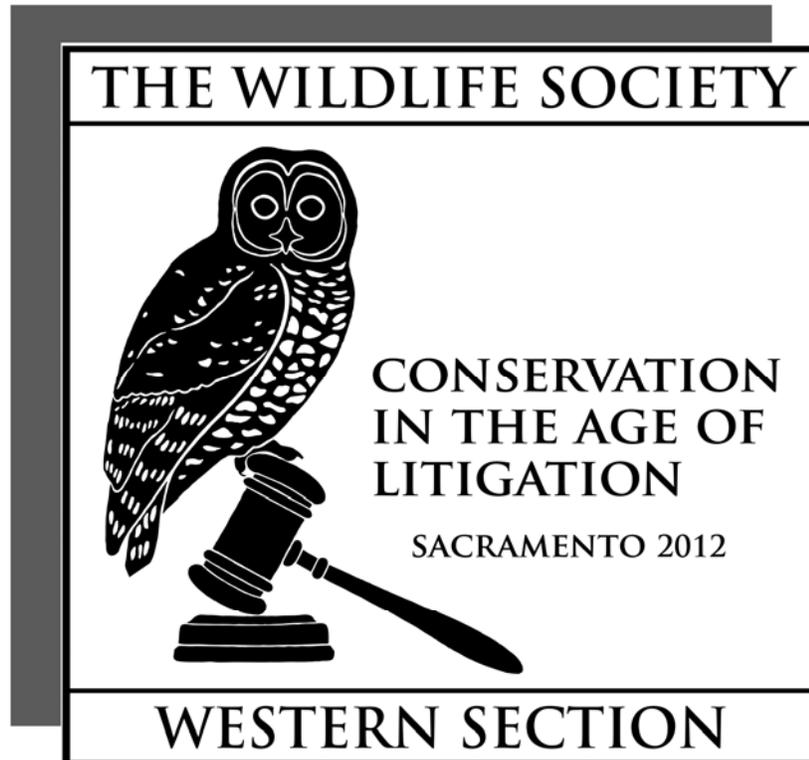


*2012 Annual Conference*

# **The Western Section of the Wildlife Society**



## **Abstracts**

February 1-3, 2012

Woodlake Hotel (formerly Radisson Hotel)

Sacramento, California

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### *EVIDENCE FOR THE PERSISTENCE OF THE NATIVE CASCADE RED FOX (VULPES VULPES CASCADENSIS) IN SOUTHERN WASHINGTON: PRELIMINARY RESULTS*

**JOCELYN AKINS**, University of California Davis, One Shields Avenue/Old Davis Rd., Davis, CA, 95616, (541) 399-6348, jakins@ucdavis.edu; Co-authors: Mark J. Statham, Mason Reid, Keith B. Aubry and Ben N. Sacks

**Student Paper**

*Conservation and Management of Carnivores*

*Wed, Feb 1, 4:05 pm*

**Abstract:** Montane ecotypes are particularly sensitive to climate change and proximate coinciding factors such as habitat loss and introgression of non-native predators and competitors. They serve as indicators of future changes that will eventually affect more tolerant species. The Cascade red fox (*Vulpes vulpes cascadenis*, CRF) is one of three montane subspecies of red fox that are an evolutionarily divergent group, descended from the oldest lineage of North American red foxes. CRF represents a unique lineage within this group that is endemic to Washington and restricted to the subalpine and alpine zones of the Cascade Mountain Range. Climatic warming in the upper montane biome appears to have caused or exacerbated precipitous declines in its distribution and abundance. We are currently surveying CRF in southern Washington to evaluate potential causes of their decline. Scat and hair samples (N = 100) were collected via surveys at baited stations, snow tracking, and along trails from 2009 to 2011, and analyzed using mitochondrial DNA, 33 microsatellite markers, and a sex marker. We will present preliminary results on distribution, connectivity, genetic diversity, and abundance. This project will provide a conservation assessment for the subspecies, and help to understand the effects of climate change on montane habitat specialists.

### *HIGH SPATIAL AND TEMPORAL RESOLUTION INTERPOLATED CLIMATE SURFACES FOR CALIFORNIA*

**OTTO ALVAREZ**, University of California, Engineering Dept., 5200 North Lake Rd., Merced, CA, 95343, (510) 326-6994, oalvarez00@gmail.com

*Challenges of Natural Resource Management in a Changing Climate*

*Fri, Feb 3, 8:05 am*

**Abstract:** Current and accurate climatic surfaces are crucial to predict and determine the change in climate and the effect on the ecosystem. Many products have traditionally only used DEM as covariates in the interpolation phase and very limited research has been done to determine if there is another source of data that has better correlation. We considered several covariates, elevation (DEM), slope, aspect, solar potential, radio detection and ranging (radar), and two different Normalized Difference Vegetation Index (NDVI) products derived from AVHRR and MODIS. We have also tested a range of possible degrees for polynomial function degree. The best combination of covariates and polynomial function degree was determined by 10-fold cross-validation for each climatic variable (precipitation, minimum temperature, mean temperature, and maximum temperature). We generated two monthly data sets: (1) an average of 1950-2000 and (2) a yearly average ranging from 1950 to 2000 at a spatial resolution of 1km<sup>2</sup>. Leading covariate candidates were: precipitation polynomial function degree of 2 with radar being the covariate, maximum temperature polynomial function degree of 2.4, mean and minimum temperature polynomial function degree of 1.8, for all three temperatures DEM was the covariate. A comparison to other products such as PRISM and WorldClim showed strong agreement across large geographic areas, but our product (ClimSurf) varied at high elevation regions such as in the Sierra Nevada Mountains; a region that has great hydrological, cultural, and ecological importance. Our findings suggest that, when looking at the uncertainty base for an ecoregion or DEM classes, radar and DEM are the best covariates to generate climate surfaces.

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### POPULATION SIZE OF THE SAN CLEMENTE ISLAND FOX

**WILLIAM ANDELT**, Colorado State University, 1474 Campus Delivery, Fort Collins, CO, 80523-1474, (970) 491-7093, william.andelt@colostate.edu; Co-authors: Kenneth P. Burnham, Nicholas P. Gould and Kyran E. Kunkel

#### *Ecology and Management of Wildlife on Military Lands*

*Thu, Feb 2, 3:25 pm*

**Abstract:** Because the island fox (*Urocyon littoralis*) has been listed as endangered by the US Fish and Wildlife Service on 4 of 6 Channel Islands, we conducted modified mark-resight surveys to estimate population size and density of the island fox on the northwestern 55% of San Clemente Island, California. During 2007, 2008, 2009, and 2010, we used marked samples of 46, 28, 30, and 38 radio-collared foxes and “resighted” the foxes via capture of 163, 208, 184, and 190 foxes 387, 361, and 343, and 283 times, respectively, on 10 trapping grids. We estimated that 348 (95% CI = 285–440), 842 (95% CI = 527–1,520), 380 (95% CI = 285–539), and 429 (95% CI = 315–624) foxes were present during late June–July 2007, July 2008, late June–July 2009, and July 2010, respectively. This resulted in densities of 4.3, 10.5, 4.7, and 5.3 foxes/km<sup>2</sup> during the 4 periods. During March 2008–February 2009, we used marked samples of 13–22 radio-collared foxes and visually “resighted” marked and unmarked foxes, and estimated that 7.9 foxes and a density of 9.5 foxes/km<sup>2</sup> occurred in 2 urban areas.

### MONITORING GREATER SANDHILL CRANES ON MODOC NATIONAL WILDLIFE REFUGE, CALIFORNIA: PIECING TOGETHER A HISTORY OF GREATER SANDHILL CRANES 1980-2010.

**DOMINIC BACHMAN**, Modoc National Wildlife Refuge, PO Box 1610, Alturas, CA, 96101, dominic\_bachman@fws.gov; Co-author: Cameron T. King

#### *Ecology and Management of Waterfowl and Wetlands*

*Thu, Feb 2, 1:45 pm*

**Abstract:** The Central Valley Population of the Greater sandhill crane (*Grus canadensis tabida*) is listed as threatened by the state of California. Cranes arrive at Modoc from their wintering areas by February and leave by November. Breeding cranes begin to nest as early as mid-April and colts can be seen by late-May and throughout the summer until the fall migration begins. The refuge supports an average of 45 nesting pairs annually which fledge an average of 12 colts. During the last 30 years the Modoc refuge has had an intensive monitoring program for cranes. Monitoring has included: banding, pair counts, nest surveys, mortality factors, survival and production estimates. We conducted a review of all available data from the last 30 years. During this period 300 cranes were captured and banded with color coded markers. Over 5000 re-sightings of individually marked birds have been made. We used GIS to analyze nesting locations and temporal crane use on the refuge. Detailed analyses using program MARK revealed that annual survival probabilities varied by age class. These analyses will be a great baseline dataset that will help refuge managers assess future monitoring needs and determine if any management changes are needed.

