The Wildlife Society 2012 Conference Book

Scheduled Events

SYMPOSIA 2
PRESENTATIONS – SUNDAY MORNING 3
PRESENTATIONS – MONDAY AFTERNOON 10
PRESENTATIONS – TUESDAY MORNING 13
PRESENTATIONS – TUESDAY AFTERNOON 15
PRESENTATIONS – WEDNESDAY MORNING 23
PRESENTATIONS – WEDNESDAY AFTERNOON 32
POSTERS – MONDAY MORNING 39
POSTERS – MONDAY AFTERNOON 42
SRIP POSTERS – MONDAY EVENING - BALLROOM 48
POSTERS – TUESDAY MORNING – HALL A 50
POSTERS – TUESDAY AFTERNOON – HALL A 52
POSTERS – WEDNESDAY MORNING – HALL A 54
OTHER USGS ATTENDEES 56

Sync Events to iPhone Calendar **OR** **Bookmark our Google Calendar**

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SYMPOSIA

Core Competencies and Wildlife Professionals in a Changing World
Sunday, October 14, 2012 | 8:30 a.m. – 12:20 p.m. PDT | Room B113-114
USGS Organizers:
Angela Fuller - New York Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/New_York/

What are core competencies needed by today's wildlife professionals to be effective in a rapidly changing world, how are these taught or acquired, how do they relate to professional society certification criteria, and how do we know when students have mastered these competencies? While many of the fundamental relationships between wildlife and their habitats are similar to the days of Aldo Leopold, human settlement patterns, land use, technology, energy issues, attitudes of stakeholders, and expectations of students and employers have substantively changed the work environment. The College and University Wildlife Education Working Group and TWS Ad Hoc Committee on Certification join to review the historical context of what is expected of effective wildlife professionals across the dynamic spectrum of occupational categories and how educational institutions, agencies, and professional organizations can synergize to best meet future needs of society and the wildlife resource. Key findings of presentations and the discussion will be developed into a draft Best Management Practices for an "ideal" program to be posted on the web site of the Working Group shortly after the symposium and contained in a paper to be submitted to the Wildlife Society Bulletin or The Wildlife Professional.

Recent Developments in and Applications of Spatial Capture-Recapture Models
Sunday, Oct 14, 2012 | 8:30 a.m. - 12:20 p.m. PDT | Room B110
USGS Organizers:
Andy Royle – USGS Patuxent Wildlife Research Center
http://www.pwrc.usgs.gov

This symposium will provide wildlife managers and scientists a concentrated overview of spatially-explicit capture-recapture methods. Spatial capture-recapture is a relatively new methodological area which in recent years has grown widely in its application. As applications have increased, so has the need for more sophisticated models that accommodate real-world systems. This session will present recent model developments, and demonstrate applications of these new models. Some speakers will present the statistical development of these newly developed models along with illustrative applications. Application presenters will provide an example demonstrating how these models are useful in real-world systems. Several presenters will focus on software implementation.

Multi-Scale Modeling for Conservation of Migratory Birds
Tuesday, October 16, 2012 | 1:30 – 5:20 p.m. PDT | Room B113-B114
USGS Organizers:
David Haukos – USGS Kansas Cooperative Fish and Wildlife Research Unit
Mike Runge – USGS Patuxent Wildlife Research Center
Joseph Fleskes – USGS Western Ecological Research Center
http://www.coopunits.org/Kansas/

http://www.pwrc.usgs.gov
http://www.werc.usgs.gov

Populations of migratory birds use multiple habitats across a wide variety of ecosystems throughout the year. Historically, investigation and modeling the demography of migratory bird populations has primarily been limited to individual species during discrete periods of the annual life cycle. However, during discrete periods, the multi-species migratory bird community is are comprised of a mixture of individuals with different histories in terms of previously used habitats and physical locations. In addition, during migration and movements, individual migratory birds have options of traveling to different regions, ecosystems, and habitats to fulfill their physiological needs during the annual cycle. However, a suitable framework to quantitatively incorporate such "cross-seasonal" influences on the population demography of migratory birds is lacking. The Pintail Action Group proposes to host a symposium "Multi-scale modeling for migratory birds" that will include (1) an introduction to the issue including background, previous limitations, and future opportunities; (2) potential frameworks and quantitative approaches to building a demographic model to incorporate cross-seasonal effects; and (3) case studies highlighting efforts to build this type of population model.

Hierarchical Models for Wildlife Surveys over Time and Space
Wednesday, October 17, 2012 | 8:30 a.m. – 12:00 p.m. PDT | B115-B116
USGS Organizers:
Mevin Hooten - Colorado Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Colorado/

Wildlife ecologists and managers often use survey data to make inferences about demography and population trends over space and time. Such data are often imperfect with regards to the parameter of interest. For instance, animals are often imperfectly detected, and some quantities of interest (e.g., population trend, survival) are never directly observed, and must be inferred indirectly. In many such cases, hierarchical modeling provides a mechanism for making inferences from these data. Hierarchical modeling also is a natural framework for addressing temporal and spatial autocorrelation in survey data, two features that are ubiquitous in ecological datasets. In this symposium, we bring together a diverse group of speakers who address recent method developments in hierarchical modeling for wildlife surveys, as well as case studies and practical applications.

PRESENTATIONS – SUNDAY MORNING

Flea and plague ecology in prairie dog colonies: Ages of colonies, means of colony establishment, and soil characteristics
Sunday, October 14, 2012 | 8:30 a.m. PDT | Room A105
WERC Contributors:
Dean Biggins – USGS Fort Collins Science Center
http://www.fort.usgs.gov/

Populations of prairie dogs (*Cynomys*) were once abundant in western North America but their populations have dramatically declined partly due to plague, a non-native zoonotic disease caused by the flea-borne bacterium *Yersinia pestis*. The Utah prairie dog (*C. parvidens*) is federally listed as threatened and, at many sites, other species of prairie dogs have been extirpated or have been reduced to the point that they are unable to serve historic ecological functions. Many associated species have similarly declined in abundance and at least one, the black-footed ferret (*Mustela nigripes*), is highly endangered. The abundance of fleas appears to be related to rates of plague transmission and *Y. pestis* might persist in flea populations, underscoring the importance gaining an improved understanding of the ecology of prairie dog fleas. During June-September 2010-2012, we collected fleas from black-tailed prairie dogs (*C. ludovicianus*) at the Vermejo Park Ranch, New Mexico, and related the flea data to characteristics of the prairie dog colonies and to soil types. Fleas were more abundant in old colonies than new colonies. Also, fleas were more abundant in natural colonies with no history of insecticide treatment than in translocation colonies that were treated with insecticides at the time the colonies were established. Flea abundance was highest in old natural colonies, followed by old translocation colonies, new natural colonies, and new translocation colonies, respectively. Flea abundance was highest in colonies with moderately textured surface soils that may allow water infiltration (perhaps reducing rates of desiccation in fleas) and in areas of colonies with sub-surface soils comprised primarily of fine clay particles (which have higher water-holding potential, and might be less irritating to fleas than sand and silt particles). These findings could have important conservation implications for prairie dogs and the endangered black-footed ferret.

Estimating mountain lion abundance from unstructured spatial sampling: notes on sampling and model parameterization

Sunday, October 14, 2012 | 8:50 a.m. | Room B110-B112

USGS Contributors:
Robin Russell* – USGS National Wildlife Health Center
Andrew Royle – USGS Patuxent Wildlife Research Center
http://www.nwhc.usgs.gov
http://www.pwrc.usgs.gov

We present results of applying spatial capture-recapture models to a mountain lion (*Puma concolor*) data set from Montana. Rather than being laid out a priori, lion trackers adapted survey routes based on the presence of lion tracks, information provided by opportunistic observers of lions or lion tracks in the area, and knowledge of previous lion encounter locations. We present density estimates of mountain lions in the Garnet Mountain region adjusted for unstructured spatial sampling from several different models. Alternative models included effects of sex and survey effort on detection probability, and sex on the decay function of the detection probability as a function of distance. Additionally, we present density estimates from models at a range of values for several user-defined parameters, including grid and buffer size, and shape of the detection function. We conclude that models are robust to adjustments in these parameters, and that spatial capture-recapture models provide a framework for accurate density estimation for large elusive carnivores such as mountain lions.

Use of a spatially-explicit capture-recapture model for estimating population size of black bears in south-western New York

Sunday, October 14, 2012 | 8:30 a.m. PDT | Room B110-B112

USGS Contributors:
Angela Fuller - USGS New York Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/New_York/

The American black bear (*Ursus americanus*) population in the southern tier of New York has recently experienced increased density and range expansion. The population has expanded northward into areas of greater agriculture and human densities, resulting in an increase in the frequency and intensity of human-bear interactions. To help inform harvest management decisions and to develop a sampling framework for monitoring the population, we conducted a non-invasive, genetic, mark-recapture study of black bears to estimate population abundance and density in this expanding range. During two sampling seasons (summers 2011, 2012), we collected hair samples at approximately 120 barbed wire sites across a 2,624 km2 study area. Sites were relocated to new locations in the study area after 5 weeks, totaling 10 weeks of sampling during each season. Hair samples were analyzed at 7 microsatellite loci and 1 sexing marker to create genotypes and encounter histories for individuals. We applied a spatially-explicit capture-recapture (SCR) model in a hierarchical framework to estimate population abundance and density. Activity centers of individual bears were modeled as latent variables, and observation-level covariates included gender, behavior, relocation of sites, and habitat at multiple scales. Explicitly including the geographic coordinates of encounter histories, SCR methods in population estimation provide an advantage over traditional, non-spatial methods by directly accounting for the variability in capture probability that is caused by edge individuals at the periphery of the trapping array, as is often a concern with open populations. We conclude by discussing the use of landscape-specific densities for forecasting the magnitude of future population growth.

Assessing population structure and subspecific status of the Western Shovel-nosed snake across the Colorado and Sonoran desertscrub valleys of California and Arizona
Sunday, October 14, 2012 | 8:50 a.m. PDT | Room A103-A104
USGS Contributors:
Dustin Wood* - USGS Western Ecological Research Center
Amy Vandergast - USGS Western Ecological Research Center
http://www.werc.usgs.gov/

There is concern that the Tucson Shovel-nosed snake (*Chionactis occipitalis klauberi*) has experienced significant declines over the past 25 years, which has lead to a petition to list klauberi under the Endangered Species Act. An important question in evaluating that petition is whether *klauberi* is a distinct subspecies. Subspecific recognition within the Western Shovel-nosed snake has been based primarily on weak morphological differentiation, and is further complicated by the fact that *klauberi* purportedly forms a large zone of intergradation with the Colorado Shovel-nosed snake (*C. o. annulata*) across central Arizona. Results from our previous range-wide analyses, using morphology and mtDNA data, supported six monophyletic units; however, neither genetic nor morphological data were entirely concordant with the traditional subspecies taxonomy. In particular, representative samples of *klauberi* were marginally differentiated morphologically, yet genetically embedded in a mtDNA clade that included both *klauberi* and *annulata*. Given these inconclusive results, we developed a multi-locus strategy, using nuclear microsatellite loci, to provide a robust estimate of the genetic units within shovel-nosed snakes, with particular emphasis on the zone of intergradation between the klauberi and annulata subspecies. We use 11 microsatellite loci genotyped for 264 specimens and two Bayesian clustering methods to infer population structure without a priori subspecies assumptions. Analyses

support five genetic clusters across the species range, with admixture between groups generally occurring along contact zones. Importantly, one of the clusters recovered was concordant with the distribution of *klauberi*, providing genetic support for taxonomic recognition. Finally, significant estimates of population differentiation between clusters are detectable and appear to be driven, at least in part, by isolation-by-distance. However, even after controlling for geographic distance there still appears to be a gene flow barrier between the Tucson Shovel-nosed snake and more western genetic clusters, suggesting factors other than geographic distance may be at play.

Utility of a national sampling grid to integrate and improve avian monitoring
Sunday, October 14, 2012 | 8:50 a.m. PDT | Room B115
USGS Contributors:
Elizabeth Martin* – USGS Center for Biological Informatics
http://biology.usgs.gov/cbi/

Use of standard or agreed upon methods and frameworks during the data collection and/or data delivery phases of monitoring projects can facilitate coordination and integration of data from cross-scale monitoring efforts. Existing standard location reference systems, such as the United States National Grid (USNG) and the global Military Grid Reference System (MGRS), have the potential to serve as standard grids for use in grid-based sampling designs of avian monitoring projects. These spatial reference systems possess the qualities necessary for use in ecological monitoring and spatial analyses in that they: are scalable with nested cells based on multiples of 10 (e.g. 1, 10, 100, 1000 meters), have square cells with resolutions of up to 1-meter, and have national and global extents respectively. Both USNG and MGRS are naming systems for describing areas that are based on the Universal Transverse Mercator (UTM) coordinate system. When USNG uses the WGS 84 datum, it is the same as MGRS. Because of their spatial continuity and hierarchical structure, USNG and MGRS can be used to develop sampling grids for monitoring studies across various spatial scales. Sampling grids are then used to conduct random, stratified or systematic sampling in an area of interest that can be referenced across studies by conveying point position and precision when reporting location as USNG/MGRS coordinates. USNG and MGRS can also be used to analyze, summarize and visualize monitoring data by attributing grid cells with data values at the scale of interest. Sharing of sampling grids and monitoring data via their USNG/MGRS coordinates and associated grid cell attributes can facilitate coordination and integration of avian monitoring data across studies. Examples of how USNG and MGRS are being used in monitoring, research and conservation planning will be provided during this presentation.

Spatial and other design tradeoffs in a long-term monitoring program for stream salamanders
Sunday, October 14, 2012 | 9:10 a.m. PDT | Room A103-A104
USGS Contributors:
Adrianne Brand* - USGS Patuxent Wildlife Research Center
Evan Campbell Grant - USGS Patuxent Wildlife Research Center
http://www.pwrc.usgs.gov

Monitoring programs that are initially designed with the explicit goal to provide information useful for discriminating among future management decisions are more cost-effective and useful for agencies such as the National Park Service that are tasked with long-term maintenance of natural resources. To

evaluate the effectiveness of a monitoring program for headwater stream amphibians in the National Capital Region Inventory and Monitoring Network, we surveyed 3 complete second- and third-order stream networks in the C&O Canal National Historic Park over 3 seasons for each of 2 years. The completeness of these surveys allowed us to evaluate seasonal dynamics in amphibian occupancy for four stream salamander species as well as design considerations such as transect length, placement within the network, sampling season, and sampling frequency. An important primary consideration was the potential scale and parameter of interest, in this case, whether park managers were interested in evaluating salamander occupancy of individual headwater branches or at a larger catchment scale, and what life stages were most important to inform future decision-making. If all life stages are important, spring and summer sampling is paramount, but more frequent sampling or longer transects may be required to increase detection probability. Transect placement considerations mostly depend on the parameter of interest, as some network locations have more stable occupancy and are less conducive to estimation of local colonization and extinction (which may make them suitable for monitoring depending on the goals of the monitoring program). Most importantly, monitoring should be directly relevant to decisions at the park level, and should be designed to provide the scale of inference needed to properly inform those decisions.

Mite associated disease impact on the federally endangered Amargosa vole
Sunday, October 14, 2012 | 9:10 a.m. PDT | Room A105
USGS Contributors:
Robert Klinger - USGS Western Ecological Research Center
http://www.werc.usgs.gov

During re-assessment of the distribution of the federally endangered Amargosa vole (*Microtus californicus scirpensis*) in 2010 a mite-associated skin disease was discovered in 40% (61/151) of voles at 3 of 16 sites. Infested voles had bright orange mites associated with ulcerative lesions located on the external ear pinnae, genitalia, or mammae. External ear lesions were often associated with pinna deformity and tissue loss. To assess individual and population-level effects of the disease we conducted focused trapping at six 1 hectare grids from December 2011 through March 2012. Biological samples were obtained to assess the extent of disease and associated pathology in infested individuals, and population surveillance was initiated to assess disease prevalence, distribution, and potential impact on vole demographic rates. Anatomical characterization of mites recovered from affected voles performed using light microscopy, scanning electron microscopy and DNA sequencing of the 18S rRNA gene showed that the vole mite shared 92-97% homology with the Trombuculid mite, *Leptotrombidium deliense*. Histology of necrotic skin lesions of varying severity reported ulcerative inflammatory dermatitis directly associated with mites. Genetically homologous mites collected from a sympatric mouse with orange lesions but no associated necrosis suggests potential species variation in response to the mite. Mite infestation prevalence was 13% (3/22) in January 2012, and 6% (3/50) in March 2012. Preliminary abundance estimates from 219 captures of 97 individuals indicated that 84% (81/97) of the sampled vole population occurred in a single 1 hectare site. This site also had the highest prevalence of mite-associated skin disease. The monthly survival rate was 0.512 (±0.045), but more data are needed to compare survival between mite-affected and unaffected voles. Individual impact from the mite associated disease on overall body condition appears to be limited; however longer-term data is needed for further surveillance and protection of this species.

Patterns and vital rates of a terrestrial salamander following timber harvest: Does structural retention ameliorate the effect of clearcutting?
Sunday, October 14, 2012 | 9:30 a.m. PDT | Room A103-A104
USGS Contributors
Clint Otto* - USGS Patuxent Wildlife Research Center
http://www.pwrc.usgs.gov/

Clearcutting poses both short- and long-term threats to forest biodiversity. Retention of habitat elements, such as green trees and coarse woody debris, has been proposed as a forest management strategy to alleviate the negative effects of clearcutting on wildlife. We used two concurrent approaches to investigate red-backed salamander (*Plethodon cinereus*) response to structural retention prescriptions in harvested forests. First, we preformed a correlative study within a managed, forest landscape (560,000ha) to determine how patterns in salamander occupancy were related to structural retention within 1 to 5 year old aspen clearcuts. Second, we conducted a field experiment using artificial enclosures at a subset of study sites to determine how salamander survival was influenced by structural retention. For both studies, we used a class of hierarchical models that account for the limited detectability of our fossorial study species. We observed little evidence that patterns in salamander occupancy over our study landscape was related to structural retention attributes within harvested aspen stands. However, salamander survival with harvest units was positively influenced by green tree and coarse woody debris retention. In some cases, estimated survival was higher for harvested sites with high levels of structural retention than sites within 40 to 60 year old stands. Our study highlights the importance of using multiple population metrics when assessing the response of amphibians to silvicultural practices. Furthermore, our study emphasizes the need for multi-scaled management objectives for reducing the negative effects of clearcutting on forest wildlife.

