engines in DISTANCE. The variable affecting detection that appeared most often in the best-supported MCDS models was 'Year.' Yellow warbler (*Setophaga petechia*) had the greatest density with 4.45/ha (95% CI: 4.31 - 4.59), followed by Spotted Towhee (*Pipilo maculatus*) with 1.64/ha (95% CI: 1.57 - 1.71) and Warbling Vireo (*Vireo gilvus*) with 1.64/ha (95% CI: 1.58 - 1.70). Although there were annual fluctuations in density, initial linear trend analyses did not indicate a significant decline for any species. In fact, 7 species appeared to have an increasing trend since 1992, including Yellow Warbler, Ash-throated Flycatcher (*Myiarchus cinerascens*), Blue-gray Gnatcatcher (*Polioptila caerulea*), Black-headed Grosbeak (*Pheucticus melanocephalus*), Black-throated Gray Warbler (*S. nigrescens*), Bullock's Oriole (*Icterus bullockii*), Chipping Sparrow (*Spizella passerina*), and Yellow-breasted Chat (*Icteria virens*). At-risk species Southwestern Willow Flycatcher (*Empidonax traillii extimus*) and Yellow-billed Cuckoo (*Coccyzus americanus*) did not have enough observations during the study to obtain density estimates or trends. It is encouraging that riparian bird populations in Utah are not declining at alarming rates, as was expected. Nonetheless, protecting and restoring riparian systems remains important for keeping

population trends steady in the face of drought, fire, exotic species, and human activity, which may be exacerbated by climate change.

GENE FLOW AND DISEASE TRANSMISSION IN JACKRABBIT POPULATIONS IN SOUTHERN UTAH

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White tailed jackrabbits, *Lepus townsendii*, are an essential part of the food chain in southern Utah and account for a large percentage of the diet of large mammal, reptile, and raptor populations. Jackrabbit populations have declined in number over the past several breeding seasons due to habitat fragmentation and hunting. The outbreak of diseases, such as tularemia, have also had a profound impact on *L. townsendii* population numbers. Tularemia is a fast acting disease that spreading quickly by direct contact and infected tick transmission. This disease primarily results in the death of infected animals. Tularemia also infects several other mammal populations in the area, including the endangered black-footed ferret and Canadian lynx. As a result, I expect populations that express higher levels of gene flow have a higher risk of spreading the disease. I propose to estimate gene flow and population structure in the jack rabbit populations found through southern Utah with microsatellite DNA markers. White tailed jackrabbit DNA will be taken from live-captured and hunted individuals. Deceased rabbits will be examined for the disease by examination of liver size and identification of disease spots. These will then be noted to distinguish which populations have been exposed to the disease. By determining gene flow between populations of *L. townsendii*, we will be able to better manage the transmission of the disease between populations of white tailed jackrabbits, and potentially prevent the spread of this disease to humans and endangered mammals in the area.

POPULATION BIOLOGY AND GENETICS OF INVASIVE TURTLES IN THE VIRGIN RIVER BASIN

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Invasive species cause extensive ecological damage and are considered major threats to the biodiversity of ecosystems. The mode that invasive species succeed ranges from out-competing the native species to utilizing changing abiotic factors. The red-eared slider (*Trachemys scripta*) and the smooth soft-shell (*Apalone spinifera*) have been marked as invasive exotics throughout many areas of the world. They have the potential to cause deleterious effects on native species. There are no chelonian species native to southern Utah, with the exception of the endangered desert tortoise. However, both *T. scripta* and *A. spinifera* have been noted in abundance in the Virgin River drainage system. We propose to quantify the effects these species have on this system and the endangered fish species found therein. We have two main objectives for this proposal. The first is to quantify the demographic characteristics of these invasive turtle species in the Virgin River System. Secondly, we will estimate the population genetic structure of these invasive turtles to determine effective

population sizes and attempt to identify the source populations. Turtles will be trapped in several areas throughout the drainage system to estimate population size, analyze stomach contents, identify nesting areas and collect genetic material. We will extract DNA and characterize several microsatellite loci in the invasive populations. This information will be used to assess the impact that these invasive species have on the Virgin River ecosystem.

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Mike Conover – Presentations

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Many thanks to our volunteers:

Becky Bonebrake – Field Tour Planner

Rhett Boswell – Field Tour Assistant

Tracey Gay – Event Logistics

Laurie Controneo, Tess Gingery, Alex Hancock,

Riley Taylor, Betsy Bancroft, Jackie Grant, Bill

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