### BLACK ABALONE HABITAT SURVEYS AND THE RESTORATION OF INTERTIDAL RECRUITMENT HABITAT ON SAN CLEMENTE ISLAND- A PILOT STUDY TO AID IN THE SPECIES RECOVERY

**CHRISTY BELL**, University Of California, Santa Cruz, 100 Shaffer Road, Santa Cruz, CA, 95060, (831) 459-5149, chrisroe@ucsc.edu; Co-authors: Karah N. Ammann, Nathaniel C. Fletcher, Maya K. George, David P. Lohse, C. Melissa Miner, Daniel W. Orr, Peter T. Raimondi, Melissa A. Redfield and Sara E. Worden

#### *Conservation Planning and Environmental Offsets: Tools for Species Recovery?*

*Wed, Feb 1, 1:25 pm*

**Abstract:** Black Abalone (*Haliotis cracherodii*) have experienced mass mortalities along the coast of California since the mid 1980s and are now protected under the USA Endangered Species Act. Mortality is largely due to a fatal wasting disease called “withering syndrome.” Working with MARINe (Multi-Agency Rocky Intertidal Network) and PISCO (Partnership for Interdisciplinary Studies of Coastal Oceans), we have documented their decline along the California coast. In addition to assessing changes in abundance and size structure, we have also characterized the quality of black abalone habitat from Point Arena to Point Conception. Our 20 years of

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monitoring data show that once a population crashes, community structure changes and habitat quality degrades, possibly contributing to recruitment failure. For example, cracks that were once dominated by bare rock and crustose coralline algae (favorable to black abalone) become filled with sessile invertebrates and sea urchins. Our data on recruitment and habitat alteration post-disease suggest that without intervention the recovery of black abalone in areas decimated by “withering syndrome” is not very likely. In 2012 we will assess the habitat and initiate a pilot study on San Clemente Island (funded by the U.S. Navy) to restore appropriate habitat consistent with the presence of grazing adult abalone.

### **ECOLOGICAL ROLE OF THE SALAMANDER *ENSATINA ESCHSCHOLTZII*: DIRECT IMPACTS ON THE ARTHROPOD ASSEMBLAGE AND INDIRECT INFLUENCE ON THE CARBON CYCLE IN MIXED HARDWOOD**

**MICHAEL BEST**, Humboldt State University, 1 Harpst Street, Arcata, CA, 95521, (707)826-7743; addsmike14@yahoo.com; Co-author: Hartwell Welsh

**Student Paper**

***Conservation of Amphibians and Reptiles***

***Fri, Feb 3, 2:25 pm***

**Abstract:** Terrestrial salamanders are the most abundant vertebrate predator in northwestern California forests and fulfill a critical ecological, and arguably keystone, role converting invertebrate to vertebrate biomass based on their sheer numbers (see Davic and Welsh 2004). The most common species of terrestrial salamander in northwestern California is the *Ensatina* salamander (*Ensatina eschscholtzii*) (hereafter *Ensatina*). In an experimental design We tested top down effects of *Ensatina* on leaf litter invertebrates and the potential for such top down effects to decrease the rate of leaf litter decomposition and thus foster carbon sequestration. The study ran during the rainy season (November through April) over two years (2007-2009) in the Mattole River watershed. Results from the first year indicate a strong top-down effect and a 13% decrease in litter decomposition compared to control plots. This is attributed to the salamander’s selective removal of large and competitive detritivores (beetle and fly larva, millipedes, etc.) enabling smaller invertebrates to become more numerous. Thus the *Ensatina* promotes healthy invertebrate populations via optimal foraging theory and simultaneously promotes carbon sequestration in Northern California forests. Results from year 2 indicate that these effects are ameliorated by weather conditions and that the capacity of carbon sequestration may be influenced by water year.

### **INNOVATIVE TECHNOLOGY FOR PREDATOR RESEARCH AND MANAGEMENT SUPPORTING LISTED SPECIES RECOVERY ON THE NAVAL AUXILIARY LANDING FIELD, SAN CLEMENTE ISLAND, CALIFORNIA**

**DANIEL BITEMAN**, Institute for Wildlife Studies, 2327 Kettner Blvd, San Diego, CA, 92101, (619) 524-9064, biteman@iws.org; Co-authors: Andrew S. Bridges and David K. Garcelon

***Ecology and Management of Wildlife on Military Lands***

***Thu, Feb 2, 2:25 pm***

**Abstract:** Recovery programs for federally listed San Clemente loggerhead shrike (SCLS; *Lanius ludovicianus mearnsi*) and San Clemente sage sparrow (SAGS; *Amphispiza belli clementeae*) have been conducted by the U.S. Navy since the 1990s. Non-native mammalian predators were implicated in the historic population declines and remain an obstacle to recovery. The population of SCLS reached a low of 14 individuals in 1998, requiring extreme measures to protect the population. We have worked with the Navy to reduce predation threats by developing a variety of innovative technological techniques for managing predation. These include shock-collars attached to native island foxes (*Urocyon littoralis*) to protect nest sites, and a variety of still-frame and video monitoring systems to identify species predating nests. An automated trap-monitoring system allows us to be immediately alerted, either directly or via the internet, if a trap has been tripped. Finally, we employed a mobile, thermal infrared surveillance and video camera system allowing us to locate, identify, and removal spotlight-wary feral cats. These techniques have provided a more quantitative understanding of predation effects and allow us to better allocate protection efforts. In the future these and similar technologies will likely play an increasing role in SAGS and other avian species recovery programs.

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### **FIRST CREDIBLE REPEAT CENSUS OF SIERRA SOOTY GROUSE (DENDRAGAPUS FULIGINOSUS SIERRAE)**

**JAMES BLAND**, California Department of Fish and Game, 705 Birch Court, Herndon, VA, 20170, (310) 962-7938, Bland\_jim@yahoo.com

*Ecology and Management of Upland Game Birds*

*Wed, Feb 1, 2:05 pm*

**Abstract:** I have developed census methods that account for several perplexing aspects of Sierra Sooty Grouse breeding biology, including low population density, clumped dispersion of breeding males, seasonality of singing, and anomalous singing by young males. In 2006-2009 (15 April-07 June), I surveyed territorial males in a 167 km<sup>2</sup> area near Pinecrest, California, by listening for singing males along a network of parallel transects and broadcasting recorded female vocalizations. I located 128 males, clustered in 21 “hooting groups.” In 2009 (19 Apr-12 June), I censused 15 of these groups by spot-mapping, playing recorded female vocalizations to stimulate singing when needed. I counted each group five times, and found that three well-timed counts were sufficient. In 2011 (04 May-13 June), I re-censused 12 of the groups. Between 2009 and 2011, persistently territorial males declined from 62 to 55 (11.3 %, or ~5.6 %/yr). The decline was well within the range reported for stable Sooty Grouse populations, but is a short-term decline nonetheless. Declines considered inconsequential for high-density populations elsewhere might be unsustainable among Sierra Nevada populations, which occur at lower densities and exhibit group breeding. The Pinecrest population should continue to be monitored to determine longer-term population trends.

### **REGIONAL EXTIRPATION OF MOUNT PINOS SOOTY GROUSE (DENDRAGAPUS FULIGINOSUS HOWARDI)**

**JAMES BLAND**, California Department of Fish and Game, 705 Birch Court, Herndon, VA, 20170, (310) 962-7938, Bland\_jim@yahoo.com

*Ecology and Management of Upland Game Birds*

*Wed, Feb 1, 2:25 pm*

**Abstract:** The last well-substantiated sighting of Mount Pinos Sooty Grouse in the “sky islands” of south-central California was in 1992. Between 2002 and 2009, I conducted springtime auditory surveys on the 11 sky islands with known or potential historic habitat - old forest with fir. I also examined historic records and geospatial databases to chronicle the grouse’s decline and assess the current status of its habitats. I found no evidence of grouse on the sky islands, but did confirm singing males in “mainland” Sierra Nevada habitats 4 and 26 km to the north. European settlers impacted the region’s forests with livestock grazing, small-scale logging, and hunting. More recently, catastrophic wildfire, commercial logging, and housing development have been most detrimental. Preliminary genetic studies indicate museum specimens collected at Mt Pinos are from a distinct and previously unrecognized species. Genetic evidence also indicates the extant northern population segment is actually a southern extension of *D. f. sierrae*. If these findings are confirmed, Mount Pinos Sooty Grouse will become one of California’s most recently extinct species. The loss of this iconic old forest species suggests resource extraction has distressed California’s sky islands, and highlights the need for more effective regional-scale conservation of old montane forest.