A novel approach for estimating occupancy of the Oregon Slender salamander
Sunday, October 14, 2012 | 11:20 a.m. PDT | Room A103-A104
USGS Contributors:
Katie Dugger - USGS Oregon Cooperative Fish and Wildlife Research unit
http://www.coopunits.org/Oregon/

The Oregon Slender salamander (*Batrachoseps wrighti*) is a terrestrial amphibian species strongly associated with late successional forests and decaying downed wood, but the reclusive nature of this species makes detection and estimating population sizes difficult. Given the life history constraints for this species, we posit that sampling methods designed to detect and capture salamanders are either destructive to the habitats being sampled or, if not destructive, the techniques are largely ineffective. Additionally, few of these approaches use robust sampling and analytical designs that allow for the estimation of detection and temporary emigration rates, which are key variables in determining occupancy and/or population size. Our one year pilot study employed a newly established light-touch sampling protocol and a space-for-time analytical technique to quantify occupancy rates in mature 2nd growth forest stands. Average species-level detection probability was 0.15 (95% CL: 0.05-0.36) and average occupancy probability was 0.83 (95% CL: 0.20-0.99). None of the habitat covariates we investigated, including the amount of decayed wood and site productivity, were associated with detection probability or occupancy. These survey methods will be applied for the next two years in a survey designed to quantify Oregon Slender salamander occupancy as a function of stand age and

understory complexity. These non-destructive sampling and robust analytical techniques will be used to collect data on how the Oregon Slender salamander responds to disturbance with changes in detection rates and site occupancy, which is information vital to conservation.

Movement ecology of the endangered Hawaiian Goose
October 14, 2012 | 12:00 p.m. PDT | Room A106
USGS Contributors:
Steven Hess - USGS Pacific Island Ecosystems Research Center
http://www.usgs.gov/ecosystems/pierc/

The endangered Hawaiian Goose (*Branta sandvicensis*),or Nēnē, underwent a severe population decline in the early 20th Century. Nēnē were reintroduced throughout Hawaiʻi Island from captivity since 1960, however, traditional movement patterns did not become reestablished until recently. We used satellite telemetry with GPS capacity to study three aspects of reestablished Nēnē movement patterns; altitudinal migration, multi-scale habitat selection, and migration routes. Many tropical bird species make seasonal migrations between elevation zones. Two subpopulations of Nēnē moved 974.4 m (95% CI ± 22.0) and 226.4 m (95% CI ± 40.7) in elevation on average. These movements were in the opposite direction of most tropical bird species, from lowland breeding and molting areas in September-April, to high-elevation shrublands during the non-breeding season of May-August. We determined factors influencing the habitat selection of Nēnē at two scales using binomial Generalized Linear Models. Meso-scale habitat modeling revealed that Nēnē preferred alien grass and human-modified landscapes while breeding and molting, and native subalpine shrubland during the non-breeding season. The best model supported by QAICc (wi = 0.91) included: season, elevation, distance to water, land cover class, elevation x land cover class, and season x distance to water. Fine-scale habitat modeling included all predictors from the top-ranked meso-scale model and three additional predictors, but yielded little additional resolution. Results were consistent with historical records, although dissimilar from habitat preference studies of other non-migratory Hawaiʻi Island subpopulations. Brownian bridge movement models showed well-defined movement routes for two subpopulations of Nēnē among sequential breeding, molting, and non-breeding home ranges between seasons. These previously isolated subpopulations of Nēnē used common migration routes and moved seasonally between elevation zones to access preferred habitats. Restoration of endangered tropical bird species throughout their entire altitudinal range may be important for reestablishing traditional movement patterns and appropriate seasonal behaviors.

The role of professional societies in helping to fulfill core competencies needed by wildlife professionals
Sunday, October 14, 2012 | 12:00 p.m. PDT | Room B113-B114
USGS Contributors:
Angela Fuller - USGS New York Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/New_York/

The Wildlife Society was founded to advance the following principal objectives, 1) establishment of professional solidarity and maintenance of the highest possible professional standards, 2) development of all types of wildlife management along sound biological lines, 3) publications to advance these ends, and 4) protection of the interests of its members. All of these objectives are relevant to the

professional development of wildlife biologists today. The primary source of professional education and training has been college and university programs and employers. Professional societies, like TWS, have played a role by establishing minimum standards for programs (i.e., accreditation) or graduates (i.e., certification). Recently, employers have recognized gaps in mastery of core competencies in recent graduates and new hires, and all concerned parties have searched for ways to fill those gaps. Professional societies can play a significant role in a number of ways, at both local and national levels. We will discuss several TWS initiatives that have addressed head-on the role of providing training in core competencies and that have fostered the development of young professionals. Additionally, we will examine what other professional societies are doing to fulfill core competencies. Finally, we conclude with a summary of key findings of presentations in this symposium.

PRESENTATIONS – MONDAY AFTERNOON

Enhancing grassland sparrow populations on reclaimed mine grasslands: A large-scale experiment of woody vegetation removal
Monday, October 15, 2012 | 2:30 p.m. PDT | Room A103-A104
USGS Contributors:
Duane Diefenbach - Pennsylvania Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Pennsylvania/

Grassland sparrow populations have experienced substantial declines across their range, and reclaimed surface mine grasslands have been recognized for their importance to grassland sparrow populations. Increasingly, individuals and institutions have called for the removal of woody vegetation from grasslands to promote grassland sparrow populations. We designed a three-year experimental study to monitor grasshopper (*Ammodramus savannarum*) and Henslow's (*A. henslowii*) sparrow population dynamics across eight fifty-acre plots of surface mine grasslands with various amounts of scattered woody vegetation coverage (~5-35%). Using a before-after-control-design, we removed woody vegetation from treatment plots following the first breeding season. We measured the changes in sparrow populations on using mixed, robust-design, and nest survivorship models. Daily nest survivorship was unrelated to woody vegetation levels for either species, but fledgling production for grasshopper sparrows was inversely related to the amount of woody vegetation around the nest and on the plot. Grasshopper sparrow apparent survival rates were not different between control and treatment plots. Henslow's sparrow populations, however, experienced a three-fold decrease in apparent survivorship following woody vegetation removal compared to Henslow's sparrow populations on control plots. Both species occupied and nested on plots in excess of 30% areal shrub coverage. Grasshopper sparrow population size increased by 25% following woody vegetation removal, compared to control plots, while Henslow's sparrow treatment plot populations declined more rapidly than Henslow's sparrows on control plots. Our results suggest that removal of woody vegetation from surface mine grasslands has a positive and immediate, albeit subtle effect on grasshopper sparrow populations and no positive effect on Henslow's sparrow populations at least during the two years following woody vegetation removal. Given the large expense involved in woody vegetation removal and lack of response by Henslow's sparrows we favor and discuss other management strategies to increase grassland sparrow populations on reclaimed surface mine grasslands.

Zephyr or tempest? Effects of wind energy development on breeding grassland songbirds
Monday, October 15, 2012 | 2:50 p.m. PDT | Room A103-A104
USGS Contributors:
Anna Chalfoun - Wyoming Cooperative Fish and Wildlife Research Unit
http://www.wyocoopunit.org/

Industrial-scale wind energy developments are a novel and rapidly increasing form of anthropogenic disturbance presenting new mitigation challenges for resource managers. The vast majority of research to date has investigated direct effects of wind energy development on wildlife, such as mortality from turbine strikes, whereas few studies have focused on potential indirect effects. We examined variation in grassland bird nesting success and nestling condition along a 500 meter spatial gradient of proximity to wind turbines for two songbird species within two wind farms in Wyoming. We modeled daily nest survival of horned lark, our most abundant species, using logistic regression with AICc model ranking of landscape scale and nest-site scale predictor variables. The constant survival model ranked highest, though all models including those with nearest turbine distance were closely weighted and within 2 ΔAICc units, indicating no overwhelming support for a single model. Daily nest survival rates for the horned lark, did not vary with proximity to turbines, but overall nest success was extremely low. Horned lark nestling mass, an index of nestling quality, increased with proximity to turbines. Nestling masses of the McCown's longspur, the second most abundant species at our sites, did not vary in relation to turbine proximity. Our results show no clear trend in avian nesting success with proximity to turbines, however the uniformly low rate of horned lark nest success may indicate a larger scale is necessary to better describe wind energy development's influence on local avian nesting dynamics. Research investigating potential impacts and means of mitigating any impacts of wind energy development to avian grassland species is essential, particularly in light of the steep rates of population decline grassland birds have experienced throughout North America over the last 40 years.

Predicting avian community response to changes in forest structure associated with management practices in the Sierra Nevada
Monday, October 15, 2012 | 4:40 p.m. PDT | Room A105
USGS Contributors:
Elise Zipkin - USGS Patuxent Wildlife Research Center
https://www.pwrc.usgs.gov/

In the absence of fire, fuels have accumulated in many Sierran forests causing concerns over the occurrence of catastrophic wildfires. Fuel reduction treatments are implemented on federal and state lands to reduce the threat of wildfire by mechanically removing biomass. Although these treatments can reduce fire hazard, there is increasing interest in designing silvicultural prescriptions that can also restore wildlife habitat. We used a multi-species occupancy modeling approach to build habitat-suitability models for passerine birds of the Lake Tahoe Basin based on forest structure and environmental variables. Using a Bayesian hierarchical framework, we predicted how changes in forest structure will affect the probability of occurrence of many avian species and foraging guilds in the Tahoe Basin. We used model estimates to predict changes in species richness and community composition under three categories representing possible management practices: no active management, a typical fuel reduction treatment with emphasis on maximum spacing between trees, and a thinning treatment that creates structural heterogeneity in the residual forest. Although our

models indicated that overall species richness would decline with either fuel reduction treatment, the prescriptions were predicted to differ in species richness and evenness. Differences in avian responses to the modeled management options suggested that community membership would change markedly depending on forest management, further emphasizing the importance of creating heterogeneity at the landscape scale.

Integrating land-cover data with data from acoustic and other ground-based sensors to assess environmental benefits of the Wetland Reserve Program in Iowa
Monday, October 15, 2012 | 4:40 p.m. PDT | Room 117-119
USGS Contributors:
Walt Sadinski - USGS Upper Midwest Environmental Sciences Center
Alisa Gallant - USGS EROS
Mark Roth - USGS Upper Midwest Environmental Sciences Center
http://www.umesc.usgs.gov/
http://eros.usgs.gov

Since the mid-1800s, humans have reduced native grasslands that once covered approximately 80% of Iowa's land area to approximately 5%, converting the vast majority to cropland and much of the remainder to pasture or hay production. In the process, agriculturalists drained wetlands extensively in areas such as the Des Moines Lobe, an intensively farmed portion of the Prairie Pothole Region in Iowa, and created stock ponds and other impoundments in regions where wetlands were less common historically. These and changes to other historical land-cover types, produced hydrologic and biological conditions very different from those of the past. More recently, farmers have been removing lands from the Conservation Reserve Program and also farming marginal lands previously not farmed to increase production for biofuels. Historical and recent changes in Iowa land cover and use provide critical landscape context for evaluating environmental benefits of the Wetland Reserve Program (WRP). We considered this context when we initiated a 2012 field study of potential wildlife benefits at 28 WRP sites in the northern Des Moines Lobe. We categorized WRP sites based upon the potential landscape quality and connectivity (high or low) in surrounding 4-km2 neighborhoods due to land cover, land management, and human-population and infrastructure footprints and upon the length of time they were enrolled in the WRP (≤ 5 y or ≥ 10 y). We selected seven replicate study sites and instrumented them with sensors to measure amphibian and bird calling activity in relation to weather conditions, water depths, and landscape factors, such as wetland density and vegetation heterogeneity. Based upon our results from non-WRP studies, we expect our novel use of acoustic recorders and approaches to analyzing acoustic data relative to environmental conditions will be informative for observing any benefits of WRP sites for wildlife in a landscape context.

Effects of fish-eating birds on Columbia River salmonids
Monday, October 15, 2012 | 5:00 p.m. PDT | Room B115-B116
USGS Contributors:
Daniel Roby - Oregon Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Oregon/

The so-called "4 H's" (Harvest, Habitat, Hydrosystem, Hatcheries) are widely recognized as the primary factors causing 13 of 20 Evolutionarily Significant Units (ESUs) of anadromous salmonids

(*Oncorhynchus* spp.) from the Columbia River basin to be listed under the U.S. Endangered Species Act (ESA). In the last 15 years, however, evidence has accumulated implicating avian predation on out-migrating juvenile salmonids as a significant limiting factor for recovery of at least some ESA-listed ESUs in the basin. Two piscivorous waterbirds in particular, Caspian terns (*Hydroprogne caspia*) and double-crested cormorants (*Phalacrocorax auritus*), have emerged as the primary avian predators on salmonids in the basin. Breeding colonies of Caspian terns and double-crested cormorants near the mouth of the Columbia River are the largest known for the respective species. In 2011, birds from these two colonies consumed an estimated 25 million salmonid smolts, or approximately 15% of all juvenile salmonids that survived to the mouth of the River. Further up-river on the Columbia Plateau, Caspian terns and double-crested cormorants nest in much smaller colonies, but salmonid smolts can be a much higher proportion of their diets compared to the estuary. One particular Caspian tern colony on the Plateau consisting of only ca. 400 breeding pairs consumed at least 15% of all smolts belonging to a threatened steelhead population. Our analyses indicate that, at current colony sizes, management to reduce avian predation on juvenile salmonids in the Columbia Basin will not by itself recover any ESA-listed ESU of anadromous salmonids. Reductions in avian predation could, however, result in increases in salmonid population growth rates comparable to some other salmonid recovery actions in the Basin. Resource managers are attempting to reduce avian predation on ESA-listed anadromous salmonids non-lethally by discouraging nesting at colony sites where predation rates are significant and encouraging nesting at alternative colony sites.

PRESENTATIONS – TUESDAY MORNING

Investigating American pika habitat selection in the southern Greater Yellowstone Ecosystem
Tuesday, October 16, 2012 | 8:50 a.m. PDT | Room A106
USGS Contributors:
Erik Beever - USGS Northern Rocky Mountain Science Center
Leah Yandow - Woming Cooperative Fish and WIldlife Research Unit
http://www.nrmsc.usgs.gov/
http://www.wyocoopunit.org

Contemporary climate change has altered classic extinction dynamics. Consequently, conservation in alpine ecosystems must consider habitat selection patterns under novel conditions. American pikas (*Ochotona princeps*) and are an ideal species for evaluating climate-driven changes in habitat selection because of their temperature sensitivity, dependence on snow and naturally patchy distribution.

Relatively little is known about pika distribution or habitat selection in the Greater Yellowstone Ecosystem, despite range-wide research initiatives. As a result, regional responses to climate change are largely speculative. To better assess pika habitat selection, we examined pika occupancy at 211 sites on the Bridger-Teton National Forest, June -October 2010 and 2011. We generated sample points in four elevation bands using a generalized random tessellation stratified (GRTS) sampling design. At each site we surveyed for pikas in a 12m fixed-radius plot and used a 100m line-point intercept transect to quantify forage. We deployed 40 pairs of surface/subsurface temperature loggers at a subset of points to better understand the relationship between ambient and subterranean temperatures.

Forty-eight percent of sites were occupied within the 12m plots. Occupancy rates were higher with increased detection distance from plot center (0-200m, 67% occupancy). We used logistic regression models and AIC model selection to examine predictors of patch occupancy. Important predictors included elevation, forage availability and rock size. Low elevation loggers recorded temperatures below -10°C during 10.6% of 9,138 hours. In contrast, medium and high elevation temperatures were below -10°C during 2.1% and 2.7% of hours, respectively. We recorded no hours in which temperatures exceeded 28°C, a proposed limiting heat threshold. Results of our work indicate that cold exposure and snow cover may be drivers of pika habitat selection. With continued temperature increases and low elevation snow depths predicted near zero by the end of the century, pikas and other alpine mammals will face increasing difficulty.

Population dynamics of king eiders breeding in northern Alaska
Tuesday, October 16, 2012 | 8:50 a.m. PDT | Room A107-A109
USGS Contributors:
Abby Powell - Alaska Cooperative Fish and Wildlife Research Unit
Rebecca Bentzen - Alaska Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Alaska/

The North American population of King Eiders (*Somateria spectabilis*) has declined by more than 50% since the 1970s for unknown reasons. King Eiders spend most of their lives in remote areas forcing managers to make regulatory and conservation decisions based on sparse information. We incorporated available published estimates of vital rates with new estimates to build a female, stage-based matrix population model for King Eiders and examine the processes underlying population dynamics of king eiders breeding at two sites, Teshekpuk and Kuparuk, on the coastal plain of northern Alaska and wintering around the Bering Sea (2001-2010). Clutch size ranged from 2 to 8 eggs and averaged 4.4 eggs/nest. Estimated site year-specific process variation in clutch size was 0.07 (95% CI = 0.06-0.23). Adult annual survival rate was high (0.94, 95% CI: 0.90-0.96) and spatially and temporally invariant ($\sigma 2 = 0.0002$). First year survival was 0.65 (95% CI: 0.53-0.76) and more variable ($\sigma 2 = 0.003$) than that of adults. We predicted a stable to decreasing population ($\lambda = 0.978$, 95% CI: 0.938 - 1.140) and that population growth was most sensitive to changes in adult female survival (sensitivity = 0.93) but that low duckling survival may be a bottleneck to productivity (retrospective variation in λ was 65% due to variation in duckling survival). Although adult survival was high and invariant, catastrophic events could have a major impact and we need to consider how to mitigate and manage threats to adult survival. However, if vital rates remain stable, the more variable reproductive parameters (duckling and nest survival) may be more responsive to management actions such as predator control and limited anthropogenic disturbance in breeding areas. While we were limited in some aspects by sample size and missing parameters, our model is an important step in managing the population and mitigating future impacts.

PRESENTATIONS – TUESDAY AFTERNOON

Alternative statistical models for small counts of California spotted owl fledglings
Tuesday, October 16, 2012 | 1:30 p.m. PDT | Room A103-104
USGS Contributors:
Brian Cade - USGS Fort Collins Science Center
http://fort.usgs.gov/

We modeled 20 years of records (1991 - 2010) on California spotted owl (*Strix occidentalis occidentalis*) fledgling counts (0 - 3) in the Lassen National Forest as they related to climatic (temperature and precipitation from PRISM), demographic (age of female, number of young fledged in prior years), and local habitat (percent forest cover, etc.) characteristics at owl nesting territories (n = 795 territory-year observations on 87 territories). We used two statistical procedures to model changes in the proportions of these small counts: quantile count regression and cumulative ordinal logistic regression without a proportional odds assumption. Previous simulation experiments by McDonald and White (2010. JWM 74:514-521) recommended ordinary least squares (OLS) regression because it provided valid probabilities for hypothesis tests on mean rates of change for similar small counts, despite the obvious violations of the assumptions of continuous error distributions with homogeneous variances. However, because the means of small bounded counts can have heterogeneous proportions for each count, changes in the mean count do not necessarily convey all the useful information associated with a change in distribution of these counts. Both the ordinal logistic and quantile count regression models estimated similar negative effects of prior fledgling production, negative effects of subadult compared to adult nesting females, negative effects of winter (Nov-Feb) and early nesting (Mar-Apr) precipitation, and positive effects of early nesting minimum temperature on the proportions of fledgling counts. Estimates for changes in the quantiles or proportions of counts with predictors were heterogeneous across counts as anticipated, with greater rates of change associated with higher quantiles and proportions of larger counts. We discuss differences and similarities between these two alternative statistical models for changes in distribution of small counts and the additional information provided compared to modeling mean counts.