### **THE IMPACTS OF ENERGY DEVELOPMENT NOISE PLAYBACK ON LEK ATTENDANCE AND BEHAVIOR IN GREATER SAGE-GROUSE**

**JESSICA BLICKLEY**, University of California, Davis, One Shields Ave, Davis, CA, 95616, (805) 570-8068, jlblickley@ucdavis.edu; Co-authors: Diane J. Blackwood and Gail L. Patricelli

**Student Paper**

*Ecology and Management of Upland Game Birds*

*Wed, Feb 1, 3:05 pm*

**Abstract:** The spread of human development has caused a dramatic increase in noise across the landscape. Recent studies suggest that noise may negatively impact the behavior and distribution of wild animals, yet little is known about the causes and consequences of this impact. Further, most previous studies have not been designed

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to isolate noise impacts from other confounding factors. This study is investigating the impacts of energy development noise on greater sage-grouse (*Centrocercus urophasianus*), a species of management concern across western North America. Sage-grouse are declining in areas of energy development and circumstantial evidence suggests that noise is a cause of this decline. To test this hypothesis, we monitored control leks and leks with experimentally-introduced energy development noise for three seasons. Noise playback resulted in immediate and drastic declines in lek attendance and elevated fecal corticosterone for male sage-grouse on noise leks relative to paired controls. We also compared male display behaviors on experimental and control leks to assess the impacts of noise on individual behavior. This is the first long-term playback experiment offers a unique opportunity to experimentally address noise impacts on avian behavior and breeding site selection while informing conservation efforts for this species.

### TEMPORAL VARIATION IN MALE BREEDING PROPENSITY INFLUENCES LEK COUNT INDICES OF POPULATION GROWTH IN GREATER SAGE-GROUSE

ERIK BLOMBERG, University of Nevada, Reno, 1664 North Virginia Street, Reno, NV, 89557, (775) 622-2137, ejblomberg@gmail.com; Co-authors: James S. Sedinger, Daniel V. Nonne and Michael T. Atamian

Student Paper

*Ecology and Management of Upland Game Birds*

Wed, Feb 1, 1:25 pm

**Abstract:** Count-based indices are commonly used to quantify population growth ( $\lambda$ ), but such indices implicitly assume equal detection through time and space. Greater sage-grouse populations are commonly monitored using counts of males displaying on breeding leks. The extent to which annual variation in male breeding propensity alters detection probability and biases lek count indices is unexplored. We used capture-mark-recapture analyses to quantify breeding propensity of male sage-grouse in Eureka Co, NV. We then estimated the proportion of variance in annual lek count trends that was associated with realized rates of population growth, versus error attributed to variation in breeding propensity. Male breeding propensity was generally high ( $> 80\%$ ), except for one year in which 49% of males did not attempt to breed (breeding propensity =  $0.51 \hat{\pm} 0.21$ ). The majority of variance in annual lek count trends was associated with realized  $\hat{\lambda}$  (semipartial  $R^2 = 0.76$ ), indicating general robustness of lek counts as an index to population change. However, error associated with annual variation in breeding propensity also influenced lek count results (semipartial  $R^2 = 0.16$ ). Lek counts are best suited for deriving long-term trend estimates, and use of counts to quantify annual population growth should be avoided.

### CALIFORNIA'S WESTERN POND TURTLE (EMYS MARMORATA): CONSERVATION ISSUES AND OPTIONS

BETSY BOLSTER, California Department of Fish and Game, 1812 9th Street, Sacramento, CA, 95811, (916) 445-3684, bbolster@dfg.ca.gov; Co-authors: DON ASHTON (presenting) and Hartwell Welsh

*Conservation of Amphibians and Reptiles*

Fri, Feb 3, 3:45 pm

**Abstract:** The western pond turtle (*Emys* [or *Actinemys*, formerly *Clemmys*] *marmorata*) is California's only remaining native freshwater turtle. Formerly abundant, populations of pond turtles are now declining in many parts of the state. The California Department of Fish and Game and USDA Forest Service Redwood Sciences Laboratory recently completed a comprehensive overview of conservation issues and options for this Species of Special Concern. Our intent is to increase awareness and understanding of the turtle's biology and resource requirements, provide standardized methods for investigating, monitoring, and reporting, and describe research needs related to turtle conservation. Our goal is to preclude the need for threatened or endangered listing by offering proactive conservation options. I will present highlights of the document.

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### *PERSISTENCE OF LARVAL TAILED FROGS AND TORRENT SALAMANDERS IN HEADWATER STREAMS ON REDWOOD TIMBERLANDS IN NORTH COASTAL CALIFORNIA*

**RYAN BOURQUE**, Green Diamond Resource Company, PO Box 68, Korb, CA, 95550, (707) 668-4432, rbourque@greendiamond.com; Co-authors: Lowell V. Diller, Matt R. House and David W. Lamphear

*Conservation of Amphibians and Reptiles*

*Fri, Feb 3, 2:45 pm*

**Abstract:** The Coastal Tailed Frog (*Ascaphus truei*) and Southern Torrent Salamander (*Rhyacotriton variegatus*) are listed in California as species of special concern. Both species are adapted to clear cold-water habitats and populations may be reduced by sedimentation and increased water temperatures caused by timber harvesting and road building and maintenance. Due to conservation concerns, Green Diamond Resource Company (GDRCo) included both species in its aquatic habitat conservation plan (AHCP). One monitoring objective for these amphibians was to sustain known occupancy rates and assess potential impacts of forest management activities. To satisfy this objective, we studied the persistence of larval *A. truei* and *R. variegatus* in headwater streams across GDRCo's California ownership. Larval occupancies were initially determined in 1994 and 1995 at randomly selected headwater streams and these baselines were compared to occupancies in 2008 and 2009. We used patch occupancy models to calculate occupancy rates and detection probabilities, and assess the potential affects of timberland management on occupancy. Our results indicated that occupancy rates of both species were constant or potentially higher in headwater streams in coastal redwood timberlands managed by Green Diamond over the past 14 years, which suggests that populations will persist under the protective measures in the AHCP.

### *ASSESSMENT OF WETLAND MANAGEMENT PRACTICES IN THE CENTRAL VALLEY OF CALIFORNIA*

**MICHAEL BROWN**, UC Davis, 2104 Del Rey Ct, Davis, CA, 95616, (831) 239-8307, scmb23@gmail.com; Co-authors: John M. Eadie, Rob H. Doster and Mark N. Lubell

*Ecology and Management of Waterfowl and Wetlands*

*Thu, Feb 2, 3:25 pm*

**Abstract:** Two-thirds of California's remaining wetlands are privately owned and managed and these wetlands provide critical wintering habitat for waterfowl of the Pacific Flyway. Both public and private conservation organization dedicate resources to the creating and restoration of these wetlands. However there is no procedure in place to track the trends of habitat condition after projects are complete. We hope to fill this critical lack of information about these wetlands by implementing a survey of private land managers to determine how they manage their wetlands. Given the specific limitation to management in different regions of the state we have created two surveys one for the Sacramento and San Joaquin Valleys and one for Suisun marsh and have distributed 650 surveys.

### *A CONTRACTOR'S PERSPECTIVE - ADAPTING MITIGATION MEASURES TO IMPROVE ENVIRONMENTAL PROTECTION*

**CHAD BROWN**, CDM Constructors Inc., 11373 N. Lower Sacramento Rd, Lodi, CA, 95242, (925) 933-2900, BrownCE@cdm.com

*Mitigation Measures: Challenges and Realities during Project Implementation*

*Fri, Feb 3, 10:25 am*

**Abstract:** Mitigation of environmental impacts is a major element of construction project management in modern times. This effort is most challenging when the specified mitigation measures are at odds with the current land use and viable construction means and methods. Strong collaboration between the constructor, regulators, and environmental monitors offers the opportunity to adapt mitigation measures to improve environmental protection beyond what the "letter of the law" might have achieved. In this presentation, we will discuss the specific mitigation measures initially required for a large pipeline installation project in northern CA, and the collaborative, adaptive approach that enabled the project to be completed sooner with significantly reduced environmental impact.