Building models for migratory birds: Capturing temporal and spatial linkages
Tuesday, October 16, 2012 | 1:30 p.m. PDT | Room B113-B114
USGS Contributors:
Mike Runge - USGS Patuxent Wildlife Research Center
http://www.pwrc.usgs.gov/

The population dynamics of migratory birds are influenced by drivers that operate at multiple spatial scales throughout the annual cycle. Hypotheses abound for these temporal and spatial linkages, and include such dynamics as cross-seasonal interactions mediated by energetic or behavioral mechanisms, and multi-scale effects mediated by density-dependent mechanisms. Demonstration of these effects with direct empirical evidence has been elusive, however, in part because typical field work focuses only on one season or place. As new technologies, like stable isotopes and geolocators, reveal the connections between seasons, data are arising to test these hypotheses, and new modeling is needed to understand the full implications of these linkages. To capture these complex dynamics, models for migratory birds need to incorporate mechanisms for these temporal and spatial linkages. The temporal linkages, that is cross-seasonal or “carry-over” effects, arise when drivers in one season affect

demographic success in a subsequent season; these effects can affect the whole population, or can affect sub-populations differentially. The spatial linkages have two forms: metapopulation dynamics, and cross-scale effects. Metapopulation dynamics require tracking separate spatial segments of the population, and understanding the cross-seasonal linkages between them. Cross-scale effects arise when different drivers act at different scales, and when there are scale-dependent regulatory mechanisms. One of the biggest challenges in building multi-scale models for migratory birds is that there are often critical parameters that are difficult to measure directly. Hierarchical modeling methods offers promise, however, by allowing us to infer latent parameters by integrating data sets collected at different spatial and temporal scales. In this talk, I describe a generic framework for modeling the population dynamics of migratory birds that captures these complexities, suggest how the application context for these models is critical in their design, and provide the background for the more detailed talks to follow.

A practical guide for use of home range estimators
Tuesday, October 16, 2012 | 2:10 p.m. PDT | Room A103-A104
USGS Contributors:
Mevin Hooten - Colorado Cooperative Fish and Wildlife Research Center
http://www.coopunits.org/Colorado/

Characterizing animal space use is fundamental for understanding the landscape properties that influence animal ecology and a key component of population level wildlife conservation and management. Numerous home range methods have been developed and used to estimate animal space use, and identifying the best estimator for a given system is critical for the successful interpretation of animal spatial data. However, a rigorous comparison framework and guidelines for the general strengths and weaknesses of the primary home range estimation methods are lacking. Here we compare the ability of home range estimators to capture spatial use patterns of simulated animal movement paths that are based on real animal data collected from African elephants (*Loxodonta africana*) and American black bears (*Ursus americanus*), and represent behavioral movement categories of clustered foraging, migration between two points, and random walk. We focus our analysis on performance of estimators thought to be of the greatest potential use with detailed animal movement data: kernel density with plug-in bandwidth, local convex hull, and Brownian bridge home range methods. Performance is assessed for each method for its binary and continuous outputs by computing type I and II errors (i.e., propensity to include unused areas or exclude truly used areas) and root mean squared error (i.e., magnitude of error in estimating true probabilities of use) for different sampling intensities of the simulated movement paths. Using the results from these analyses, we develop a comparison framework and a simple guide to assist practitioners and academics in the decision making process regarding which home range estimator to apply to their system specific questions and needs.

Distribution and abundance of American pika in the Sierra Nevada and White Mountain ranges of California
Tuesday, October 16, 2012 | 2:10 p.m. PDT | Room A106
USGS Contributors:
Robert Klinger* – USGS Western Ecological Research Center
Cody Massing – USGS Western Ecological Research Center

http://www.werc.usgs.gov/

We used a combination of line transect and point count surveys to collect data on distribution, abundance and habitat use of American pika (*Ochotona princeps*) in the Sierra Nevada and White Mountain ranges of California between 2008 and 2011. In the Sierra Nevada, observations were made each year along a minimum of 9 (2008) and a maximum of 21 (2011) 10-km transects, and at a minimum of 40 (2008) and a maximum of 210 (2011) point count stations. In the White Mountains, six transects 1.5 to 8 km long were sampled each year. Pika occurred widely throughout the alpine and subalpine zones of both ranges, but their distribution was very patchy and occupancy and abundance highly variable. Approximately 37% of the study area was occupied by pika, but variability in occurrence within a given geographic region was as high as variability between regions. Site occupancy expanded between 2008 and 2009 but 50% fewer sites were occupied in 2011 following the second consecutive heavy and extended winter in as many years. Land cover and topography variables had greater predictive value of occupancy than climate variables. Density was highly variable at patch, local, and regional scales; areas in both mountain ranges that had high abundance in one year could have much lower abundance the next year and vice versa. Density in the White Mountain range was generally 3-4 times greater than that in the Sierra Nevada (12.2 km2 ± 1.4 SE vs. 3.5 km2 ± 0.4, respectively), but density decreased by about 50% in both ranges following the winter of 2010/2011. The distribution and abundance of pika in the Sierra Nevada and White Mountain ranges are very dynamic, but even in years when populations are low tens of thousands of individuals occur in the two mountain ranges.

Movements, stopover locations, and body condtion of lesser scaup during spring migration
Tuesday, October 16, 2012 | 2:10 p.m. PDT | Room B113-B114
USGS Contributors:
Alan Afton – Louisiana Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Louisiana/

We investigated migratory flight parameters of female lesser scaup (*Aythya affinis*) using Pool 19 of the Mississippi River to evaluate the relative importance of subsequent stopover habitats in the upper-Midwest. We randomly selected females for implantation with intracoelomic satellite transmitters and obtained locations every 1.4 days. We estimated flight parameters of 44 females during springs 2007 (n=11), 2008 (n=21) and 2009 (n=12), between Pool 19 and their inferred breeding sites. Females spent an average of 7.1 ± 3.5, 17.3 ± 2.5 and 20.3 ± 3.3 days (year mean ± SE) in the upper-Midwest after leaving Pool 19, respectively, before migrating on to their breeding sites. Overall, females spent 40 days, on average, in migration after departure from Pool 19 until arrival on their breeding sites, of which 16 days (40%) were spent within the upper-Midwest. The number of females stopping over in IA, SD, MN and ND were 13 (30%), 11 (25%), 20 (45%) and 35 (80%), respectively. ANCOVA indicated that flight parameters did not vary among years or with body mass. Females made, on average, a minimum of 7.4 ± 0.5 (± SE) stops (Range = 1 to 14 stops) between Pool 19 and their inferred breeding sites. Straight-line distances, between Pool 19 and breeding sites ranged from 984 to 4541 km and averaged 2803.4 ± 133.4 km (± SE). Mean time between departure from Pool 19 and arrival on breeding sites averaged 39.8 ± 2.3 days (± SE), with a minimum and maximum of 7 and 82 days, respectively. Mean overall rate of movement from Pool 19 to breeding sites was 78.1 ± 4.6 km/day (± SE), with a range of 26.6 to 181.3 km/day. Females stopped and spent substantial time within the upper-Midwest; thus, forage conditions there, particularly in MN and ND, may influence subsequent reproductive success.

Using auxiliary known-fate data to improve harvest estimates from tag-recovery models
Tuesday, October 16, 2012 | 2:30 p.m. PDT | Room A103-104
USGS Contributors:
Frances Buderman - Pennsylvania Fish and Wildlife Cooperative Research Unit
Duane Diefenbach - Pennsylvania Fish and Wildlife Cooperative Research Unit
http://www.coopunits.org/Pennsylvania/

Tag-recovery models can be a cost-effective means to estimate harvest and survival rates but require animals to be captured immediately prior to the hunting season. Wild turkey (*Meleagris gallapavo*) and white-tailed deer (*Odocoileus virginianus*) are easiest to capture in winter but their hunting seasons do not occur until autumn. Consequently, the mortality rate between date of capture and the fall hunting season is 0.52 for female turkeys and 0.11 for white-tailed deer and tag-recovery estimators provide negatively-biased harvest rate estimates. To obtain unbiased estimates of annual harvest rates we developed a modified tag-recovery model that incorporated survival rate information from known-fate analyses of animals with radio-transmitters. We evaluated various scenarios with different capture-to-hunting season survival rates, harvest rates, and annual survival rates to compare bias and precision of our joint known-fate and tag-recovery estimator to a standard tag-recovery estimator. Simulations varying the allocation of radio-transmitters and tags indicated that precision (CV) improves as harvest rate increases. Estimates can be obtained that are equally precise (difference between CVs ≤ 3%) as those from a standard tag-recovery estimator by adding between 25 and 75 radio-transmitters. We evaluated precision and bias of our joint model and found, on average across all tag allocations, that the joint model outperformed a standard tag-recovery model when as few as 25 radio-transmitters were deployed. With auxiliary information, the joint known-fate and tag-recovery model is an unbiased estimator when mortality occurs between capture and direct recoveries and can provide estimates with equivalent levels of precision to tag-recovery models when tagging occurs immediately prior to harvest.

Modeling scaup populations across seasons and regions: application for a comprehensive conservation action plan
Tuesday, October 16, 2012 | 2:30 p.m. PDT | Room B113-B114
USGS Contributors:
Jane Austin – USGS Northern Prairie Wildlife Research Center
http://www.npwrc.usgs.gov/

The combined breeding-season populations of greater scaup (*Aythya marila*) and lesser scaup (*A. affinis*) (hereafter, scaup) of North America experienced a marked and prolonged decline between the mid-1980s and 2000s. The population's continental range challenges efforts to understand both the nature of constraints operating on the populations and the temporal and geographic scope of their influences. To tackle the complex issues and scales involved, we have taken a top-down approach in the development of a conservation framework. We structured the annual cycle with a population model consistent with the spatial and temporal scales specified by the conservation plan's objectives and potential decisions so that it could be used to predict the likely impact of individual management actions or a suite of actions. Demographic parameters represented three breeding regions and three seasons. For each vital rate, we identified possible actions that could affect that rate (e.g., upland cover

programs to enhance hen success). We relate effects of actions on vital rates, and hence the continental population, through simple functional relationships. The model structure includes alternative hypotheses about the annual cycle, which can be valuable in assessing different management alternatives. This top-down, model-based approach has highlighted many technical challenges and uncertainties related to model structure, scale, density dependence, and costs and efficacies of actions. The uncertainties and issues identified through this process and in the final plan will help structure future scaup research and management actions and priorities.

Incorporating ecohydrologic variables into modeling of patterns of montane-mammal distribution and abundance

Tuesday, October 16, 2012 | 2:50 p.m. PDT | Room A106

USGS Contributors:

Erik Beever* - USGS Northern Rocky Mountain Science Center

http://nrmsc.usgs.gov/

Montane ecosystems have been suggested by both paleontological and contemporary research to often be systems of relatively rapid faunal change, compared to many valley-bottom counterparts. In addition to often (but not always) experiencing greater magnitudes of contemporary change in climatic parameters than species in other ecosystems, mountain-dwelling wildlife must also accommodate often-greater intra-annual swings in temperature and wind speeds, poorly developed soils, and generally harsher conditions. Here, we sought to understand whether combinations of biogeographic, land-use, topographic, and climatic variables predicted abundance of American pikas (*Ochotona princeps* Richardson) across the 38.2-million-ha hydrographic Great Basin, and to quantitatively assess the ability of pikas to use behavioral plasticity to adapt to changing climates. We present new results of pikas that illustrate how biologically relevant derived hydrological variables such as growing-season precipitation and maximum snow-water equivalent can be important predictors of abundance (quantified using paired double-observer distance sampling on line transects). We also present new results from pikas and other taxa in the Northern Rocky Mountains that illustrate how behavioral plasticity can, in at least some cases, 'soften' the boundaries of species' bioclimatic niches. We describe several emerging efforts, technologies, and approaches that may contribute greatly to broad-scale, mechanism-based investigations to inform management and conservation of diverse montane wildlife and the ecosystem components with which they interact. Based on our empirical findings and our review of related literature, we propose tenets that may serve as foundational starting points for our expanding research on plasticity and adaptation vs. distributional change in montane animals across the Northern Rocky Mountains region.

A modeling framework to integrate harvest and habitat management of North American waterfowl: case-study of northern pintail metapopulation dynamics

Tuesday, October 16, 2012 | 2:50 p.m. PDT | Room B113-B114

USGS Contributors:

Brady Mattsson* - USGS Patuxent Wildlife Research Center

Mike Runge – USGS Patuxent Wildlife Research Center

David Haukos – Kansas Cooperative Fish and Wildlife Research Center

Joseph Fleskes – USGS Western Ecological Research Center

Wayne Thomartin – USGS Upper Midwest Environmental Science Center

http://www.pwrc.usgs.gov
http://www.coopunits.org/Kansas/
http://www.werc.usgs.gov/
http://www.umesc.usgs.gov

We developed and evaluated the performance of a metapopulation model designed to enable managers to examine, for the first time, consequences of alternative management strategies involving habitat conditions and hunting on both harvest opportunity and carrying capacity for migratory waterfowl at a continental scale. We focus on the northern pintail (*Anas acuta*; hereafter, pintail), which serves as a useful model species to examine the potential for integrating waterfowl harvest and habitat management in North America. We developed submodel structure capturing important demographic processes for pintail populations during breeding, fall migration, winter, and spring migration while representing several core breeding and nonbreeding areas. Continental-scale predictions from our baseline parameterization resulted in a carrying capacity of 5.5 million with an equilibrium population size of 2.9 million and harvest rate of 12% at maximum sustained yield. These values are within 10% of those from the pintail harvest model currently used by the U.S. Fish and Wildlife Service. Our model allows estimation of the relative contributions to continental-scale population dynamics of habitat quantity and quality among the core breeding and nonbreeding areas. Ongoing model refinements include: 1) extending submodels with additional parameters to link impacts of habitat management and environmental conditions on biological response parameters; 2) completing a formal sensitivity analysis; and 3) estimating costs of changing biological parameters through habitat management efforts. By integrating habitat and harvest dynamics within this modeling approach, we can predict habitat and harvest management influences on continental-scale population responses while explicitly considering putative effects of climate change. Our model could be readily adapted to address management questions for many habitat-limited species.

A multi-scale examination of stopover habitat use by migrant shorebirds in the southern great plains
Tuesday, October, 16, 2012 | 4:00 p.m. PDT | Room B113-B114
USGS Contributors:
Gene Albanese - Kansas Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Kansas/

We used age-structured population models with a seasonal structure, density dependent growth of goslings, and estimates of demographic parameters from throughout the annual cycle to model effects of ecological change and management actions on dynamics of the Pacific Black Brant (*Branta bernicla nigricans*) population. Models indicate that a number of factors operating throughout the annual cycle influence dynamics of Black Brant. Sport harvest rates in the 1950s exceeded 10% for all age-sex classes, which was sufficiently high to produce population decline, especially when combined with local subsistence harvest on the breeding area. Harvest rates have declined steadily since the 1950s and now represent < 1% of each age-sex class. Annual survival of adults has increased to 0.88, which would have been consistent with population increase under historical ecological conditions. Nest predation rates increased dramatically, however, in the 1980s, and the resulting reduced nest success has reduced recruitment rates sufficiently to induce continued population decline. An additional confounding factor in this population is that geese maintain foraging habitat for their offspring by grazing. In years of high nest predation, foraging is reduced because geese leave the area to undergo molt migration, and foraging habitat is lost. Reduced foraging habitat reduces growth rates of goslings,

which in turn reduces their survival over the first year. Reduced first-year survival is, by itself, adequate to induce population decline and when combined with low nest success produces rapid population decline. Finally, we have estimated effects of warmer sea surface temperatures and availability of eelgrass in winter on probability of breeding the following spring. We show that reduced availability of eelgrass, as might be expected under warmer ocean conditions, can reduce breeding probability sufficiently to produce population decline. Overall, we show that numerous factors throughout the year affect dynamics of Black Brant.

Isolation and fragmentation in sage-grouse: genetic fingerprints at the crime scene
Tuesday, October 16, 2012 | 4:00 p.m. PDT | Room B117-B119
USGS Contributors:
Sara Oyler-McCance* - USGS Fort Collins Science Center
http://www.fort.usgs.gov

Habitat loss and fragmentation have left both species of sage-grouse with a number of populations that are small and isolated from larger, more contiguous portions of the range. Substantial impacts from recent energy development, other anthropogenic land use changes, and climate warming may also further fragment and isolate populations of both species. Isolation and fragmentation can lead to reduced levels of genetic variation, and although the importance of maintaining substantial genetic variation in small populations is debated, most agree that genetic variation is relevant to the health and viability of populations and that it should be addressed and monitored in management plans. One of the best examples of inbreeding depression in small, isolated populations has been documented in the sage-grouse cousin, Greater Prairie-Chicken. In a peripheral population of Greater Prairie-Chickens in Illinois researchers showed that fertility and hatching success were reduced due to a bottleneck caused by habitat loss. Lessons learned from this study of Greater Prairie-Chicken have been applied to sage-grouse. Some sage-grouse populations have experienced similar isolation and reduction in population size resulting from the loss of habitat and, as a result, have been involved in translocation programs to increase genetic variability and augment populations. The future of sage-grouse genetic research is being driven by improved genetic techniques and expanded applications of habitat and anthropogenic landscape data, which provide the basis for landscape genetic analyses. Such methods can be used to identify how landscape features and anthropogenic stresses influence gene flow and connectivity among populations. Landscape genetic approaches have been applied to prairie-chicken populations and are currently being conducted on both species of sage-grouse. This information can potentially inform the prioritization of habitats for conservation and strategies to mitigate impacts from climate change and energy development.