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### AN OWNER'S PERSPECTIVE OF MITIGATION IMPLEMENTATION

**MICHAEL CALLAHAN**, City of Stockton, Department of Municipal Utilities, 11373 N Lower Sacramento Road, Lodi, CA, 95242, (209) 937-8994, Michael.Callahan@ci.stockton.ca

*Mitigation Measures: Challenges and Realities during Project Implementation* **Fri, Feb 3, 9:25 am**

**Abstract:** Mitigation measures translate to legal and financial commitments that ultimately fall on the shoulders of the owner. These obligations range from the establishment and management of conservation easements and preserves to how infrastructure is designed, operated and maintained. Often times the requirements of these measures have unintended financial obligations that cannot be met and create conflicts between agencies. Proper implementation of mitigation measures is also important to ensure violations do not occur during project construction and operation that may result in additional financial and legal ramifications. These challenges can be prevented when effective communication occurs amongst the project team which includes the construction manager, contractor, environmental consultant and owner.

### ASSESSING DISEASE RISK FROM A NOVEL PARASITE INFECTION IN PACIFIC FISHER (MARTES PENNANTI)

**DEANA CLIFFORD**, California Department of Fish and Game, 1701 Nimbus Road, Rancho Cordova, CA, 95670, (916) 358-2378, dclifford@dfg.ca.gov; Co-authors: Leslie Woods, Vasyl Tkach, Eric Hoberg, Richard Callas, Richard N. Brown, J. Mark Higley, Ken Haynes and Mourad W. Gabriel

*Wildlife Diseases and Pathology* **Fri, Feb 3, 1:45 pm**

**Abstract:** We conducted assessments of health and infectious disease in Pacific fisher being considered for translocation during a large-scale collaborative project to reintroduce these mustelids from north and northwestern CA onto historic range in northeastern CA. In 2010, severe peri-anal swellings with multiple subcutaneous abscesses were observed in a female fisher captured in Humboldt County. Two skin punctures were noted in the area, thus the injury was thought to be due to trauma and the animal was placed on antibiotics and supportive care. Subsequently, a second female fisher captured from the same general area exhibited similar abnormalities. Examination of biopsy specimens taken from the affected abscess tissue revealed severe diffuse, pleocellular (eosinophilic, plasmacytic) inflammation associated with adult digenean trematodes (flukes) and ova. A small number of trematode parasites, provisionally referred to the Troglotrematidae, were recovered from these and three more infected animals from Humboldt County. Discovery of a newly documented digenean in fisher is the basis for ongoing studies to determine species identity, life history, and geographic distribution for an assemblage of hosts and parasites. Additional field-based collections are needed to delineate prevalence, and potential impact of this apparently novel digenean trematode in fisher populations.

### CLINICALLY SIGNIFICANT BATRACHOCHYTRIUM DENDROBATIDIS (Bd) INFECTION ASSOCIATED WITH BULLFROG MORTALITIES IN NORTHERN CALIFORNIA

**DEANA CLIFFORD**, California Department of Fish and Game, 1701 Nimbus Road, Rancho Cordova, CA, 95670, (916) 358-2378, dclifford@dfg.ca.gov; Co-authors: Allan Pessier, Megan Jones, Sarah Krycia, Jane Vorpagel, Tony Welch, Janet Foley

*Conservation of Amphibians and Reptiles* **Fri, Feb 3, 1:05 pm**

**Abstract:** In late February 2010 a large number of dead American bullfrogs (*Lithobates catesbeianus*) were reported at Finley Lake in Tehama Co., California. Over 600 dead post-metamorphic bullfrogs as well as occasional larvae tadpoles were present in the lake. No healthy post-metamorphic individuals were observed. Twenty post-metamorphic bullfrogs were collected for necropsy and disease testing and water samples were taken for toxicology testing. Organophosphate, carbamate, and triazine compounds, and ammonia were not detected in sampled water. Eighteen of 20 (90%) bullfrogs had Bd zoospores detected via PCR, with 12/18 (67%) positive frogs having high zoospore counts (> 1,000 zoospore equivalents). Only 3/20 (15%) individuals were

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PCR positive for ranavirus infection, but none had histologic lesions suggestive of ranaviral disease. For 6/ 10 carcasses, Bd infection was associated with histologic lesions including epidermal hyperplasia and hyperkeratosis with zoosporangia present within keratinized skin. Lesions were mild to moderate in severity and likely to have been clinically significant. Another potential contributor to death was poor body condition as determined by a lack of grossly and histologically visible adipose tissue. This is the first documentation of clinically significant chytrid infection contributing to mortality in bullfrogs, a species normally considered an asymptomatic carrier of Bd.

### **GREATER SAGE-GROUSE NEST SURVIVAL IN RELATION TO RAVEN ABUNDANCE, HABITAT FEATURES, AND TIMING OF NEST INITIATION**

**PETER COATES**, U.S. Geological Survey, 6924 Tremont Road, Davis, CA, 95620, (530) 669-5073, pcoates@usgs.gov; Co-authors: Zachary B. Lockyer, Michael L. Casazza and David J. Delehanty

*Ecology and Management of Upland Game Birds*

*Wed, Feb 1, 1:05 pm*

**Abstract:** Population vital rates of greater sage-grouse (*Centrocercus urophasianus*), recently designated as a candidate species under the Endangered Species Act, within the Great Basin are not well-understood. The growing development of renewable energy infrastructure within areas inhabited by sage-grouse is thought to influence predator and vegetation communities. For example, common ravens (*Corvus corax*), a synanthropic sage-grouse nest predator, are increasing range-wide and select transmission lines and other tall structures for nesting and perching. In northwestern Nevada, we monitored sage-grouse nest survival relative to multi-scale habitat features and nest predators over three years. Predator indices and habitat features were included as explanatory variables in a three-step modeling approach using maximum likelihood estimation. Additionally, videography at nest sites (n = 38) were used to identify sage-grouse nest predators. We estimated nest survival at 19.76% (CI, 10.6 – 31.1%), which was substantially lower than other derived likelihood values across sage-grouse range. The most parsimonious model for nest survival consisted of an additive effect between ordinal date and number of active sage-grouse nests ( $w = 0.64$ ). Estimated odds of survival increased by 17.6% (CI, 1.9 – 35.6%) with an additional 10% increase in number of active nests. A second model with substantial support from the data included an additive effect between ordinal date and raven indices. An estimated one additional raven averaged per nest (159-ha scale), increased the probability of nest failure by 66.8%. One mechanism contributing to the ordinal date effect appeared to be explained by raven foraging behavior based on our videography at sage-grouse nests. Results from this study are consistent with findings from a previous study in northeastern Nevada. These results are timely because raven populations are expanding within the sagebrush ecosystem, which is thought to be a result of increased energy-related anthropogenic subsidies. We encourage management aimed to reduce interactions between nesting grouse and ravens with increased emphasis within the first three weeks of the nesting season.

### **APPARENT SURVIVAL OF SNOWY PLOVERS VARIES WITH REPRODUCTIVE EFFORT, YEAR AND BETWEEN SEXES**

**MARK COLWELL**, Wildlife Department, Humboldt State University, Arcata, CA, 95521, (707) 826-3723, mac3@humboldt.edu; Co-authors: Wendy J. Pearson, Luke Eberhart-Phillips and Steven J. Dinsmore

*Ecology and Management of Shorebirds*

*Wed, Feb 1, 3:05 pm*

**Abstract:** Theory predicts a trade-off between reproductive effort and survival, which suggests that some practices aimed at increasing productivity may compromise adult survival and population growth. We analyzed a 10-year data of 225 marked Snowy Plovers (*Charadrius nivosus*), a threatened shorebird, to determine if high reproductive effort correlated with low survivorship. Adult plovers resided in the population an average of 2 years (range: 1-10 years), during which females laid 3-60 eggs, and both males and females invested considerable time in incubation and brooding. Apparent survival varied annually and it was higher for males ( $0.850 \pm 0.087$ ) than females ( $0.736 \pm 0.133$ ). We found no evidence that increased reproductive effort, either current or cumulative, compromised survival. Instead, apparent survival correlated positively with incubation time, which

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may be related to either high quality individuals having high reproductive rates and high survival or emigration of failed breeders (who incubated for shorter intervals). Although results suggest that some practices (e.g., nest exclosures) aimed at increasing productivity will not compromise survival, we caution that these same practices may have serious negative consequences for population growth if: 1) reproductive effort does not translate into higher per capita fledging success, and 2) direct mortality of adults results from the practice.

### **STATUS SURVEY FOR ENDANGERED BAKERSFIELD CACTUS**

**BRIAN CYPHER**, CSU-Stanislaus, End. Spp. Rec. Prog., P.O. Box 9622, Bakersfield, CA, 93389, (661) 835-7810, bcypher@esrp.csustan.edu; Co-authors: Erin N. Tennant, Christine L. Van Horn Job and Scott E. Phillips

*Renewable Energy and Wildlife Conservation*

*Fri, Feb 3, 2:45 pm*

**Abstract:** Bakersfield cactus (*Opuntia basilaris* var. *treleasei*) is listed as federally and state endangered, primarily due to profound habitat loss. We conducted a survey of occurrence sites with the goal of assessing the current status of the species. Of the 39 sites in the California Natural Diversity Database, we visited 33 and examined aerial photography or conducted aerial surveys of the remaining sites. Of these, 26 populations were confirmed extant, 10 are believed to be extirpated, and the status of 3 could not be determined. Furthermore, 2 previously unreported populations were documented, and 5 undocumented translocated populations were identified. Of the 33 sites with Bakersfield cactus, 27 occur entirely or partly on private lands. Only 4 entire populations and parts of 8 others are permanently conserved. Estimated population size ranges from 2 to over 11,000 plants, but 16 (59%) populations have 100 plants or fewer. At least 9 populations were considerably smaller compared to previous estimates. Habitat conditions within remaining populations ranged from relatively undisturbed to highly disturbed. A number of internal and external threats were documented. Bakersfield cactus appears to be declining on multiple landscape scales. Thus, aggressive proactive measures are warranted for the conservation and recovery of Bakersfield cactus.

### **MODELING EFFECTS & MITIGATION: SOLAR ENERGY DEVELOPMENT AND THE MOJAVE DESERT TORTOISE**

**CATHERINE DARST**, U.S. Fish and Wildlife Service, Desert Tortoise Recovery Off, 2493 Portola Road, Suite B, Ventura, CA, 93003, (806) 644-1766, cat\_darst@fws.gov; Co-authors: Philip Murphy and Nathan Strout

*Renewable Energy and Wildlife Conservation*

*Fri, Feb 3, 1:45 pm*

**Abstract:** We are developing a spatial decision support system that quantifies the impacts of threats to tortoise populations and identifies and prioritizes recovery actions that are most likely to ameliorate those threats. The system models the inter-relationships among threats and tortoise population declines (i.e., which threats cause other threats, and how do these threats increase stresses on tortoise populations) and recovery action-tortoise population relationships (i.e., what are the most appropriate actions given a set of population stresses faced by the species?). We use GIS data of the spatial extent of threats to estimate how changes in threats contribute to changes in risk to tortoise populations utilizing a standard conservation lexicon. Changes in risk to the desert tortoise can come in the form of 1) threat increase (e.g. installation of a large-scale solar project within tortoise habitat, including both direct and indirect effects) or 2) threat decrease (e.g. undertaking a suite of recovery actions within tortoise habitat). The two outputs can then be compared to explore the extent of action required to compensate for increased risk to desert tortoise populations from the large-scale development project. The results presented here are based on the best modeling and existing information at this time; we are improving the underlying models, spatial data, and geoprocessing steps within the system iteratively with each new calculation.

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### **LOS VAQUEROS RESERVOIR CREATION (1997) AND EXPANSION (2011): ASSESSING PAST PROJECT MITIGATION REQUIREMENTS TO IMPROVE CURRENT/EXPANSION MITIGATION REQUIREMENTS**

**CHERYL DAVIS**, Contra Costa Water District, 100 Walnut Blvd, Brentwood, CA, 94513, (925) 240-2362, cldavis@ccwater.com; Co-authors: Fran Garland and Mary A. Shea

**Conservation Planning and Environmental Offsets: Tools for Species Recovery?** **Wed, Feb 1, 3:05 pm**

**Abstract:** The Contra Costa Water District obtained a watershed of approximately 20,000 acres in East Contra Costa and Alameda counties and in 1997 created the 100 thousand-acre-foot (TAF) Los Vaqueros Reservoir. The watershed supports many protected species including: California red-legged frog (*Rana draytonii*), California tiger salamander (*Ambystoma californiense*), and San Joaquin kit fox (*Vulpes macrotis mutica*). Currently (2011) the District is expanding the reservoir capacity to 160 TAF. District staff looked at mitigation requirements for the reservoir creation, including conservation easements, habitat restoration and creation, and management plans to assess if the requirements support federal recovery plans for the above species and how current mitigation planning for the expansion could improve support. Initial mitigation requirements included conservation easements for kit fox and 91 ponds were preserved, restored or created for amphibians. The District concluded that while the initial mitigations for amphibians support recovery plans for these species, some aquatic habitat is highly managed, counter to current mitigation theory and goals. Highly managed aquatic habitat is not included in current mitigation plans for the expansion. Additionally, locations of initial conservation easements for kit fox were reevaluated and improvements in site selection made, including the purchase of several off-site properties with key habitat requirements.

### **EXPLORING MUSSEL BED RESTORATION STRATEGIES ON VANDENBERG AIR FORCE BASE**

**KRISTIN DE NESNERA**, Long Marine Lab, University of California Santa Cruz, 100 Shaffer Road, Santa Cruz, CA, 95060, kdenesne@ucsc.edu; Co-author: Laura M. Anderson

**Student Paper**

**Ecology and Management of Wildlife on Military Lands**

**Thu, Feb 2, 2:05 pm**

**Abstract:** Mussel beds are critically important to the ecological health of rocky intertidal systems, providing an important source of food and habitat for a variety of organisms. Human-induced disturbances, like oil spills, have been shown to be extremely damaging to mussel beds and natural recovery can take as long as two decades. This project is exploring a strategy to speed up the natural restoration process of injured mussel beds. It is thought that the presence of adult mussels and their byssal threads facilitate the settlement of mussel recruits. We transplanted adult mussels (*Mytilus californianus*) into cleared 50 x 50 cm plots at two sites along Vandenberg Air Force base. Each month the number of remaining transplants was recorded. Species percent cover was estimated in each plot using a point contact grid with 100 evenly spaced points and mussel recruitment was measured within plots and using artificial substrate. Overall, the presence of mussel transplants does appear to increase mussel recruitment and species diversity, suggesting this strategy could speed recovery of injured mussel beds. However, this will likely be best for small spatial scale restoration as large-scale implementation would be cost prohibitive and potentially damaging to the donor population.

### **MANAGING THE ENDANGERED HAWAIIAN GOOSE DURING ARMY TRAINING AT POHAKULOA TRAINING, HAWAII ISLAND**

**ROGELIO DORATT**, Colorado State University, CDR, USAG-HI, PTA, Hilo, HI, 96720, (808) 937-4717, redoratt@rams.colostate.edu; Co-authors: Lena D. Schnell, Robert Brozka, Bridget A. Frederick, John T. Polhemus and Peter Peshut

**Ecology and Management of Wildlife on Military Lands**

**Thu, Feb 2, 4:25 pm**

**Abstract:** Pohakuloa Training Area (PTA) is the largest U.S. Army holding in the state of Hawaii at 131,805 acres and is a main tactical training area for military training. PTA's Natural Resource Office (NRO) is

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mandated, when possible, to resolve natural resource management issues to maximize the training capacity of the installation. A main issue at PTA is the presence of the endangered Hawaiian Goose Nene (*Branta sandvicensis*) during live-fire training exercises and other military trainings at Range 1, a military training complex. Monitoring and surveying programs have been established to determine Nene presence patterns and behavior at Range 1 with objectives to support military live-fire exercises and the safety of the Nene. To facilitate training at Range 1 when Nene are present, NRO and US Fish and Wildlife Service established protocols for monitoring Nene during training exercises. From 2009-2011, one thousand two hundred and twenty-two geese have been recorded at Range 1 and NRO has supported a total of 90 days of military training, of which Nene were present on 21 days and training was altered or cancelled on 15 days. Continued cooperation between the Army, USFWS, and NRO is essential for protecting Nene and maintaining military mission-level readiness.