Estimating age from recapture data: an integrated model to infer age-at-length from incremental growth measures and ancillary data
Tuesday, October 16, 2012 | 4:20 p.m. PDT | Room A103-A104
USGS Contributors:
Mitch Eaton - New York Cooperative Fish and Wildlife Research Unit
William LInk - USGS Patuxent Wildlife Research Center
http://www.coopunits.org/New_York/
http://www.pwrc.usgs.gov/

Estimating the age of individuals is relevant for answering important ecological questions, modeling population demographics and managing exploited or threatened species. Significant effort is given to determining age through the use of growth annuli, secondary physical characteristics, and growth models. Many species, however, either do not exhibit physical characteristics useful for independent age validation or are too rare to justify sacrificing individuals to establish the relationship between size and age. Length-at-age models in fisheries and other literature often overlook variation in individual growth rates and consider growth parameters as population parameters. More recent models have taken advantage of hierarchical structuring of parameters and Bayesian methods to allow for variation among individuals as functions of environmental covariates or individual-specific random effects. Here, we describe hierarchical models in which growth curves vary as individual specific stochastic processes, and show how these models can be fit using capture-recapture data and integrated with other data sources. We combine these independent data sources in a Bayesian analysis, distinguishing natural variation from measurement error. We illustrate using data for African dwarf crocodiles (*Osteolaemus tetraspis*), comparing two growth models. Given a single head length measurement, the model predicts crocodile age with relative confidence up to 9 years, beyond the size of reproductive maturity. As an animal approached asymptotic size, the model's predictive ability declined as expected. The range of age predictions included size thresholds important to consider for demographic model parameters; improved estimates of age, therefore, will increase the precision of population growth estimates. The modeling approach we present can be applied to other species and offers significant advantages when multiple sources of data are available and traditional aging techniques are not practical.

Spatial and temporal variability in alpine meadow condition and boundaries in the Sierra Nevada mountain range of California

Tuesday, October 16, 2012 | 4:20 p.m. PDT | Room A106

USGS Contributors:
Robert Klinger* - USGS Western Ecological Research Center
Otto Alvarez - USGS Western Ecological Research Center
Matthew Brooks - USGS Western Ecological Research Center
J.R. Matchett - USGS Western Ecological Research Center
http://www.werc.usgs.gov

Alpine meadows provide critical habitat for many mammal species but are considered to be particularly vulnerable to climatic shifts. It is generally assumed that the loss or alteration of alpine meadow habitat would be from drying and/or transitions to woody dominated (conifers and/or shrubs) communities, but data on the degree to which this is actually occurring is lacking for the Sierra Nevada mountain range. Therefore, our goal was to use aerial photos and remote sensing data to analyze changes in alpine meadow boundaries and condition (productivity and wetness) across three degrees of latitude and 2650 meters of elevation in the Sierra Nevada. The analysis of the aerial photos indicated that conifer density increased in areas associated with meadow ecotones but there was little encroachment within the meadows themselves. GIS layers on downscaled climate and vegetation productivity (the normalized difference vegetation index, NDVI) were analyzed to evaluate if there was evidence of temporal or spatial change in meadow productivity from 1990-2010. Generalized additive models indicated there was substantial temporal variability in meadow productivity but little overall change or even a slight increase over the last 20 years. Principal Components Analysis indicated that meadows that had decreased in productivity were mostly small ones in the southern part of the range. The results suggest that climatically related changes to vegetation may be ongoing in lower elevation

zones in the Sierra Nevada but have not occurred to the same extent in higher elevation zones. Overall, habitat conditions for many mammal species in the alpine zone of the Sierra Nevada are spatially and temporally variable but do not appear to be deteriorating in quality or quantity.

Shorebirds across the Western Hemisphere: Understanding the linkages
Tuesday, October 16, 2012 | 4:40 p.m. PDT | Room B113-B114
USGS Contributors:
Susan Skagen - USGS Fort Collins Science Center
http://www.fort.usgs.gov

Shorebirds represent a diverse avian group in body size, cross-seasonal habitat use patterns, migration distance, and distribution throughout the Western Hemisphere. Shorebirds are renowned for their extraordinary long-distance migrations, with some traveling as many as 15,000 km between southern South American wintering grounds and Canadian Arctic breeding areas. The migration period is particularly demanding and is suspected to elevate mortality rates and theoretically limit population growth of some bird species. Migration stopover ecology has been the focus of work on population estimation and distribution modeling of en route shorebird migrants of the interior prairie wetland landscape of North America, projecting future distributions of shorebirds based on species distribution models and high resolution climate data, and examining contemporary and future patterns of winds aloft across the prairie region using dynamically downscaled (high resolution) climate data. To advance conservation by identifying which part of the annual cycle is limiting growth of many shorebird populations and to understand cross-seasonal linkages, scientists affiliated with the Western Hemisphere Shorebird Group collectively are studying shorebirds across their annual cycles to quantify movements, body condition, population vital rates, and threats to population persistence. Linkages between migration stopover and population demography are illustrated via case studies of several species, including Semipalmated Sandpipers (*Calidris pusilla*), Western Sandpipers (*C. mauri*), Red Knots (*C. canutus*), Pectoral Sandpipers (*C. melanotos*), and others. Modeling efforts, including dynamic programming and multistate capture-recapture models, have uncovered clear linkages such as enhanced reproductive success of female Pectoral Sandpipers and higher apparent survival of Red Knots arriving at breeding grounds with greater fat reserves from migration. This emerging body of knowledge will enhance the comprehensive protection provided by the Western Hemisphere Shorebird Reserve Network.

PRESENTATIONS – WEDNESDAY MORNING

Management fairy tale or nightmare? Demography and inter-colony dispersal of Caspian terns in the Pacific Coast region of North America
Wednesday, October 17, 2012 | 8:30 a.m. PDT | Room A103-A104
USGS Contributors:
Danial Roby - Oregon Cooperative Fish and Wildlife Research Unit
Katie Dugger - Oregon Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Oregon/

We investigated the demographics and inter-colony movements of Caspian terns (*Hydroprogne caspia*) in the Pacific Coast region of North America based on re-sightings of color-banded individuals breeding at two colonies, a very large colony in the Columbia River estuary and a much smaller colony on the mid-Columbia River. The colony on East Sand Island in the estuary was of particular interest because it is the largest colony for the species in the world, and recent management actions are designed to reduce colony size in an effort to enhance survival of juvenile salmonids (*Oncorhynchus* spp.) listed under the U.S. Endangered Species Act. Apparent annual survival of adult Caspian terns nesting in the Columbia River estuary and on the mid-Columbia River was 0.95 and 0.94, respectively, and apparent median age at first reproduction was at least 6 years and 5 years post-hatch, respectively. Colony site philopatry of breeding adults at both colonies was high; however, some individuals prospected for breeding colonies over much of the region, from the Salton Sea in southeastern California to the Copper River Delta in south-central Alaska. For some individual terns, dispersal distances between breeding colonies of up to 3,000 km were documented within a single breeding season. The majority of sub-adults visited breeding colonies for several years prior to their first reproductive attempt, suggesting that sub-adults can prospect at multiple colonies prior to nesting. Terns from the large colony in the Columbia River estuary responded quickly to the availability of new colony sites as far as 550 km away and established successful breeding colonies in less than a year. These demographic and life history traits should be considered in implementing management actions to reduce the mortality of ESA-listed juvenile salmonids due to predation by Caspian terns in the Columbia Basin.

Historical perspective on hierarchical models, their implementation and use in wildlife studies
Wednesday, October 17, 2012 | 8:30 a.m. PDT | Room B115-B116
USGS Contributors:
Mevin Hooten* - Colorado Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Colorado/

Many ecological studies involving the measurement of wildlife populations and communities result in data that arise from at least these two processes: 1.) the underlying ecological or biological process of interest and 2.) a process associated with the sampling or monitoring mechanism. The manner in which we collect ecological data induces a nested dependence of our observations on the underlying processes. Many of the statistical models we regularly employ in wildlife studies are naturally hierarchical, whether we explicitly acknowledge it or not. For example, occupancy studies yield data that arise from a true underlying ecological process that is then filtered through an observational instrument. Hierarchical model structure allows one to easily connect several mechanisms that give rise to the data in a directed acyclic graph. Statistical inference then proceeds using formal probability and calculus to learn about graph components by conditioning on observed data and explicit graph linkages. As the recent literature indicates, this form of statistical modeling is incredibly powerful in terms of intuition and model building, however, as model complexity increases, computing becomes more specialized and methods for model evaluation and comparison become numerous. With statistical methodology rapidly evolving, ecologists and wildlife biologists are charged with learning and appropriately using these methods while ensuring they adhere to the intent and rigor of the statistical underpinnings when teaching and communicating research.

Potential effects of extreme climatic events on California Black Rail breeding habitat
Wednesday, October 17, 2012 | 9:10 a.m. PDT | Room A103-A104
USGS Contributors:
Vivian Thuy-Vy Bui* - USGS Western Ecological Research Center
Karen Thorne - USGS Western Ecological Research Center
Kevin Buffington - USGS Western Ecological Research Center
John Takekawa - USGS Western Ecological Research Center
http://www.werc.usgs.gov

Coastal salt marshes are projected to be disproportionately impacted by climate change, including increased storm frequency and intensity. The San Francisco Bay estuary is one of the largest remaining tidal marsh complexes in California and contains important habitat for federal and state-listed wildlife species. Our objective was to evaluate the potential impact of storms on California Black Rail (*Laterallus jamaicensis coturniculus*) breeding habitat. In 2005-2006, we calculated home ranges of individual rails through radio telemetry. In 2010, we conducted elevation and vegetation surveys in these same areas to characterize rail habitat. Water level loggers were deployed to capture local hydrograph information and then hindcasted to 2005- 2006 to create site-specific tidal datums. By combining tidal information, habitat data, and rail home ranges, we were able to measure inundation risk of rail habitat during the breeding season. We found the frequency of stormy days in April to be increasing in our study area over the past few decades (R2=0.22), indicating that storm frequency and overall tide levels may continue to rise during times of rail nesting efforts. A storm in April 2006 was of sufficient intensity to inundate dominant marsh vegetation by an additional 20%, reduce overall availability of the marsh to rails, and increase the frequency of tide levels above mean rail nest height when compared to the previous year. Water level monitoring in 2010 and 2011 at three additional sites indicate that there was a 7-fold increase in the percent of habitat inundated during the March 2011 storm compared to periods of non-storm high water. In the face of changing climate patterns and resulting increased inundation of coastal salt marsh habitats, land managers will need to take into consideration availability of adjacent upland refugia during the breeding season when developing conservation strategies for threatened salt marsh species.

Bat white-nose syndrome, an emergent wildlife disease
Wednesday, October 17, 2012 | 9:10 a.m. PDT | Room B110-B112
USGS Contributors:
David Blehert - USGS National Wildlife Health Center
http://www.nwhc.usgs.gov

White-nose syndrome (WNS) is an emergent wildlife disease that has caused unprecedented mortality among bats of the eastern United States and Canada. Since the winter of 2006-2007, bat population declines approaching 100% have been documented at some affected hibernacula, and total estimated losses have exceeded five million bats. Affected hibernating bats often present with visually striking white fungal growth on their muzzles, ears, and/or wing membranes. Histopathological and microbiological analyses demonstrated that WNS is characterized by a hallmark fungal skin infection caused by a newly described species of psychrophilic (cold-loving) fungus, *Geomyces destructans*. The fungus was initially discovered by laboratory culture at 4°C, and it cannot grow above 19°C, properties consistent with a pathogen that specifically infects hibernating animals. Laboratory infection studies

have since demonstrated that *G. destructans* is the sole causative agent of WNS, and the fungus is transmissible bat-to-bat. Additionally, the fungus has been shown to persist in soil of hibernacula occupied by infected bats demonstrating that environmental reservoirs likely play a role in the ecology of this disease. Bats of North America are primary predators of nocturnal insects, and the unprecedented bat population declines caused by WNS may have far-reaching ecological consequences.

Estimating abundance while accounting for excess zeros, correlated behavior of animals, and other sources of dependence
Wednesday, October 17, 2012 | 9:10 a.m. PDT | Room B115-B116
USGS Contributors:
Robert Dorazio - USGS Southeast Ecological Science Center
http://fl.biology.usgs.gov/

The class of N-mixture models allows abundance to be estimated from repeated, point-count surveys while adjusting for imperfect detection of individuals. We developed an extension of N-mixture models to account for two commonly observed phenomena in point-count surveys -- rarity and lack of independence induced by unmeasurable sources of variation in the detectability of individuals. Rarity increases the number of locations with zero detections in excess of those expected under simple models of abundance. Correlated behavior of individuals and other phenomena, though difficult to measure, increases the variation in detection probabilities among surveys. Our extension of N-mixture models includes a hurdle model of abundance and two candidate models of detectability that account for additional (extra-binomial) sources of variation in detections among surveys. As an illustration, we fit these models to repeated point counts of the West Indian manatee, which was observed in a pilot study using aerial surveys.

Response of yellow rails to habitat and landscape features in the context of fire
Wednesday, October 17, 2012 | 9:30 a.m. PDT | Room A103-A104
USGS Contributors:
Jane Austin – USGS Northern Prairie Wildlife Research Center
Deborah Buhl – USGS Northern Prairie Wildlife Research Center
http://www.npwrc.usgs.gov

The yellow rail (*Coturnicops noveboracensis*) is a focal species of concern associated with shallowly flooded emergent wetlands, most commonly sedge meadows. Yellow rail populations are believed to be limited by loss or degradation of wetland habitat due to drainage, altered hydrology, and fire suppression, factors which have resulted in encroachment of shrubs and change in vegetative cover. We conducted nocturnal call-playback surveys for yellow rails at 64-69 points each of three years at Seney National Wildlife Refuge in the Upper Peninsula of Michigan. We used generalized linear mixed models to assess the effects of habitat and landscape covariates on the detection of yellow rails. Covariates included water depth, litter depth, graminoids and forb cover, graminoid height, shrub cover, visual obstruction (cover board), time since last fire, and land cover types at 2 scales around each point. At the smaller (163-m radius) scale, quadratic models with maximum and mean water depths best explained the data. At the 300-m scale, the best model contained year and time since last fire (0-2, 3-5, and >5 yr), with highest probability of use for points burned within the previous 2 years.

Fire history affected percent open area, litter depth and its variability, variability in graminoid height, and visibility measures. Results from these data and data on fire effects on the plant community and structure will help wetland managers restore and maintain open sedge systems for yellow rails.

Understanding habitat use is necessary for assessing risk from wind energy development
Wednesday, October 17, 2012 | 9:30 a.m. PDT | Room B113-B114
USGS Contributors:
Douglas Johnson - USGS Northern Prairie Wildlife Research Center
http://www.npwrc.usgs.gov

The habitats selected by an animal influence not only its fitness but also its exposure to risks posed by various events, including collisions with wind turbines. Therefore knowledge of an animal's habitat selection and use is very valuable for siting wind farms to avoid or minimize the number of collisions. Human's understanding of habitat selection of animals is extremely incomplete and highly biased, however, with weakest information about areas infrequently visited by humans, species that are less conspicuous or well-known, and pathways used during migration, especially of nocturnal migrants. Guidelines for wind development propose that adverse effects be minimized (preferably avoided) and losses be compensated. Minimizing effects requires an understanding of habitat use. Mapping known breeding ranges and wintering ranges, while useful, is simply inadequate. Much of the risk to golden eagles (Aquila chrysaetos) and other wildlife lies outside these identified areas; a better understanding of habitat selection in a broader sense is needed. Compensating for losses requires estimating the number of losses, identifying methods to compensate, and estimating the effectiveness of those methods, so that the expected compensation can be matched to the expected losses. Estimating losses in turn requires well-designed programs for monitoring fatalities, and evaluating compensation methods will need a solid understanding of habitat selection, especially habitats that are limiting.

Build it and they will come? Assessment of a mitigation habitat network for Caspian terns
Wednesday, October 17, 2012 | 9:50 a.m. PDT | Room A103-A104
USGS Contributors:
Daniel Roby - Oregon Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Oregon/

In response to conflicts between Caspian terns (Hydroprogne caspia) and juvenile salmonids (Oncorhynchus spp.) in Oregon and Washington's Columbia River Estuary (CRE), resource managers are attempting to reduce tern breeding habitat in the CRE and mitigate for that loss by creating or enhancing habitat elsewhere. From 2008 - 2012, a total of nine islands were built in four high desert wetlands of eastern Oregon and northeastern California and in one reservoir in western Oregon. Altogether, these islands constitute 3.4 hectares of potential nesting habitat. Social attraction techniques (decoys, sound systems playing recorded calls) have been implemented at each island to enhance their appeal to terns. We examined use of these islands by terns to assess the mitigation effort and to identify factors enhancing or limiting tern restoration efforts. Caspian terns responded quickly to new habitat and nested at six of seven sites in the first year of availability (two sites were not available until 2012). Only one site, of the seven available through 2011, has not been used for nesting in any year, although small numbers of terns have roosted at the site. Through 2011, colony sizes at each site were largest in the first or second year following construction, although recent results have been confounded by reduced Caspian tern nesting across the Pacific Coast states during 2010 - 2011.

All successful locations had some history of Caspian tern nesting prior to island construction. Factors limiting colonization or persistence included the presence of avian predators, competition for space with gulls, nest predation by gulls, potentially limited forage base, and limited water availability due to drought and/or water management practices. Establishing a self-sustaining metapopulation of Caspian terns across this new habitat network may require additional efforts (e.g., predator/gull management), as has been seen with tern restoration efforts elsewhere in North America.

Modeling marbled murrelet habitat using LiDAR-derived canopy data
Wednesday, October 17, 2012 | 10:40 a.m. PDT | Room A104-A104
USGS Contributors:
Joan Hagar - USGS Forest and Rangeland Ecosystem Science Center
Patti Hagerty - USGS Forest and Rangeland Ecosystem Science Center
http://fresc.usgs.gov/

LiDAR can substantially improve the accuracy and precision of characterizations of habitat relationships for wildlife species known to be responsive to forest structure by providing fine-scale vegetation data that are inaccessible by both ground plot and other remote sensing methods. We used LiDAR data to determine occupancy probability for the federally threatened marbled murrelet in the Oregon Coast Range. Our goal was to provide a predictive tool for developing better occupancy maps for threatened and endangered species and to guide habitat management. Our objective was to identify LiDAR-derived variables that can be used as reliable predictors of murrelet occupancy at the stand-level spatial scale, and nesting habitat at finer spatial resolution. We used murrelet occupancy and nest location data collected following Pacific Seabird Group protocol, and canopy metrics calculated from discrete return airborne LiDAR data using the FUSION software package, to fit a logistic regression model predicting the probability of occupancy. Our final model for stand-level occupancy included distance to coast, stand size, and four LiDAR-derived variables (SD of the 99th percentile of returns, the mean of the average elevation of returns, the mean of the kurtosis of the elevation of returns, and the maximum canopy surface ratio derived from the LiDAR highest hits raster). With an area under the curve value (AUC) of 0.82 this model had excellent discrimination, but only moderate agreement when evaluated with Cohen's κ (κ = 0.52). Our model provided better discrimination between occupied and unoccupied stands than a model using variables derived from Gradient Nearest Neighbor maps that were previously reported as important predictors of murrelet occupancy (AUC = 0.72, κ = 0.33). Our model can be used to identify sites that have high probability of occupancy by murrelets based on the fine-scale canopy characteristics to which this species is known to respond.