### **ESTIMATING POST-FLEDGING SURVIVAL IN PASSERINES: INSIGHTS FROM SEPARATE ANALYSES OF RADIO TELEMETRY AND MARK-RECAPTURE DATA**

**KRISTEN DYBALA**, Dept of Wildlife, Fish & Conservation Biology, UC Davis, One Shields Ave, Davis, CA, 95616, (415) 218-9295, kedybala@ucdavis.edu

**Student Paper**

**Conservation and Management of Songbirds**

**Thu, Feb 2, 1:45 pm**

**Abstract:** Empirical estimates of juvenile survival in passerines are often considered too difficult to obtain, severely limiting our understanding of passerine population dynamics, evolution, and conservation. Recent advances have been made by a growing number of radio telemetry studies on post-fledging survival, when mortality is expected to be highest. However, the high cost and possible increased mortality risk generally limit radio telemetry to small-scale, short-term studies. In contrast, mist-netting is a relatively inexpensive and safe method of obtaining mark-recapture data, but is rarely used to estimate post-fledging survival. In this study, I directly compared estimates of post-fledging survival for a population of Song Sparrows (*Melospiza melodia*) obtained from separate analyses of a short-term radio telemetry study and a long-term mark-recapture study. Both resulted in nearly identical estimates of survival over the dependent, post-fledging period at 55%. The radio telemetry data had the advantage of estimating dispersal rates immediately following the post-fledging period, while the mark-recapture data was better able to detect effects of environmental and individual covariates. Both contributed to a more complete understanding of juvenile survival in this population. Mist-net data may be an untapped resource that can contribute to a broader understanding of post-fledging survival rates in passerines.

### **INTRASPECIFIC BLACK BEAR SPATIAL PATTERNS AND INTERACTIONS AT A SMALL SPATIO-TEMPORAL SCALE**

**DESIREE EARLY**, Green Diamond Resource Company, 900 Riverside Drive, Korb, CA, 95550, (707) 668-4438, deearly@greendiamond.com

**Large Mammal and Big Game Ecology and Management**

**Fri, Feb 3, 8:45 am**

**Abstract:** Few studies have examined spatial patterns of American black bears (*Ursus americanus*) at small spatial and temporal scales. In 2008, we radio-collared 16 black bears (8 females and 8 males) in a 175 km<sup>2</sup> study area in Humboldt County, California. We measured home range size, overlap, and overlap frequency to describe static spatial patterns (without a temporal component). We measured the black bear spatial and temporal interactions by examining distances between bears and by examining the use of home range overlapping areas. The mean home-range estimate was larger for males than for females. Females overlapped other bears with a greater percentage of their overall home range than males. Male home ranges overlapped other bears with a greater frequency than females. According to the spatial and temporal interaction analysis based on distances between bears, bears were not moving in response to neighboring bears. Spatial and temporal interactions occurred for 24% of the pairs of bears utilizing home range overlapping areas. The lack of significant spatial and temporal interactions may be a result of high black bear densities. Alternatively, bears within the study area may be interacting at a finer scale (i.e., within food patches) than this study was able to detect.

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### POPULATION VIABILITY OF SNOWY PLOVERS IN COASTAL NORTHERN CALIFORNIA

LUKE EBERHART-PHILLIPS, Humboldt State University, Department of Wildlife, 1 Harpst Street, Arcata, CA, 95521, (530) 919-6603, luke.eberhart@gmail.com; Co-author: Mark A. Colwell **Student Paper**

*Ecology and Management of Shorebirds*

*Wed, Feb 1, 3:25 pm*

**Abstract:** Spatial distributions of many endangered species are fragmented into distinct subpopulations due to human disturbance or natural geographic isolation. A valid assessment of metapopulation viability first requires a strong understanding of subpopulation viability. We conducted a population viability analysis (PVA) on a small population of the threatened western snowy plover (*Charadrius nivosus*) in Northern California. The threatened status of the plover results from three limiting factors affecting productivity: 1) human disturbance, 2) encroachment of exotic vegetation in nesting habitat, and 3) predation of eggs and chicks by native and introduced vertebrates. Our study utilized 11-years of mark-recapture, productivity, and movement data to explore population viability under various management scenarios that address the three limiting factors, and how viability is influenced by periodic over-winter catastrophes in survival and the role this could play in future climate change. Simulations of population growth indicated that if vital rates remain at the status quo, the population will never reach the delisting requirements within the next 50 years. We found that population growth was most sensitive to a periodic “cold-snap” catastrophe that reduces survival by 30%. Our findings suggest that habitat management is of least concern and that recovery efforts need to address overwinter mortality.

### MANAGING ACROSS THE LANDSCAPE & JURISDICTIONAL BOUNDARIES

JODY ERIKSON, The Keystone Center, 1600 Broadway, #1920, Denver, CO, 80202, (303) 468-8862, jerikson@keystone.org; Co-author: Julie Shapiro

*Challenges of Natural Resource Management in a Changing Climate*

*Fri, Feb 3, 8:25 am*

**Abstract:** One of the big challenges with managing natural resources in a changing climate is resources and management cross through various jurisdictions and solutions don't stop at the county, state, reservation, federal partnerships/initiatives' or private landowner boundaries. Another challenge is increasing demand for development – more homes, need for natural resources and desire for more access to public lands. A third challenge is decreasing financial resources for natural resource managers. Multiple stakeholder processes can address all three of these challenges. They bring together the various jurisdictional decision makers to build agreements on challenges and management solutions across federal, state, tribal, private and NGO lines. They bring experts, advocates and decision makers together to find the best balance between human needs and conservation. And they collaboratively work to leverage resources to share and develop science and actions to improve conservation on the ground. One example of a multiple stakeholder process addressing these challenges (and other challenges) is DOI's Landscape Conservation Cooperatives (LCC).

### RESTORING HABITATS AND CONNECTIVE CORRIDORS TO SUPPORT SPECIES RECOVERY IN THE NATOMAS BASIN

KELLY FITZGERALD-HOLLAND, AECOM, 2020 L Street, Suite 400, Sacramento, CA, 95811, (916) 266-4938, kelly.holland@aecom.com; Co-author: Steve Chainey

*Conservation Planning and Environmental Offsets: Tools for Species Recovery?*

*Wed, Feb 1, 2:25 pm*

**Abstract:** Beginning in 2007, the Sacramento Area Flood Control Agency (SAFCA) began implementing the Natomas Levee Improvement Program's (NLIP) Landside Improvement Project, which addresses deficiencies in the Natomas levee system through a combination of adjacent levees, seepage berms, and other structures. Although project design avoided substantial removal of vegetation on the waterside levee, sensitive biological resources on the landside were temporarily and permanently affected by project implementation. SAFCA, with support from AECOM, developed a comprehensive conservation strategy to offset these impacts, with the intent of supporting the objectives of the Natomas Basin Habitat Conservation Plan (NBHCP), in particular contributing

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to the recovery and conservation of giant garter snake and Swainson's hawk in the Basin. Key components of the strategy are to: (1) increase the amount of habitat protected for NBHCP-covered species; (2) consolidate large areas of habitat; (3) and improve connectivity between core habitat reserves, and substantially increase the size of these critical habitats. These components of the strategy are being accomplished by restoration and permanent protection of important habitats and connectivity corridors in the Basin – specifically, managed marsh, canal systems, native grasslands, and landside woodlands that provide habitat for giant garter snake, Swainson's hawk, and valley elderberry longhorn beetle.

### LANDSCAPE EPIDEMIOLOGY OF *BATRACHOCHYTRIUM DENDROBATIDIS* IN CENTRAL CALIFORNIA

**GRETCHEN FLOHR**, 3212 Round Hill Drive, Hayward, CA, 94542, (925) 789-7459, gpadgettflohr@aol.com;  
Co-author: Robert L. Hopkins, II

#### *Conservation of Amphibians and Reptiles*

*Fri, Feb 3, 1:25 pm*

**Abstract:** Amphibian chytridiomycosis (caused by *Batrachochytrium dendrobatidis*; Bd) was first identified in 1998 and has since been implicated in numerous amphibian declines worldwide. Most researchers have since investigated broad-scale geographic and taxonomic occurrences of the pathogen in tropical lotic or cool montane systems. In this study, we analyzed how environmental factors, land use practices, and landscape structure may affect the dynamics of the pathogen's distribution in a landscape dominated by lentic systems within a region of Mediterranean climate. We quantified the occurrence of Bd testing the six resident amphibian species that occur in 54 isolated perennial and ephemeral ponds in central California between May and June annually from 2004 to 2007. The geographic distribution of Bd within the landscape varied markedly between years. Inter-annual variation in climate affected the pond landscape structure indicating that climate conditions indirectly influence the distribution of the pathogen. Fourteen ponds, 12 perennial and 2 ephemeral, were positive for Bd 3 of 4 years of the study and were treated as Bd hotspots for comparative purposes. Occurrences of Bd within the landscape were spatially autocorrelated and ponds within 1000-1500 m of Bd hotspots were more likely to test positive. Local land use, (presence/absence of grazing or recreational activity and developed lands), did not influence Bd status of a pond, indicating that the most likely means of Bd transmission between ponds may be waterfowl and/or amphibians.