Spatially varying estimates of extinction risk from North American Breeding Bird Survey indices: application of a hierarchical state-space approach
Wednesday, October 17, 2012 | 10:40 a.m. PDT | Room B115-B116
USGS Contributors:
Wayne Thogmartin* - USGS Upper Midwest Environmental Sciences Center
http://www.umesc.usgs.gov

The Breeding Bird Survey (BBS) is the most important means for assessing the status and trend of landbird species in North America. Information on status and trend is critical in prioritizing research and conservation effort; Partners in Flight uses this information, for instance, to characterize risk for

>400 species. Extinction risk is the integration of trend, variability in trend, and population size. The Partners in Flight measure of risk inexpertly reconciles these characteristics of risk. Thus, we employed autoregressive state-space models allowing us to calculate the probability of a species declining in abundance to the point where it is no longer adequately surveyed by the BBS (i.e., quasi-extinct). The generic model for this calculation is written as $x_t = x_{t-1} + u + w_t$, where $w_t \sim N(0,\sigma^2)$, and $y_t = x_t + v_t$, where $v_t \sim N(0,\eta^2)$. y_t is the logarithm of the observed population size at time t (as described currently by annual indices of abundance calculated with hierarchical Bayesian over-dispersed count models), x_t is the unobserved state at time t, u is the growth rate, and σ^2 and η^2 are the process (environmental stochasticity) and observation error variances, respectively. These methods artfully combine trend, variability in trend, and population size to provide relative predictions of risk, as well as disentangling observation error from environmentally induced stochasticity. We calculated and mapped regional probabilities of quasi-extinction, with bootstrapped confidence intervals, for all species adequately surveyed by the BBS. Our ultimate aim is to incorporate regional estimates of the probability of quasi-extinction into the annual calculations reported by the BBS as a means of delivering objective measures of risk. Such objective measures of risk, described spatially and temporally, will provide a more robust basis for prioritization efforts.

Effects of management and disturbance on waterbird use at Wetland Reserve Program sites in Arkansas and Missouri

Wednesday, October 17, 2012 | 11:00 a.m. PDT | Room A103-A104

USGS Contributors:
Jessica Tapp* - Missouri Cooperative Fish and Wildlife Research Unit
Elisabeth Webb - Missouri Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Missouri/

The Natural Resource Conservation Service implemented the Migratory Bird Habitat Initiative (MBHI) in summer 2010 to mitigate potential loss of wetland habitat caused by the Deepwater Horizon oil spill. The goal of MBHI was to improve wetland habitats on private farmlands, catfish ponds, and Wetland Reserve Program (WRP) easements in the Lower Mississippi Alluvial Valley to provide additional habitats for wintering and migrating waterbirds. Priorities for WRP lands included addressing waterbird food habitats, providing habitat structure, and additional management activities such as planting and/or disking on moist-soil wetlands. We conducted bi-monthly waterbird surveys on 32 randomly selected WRP wetlands in Arkansas and Missouri from August 2011-February 2012 to quantify habitat use by fall migrating shorebirds (Charadriiformes) and wintering dabbling ducks (Anatinae). Waterbird species composition was similar to previous studies completed on WRP sites. Mean dabbling duck density (ducks/ha) was greatest at sites that had been planted (22.7±1.1), whereas mean species richness (species/ha) was greatest was greatest at sites that had been planted and experienced hunter disturbance (0.4±0.1). Sites that had been established <10 years ago had both the greatest mean shorebird density and species richness (3.5±0.9 and 0.9±0.7). Our preliminary results demonstrate the response of shorebirds and waterfowl to increased food resources on MBHI funded wetland restoration and enhancement projects. We are currently processing seed and invertebrate samples to derive food biomass and density estimates, which we will then relate directly to waterbird abundance on each site. Continuation of surveys and sampling through fall 2012 on WRP sites in the Lower Mississippi Alluvial Valley will allow us to further evaluate the effectiveness of MBHI funded wetland management for migrating and wintering waterbirds.

What you always wanted to know about chronic wasting disease, but were afraid to ask
Wednesday, October 17, 2012 | 11:00 a.m. PDT | Room B110-B112
USGS Contributors:
Michael Samuel - USGS National Wildlife Health Center
http://www.nwhc.usgs.gov/

Chronic wasting disease (CWD) in free-living cervids has been found in 16 states and two Canadian provinces, and continues to be discovered in new areas. The disease affects several important species of the North American cervids, with potential long-term social, economic, and management implications. In endemic areas, the disease continues to increase in prevalence and spread across the landscape. Several characteristics of this disease make it challenging to understand and difficult to manage. The agent is a nearly indestructible protein that can be transmitted between animals or through the environment. Animals have a long infectious period before disease signs can be recognized and during that time they can infect other susceptible deer. The disease is always fatal and there are currently no known cures or vaccines to prevent infection. Like similar diseases in sheep, cattle, and humans some animals have genetic resistance/susceptibility CWD, but there are no completely resistant genotypes. A common characteristic of CWD in deer is that infection rates are much higher in males than females, but the reason or long-term implications of this pattern are not well understood. In addition, the unknown origin of CWD and mechanisms of geographic spread make disease prevention difficult. In nearly all cases, management efforts to eradicate CWD have been unsuccessful, which suggests future spread and higher infection rates are likely. This presentation will review key biological features of CWD relative to deer ecology, discuss recent research findings, and discuss future concerns about CWD and big game management.

Building an adaptive management framework when data are lacking: eliciting information from decision stakeholders
Wednesday, October 17, 2012 | 11:20 a.m. PDT | Room A106
USGS Contributors:
Jill Gannon - USGS Northern Prairie Wildlife Research Center
Clinton Moore - Georgia Cooperative Fish and Wildlife Research Unit
Terry Shaffer - USGS Northern Prairie Wildlife Research Center
http://www.npwrc.usgs.gov
http://www.coopunits.org/Georgia/

Adaptive management is a form of structured decision making designed to guide management of natural resource systems when their response to management is uncertain. The basic elements of an adaptive management framework include a recurrent decision, a set of candidate management actions from which the decision is selected, a stated objective of management, a set of predictive models that represent competing hypotheses about system response to the selected management action, and a monitoring program to assess predictive performance and relative credibility of the alternative models. An often expressed criticism of adaptive management is that it requires too much data on the front end to develop the framework. This, we argue, is a misperception because data poor situations, where uncertainty about system behavior is high, are exactly those where adaptive management is best suited and most useful. We present a case study of native prairie restoration on USFWS-owned land within the northern Great Plains to demonstrate how, lacking data, we successfully developed and

implemented an adaptive management framework that relies almost exclusively on expert opinion. We describe the approach and methods we used to elicit expert opinion from decision stakeholders and to inform the various elements of the framework including 1) preferences about the management objective, 2) competing models that predict system response to management actions, and 3) measures of uncertainty regarding degree of control of the management application. We demonstrate that a lack of data is not a barrier to developing and implementing an adaptive management framework. Furthermore, once the framework is put into action, incoming data are immediately used as feedback to inform future management decisions. As data accumulate, they can be used to improve upon or replace elicited framework elements with empirically derived ones. Overall, the result is improved conservation delivery in the long-term as uncertainties are resolved.

Plague disrupts ecosystems and creates challenges for wildlife conservation
Wednesday, October 17, 2012 | 11:40 a.m. PDT | Room B110-B112
USGS Contributors:
Dean Biggins* - USGS Fort Collins Science Center
Tonie Rocke - USGS National Wildlife Health Center
Jerry Godbey - USGS Fort Collins Science Center
Shantini Ramakrishnan - USGS Fort Collins Science Center
Amanada Goldberg - USGS Fort Collins Science Center
http://www.fort.usgs.gov
http://www.nwhc.usgs.gov

Plague, the disease caused by the primarily flea-borne bacterium *Yersinia pestis*, was introduced to the Americas circa 1900. Invasion of the disease that caused such widespread human suffering in Eurasia generated significant attention among medical practitioners, but an understanding of the ecological consequences has progressed slowly. In some mammals, plague erupts in epizootics that result in large scale mortality. Whether such outbreaks are important to maintain *Y. pestis* populations or are simply paroxysms that amplify the bacterium locally remains unclear. Although epizootics of plague are clearly disruptive, low disease transmission during enzootic periods might characterize *Y. pestis* maintenance. Persistence of plague in enzootic form can cause chronic problems as exemplified by several controlled experiments during non-epizootic periods. . First, vector control increased annual survival rates of adult prairie dogs by 31-45 % for 3 species of prairie dog (*Cynomys* spp.) in Utah and Montana,, Second, survival of black-footed ferrets (*Mustela nigripes*), a specialized predator of prairie dogs, was improved by >200% by implementing vector control on the colonies of prairie dogs they inhabited or by vaccinating the ferrets against plague. Third, vector control or plague vaccination significantly increased survival of Mexican woodrats (*Neotoma mexicana*) in the eastern Colorado foothills. Thus, enzootic plague appears to substantially influence populations of a variety of species in the western U.S. Multiple indirect effects also are plausible. Disruptions to ecosystems caused by epizootic or enzootic plague can be especially dramatic when the disease influences keystone or foundation species such as prairie dogs. Plague can also prevent recovery of endangered species such as the ferret or Utah prairie dog (*C. parvidens*). Although insecticides can control fleas that transmit plague, newly developed vaccines are more promising management tools.

Evaluating the predictive abilities of hierarchical community occupancy models
Wednesday, October 17, 2012 | 11:40 a.m. PDT | Room B115-B116

USGS Contributors:
Elise Zipkin* - USGS Patuxent Wildlife Research Center
Evan Grant - USGS Patuxent Wildlife Research Center
http://www.pwrc.usgs.gov/

The ability to accurately predict patterns of species' occurrences is fundamental to the successful management of animal communities. To determine optimal management strategies, it is essential to understand species-habitat relationships and how species habitat use is related to natural or human-induced environmental changes. Using five years of monitoring data in the Chesapeake and Ohio Canal National Historical Park, Maryland, USA, we developed four multi-species hierarchical models for estimating amphibian wetland use that account for imperfect detection during sampling. The models were designed to determine which factors (wetland habitat characteristics, annual trend effects, spring/summer precipitation, and previous wetland occupancy) were most important for predicting future habitat use. We used the models to make predictions of species occurrences in sampled and unsampled wetlands and evaluated model projections using additional data. Using a Bayesian approach, we calculated a posterior distribution of receiver operating characteristic area under the curve (ROC AUC) values, which allowed us to explicitly quantify the uncertainty in the quality of our predictions and to account for false negatives in the evaluation dataset. We found that wetland hydroperiod (the length of time that a wetland holds water) as well as the occurrence state in the prior year were generally the most important factors in determining occupancy. The model with only habitat covariates predicted species occurrences well; however, knowledge of wetland use in the previous year significantly improved predictive ability at the community level and for two of 12 species/species complexes. Our results demonstrate the utility of multi-species models for understanding which factors affect species habitat use of an entire community (of species)
and provide an improved methodology using AUC that is helpful for quantifying the uncertainty in model predictions while explicitly accounting for detection biases.

PRESENTATIONS – WEDNESDAY AFTERNOON

Reconstructing time-specific diet composition in greater sage-grouse chicks using feather stable isotopes
Wednesday, October 17, 2012 | 1:30 p.m. PDT | Room A103-A104
USGS Contributors:
Erik Blomberg - USGS Western Ecological Research Center
http://www.werc.usgs.gov

Diet during early stages of growth can have profound direct effects on young birds, as well as carryover effects to later life stages. Many diet studies for precocial birds rely 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, non-lethal method for analyzing diets of greater sage-grouse (*Centrocercus urophasianus*) chicks 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 during 1-week periods. 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. These results are consistent with previous studies that suggest a shift to a greater herbivory as chicks aged. We also show chicks that maintained a more intermediate diet were larger at 28 days, compared to individuals that consumed greater proportions of either 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 management that can compliment studies of habitat use and survival.

Population demography of the Northern spotted owl
Wednesday, October 17, 2012 | 1:30 p.m. PDT | Room B115-B116
USGS Contributors:
Katie Dugger - Oregon Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Oregon/

After the NWFP was adopted in 1994, the Forest Service and BLM agreed to monitor spotted owl populations on 8 long-term study areas in Washington, Oregon, and California. The objective of these studies was to determine if the spotted owl population would eventually stabilize or increase as cutover forests on federal lands gradually began to recover. It has now been 19 years since the plan was adopted, and some of the long term demography studies have been in existence for nearly 27 years.

In January 2009 I and the other biologists who conduct the long term studies of spotted owls conducted an analysis of all of the data collected since 1985. We found that, despite the large amount of habitat protected for spotted owls, the spotted owl population is continuing to decline, especially in Washington State. Overall, the average rate of population decline was 2.9% per year. Our analysis suggests that the continued decline of the spotted owl population is due to continued habitat loss and to the invasion of the barred owl, which is gradually increasing in numbers along the west coast. It is not clear if there is anything that can be done to alter the barred owl situation, as they seem to be here to stay.

Absence of evidence or evidence of absence?
Wednesday, October 17, 2012 | 1:50 p.m. PDT | Room B113-B114
USGS Contributors:
Manuela Huso* - USGS Forest and Rangeland Ecosystem Science Center
http://fresc.usgs.gov/

The current site monitoring protocol and statistical tools we have for estimating actual fatality from observed carcasses are fairly robust when the numbers of observed carcasses are relatively high, but a non-zero estimate of the dead population using Horvitz-Thompson based estimators can only be achieved if at least one carcass is found. When the target population is small, as might be expected for

endangered species, the likelihood of finding no carcasses of the target population may be high, yet observing no carcasses cannot necessarily be interpreted to mean no or even low numbers of dead individuals. We present a Bayesian approach that uses information about the search process and estimated detection probabilities to provide posterior probabilities of the actual fatality being 0, 1, 2, ⋯ This approach can be used both to inform post-construction monitoring design as well as to estimate the potential that actual fatality of a rare species exceeded a pre-set limit.

More and bigger bucks, but hunters' opinions remain unchanged
Wednesday, October 17, 2012 | 2:10 p.m. PDT | Room A106
USGS Contributors:
Duane Diefenbach - Pennsylvania Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Pennsylvania/

Pennsylvania initiated antler point restriction regulations (APR) in 2002 to reduce the yearling harvest rate (HR) of male white-tailed deer (*Odocoileus virginianus*) and increase the number of ≥2-year-old males in the population. We mailed questionnaires during 2002-2005 to the same hunters to measure their expectations of the effects of APRs, their experiences during the first 3 years, and to assess whether their support for APRs changed. Simultaneously, we trapped and radiomarked 453 yearling and 103 adult males in 2 study areas during 2002-2005. We found no differences in HR between study areas and estimated yearling HR was 0.31 (SE = 0.04), adult HR was 0.59 (SE = 0.08), and the survival rate of males outside the hunting season was 0.92 (SE = 0.02). The APRs increased the harvest of males ≥2 years old by 42%. However, we found little change in the proportion of hunters supporting APRs from before the regulations were implemented to 3 years afterward. When asked about APRs as a statewide regulation, 23% were more supportive, 29% were less supportive, and 48% were unchanged in their level of agreement. When asked if APRs were a good change in management, 21% were more supportive, 31% were less supportive, and 49% were unchanged. Empirical data indicated reduced subadult harvest rates, high survival rates outside of the hunting season, and an increased number of adults in the population such that hunters should have observed more antlered deer during their hunting experience. However, there was little change in directional support for APRs after 3 years. These results are consistent with human psychological research, which suggests most hunters formed an expectation of the effects of APRs and ignored new information contrary to their expectation after APRs were implemented.

Competitive interactions and resource partitioning between northern spotted owls and barred owls in western Oregon
Wednesday, October 17, 2012 | 2:10 p.m. PDT | Room B115-B116
USGS Contributors:
David Wiens - USGS Forest and Rangeland Ecosystem Science Center
http://fresc.usgs.gov/

Competition with invasive barred owls (*Strix varia*) is an increasingly relevant factor to consider in managing threatened northern spotted owl (*Strix occidentalis caurina*) populations and their habitats. We used radiotelemetry data from 29 spotted owls and 28 barred owls to investigate spatial relationships, habitat selection, and dietary overlap between these previously allopatric predators in western Oregon, USA. Individual spotted and barred owls in adjacent territories often had overlapping

home ranges, but interspecific space sharing was largely restricted to broader foraging areas with minimal spatial overlap among core-use areas containing nest sites. The two predators displayed broadly similar patterns of habitat selection, as both species spent a disproportionate amount of time foraging in patches of old (>120 yrs old) conifer forest or in lowland riparian areas with large hardwood trees. Diets of both species were dominated nocturnal mammals, but barred owls captured many terrestrial, aquatic, and diurnal prey species that were rare or absent from diets of spotted owls. Measures of niche overlap calculated for spatially associated pairs of spotted owls and barred owls in adjacent territories showed that the two species were most similar in their use of forest conditions (81%) followed by diets (43%) and then spatial distributions (18%). In addition to overlap in resource use, we also identified strong associations between the presence of barred owls and the behavior of spotted owls as shown by changes in space-use, habitat selection, and reproductive output of spotted owls exposed to varied levels of spatial overlap with neighboring barred owls. We conclude that increasing populations of barred owls can affect the viability of spotted owls both directly (via territorial exclusion from critical resources) and indirectly (via joint exploitation of mammalian prey).

Understanding bat movements in relation to wind turbines using radar: challenges and opportunities
Wednesday, October 17, 2012 | 2:10 p.m. PDT | Room B113-B114
USGS Contributors:
Robb Diehl* - USGS Northern Rocky Mountain Science Center
Todd Preston - USGS Northern Rocky Mountain Science Center
http://www.nrmsc.usgs.gov

Portable radars appear regularly as instruments of choice in assessments of the potential impacts of wind facilities on flying animals. Although birds frequently dominate the airspace, bats often experience considerably greater mortality at wind turbines, yet radars are challenged in distinguishing among these taxa. We used data gathered on the movements of birds and bats near a wind facility in southeastern Pennsylvania as a context for discussing the challenges and opportunities for the use of radar in understanding how wind facilities may impact flying animals. The radar coverage area was divided into four equal area sample regions equidistant from the radar. These sample areas were chosen to examine turbine avoidance or attraction behavior by flying animals while accounting for sources of bias. We categorized four different radar track types, although track type is not necessarily associated with a particular target type. Straight tracks in the vicinity of the wind facility dominated the airspace (>90% of all tracks) and were most likely caused by migrating songbirds. Remaining tracks were curved, circuitous, or stationary (e.g., hovering). Movement patterns consistent with turbine avoidance by targets were present, but other causes could not be ruled out. Movements consistent with widespread attraction of flying animals to wind turbines were not obvious. If present such tracks were few in number and would be difficult to distinguish against the din of passage migrants moving through the area.

Incorporating long-term spatial and temporal effects in a heuristic state space model to evaluate land management alternatives in Alabama
Wednesday, October 17, 2012 | 2:50 p.m. PDT | Room A107-A109
USGS Contributors:
James Grand - Alabama Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Alabama/

Conservation decisions are often made based on expected outcomes without full consideration of costs, likelihood of success, or spatial and temporal consequences of their implementation. We used structured decision making to establish management objectives and compile information for development of a decision support tool to evaluate management alternatives on nine state owned lands in the coastal plain and piedmont of Alabama. The identified problem was to determine how to best manage state lands to enhance primary functions of properties while improving habitat for imperiled wildlife species. We developed a heuristic state space model to predict consequences on wildlife species of 10 management alternatives implemented over a 100 year planning horizon. Management objectives, alternatives, and costs were elicited from land managers and included combinations of actions that affect land cover type and structure on uplands, floodplains, and wildlife openings. We used a matrix of land cover transition rates describing natural and human-induced processes to predict the cost of management, user (e.g. hunters and hikers) preferences, and wildlife responses based on likelihood of land cover change. We derived user preferences from surveys of potential users. Wildlife responses were predicted from occupancy rates estimated from field data. We estimated the utility of each alternative based on the average of the scaled outcomes for each objective on each state park and wildlife management area. The preferred alternative varied among study areas based on their intended use. For example, maintaining wildlife openings within upland pine provided greater utility for imperiled species on wildlife management areas within the coastal plain. Our model is capable of incorporating additional objectives and trade-offs and would be useful for evaluating alternatives at landscape scales in similar regions. Additionally, we make recommendations for monitoring programs and user preference surveys that may reduce the ambiguity of management decisions.

Relating bat fatality to post-construction bat activity and weather patterns
Wednesday, October 17, 2012 | 2:50 p.m. PDT | Room B113-B114
USGS Contributors:
Manuela Huso - USGS Forest and Rangeland Ecosystem Science Center
http://fresc.usgs.gov

The strong, but as of yet unsubstantiated, assumption behind pre-construction bat acoustic surveys at wind energy facilities is that high pre-construction bat activity equals predictably high post-construction fatality. Yet, many factors may confound this pre-/post-construction relationship resulting in a weak or non-existent correlation. Thus, attempts to model risk based on pre-construction measures of activity may be unfounded. In fall 2011, we initiated a study at the Casselman Wind Power Project, Pennsylvania to investigate the relationship between post-construction bat activity, measured at the height of the turbine nacelle, and fatality. We assigned each echolocation sequence and fatality to one of three groups; high frequency, low frequency, and hoary bats (*Lasiurus cinereus*). We fit models at two scales, 1) the turbine scale relating total estimated fatality at each turbine to total activity throughout the period, and 2) the site scale relating total observed fatality among all turbines each night to total activity among all turbines throughout the period. Each of these analyses was carried out for two periods: evening, defined as sunset to 4 hours pre-dawn and entire night defined as sunset to sunrise. We found no correlation between total fatality and total activity for high frequency bats at the turbine scale, regardless of period of night, but did observe significant correlations for low frequency and hoary bats for both periods of the night. However, the strength of these relationships was moderate, with adjusted R2 values between 0.39-0.65. Model selection results provided little

evidence for nightly fatality related to activity, weather, and turbine operations for any combination of bat group or period of night. We were unable to develop models relating fatality to activity on a nightly basis. Our analyses are exploratory, in part because so little data exist upon which to develop a priori, confirmatory hypotheses and associated candidate models.

Monitoring bat activity at wind turbines with near infra-red videography
Wednesday, October 17, 2012 | 3:40 p.m. PDT | Room B113-B114
USGS Contributors:
Mark Hayes - USGS Fort Collins Science Center
Manuela Huso - USGS Forest and Rangeland Ecosystem Science Center
Frank Bonaccorso - USGS Pacific Islands Ecosystem Science Center
http://www.fort.usgs.gov
http://fresc.usgs.gov
http://biology.usgs.gov/pierc/

The magnitude of bat impacts at wind energy facilities has increased the importance of research into methods to better understand the causal factors contributing to fatalities. A pair of studies in Pennsylvania and Hawaii in the fall of 2011 applied near-infrared (NIR) videography and advanced digital motion analysis to detect and track bat (and bird) occurrence, characterize behavior, and document the incidence of apparent bat strikes by turbine blades. Over 300 hours of video were acquired over several weeks at each site. Results from Pennsylvania were compared to acoustic samples of bat echolocation and ground searches of fatalities that were run concurrently. The video system detected bat occurrence both when echolocation was and was not recorded at the turbine nacelle, indicating that acoustic sampling does not perfectly identify bat presence and potential risk. Conversely, not all acoustic detections were associated with a visual detection, indicating that echolocating bats flew outside of the rotor-swept zone imaged by NIR cameras. Video monitoring also detected at least one bat strike subsequently confirmed by ground-search. On several occasions at the Pennsylvania site bats were observed exploring and interacting near the nacelle and upper tower. About four-fifths of video detections in Hawaii were of birds and no strikes were observed, although bats approached the rotor-swept area on occasion. Bat detections in Hawaii appeared to be of foraging individuals or those in transit, and no activity in proximity to a nacelle or turbine investigations by bats was seen. Our project is the first field validation of NIR videography to track and quantify target motion at distances >100 m at night under realistic operational conditions and long-term deployment scenarios. We anticipate that the technical capabilities NIR video and motion tracking will steadily improve and yield a highly effective method for monitoring wildlife impacts at wind energy facilities.

Carcass ecology: forensic techniques shed light on the possible causes of bat susceptibility to turbines
Wednesday, October 17, 2012 | 4:00 p.m. PDT | Room B113-B114
USGS Contributors:
Paul Cryan - USGS Fort Collins Science Center
Ernest Valdez - USGS Fort Collins Science Center
Craig Stricker - USGS Stable Isotope and Gas Chemistry Laboratory
http://www.fort.usgs.gov/
http://isotopes.usgs.gov/

Bats are often found dead beneath industrial wind turbines during late summer and autumn. Although bat fatalities at turbines occur on several continents, the exact reasons for such susceptibility remain a mystery. In this talk, we describe three projects in which forensic techniques were used to better understand the possible causes and population impacts of turbine fatality. The majority of bat fatalities at turbines in the temperate zones of North America involve *Lasiurus cinereus*, *L. borealis*, and *Lasionycteris noctivagans*. It has been hypothesized that mating, feeding, and/or migration behaviors of these species play a role in their susceptibility. We analyzed reproductive tracts of specimens found at turbines to assess the plausibility of the mating hypothesis. Histological analysis revealed evidence of mating readiness in all three species. We found that high proportions of juvenile males of each species can be sexually mature in their first autumn, a unique trend for North American bats. We analyzed gastrointestinal tracts from *L. cinereus* to assess the feeding hypothesis. Similar to a prior study, most of the carcasses we examined had full stomachs and intestines, indicating they fed mostly on moths in the hour prior to death. We did not find insect parts in the mouths or throats of carcasses that would be expected if bats regularly fed close to turbine blades. We analyzed stable hydrogen isotope signatures in fur of *L. cinereus* found at turbines to infer the geographic origins of individuals and better understand population impacts. Isotopes indicated that bats often died during migration and that individuals originated from many different areas and arrived at the wind facilities in no structured phenology. Combined with earlier isotope results, new patterns in the continental migration of L. *cinereus* are emerging. Forensic approaches are currently underutilized despite the potential wealth of information they can provide.

Plant response to ungulate herbivory in an arid ecosystem
Wednesday, October 17, 2012 | 4:20 p.m. PDT | Room A105
USGS Contributors:
Kate Schoenecker* - USGS Fort Collins Science Center
Linda Zeigenfuss - USGS Fort Collins Science Center
http://www.fort.usgs.gov/

Factors that influence the ability of plants to compensate for herbivory include grazing intensity, timing of grazing, water availability, nutrient availability, history of grazing, and type and age of tissue. In arid systems external factors such as moisture can have a more dominant role than internal interactions. Detailed studies that remove grazing can reveal whether patterns are caused by plant interactions or external factors, or both. We conducted research to understand the response of plants to elk (Cervus elaphus) and bison (*Bison bison*) herbivory and identify potential constraints on plant compensation in an arid ecosystem. We used a replicated herbivore exclusion experiment to evaluate herbaceous and woody species responses to grazing in elk-plus-bison versus elk-only strata in 3 vegetation communities of the San Luis Valley in south-central Colorado. We compared offtake rates, herbaceous production, willow and cottonwood growth, and leaf N content in wet meadows, cottonwood-, and willow communities of the Great Sand Dunes ecosystem. Data were analyzed using a mixed procedure, and tested for main effects and interaction effects of ungulate strata, grazing treatment, and year within each vegetation type. Wet meadows had the highest herbaceous production of all 3 community types, and overcompensated for herbivory in both ungulate strata despite much higher offtake in elk-bison meadows. Herbaceous production did not respond to grazing in the drier cottonwood and willow communities, but N content was higher in grazed than ungrazed elk-bison cottonwood stands (forb P = 0.027; graminoid P = 0.019). Willows undercompensated for browsing in both ungulate strata; height

or canopy increases were observed in ungrazed treatments. Cottonwood sapling heights increased with browsing removal (P=0.004), but sapling density did not increase even after 5 years of browsing removal. Our results support the herbivore optimization hypothesis, as well as external controls as drivers in arid ecosystems.

Do nesting birds perceive human activities as predation risk? An experimental test
Wednesday, October 17, 2012 | 5:00 p.m. PDT | Room A103-A104
USGS Contributors:
Anna Chalfoun - Wyoming Cooperative Fish and Wildlife Research Unit
http://www.wyocoopunit.org/

Breeding birds are known to alter patterns of habitat use and parental care in response to perceived predation risk. Yet whether human activities are perceived as predation risk by wildlife and elicit behavioral changes with fitness consequences remains unclear. The construction of a new pedestrian pathway through sagebrush habitats of Grand Teton National Park, Wyoming, provided a unique opportunity to experimentally test the behavioral responses of breeding birds to a novel disturbance. Using a before-after-control-impact design I measured sagebrush songbird nest densities, nest success, and a suite of parental investment and care metrics before and during pathway construction and during two subsequent years of pedestrian use. Nest densities within 50 m of the pathway decreased and average nest distances from the pathway increased post-construction. However, Brewer's (*Spizella breweri*) and vesper (*Pooecetes gramineus*) sparrows consistently fledged more young in experimental than control sites, though differences dissipated after the construction year. The predominant cause of nest failures was predation, suggesting a human-induced trophic cascade in which nesting birds close to the transportation corridor indirectly benefitted due to spatial changes in one or more predator species. Brewer's and vesper sparrow clutch size and Brewer's nestling mass were higher in experimental plots which may reflect the lower ambient nest predation risk. There were no significant effects of the treatment on egg mass, incubation rhythms or nestling feeding trips, suggesting that pairs that did nest near the pathway did not alter parental investment. The primary impact of the new pathway therefore appears to be habitat loss and effective habitat loss, as some birds avoided nesting near the disturbed area post-construction despite the reproductive benefits derived close to the pathway. The study provides an example of non-intuitive impacts of human landscape alteration on wildlife.

POSTERS – MONDAY MORNING

Poster 5: Evaluating landscape-scale conservation strategies in the south atlantic coastal plain, USA
USGS Contributors:
James Grand - USGS Alabama Cooperative Fish and Wildlife Research Unit

The South Atlantic Landscape Conservation Cooperative is a diverse partnership dedicated to the conservation of natural resources. We collaborated with a representative group from the partnership to identify two overarching goals for conservation strategies: 1) helping partners choose strategies that

are based on a shared scientific understanding about the landscape of the Southeast, and 2) helping partners solve shared problems with similar objectives. With those goals in mind we identified three broad categories of objectives related to the conservation of cultural, socioeconomic, and natural resources. We then developed a heuristic algorithm to prioritize conservation spatially and temporally in the South Atlantic Coastal Plain across 115,500 sites. The analysis includes uncertainty regarding likelihood of success, response of each specified objective, predictions for climate change, and urban growth. Our results, predict the relative change and uncertainty expected in bird and fish populations, production value, and cultural resources. Thus, we illustrate locations where specific objectives are vulnerable to climate change and urban growth based on model assumptions. We also estimate the marginal gains of several conservation strategies under cost constraints at several levels. Because some conservation actions require relatively long periods of time before their full value is achieved, we used likelihood of success and marginal gains accrued over time to emulate the development of spatially and temporally explicit conservation strategies. We then we use the overall value accrued to compare among strategies. The heuristic model we developed is capable of incorporating many types of predictions for numerous objectives. With increased specificity in the objective functions and improvements to the predictive models, this tool can be used by the partnership to choose conservation strategies that are robust to uncertainty.

Poster 7: Regional-scale vulnerability assessments of species and systems most at risk to climate change in the United States

USGS Contributors:
Shawn Carter - USGS National Climate Change and Wildlife Science Center
Laura Thompson - USGS National Climate Change and Wildlife Science Center

Vulnerability assessments provide insights on species or systems that are most likely to be affected by climate change and provide information on why those resources are most vulnerable. As such, vulnerability assessments are an important tool for informing climate change adaptation planning and have been identified as one of the primary tasks for the U.S. Department of Interior (DOI) Climate Science Centers (CSCs) that work collaboratively with the Landscape Conservation Cooperatives (LCCs; a network of public-private partnerships that promote conservation extending beyond political and jurisdictional boundaries) to explore issues related to climate change. Because climate change generally occurs across large landscapes, it is important for CSCs and LCCs to respond with coordinated and large-scale management plans to contend with potential impacts. Therefore, criteria for future vulnerability assessments should ensure that the geographic requirements of the assessment target (e.g., species, ecosystem) are considered. Additionally, it is important that the scale of the climate model projections corresponds with the desired scale of the biological responses. In 2011, the DOI requested all agencies to report ongoing or completed vulnerability assessments that pertained to a specific range of assessment targets (e.g., wildlife habitat) or threats (e.g., sea-level rise). Approximately 270 projects were reported in all 21 LCC regions. A summary of those vulnerability assessments determined that marked variability existed among projects, particularly regarding the spatial scales considered. We filtered the list of reported vulnerability assessments and determined that approximately 144 of the 270 projects met our criteria for assessment of regional-scale impacts. The majority of those projects were conducted in the southwestern U.S., which is likely due to increased focus on a large number of vulnerable resources in southwestern landscapes. Consequently, those studies may be appropriate examples for the CSCs and LCCs to consider for planning future projects.

Poster 25: Autoregressive state-space models for estimating extinction risk from Breeding Bird Survey data

USGS Contributors:
Wayne Thogmartin, USGS Upper Midwest Environmental Sciences Center

Birds are faced by a multitude of stressors, including habitat loss and alteration, collision with towers, buildings, and wind energy turbines, mortality from cats, disease, and climate change. Projecting temporal patterns in abundance to understand which species are most at risk of extinction would help prioritize the allocation of conservation effort. Extinction risk is the integration of trend, variability in trend, and population size. We used annual indices of abundance, calculated with hierarchical trend techniques from Breeding Bird Survey (BBS) data, to estimate the probability of quasi-extinction for each of 417 species of North American bird. We assumed a species was quasi-extinct when it was no longer sufficiently observable with the protocol of the Survey (i.e., an annual index <0.01). We used autoregressive state-space models for calculating species-specific probabilities of quasi-extinction for each geographic region (state, province, and Bird Conservation Region) in which the species was adequately surveyed by the BBS. Trend estimation for the BBS attempts to control for issues relating to detection, such as those caused by differences among observers in how they may count birds; the approach we used parsed residual sources of measurement error from the underlying process-related variation contributing to trend and variability in trend. This trend and variability in trend was integrated with the magnitude of the abundance index to estimate whether a species was extinction prone. Parametrically-bootstrapped confidence intervals were obtained for the species in regions where the probability of quasi-extinction was highest. We summarized these results by habitat, nesting-type, migration type, and nesting location type. We will show details of our methodological approach and summaries of our results.

Survival rates of Pacific Coast band-tailed pigeons determined using VHF and satellite telemetry

Monday, October 15, 2012 | 8:00 a.m. - 12:00 p.m. PDT | Hall A | Poster 28

USGS Contributors:
Michael Casazza – USGS Western Ecological Research Center
Peter Coates – USGS Western Ecological Research Center
Cory Overton – USGS Western Ecological Research Center
Brian Halstead – USGS Western Ecological Research Center

The Pacific Coast population of band tailed pigeons (*Patagioenas fasciata monilis*) has been in decline since the mid 1960's. Currently, the only population estimates for survival rates were derived from banding efforts primarily during the 1960's and 1970's. The highly migratory nature of this species makes conventional telemetry alone impractical for assessing annual mortality rates. The use of solar powered satellite platform terminal transmitters hereafter PTT's, on pigeons marked during the breeding season in California, Oregon, Washington and British Columbia, (n=31, 2006-2008) allowed for both seasonal and annual estimates of survival. We compare those estimates to estimates obtained from VHF radio-marked individuals in California (n=54, 1999-2000). We developed an a priori list of candidate models with covariates suspected of affecting band-tailed pigeon survival including body condition, season, sex, and age. No mortalities were observed during a 13-week breeding period and no indication of hunting related mortality was observed. Using 'RMark' in Program R we calculated an

annual survival rate of 67.8% ± 12.0 (41.0 - 85.4) for PTT marked band-tailed pigeons during 2006-2008. Weekly survival rate was 99.2% ± 0.3 (98.2 - 99.7). The model that included a breeding period covariate was the top model of the a priori set. Derived survival estimates for breeding, fall migration, winter, and spring migration periods were 100%, 87.3%, 91.0%, and 87.1%, respectively for the PTT marked birds. Of 54 VHF monitored band-tailed pigeons, we observed 3 mortalities and found the survival rate during the breeding period (15 June - 07 September) of 1999 and 2000 was 95.0% ± 3.5 (82.0 - 98.7). Lower survival during the winter, and fall and spring migration periods is likely contributing to declining pigeon abundance and future research should focus on those periods.