### COMPARISON OF CALL-PLAYBACK AND PASSIVE DETECTION METHODS TO MONITOR AVIAN MANAGEMENT INDICATOR SPECIES IN THE SIERRA NEVADA

**ALISSA FOGG**, PRBO Conservation Science, 3820 Cypress Dr. #11, Petaluma, CA, 94954, (530) 903-4830, afogg@prbo.org; Co-author: L. Jay Roberts

#### *Conservation and Management of Songbirds*

*Thu, Feb 2, 2:05 pm*

**Abstract:** During May-July 2010 and 2011, we surveyed 500 transects on ten National Forests in the Sierra Nevada region of California to monitor four avian indicator species. We used call-playback surveys in addition to passive point-count surveys to detect two species: hairy woodpecker and mountain quail. One transect consisted of four passive point count locations clustered around a fifth point count location that was followed by a call-playback survey. We examined the effectiveness of using call-playback surveys in addition to passive point-counts by asking whether call-playback surveys contributed to new transect visit observations and examined response behavior by comparing detections before and during the call-playback survey. We found that call-playback surveys were responsible for producing new Hairy Woodpecker observations on 17% of transect visits and Mountain Quail call-playback was effective at returning new observations on 7% of transect visits. Point-level comparisons demonstrated that both species, when silent during the center point count survey, respond strongly to playback; 53% of Hairy Woodpecker detections were unique to call-playback surveys compared to 33% of Mountain Quail detections. Our findings show that adding call-playback survey after passive point counts increases detection rate for these two species at both transect and point level.

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### *A REVIEW OF MULE AND BLACK-TAIL DEER POPULATION DYNAMICS*

**TAVIS FORRESTER**, University of California, Davis, 1075 Academic Surge, One Shields Ave, Davis, CA, 95616, (831) 233-1827, tforrester@ucdavis.edu; Co-author: Heiko W. Wittmer

**Student Paper**

*Large Mammal and Big Game Ecology and Management*

*Fri, Feb 3, 9:05 am*

**Abstract:** Recent population declines in mule and black-tailed deer (MBTD) (*Odocoileus hemionus*) have shown the difficulty in predicting ungulate population trends and raised concerns about the role of predation in deer dynamics. We reviewed 56 demographic and predation studies to summarize current knowledge of mechanisms in MBTD dynamics. We found reported MBTD demographic rates match general ungulate patterns, but often data to accurately estimate population growth was missing. Predation was a large proximate cause of mortality, but nutrition effects were also important and it was unclear if predation regulated populations. In light of this review we present preliminary data from an ongoing study of black-tail deer survival in the California coast range. We placed radio ear tags on 86 fawns and GPS collars on 41 adult females and monitored deer daily during summer months and every 10 days in other seasons. The most common proximate cause of mortality was predation for both adults and fawns. Fawn survival to recruitment of 0.21 and adult female annual survival of 0.68 (Kaplan-Meier estimator) were both below average values found in our review, especially adult female survival. The role of habitat quality and nutritional condition in survival is pending further analysis.

### *EXPOSURE AND POISONING WITH ANTICOAGULANT RODENTICIDES IN CALIFORNIA FISHERS (MARTES PENNANTI) INHABITING PUBLIC LANDS*

**MOURAD GABRIEL**, University of California at Davis, Veterinary Genetics Laboratory, Davis, CA, 95616, mwgabriel@ucdavis.edu; Co-authors: Leslie W. Woods, Robert Poppenga, Rick Sweitzer, Craig Thompson, Sean M. Matthews, J. Mark Higley, Stefan Keller, Kathryn Purcell, Reginald H. Barrett, Greta M. Wengert, Benjamin N. Sacks and Deana L. Clifford

*Wildlife Diseases and Pathology*

*Fri, Feb 3, 4:05 pm*

**Abstract:** Anticoagulant rodenticide (AR) poisoning has emerged as a significant conservation concern for wildlife. These toxicants are used primarily to suppress pest populations in agricultural or urban settings. As part of an ongoing collaborative effort investigating threats to fisher population persistence in the two isolated California populations, we initiated a disease surveillance program. Recently, we discovered that multiple fishers from these populations had died from AR poisoning. In order to assess the magnitude of this previously undocumented threat to fishers, we assessed AR exposure, the number that died directly due to AR poisoning, and conducted spatial analysis of telemetry data in an effort to identify potential sources of AR in the environment. We discuss the high rates of exposure to second-generation ARs, details of several AR mortalities, neonatal or milk transfer of an AR to an altricial fisher kit, and spatial data suggesting AR contamination is widespread within California fisher ecosystems. These toxicants not only pose a direct mortality or fitness risk to fishers, but could also pose significant indirect risks to these isolated populations. Future research should be directed towards investigating risks to prey populations, exposure in other rare California forest carnivores, and potential AR sources.

### *A TEST OF TASTE AVERSION CONDITIONING ON STELLER'S JAYS TO PROVIDE SHORT-TERM IMPROVEMENT OF NEST SURVIVAL OF MARBLED MURRELETS IN NORTHERN CALIFORNIA*

**PIA GABRIEL**, Humboldt State University, Wildlife Dept., 1 Harpst Street, Arcata, CA, 95521, (707) 826-3956, pg12@humboldt.edu; Co-author: Richard T. Golightly

**Student Paper**

*Conservation and Management of Songbirds*

*Thu, Feb 2, 1:25 pm*

**Abstract:** Steller's jays have been reported to be responsible for poor nest success of the marbled murrelet. In California, murrelet populations continue to decline despite protection of their habitat; reducing predation risk is an urgent management need for the recovery of murrelet populations. Predator behavior can be modified to avoid

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rare food items through conditioned taste aversion (CTA). We developed a CTA protocol with Carbachol-treated murrelet-mimic eggs. Carbachol dosage of 24 mg effectively produced aversions without long-term ill effects. Experimentally determined retention times of a conditioned aversion exceeded the testing period (8 weeks). In field evaluation of effectiveness of aversion conditioning on resident jays within 428 ha of old-growth forest in California, mimic eggs were less likely to be predated than paired control eggs ( $p < 0.001$ ). Corvid predation on murrelet-mimic eggs decreased by 37-72% after CTA. Consequently a CTA strategy may be implemented for a short-term reduction in corvid predation on murrelets. This technique may be highly cost effective.

### SPATIAL ECOLOGY OF STELLER'S JAYS IN REDWOOD NATIONAL AND STATE PARKS

**WILLIAM GOLDENBERG**, Humboldt State University, 1720 Stewart Ave., Arcata, CA, 95521, (530) 318-3427, willgoldenberg@yahoo.com; Co-authors: Luke T. George and Jeffrey M. Black **Student Paper**

*Conservation and Management of Songbirds*

*Thu, Feb 2, 1:05 pm*

**Abstract:** Despite their identification as a primary nest predator of the federally threatened Marbled murrelet (*Brachyramphus marmoratus*), little is known about Steller's jay (*Cyanocitta stelleri*) foraging ecology in coastal redwood (*Sequoia sempervirens*) forests. Point count surveys in Redwood National and State Parks have shown jay activity to be significantly higher in recreational campgrounds than non-campground control areas, likely a result of human food availability. To explore this mechanism I compared Steller's jay (1) home range size, (2) home range overlap and (3) foraging behavior between campground and control sites in Redwood National and State Parks. A total of 33 breeding adult jays were tracked at two campgrounds and four control sites between May and August of 2010-2011. While home range size was similar between sites (15.1 ha), home range overlap was >3x higher in campgrounds (22.83%) than control sites (6.27%) ( $P=0.002$ ). Vertical canopy use was similar between sites, with 49% of total foraging locations in the low canopy (<10m), 30% in the mid canopy (10-30m) and 21% in the upper canopy (>30m). The high rate of overlap in home range use rather than differences in home range size, appear to be responsible for differences in density between campground and non-campground locations.