POSTERS – MONDAY AFTERNOON

Poster 2: Effects of the Light Goose Conservation Order on the behavior and distribution of dabbling ducks in the Rainwater Basin of Nebraska

USGS Contributors:
Andrew Dinges* - Missouri Cooperative Fish and Wildlife Research Unit
Elisabeth Webb - Missouri Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Missouri/

The mid-continent population of light geese (lesser snow geese [*Chen caerulescens*], and Ross's geese [*Chen rossi*]) has increased dramatically over the last thirty years and now uses wetlands in the Rainwater Basin (RWB) in south-central Nebraska as a primary spring staging area. The Light Goose Conservation Order (LGCO) in the RWB was implemented with caution due to the potential negative impacts for non-target waterfowl species during this energetically important time. During the LGCO in the RWB, hunting is restricted to four days a week and 16 public wetlands are closed to hunting. To evaluate the effects of the LGCO in the RWB, we surveyed avian use of paired wetlands open and closed to hunting simultaneously during springs 2011 and 2012. During surveys we quantified dabbling duck abundance and behavior, and recorded all hunter encounters. We encountered a total of 74 hunting parties on study wetlands, with approximately 85% of these encounters occurring during early migration. Mean weekly dabbling duck density (ducks/ha) was greater on wetlands closed to hunting during early migration ($F = 6.82$, $P = 0.02$), but not during late migration when hunting disturbance decreased. Overall behaviors of mallards (*Anas platyrhynchos*) and northern pintails (*Anas acuta*) differed on wetlands open and closed to hunting during early migration on hunt days (Wilks' $\lambda = 0.94$, $P < 0.01$) and non-hunt days (Wilks' $\lambda = 0.89$, $P = 0.04$). In early migration mallards and pintails spent more time feeding ($F = 11.53$, $P < 0.01$) on wetlands closed to hunting, compared to those wetlands open to hunting. In the RWB, hunting disturbance during the LGCO may limit habitat use and reduce foraging time for non-target waterfowl species.

Poster 12: Predicting and managing climate change impacts on semi-arid land wetlands, shorebirds, and their prey

USGS Contributors:
Sean Murphy - USGS Forest and Rangeland Ecosystem Science Center
Susan Haig - USGS Forest and Rangeland Ecosystem Science Center
Mark Miller - USGS Forest and Rangeland Ecosystem Science Center

http://fresc.usgs.gov

Anthropogenic climate change is altering aquatic ecosystems worldwide. As a result of these abiotic changes, shorebirds and their aquatic prey that depend on such wetlands are likely to experience significant shifts in range, phenology, and population structure, particularly in arid and semi-arid regions and thus already limited in water quantity and quality. We are developing a modeling framework to determine landscape-level impacts of climate change on wetlands and wetland-dependent species in semi-arid areas of North America's Great Basin. The assessment of these impacts is not straightforward and requires a broad, integrative approach. Using a climatic dataset from 1900-2008, we will determine historic and current climate scenarios. Preliminary analyses have revealed several climate trends over the period of record. Using these scenarios, coupled with remote sensing and ground-level monitoring, we will create models of the relationships between water volume, water quality, weather, and climate to determine the scope of abiotic impacts from climate change. We are assessing the scale of wetland connectivity by using landscape-level population genetics of aquatic invertebrates that serve as key prey species for Great Basin shorebirds. Subsequently, we can use projections of future climates to model how wetland habitat quality and species connectivity will change in the coming decades and ultimately link these to shorebirds that depend on these wetlands. The Great Basin is critically important to several shorebird species and contains five sites that surpass Western Hemisphere Shorebird Reserve Network (WHSRN) Hemispheric Importance status. Our approach may serve as a general model for understanding population- and community-level climate impacts and provide a sound base for conservation planning and adaptive management by resource managers at several WHSRN sites.

Poster 20: Raptor nest occupancy in relation to coal-bed methane development in the Powder River Basin, Wyoming

USGS Contributors:
Anna D. Chalfoun - Wyoming Cooperative Fish and Wildlife Research Unit
http://www.wyocoopunit.org

More than 15,000 coal-bed methane (CBM) wells have been constructed over the past ten years in the Powder River Basin, northeastern Wyoming. This development overlaps breeding territories of many raptor species, with largely unknown consequences to nesting habitat use. Our objectives were to determine 1) temporal and spatial trends in raptor nest occupancy in relation to CBM development at both the community and individual focal species level, and 2) local habitat characteristics that may mitigate disturbance caused by energy development. Using nest occupancy data for 19 raptor species and the locations of CBM wells constructed in the Powder River Basin from 2003-2011, we used GIS to create an index of industrial impact for each raptor nest based on the inverse weighted distance to CBM wells within a 0.5 mile buffer. We analyzed the effect of industrial impact on raptor nest use using linear regression, summarizing the change in use for each nest pre- and post-well construction in a paired data format. With all species pooled, raptor nest use decreased as CBM well development occurred at closer proximities to a nest, though nest occupancy gradually increased with time since initial well construction. At the species level, Red-tailed Hawks (*Buteo jamaicensis*), Great-horned Owls (*Bubo virginianus*), Golden Eagles (*Aquila chrysaetos*) and Ferruginous Hawks (*Buteo regalis*) exhibited patterns similar to those described above. However, the effect of CBM development may be influenced by local topography, habitat conditions, and the number of years observed pre- and post-industrialization. Our results will help to inform land managers seeking to balance the needs of raptor

populations with energy extraction activities, and provide insight into species-specific tolerance levels for disturbance associated with energy development.

Poster 21: The influence of oil wells and related activity on grassland bird habitat use

USGS Contributors:
Douglas Johnson - USGS Northern Prairie Wildlife Research Center
http://www.npwrc.usgs.gov/

Western North Dakota has experienced dramatic increases in oil-drilling activity in the past two years. Experts predict that 40,000 new wells will soon be drilled in North Dakota, culminating in densities of 3-4 wells per square mile. Western North Dakota also provides critical habitat for breeding grassland birds including species of concern like Sprague's pipit and Baird's sparrow. Because oil development activity has increased so rapidly, wildlife managers and regulatory agencies have very little information about how to minimize impacts on grassland birds. Oil development activities such as well drilling and construction of new roads can lead to direct mortality (e.g. road-kills, destruction of nests) and indirect effects on grassland birds via loss, degradation, and fragmentation of their habitat.

We are examining the impact of oil development on grassland birds, specifically, how oil wells and associated roads influence habitat use by breeding grassland birds. We mapped the locations of all visible or audible birds along transect routes that incorporated grassland areas adjacent to oil well pads and roads, and as far as 500m from any disturbance. We then compared the distribution of random points to the observed distribution of birds and looked for patterns of avoidance or attraction to oil well features.

In our pilot season (2012), we conducted surveys on 23 sites in seven western North Dakota counties. The most commonly observed grassland birds were grasshopper sparrows, Savannah sparrows, clay-colored sparrows, and chestnut-collared longspurs, but Baird's sparrows and Sprague's pipits also occurred at numerous sites. Preliminary analysis shows that grassland birds as a group avoided oil wells to a distance of 200-250 m. Ongoing analysis will examine distribution patterns of individual species, possible avoidance of roads, and possible features influencing degree of avoidance (e.g. well age, noise levels, vegetation).

Poster 22: Use of artificial floating islands for nesting and refuge by the endangered California clapper rail

USGS Contributors:
Cory Overton – USGS Western Ecological Research Center
Vivian Thuy-Vy Bui – USGS Western Ecological Research Center
John Takekawa – USGS Western Ecological Research Center
http://www.werc.usgs.gov

Projected changes in sea-level indicate increasing risks to obligate tidal marsh species such as the endangered California clapper rail (*Rallus longirostris obsoletus*). Increased inundation of primary habitats threatens to lower both survival and reproduction through intermittent loss of refuge cover and flooding of nesting substrate. We provided artificial refuge cover and nesting substrate for California clapper rails using floating islands and assessed use with respect to tidal inundation patterns

and availability of natural refuge cover. Artificial refuge islands (1.5x2 m) were deployed at 10 locations in Arrowhead Marsh in Oakland, CA during the winter of 2010-11 and 2011-12. Artificial nesting islands (0.5x0.66 m) were deployed at 25 locations within each of 5 marshes in South San Francisco Bay from February 2012 to August 2012. All islands were constructed of recycled plastic materials with woven palm screens attached to rigid support poles providing cover. Waterproof, digital cameras mounted on each island recorded time elapsed images to monitor use. Nearly three million photos showed that rails regularly occupied all of the artificial refuge islands. Use of refuge islands by clapper rails increased slowly with tide level until tides reached 1.5 meters. Above 1.5 meters the odds of island use were 23 times the odds of use below 1.5 meters. Island use was also strongly diurnal. Odds of daytime use were 320 times the odds of use during the evening. Artificial nesting islands were used both for refuge during tidal inundation and as nesting substrate. Our results suggest that clapper rails in San Francisco Bay are strongly attracted to artificial habitats which provide protection from tidal inundation. Artificial islands for California clapper rails may be a timely and effective method for providing relief from adverse impacts of limited refuge and nesting habitat and could inform future habitat management under sea level rise scenarios.

Poster 29: Effects of wetland management on carrying capacity of duck and shorebird benthivores in a coastal estuary

USGS Contributors:
Arrianna Brands – USGS Western Ecological Research Center
John Takekawas – USGS Western Ecological Research Center
Joel Shinns – USGS Western Ecological Research Center
Tanya Grahams – USGS Western Ecological Research Center
Kevin Buffingtons – USGS Western Ecological Research Center
Sarah Springs – USGS Western Ecological Research Center
Keith Miles – USGS Western Ecological Research Center
http://www.werc.usgs.gov

With loss of natural wetlands, managed wetlands are increasingly relied upon to support energy requirements for wintering shorebirds and waterfowl. Despite substantial research effort on energetics in freshwater systems, less is known about invertebrate prey for waterbirds in coastal estuaries such as managed ponds in San Francisco Bay that form part of the largest wetland restoration in western North America. We assessed energy requirements for 8 shorebird and 4 diving duck species during the winters of 2007-2010 in 4 types of managed ponds - seasonal and circulation ponds each in two salinity classes - based on bird abundances, days in the season, and allometric equations that incorporate body mass and assimilation efficiency. We estimated energy available to birds on the basis of preferred prey abundances, biomass, energetic content, and prey accessibility. We then applied a daily-ration model to evaluate the carrying capacity of managed ponds for waterbirds as potential bird-days that a site can support. An average of 35,450 ± 1,559 (mean ± SE) and peak of 45,458 ± 1,653 diving ducks, and an average of 64,253 ± 14,838 and peak of 108,171 ± 4,854 shorebirds, used the study area at high tide through the winter. Greatest shorebird abundances were in seasonal ponds and greatest diving duck abundances were in circulation ponds. Prey energy varied by pond type, with mesohaline (< 30 psu) circulation ponds providing the greatest energy per unit area and total energy available for diving ducks and shorebirds, despite only 11% of the area accessible for shorebirds. Potential bird-days per ha was highest in mesohaline circulation ponds followed by low-hyperhaline (30-80 psu) circulation ponds and then medium-hyperhaline (80-150 psu) seasonal ponds, although bird-days were highly variable in

the latter. Our results suggest that pond management for depth and salinity could substantially enhance energy available for these waterbirds.

Poster 31: Increased nest predation and natural gas development; what's in the pipeline for sagebrush obligate songbirds?

USGS Contributors:
Anna Chalfoun - Wyoming Cooperative Fish and Wildlife Research Unit
http://www.wyocoopunit.org/

Natural gas development has rapidly increased within sagebrush dominated landscapes of the Intermountain West. Prior research in the Upper Green River Basin, WY, demonstrated increased nest predation of sagebrush-obligate songbirds with higher densities of natural gas wells. To better understand the mechanisms underlying this pattern we tested alternative hypotheses regarding changes in predator abundance and habitat structure across a gradient of natural gas development intensity, indexed by well density. We monitored nests of Brewer's sparrows (*Spizella breweri*), sage sparrows (*Amphispiza belli*), and sage thrashers (*Oreoscoptes montanus*) at twelve sites within two energy fields. We conducted a variety of predator surveys and measured microhabitat metrics at nest sites and paired random points. Using logistic exposure we modeled the effects of well density, predator abundance, and microhabitat features in relation to a constant survival model. Daily nest survival decreased with increasing well density for sage sparrows and sage thrashers. Top supported nest survival models varied among focal species with strong support for shrub density, seasonal variation, and shrub cover for Brewer's sparrow, sage sparrow, and sage thrasher respectively. Both shrub density and shrub cover decreased with increasing well density, suggesting the potential for bottom up forces to be affecting nest predation rates of songbirds breeding in energy fields. Despite increased detections of common ravens (*Corvus corax*) and sciurid mammals (*Tamias* spp. and *Spermophilus* spp.) with increasing well density, there was relatively little support for models which included predator abundance metrics. Shrubland bird populations are among the most rapidly declining groups of avian species in North America. With increasing demands for domestic sources of energy, the identification of specific mechanisms influencing nest predation is a critical next step in developing clear strategies for mitigating the impacts to songbirds breeding in energy fields.

Poster 32: Environmental factors affecting detection of recorded bird songs in midcontinent grasslands

USGS Contributors:
Douglas Johnson - USGS Northern Prairie Wildlife Research Center
http://npwrc.usgs.gov/

Point counts are commonly used to monitor bird populations and estimate bird abundance. Detection of birds by point counts is affected by environmental factors, but the magnitude of these effects is poorly understood, particularly in grasslands. We broadcast taped bird songs of ten grassland bird species and recorded detections thereof at 35 mixed-grass prairie sites in west-central Minnesota. Songs were played from a central speaker system and detections were recorded along an array of listening sites 30-150 m from the sound source. Each 1-minute listening period included 1-10 broadcast songs, with species randomly selected with replacement. We measured wind speed and wind direction relative to the sound source, measured habitat structure, and recorded presence of potentially

masking noise (avian or manmade) for use as covariates affecting detection. Our response variable was binary: detection or non-detection of a broadcast song by the observer. Logistic regression analyses with site as a random effect indicated that probability of detection varied by species, distance from sound source, wind speed, and wind direction. Probability of detection averaged p = 0.65 over all species and ranged from 0.26 for Le Conte's sparrow (*Ammodramus leconteii*) songs to 0.85 for eastern meadowlark (*Sturnella magna*). Probability of detection decreased linearly with distance for all species. Mean probability of detection 30 m from the sound source ranged from p = 0.74 (Le Conte's sparrow) to p = 1 (6 species), compared to p = 0.04 (Le Conte's sparrow) to p = 0.55 (vesper sparrow, *Pooecetes gramineus*) at 150 m. Species misidentification occurred mainly between two similar-sounding species (Le Conte's sparrow and grasshopper sparrow, *Ammodramus savannarum*). Future experiments will include a variety of observers to investigate observer effects on misidentification and to determine how environmental effects vary among observers.

Poster 35: Greater sage-grouse and energy development: a decision support analysis for guiding the size and location of "no surface occupancy" zones

USGS Contributors:
Peter Coates – USGS Western Ecological Research Center
Michael Casazza – USGS Western Ecological Research Center
Cory Overton – USGS Western Ecological Research Center
Brian Halstead – USGS Western Ecological Research Center
Brianne Brussee – USGS Western Ecological Research Center
http://www.werc.usgs.gov/

The development of anthropogenic features, especially those related to energy resources, in sagebrush ecosystems is an important concern to greater sage-grouse (*Centrocercus urophasianus*) populations among developers, conservationists, and land managers. Sage-grouse are highly dependent on different aspects of the sagebrush ecosystem to meet seasonal life-phase requirements. Research indicates that anthropogenic structures adversely affect sage-grouse within seasonal use areas. Land management agencies have implemented "no surface occupancy" zones of development at lek sites (breeding grounds) to prevent unfavorable effects. However, rationale for their decisions related to zone size and location are often challenged. To help inform this issue our study objective was twofold. First, we conducted an iterative spatial analysis to estimate optimal size of a zone centered on lek sites using seasonal utilization distributions of 228 sage-grouse (12,852 telemetry locations) across five populations within Mono County, California, during 2002 - 2009. We found season and site variation in fractional exponential curves that represented relationships between zone size and amount of utilization distribution. We summarized the diminishing returns of increasing zone size, which allows flexibility in land management decisions. The optimal size of a zone was 8,170 ha (20,188 acres), which equated to a buffer distance of 4.1 km (2.5 miles) based on lek configuration. We then evaluated whether or not leks represent the best locations for these zones. We compared values derived from iterations at leks with those from sites assigned randomly in other seasonal use areas. Centering zones at leks maximized the amount of utilization distribution by zone size seasonally and annually. Although energy development is not currently considered the primary threat to sage-grouse in Mono County, these analyses offer empirical support for decisions by developers and land managers that share an interest in meeting energy demands while conserving sage-grouse populations within the Great Basin.

Poster 57: Do band recoveries and satellite telemetry provide similar measures of the spatial and temporal distributions of northern pintails?

USGS Contributors:
Jerry Hupp - USGS Alaska Science Center
Paul Flint - USGS Alaska Science Center
John Pearce - USGS Alaska Science Center
http://alaska.usgs.gov

We examined whether band recoveries and satellite telemetry provided similar estimates of spatial and temporal distributions of northern pintails (*Anas acuta*) during spring migration in Eastern Russia. Our samples included 1024 recoveries of pintails banded on Japanese wintering areas (1966-2007) and locations of 102 pintails marked with dorsally mounted satellite transmitters in Japan (2007-2009). Based on detections in 1°x1° cells of latitude and longitude, band recoveries occurred across a 23% larger region (221 cells) of Eastern Russia than birds marked with satellite transmitters (180 cells). Transmitters were not detected in 62% of cells in which bands were recovered, and band recoveries were absent in 53% of the cells where satellite transmitters occurred. Compared to detection of satellite transmitters, the odds that banded pintails were recovered in a 1° cell rose 1.18 (95% CI: 1.05-1.32) for each 1000 person increase in the human population of the cell. The number of band recoveries and human population within a cell were positively correlated (r = 0.48). Within a cell, mean dates that pintails with satellite transmitters were present lagged up to 21 days behind mean recovery dates of banded pintails; evidence that dorsal attachment of transmitters may have caused pintails to delay migration. Satellite telemetry underestimated the range of movement indicated by band recoveries. However, distribution of band recoveries was influenced by human distribution and satellite telemetry detected pintail use in areas that were sparsely settled by people. Although long-term band recoveries were useful to define distribution limits of the population, satellite telemetry was necessary to identify migration habitats in areas where band recoveries were unlikely. Timing of migration movements based on PTTs should be interpreted cautiously if dorsally mounted transmitters are used.

SRIP POSTERS – MONDAY EVENING - BALLROOM

SRIP 122: Decadal-scale abundance patterns in the marine bird community of Prince William Sound, Alaska

USGS Mentors:
Daniel Roby - Oregon Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Oregon/

Over the past four decades, the marine bird community of Prince William Sound (PWS), Alaska has experienced major anthropogenic and natural perturbations. These include the Exxon Valdez oil spill and large changes in forage fish populations associated with shifts in ocean-atmosphere systems of the North Pacific (Pacific Decadal Oscillation). Prior work has documented disproportionate declines in summer populations of piscivorous seabirds in PWS, coincident with these events. It has not been determined whether this pattern of change in the marine bird community has continued to the present.

I am using a boat-based marine bird survey dataset collected during the periods 1972-73 and 1989-2012 to assess patterns of decadal population change within the marine bird community of PWS in both summer and winter. For each taxon and season, I am evaluating three nested models to identify patterns of abundance over the period 1989-2012. For taxa that are stable, increasing, or decreasing, I am calculating prediction intervals for expected abundance in 1972-73, using 1989-2012 data. I will then determine whether abundance estimates from surveys conducted in 1972-73 are within or outside of these intervals, and identify any patterns that are consistent over the period 1972-2012. Finally, over both time intervals (1972-2012 and 1989-2012) I will test the hypothesis that population abundance patterns have differed between taxa with different foraging strategies, and evaluate whether several additional ecological and life history traits may be associated with any documented patterns of change. Knowledge gained from this study will provide insight into the dynamics of a marine species assemblage during a period of ecosystem change, and help identify priorities for research and restoration in PWS.

SRIP 64: Effects of parental characteristics and environmental variation on juvenile growth and survival: a case study in Adélie penguin chicks

USGS Mentors:
Katie Dugger - Oregon Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/Oregon/

The juvenile age class is a critically important stage for many vertebrate populations as it is often a time of high mortality, with the potential to dramatically influence overall population dynamics. Understanding factors that affect survival during this stage is critical to conservation and management of wildlife populations, and provides greater overall understanding of ecosystem function. Of interest here is how age and breeding experience affect an individual's contribution to population growth, and how varying environmental conditions may exacerbate or moderate these relationships. We will investigate these questions using a population of individually marked, known-age Adèlie Penguins (*Pygoscelis adeliae*) on Ross Island, Antarctica. When Adèlie Penguin chicks are approximately two weeks old, both parents begin foraging simultaneously and the chicks leave the nest to form protective groups called créches. Preliminary observations of nests of known-age and breeding experience penguins suggest that the age and size at which chicks enter the créche may be a significant factor determining survival. We report the study design and specific hypotheses we will use to test: 1) the effects of parent age and breeding experience on chick growth rates; 2) the age and size at which chicks enter the créche; and 3) survival within the créche. We predict that chicks of older, more experienced parents will enter the créche older and larger, and that their survival within the créche will be higher. We also predict that adverse environmental conditions (e.g. heavy snowfall which affects thermoregulation of chicks; non-optimal sea ice concentration that increases parental foraging effort) will affect the growth and survival of chicks from younger parents more than it will from older parents.

SRIP 70: Microhabitat selection and mortality site characteristics of elk calves in the Blue Range Wolf Recovery Area of west-central New Mexico

USGS Mentors:
James Cain - New Mexico Cooperative Fish and Wildlife Research Unit
http://www.coopunits.org/New_Mexico/

Elk (*Cervus canadensis*) in New Mexico have been free from wolf predation since the extirpation of the Mexican gray wolf (*Canis lupus baileyi*) by the mid to late 1900s. The Mexican Wolf Recovery Plan was initiated in the late 1970s with the goal of creating a captive breeding program and reestablishing wolf populations in the wild. The initial recovery area, the Blue Range Wolf Recovery Area (BRWRA), was designated in west-central New Mexico and east-central Arizona, with reintroductions beginning in 1998. All confirmed wolf kills within the first seven months of release were of adult elk and calves, and subsequent studies have found this to be the main component of Mexican gray wolf diets. However, the impacts of wolf reintroduction, along with existing predator impacts, on neonatal survival and recruitment have not been assessed. The main purposes of this study are to characterize microhabitats selected for calf bedding sites and at cause specific mortality sites, and determine if these characteristics are related to survival. Objectives will be met by tracking tagged calves to bedsite locations and collecting data on the physical features and vegetation structure at those locations as well as at randomly determined available sites and any cause-specific mortality sites. Results to be obtained include assessing the importance of topographic and vegetation structure characteristics in site selection, determining the influences guiding this selection, and determining the relative success of these selections in promoting calf survival. By determining microhabitat differences between surviving and non-surviving calves, optimal habitat characteristics and locations can be determined. Knowledge of these relationships may allow the development of management plans that maintain optimal calf rearing habitat, reduce depredation impacts, and support sustainable populations of both elk and the Mexican gray wolf.

POSTERS – TUESDAY MORNING – HALL A

Poster 24: An evaluation of trap modifications to improve capture success of giant gartersnakes

USGS Contributors:
Glenn Wylie – USGS Western Ecological Research Center
Brian Halstead – USGS Western Ecological Research Center
Michael Casazza – USGS Western Ecological Research Center
http://www.werc.usgs.gov/

Giant Gartersnakes (*Thamnophis gigas*) are endemic to the Central Valley of California and are federally and state listed as threatened because of extensive loss of their wetland habitat. To inform recovery actions for this species we developed capture methodologies including floating inverted cone traps, but these yielded low capture probabilities. To improve capture success we evaluated eight different trap modifications related to construction material (galvanized or vinyl coated metal mesh), floating depths, funnel modifications, and baiting of traps. From 18 April to 8 September 2011 we examined the effects of trap modifications on snake captures using four transects of 24 traps each at a site known to have a population of *T. gigas*. We placed two transects in canals and two in a restored wetland to sample habitats representative of the majority of sampling conditions. Within each transect we deployed three replicates of each trap type placed in random sequence. We captured 72 T. gigas in 13,076 trap days. We analyzed the number of *T. gigas* captures in each trap type using Bayesian analysis of log-linear models. Unmodified vinyl and galvanized traps, and galvanized traps floating lower in the water with cable ties, captured fewer giant gartersnakes than predicted under the null model. Galvanized traps with cable ties had 9.13 (2.47 - 25.98) times as many captures as unmodified

vinyl traps and 5.29 (1.92 - 12.73) times as many captures as unmodified galvanized traps. Appropriately modified traps can improve capture probabilities for *T. gigas* and, perhaps, other aquatic snakes. Improved probability of capture and detection will result in more accurate estimates of occupancy, abundance, survival, recruitment, and other demographic parameters to better inform recovery action planning for *T. gigas*.

Poster 26: Interspecific competition under climate change: Addressing a critical science need for management of terrestrial Plethodontid salamanders

USGS Contributors:
Eric Dallalio - USGS Patuxent WIldlife Research Center
Evan Grant - USGS Patuxent WIldlife Research Center
Adrianne Brand - USGS Patuxent WIldlife Research Center
http://www.pwrc.usgs.gov/nearmi/

Research has indicated that closely related Plethodon species may be experiencing extinction risks due to behavioral interactions as well as climate change, prompting a movement toward implementing monitoring programs and developing management strategies. A critical uncertainty in this process is understanding how the effects of temperature and humidity influence both the potential to limit distributions of Plethodon species, and change the nature of the interaction between sympatric species; this research design investigated these relationships by using innovative mesocosms to examine growth and survival differences in response to climate and competition treatments. We maintained heterospecific and conspecific pairs of redback salamander (*Plethodon cinereus*) striped and unstriped morphotypes in three-dimensional experimental mesocosms with underground habitat and a surface habitat subjected to diurnal temperature treatments. The objective of this study was twofold: (1) to explore the ecological role of differentiation between two *P. cinereus* morphotypes with respect to the relationship between temperature and competitive behavior in vertical microhabitats, and (2) to improve the existing experimental design for future studies examining the role of ecological differentiation in energy use related to the physical and thermal environments of terrestrial *Plethodon* salamanders. Specifically, we tested the hypotheses that salamander behavior influences body condition and that behavior and body condition respond differently at high vs low surface temperatures and at conspecific vs heterospecific competition treatments. We did not find consistent patterns of differentiation between the morphotypes across temperature and competition treatments. However, we found evidence of competition and a temperature effect on behavior among all individuals, corroborating leading hypotheses on *P. cinereus* territoriality and foraging theory. These findings demonstrate that our experimental design successfully provided a template to observe these behaviors in a laboratory setting and suggest that it should be powerful in detecting differences among treatments when implemented on two distinct species.

Poster 32: Effects of current and historic habitat conditions on the occurrence of the giant gartersnake in the Sacramento Valley of California

USGS Contributors:
Brian Halstead – USGS Western Ecological Research Center
Glenn Wylie – USGS Western Ecological Research Center
Peter Coates – USGS Western Ecological Research Center
Michael Casazza – USGS Western Ecological Research Center

http://www.werc.usgs.gov/

We examined the effects of current and historic habitat on the distribution of the giant gartersnake (*Thamnophis gigas*) in the rice-growing regions of the Sacramento Valley, California. We used a removal design and Bayesian analysis, with and without informative priors on detection, to fit and evaluate single-season occupancy models. We detected the giant gartersnake at 6 of 17 sampled sites. Detection probabilities were very low, but were higher with increased water temperature, with increased sampling effort, and when sampling occurred earlier in the giant gartersnake active season. The probability of occurrence of the giant gartersnake in 25 km2 cells in the Sacramento Valley was approximately 64% using uninformative priors on detection probability and approximately 49% using priors for detection probability informed by previous surveys conducted from 2003 through 2009. Models with informative priors indicated that the giant gartersnake was more likely to occur near historic tule marsh habitat, suggesting that limited dispersal from historic locations might affect the distribution of the giant gartersnake.

Poster 34: Estimating salamander abundance within stream networks
USGS Contributors
William Fields - USGS Patuxent Wildlife Research Center
Evan Grant - USGS Patuxent Wildlife Research Center
https://www.pwrc.usgs.gov/

The interpretation of data from amphibian surveys can be confounded by imperfect detection probabilities. Replicated surveys can be used to incorporate detection probabilities into species' estimates of occupancy, but additional information on variation within sites may also be informative. We used repeated surveys in a temporary removal sampling design to estimate the abundance of seal salamanders (*Desmognathus monticola*) in 3 age classes at upstream and downstream reaches of 12 streams in the Shenandoah National Park. Our objective was to better understand the variation in abundance of different life stages at occupied sites. We used multinomial-Poisson mixture models to estimate the detection probability and abundance of salamanders in different age classes. Abundance of adult salamanders was greater in downstream reaches, but juvenile salamander abundance was similar in upstream and downstream reaches. We found evidence that detection probabilities varied by age class. Abundance of adults was greater in downstream reaches, but abundance of both juvenile classes was similar across upstream and downstream reaches. If breeding adults are evenly distributed within stream networks, then these results suggest that juveniles exhibit upstream-biased dispersal. These results are useful for designing conservation programs for seal salamanders because understanding dispersal pathways is essential for effective action.

POSTERS – TUESDAY AFTERNOON – HALL A

Poster 2: Siting wind farms for wildlife: Predicting bird and bat fatality risk at prospective wind farm sites using acoustic detectors
USGS Contributors:
Douglas Johnson - USGS Northern Prairie Wildlife Research Center

http://npwrc.usgs.gov/

Wind power is essential for reducing greenhouse gas emissions from electricity production, but large-scale wind energy facilities can have serious impacts on wildlife. Bird and bat collision fatality rates at some sites have been alarming, and proper siting of wind facilities is necessary to minimize collision impacts as the wind energy industry continues to grow. Bird and bat fatality rates vary greatly among sites; however there is no reliable method for assessing collision risk levels prior to development. Our goal is to develop a method for predicting fatality levels at potential wind energy sites based on nocturnal call rates of birds and bats. For the past two years, we have been recording bird and bat activity at over 90 locations in 8 states using a dual acoustic/ultrasonic detector. Our objectives are 1) to examine the capabilities of this detector for use in pre-construction site assessments, 2) to find the relationship between call rates and fatality rates for use in predictive models based on pre-construction recordings, 3) to examine how call rates differ before vs. after a wind facility is built, and 4) to observe how call rates vary with respect to prominent landscape features. In order to address each objective, detectors have been located at active wind farms, prospective wind farm sites, and in proximity to specified landscape features. Results from the first four migration seasons show a positive relationship between bat call rates and estimated fatality rates among wind farms. Also, we have found a similar landscape-dependent pattern at two river corridor arrays, with high bat activity at forested edges and decreasing activity with distance from edge. Call data also appear to indicate differences in bat activity at broader regional scales, with high activity near Great Lakes shorelines and less activity at interior sites.

Poster 36: The role of birth synchrony as a mechanism for an Allee effect in a translocated pronghorn population

USGS Contributors:
Diego Johnson – USGS Western Ecological Research Center
Kathleen Longshore – USGS Western Ecological Research Center
Chris Lowrey – USGS Western Ecological Research Center
http://www.werc.usgs.gov/

The translocated population of pronghorn (*Antilocapra americana*) on the Carrizo Plain National Monument in California has experienced a 20-year history of population decline, where roughly 13% of the original number of individuals currently remains within the monument boundaries. Previous research in other regions indicates that pronghorn population trends may be strongly affected by high postnatal fawn mortality due to predation. Although pronghorn normally exhibit birth synchrony to offset high predation, in small populations this strategy may be ineffective and could produce an Allee effect. An Allee effect is a positive correlation between population growth rate and population density, where decline below a critical threshold greatly increases the probability of extinction. Here, we quantify fawn survival and test for conditions that may produce an Allee effect by examining relationships between birth synchrony and predation. During 3 field seasons we outfitted 20 newborn fawns (approximately 50% of all fawns born) with lightweight breakaway GPS collars. Our analysis showed no evidence of birth synchrony and no relationship between dates of birth and survivorship. Fawn mortality was relatively high and ranged from 70-83%. Sixty-four percent of necropsies performed indicated that fawns died due to predation, 18% to internal infection, and 18% of unknown causes. In addition to addressing the role of birth synchrony as a mechanism for an Allee effect, we further assessed factors affecting fawn survival by examining whether differences in the behavior of

individual fawns (i.e. movement patterns and habitat selection) influenced survivorship. Wildlife translocations are a critical component of repopulation efforts and our results provide information about the importance of population size on successful reintroductions.

POSTERS – WEDNESDAY MORNING – HALL A

Poster 10: Remote biopsy darting methods for sampling and marking polar bears from a helicopter

USGS Contributors:
Anthony Pagano - USGS Alaska Science Center
Elizabeth Peacock - USGS Alaska Science Center
http://alaska.usgs.gov

Remote biopsy darting allows researchers to genetically identify individual animals without physical capture. Despite being less invasive and less time intensive than physical capture, biopsy darting is not commonly used in polar bear (*Ursus maritimus*) research. We identified deficiencies with the currently available biopsy darts for the purpose of sampling polar bears from a helicopter. We worked with 2 dart manufacturers to develop darts that, when fired from a helicopter, could simultaneously dye-mark individuals to avoid resampling, were brightly colored to aid in retrieval, could float to allow for sampling bears in the water, and/or were magnetic to aid in remote retrieval of darts in areas where it would be unsafe to land a helicopter (e.g., thin ice). We were able to recover 96% of the darts that had been fired, and had an 86% success rate of collecting a sample with a single biopsy dart. We were able to biopsy and recover darts from 11 polar bears in the water that we would not have been able to sample with traditional dart designs. We successfully sampled a total of 158 adult or subadult polar bears on the land, in the water, and on the sea ice in 2010 and 2011. Dye marks ensured that bears were not resampled during the same sampling period. Darts with 5 mm-wide biopsy cutting heads collected an average of 0.120 grams (95% CI: 0.113 - 0.126, n = 48) of fur, tissue, and fat. Darts with 7 mm-wide biopsy cutting heads collected an average of 0.323 grams (95% CI: 0.248 - 0.398, n = 15) of fur, tissue, and fat. Remote biopsy darting is a less invasive alternative to physically capturing animals and these dart designs enable researchers to more readily sample and identify polar bears from a helicopter.

Poster 25: Habitat interaction on a sky-island between two species of chipmunk in the Basin and Range Province of Nevada

USGS Contributors:
Chris Lowrey – USGS Western Ecological Research Center
Kathleen Longshore – USGS Western Ecological Research Center
http://www.werc.usgs.gov/

Interspecies interactions can affect how species are distributed, put constraints on habitat expansion, and reduce the fundamental niche of the affected species. Using logistic regression, we analyzed and compared 174 *Tamias palmeri* and 94 *T. panamintinus* within an isolated mountain range of the Basin and Range Province of southern Nevada. *Tamias panamintinus* was more likely to use Pinyon/Ponderosa/Fir mixed forests than Pinyon alone when compared to random sites. In the

presence of *T. palmeri*, however, interaction analyses indicated *T. panamintinus* was less likely to occupy the mixed forests. This species by habitat interaction data suggests *Tamias palmeri* excludes *T. panamintinus* from areas of potentially suitable habitat. Climate change may adversely affect species of restricted distribution. Habitat isolation and species interactions in this region may thus increase the survival risks of a major prey source as climate temperatures rise.

Poster 7: Modeling detection bias in aerial surveys of elk based on combined double-observer and sightability data

USGS Contributors:
Paul Griffin - USGS Forest and Rangeland Ecosystem Science Center
Kurt Jenkins - USGS Forest and Rangeland Ecosystem Science Center
http://fresc.usgs.gov/

Sightability modeling and double observer modeling are two approaches for estimating detection bias, a pervasive problem in aerial surveys. Sightability modeling may result in low estimation precision if the model is based on small number of sightability trials. Double-observer models are generally not as constrained by sample size as sightability models, but double-observer modeling may underestimate true abundance if detection patterns of both observers are not independent. Dependent observations resulting from both observers having similar views from an aircraft may produce unmodeled heterogeneity in the double-observer data leading to an overestimation of detection probabilities and underestimation of abundance. We developed a double-observer sightability model to account for observational biases inherent in helicopter surveys for elk, Cervus elaphus. The modeling approach was based on detection patterns of two 'independent' observer pairs within a helicopter and telemetry-based detections of elk groups that contained at least one radio-collared animal. Candidate model structures reflected hypotheses about the effect of recorded covariates and unmodeled heterogeneity on the separate detection probabilities of the front seat pair of observers, and of the back seat pair of observers. The data set included two categories of observations: 1) double-observer sightability trials for elk groups that had at least one working radio collar, and 2) double-observer observations that came from elk groups with no radio-telemetered animals. Having both categories of data allowed us to quantify the positive bias in estimated detection probability that would have resulted from a model based on double-observer observations alone. Based on preliminary results, compared to abundance estimates made with a standard sightability modeling approach, the double-observer sightability model had greater precision. We use the double-observer sightability modeling approach to estimate abundance and herd composition of elk within two survey areas at Mount Rainier National Park, Washington, USA.

OTHER USGS ATTENDEES

Anne Kinsinger
USGS Associate Director
Ecosystems Mission Area
http://www.usgs.gov/ecosystems

Steve Hilburger
USGS Ecosystems Mission Area
Wildlife: Terrestrial and Endangered Resources Program
http://www.usgs.gov/ecosystems

Ben Young Landis
USGS Ecosystems Mission Area
Conference Outreach and Social Media Coordinator
http://www.usgs.gov/ecosystems