### ISOLATION AND BEHAVIOR OF ISLAND FOXES: INSIGHTS FROM RESPONSES TO APPROACHING VEHICLES

**NICHOLAS GOULD**, Colorado State University, 1474 Campus Delivery, Fort Collins, CO, 80523-1474, (970) 491-4971, nicholas.gould@colostate.edu; Co-authors: William F. Andelt and Nathan P. Snow

*Large Mammal and Big Game Ecology and Management*

*Fri, Feb 3, 10:25 am*

**Abstract:** The San Clemente Island fox (*Urocyon littoralis clementae*) has sustained an estimated annual mortality of 3–8% due to collisions with vehicles, causing concern for the welfare of the population. We examined if these mortality rates may be due to a loss of anti-predator behavior by testing their behavioral responses toward approaching vehicles. We found that during 53% of 541 observations, island foxes remained within 5 m of an approaching vehicle, and during 26% of 258 observations, foxes remained on the road as the vehicle passed, suggesting that foxes do not recognize vehicles as threats. During 8% of 258 observations, foxes remained in the center of the road, requiring us to stop our vehicle to avoid hitting the fox. Foxes also did not show a trend toward “avoidance” behaviors at closer versus farther distances from the approaching vehicle, nor on gravel roads, where approaching vehicles were noisier, than on paved-roads. During 49 of 150 observations where foxes exhibited a directional movement, foxes approached the on-coming vehicle, and thus may suffer from an inability to recognize introduced threats. Our results suggest that an education program which emphasizes the naivete of island foxes may be needed to increase awareness of drivers and minimize mortalities.

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### **EVALUATING CONNECTIVITY MODELS USING PUMA OCCURRENCE DATA IN THE SANTA CRUZ MOUNTAINS.**

**MORGAN GRAY**, UC Berkeley, ESPM, Berkeley, CA, 94720, (415) 350-5549, morethangray@gmail.com; Co-authors: Adina M. Merenlender, Chris C. Wilmers

*Conservation and Management of Carnivores*

*Wed, Feb 1, 3:45 pm*

**Abstract:** In fragmented landscapes, habitat connectivity is essential to ensuring species persistence. Mathematical models – based on landscape features, expert opinion, or species occurrence data – are often constructed to predict landscape connectivity and are central to diverse conservation applications. Despite their widespread use, the predictions of connectivity model are not frequently evaluated with empirical data on movement patterns to confirm accuracy. We evaluated 4 landscape feature-based connectivity models using species occurrence data for Puma concolor in California's Santa Cruz Mountains. Each model was derived from a landscape feature related to the built environment: (1) distance to roads, (2) mean parcel size, (3) median patch size, and (4) a combined estimate based on models (1), (2), and (3). Our results showed that observed puma movement in the Santa Cruz Mountains was predicted as a general trend by all 4 models, with diminished accuracy at habitat quality extremes. Pumas used very low quality habitat less than predicted by the median patch size, mean parcel size, and combined models, and used very high quality habitat more than predicted by the distance to roads model. Identifying and constructing connectivity models with puma-specific indices of habitat use could improve our predictive ability and puma landscape planning.

### **REPRODUCTIVE ECOLOGY AND DEN SITE SELECTION OF FISHERS IN THE SOUTHERN SIERRA NEVADA**

**REBECCA GREEN**, PSW Research Station, USFS and UC Davis, 2081 E Sierra Ave, Fresno, CA, 93710, (559) 841-6318, regreen@ucdavis.edu; Co-authors: Kathryn L. Purcell, Craig M. Thompson, James D. Garner, Douglas A. Kelt and Heiko U. Wittmer

**Student Paper**

*Conservation and Management of Carnivores*

*Wed, Feb 1, 1:45 pm*

**Abstract:** The fisher (*Martes pennanti*) is a rare forest-dwelling carnivore and species of conservation concern in the western United States. In recent years, fishers have been studied intensively across much of their range in California; however, little is known about habitat that supports reproduction in the Sierra Nevada. Here we present data on the reproductive ecology of fisher in the southern Sierra Nevada and characteristics of den structures. We base our results on data from 27 female fishers with radiotransmitters monitored between 2008 and 2011. Our results indicate that fisher give birth as early as 23 March and move kits from natal to maternal dens as early as 14 April. Mean number of kits per female was 1.5. To date we have verified 127 reproductive dens in 122 structures, including 4 cases of apparent den failure and 5 instances of structure re-use. Of the successful dens, black oak was selected most frequently for natal ( $n = 17$ ) and maternal dens ( $n = 41$ ), although white fir ( $n = 30$ ), incense cedar ( $n = 18$ ), sugar pine ( $n = 7$ ), and ponderosa pine ( $n = 5$ ) were also used as den structures. We discuss the relevance of our results for conservation management.

### **HABITAT RELATIONSHIPS OF BIRDS WINTERING IN AN OAK WOODLAND OF COASTAL-CENTRAL CALIFORNIA**

**MICHAEL HARDY**, University of California, Berkeley, 137 Mulford Hall #3114, Berkeley, CA, 94720, (916) 307-7191, mhardy0428@gmail.com; Co-authors: William D. Tietje and Justin K. Vreeland

*Ecology and Management of Wildlife on Military Lands*

*Thu, Feb 2, 4:05 pm*

**Abstract:** As part of a long-term study on terrestrial vertebrates at Camp Roberts, California, we assessed habitat relations of wintering birds in diverse, well-structured oak woodlands using three years (1994-1996) of bird detections on nine 5.8-ha study plots. Although the plots represented a continuum of tree and shrub density and composition, all plots had >40% canopy closure. We calculated density estimates for the 10 most commonly

detected bird species and examined correlations between bird density and vegetation attributes as described by a principal components analysis. Two species were positively correlated with vegetation characteristic of dense floristically diverse woodland with a structurally complex understory, including tree density, canopy cover, coast live oak (*Quercus agrifolia*) cover, shrub density, and shrub species diversity. Conversely, three species were negatively correlated with dense vegetation and occurred more frequently in open, sparsely-treed habitat. Dense patches of live oaks with a diverse and well-developed shrub layer are less common in California landscapes than open-canopy woodlands with fewer live oaks and shrubs. Although both dense and open woodlands are important to accommodate the entire suite of oak woodland birds, we suggest that denser patches should receive priority for conservation and management because of their relative scarcity.

### **NEST-SITE SELECTION AND NEST SURVIVAL IN THE WESTERN SNOWY PLOVER (*CHARADRIUS NIVOSUS*)**

**MICHAEL HARDY**, Wildlife Department, Humboldt State University, 1 Harpst St, Arcata, CA, 95521, (916) 307-7191, mhardy0428@gmail.com; Co-author: Mark A. Colwell

#### ***Ecology and Management of Shorebirds***

***Wed, Feb 1, 1:45 pm***

**Abstract:** Predation of eggs and chicks has been identified as one of three factors limiting recovery of the Pacific Coast population of the Western Snowy Plover (*Charadrius nivosus*). Managers have undertaken various actions aimed at increasing nest survival at sites with high predation rates and attracting plovers to sites where hatching success is comparatively high. However, the influence of fine-scale habitat characteristics on plover breeding biology is not well-studied. Consequently, we used data collected from 2007-2011 on sandy ocean-fronting beaches in Humboldt County, California to model nest-site selection and daily survival rate (DSR) of plover nests as a function of habitat features. Plovers selected nest sites with higher percent debris cover and less vegetation within 3 m of the nest than available random sites. Neither male nor female plovers significantly altered their selection behavior as they gained nesting experience. Conversely, fine-scale habitat characteristics were generally poor predictors of DSR: variation between breeding sites was the single most informative covariate in our DSR models. These results suggest a disconnect between the proximate cues used by plovers when selecting a nest site and that site's ultimate quality in terms of nest survival.

### **INTEGRATED PEST MANAGEMENT FOR MINIMIZING AND AVOIDING IMPACTS TO SENSITIVE SPECIES FROM AIRFIELD BIRD AIRCRAFT STRIKE HAZARD MANAGEMENT MEASURES**

**RAYMOND HASEY**, US Air Force, 411 Airman Drive, Travis AFB, CA, 94535, (707) 424-5126, raymond.hasey@us.af.mil

#### ***Ecology and Management of Wildlife on Military Lands***

***Thu, Feb 2, 4:45 pm***

**Abstract:** Bird Aircraft Strike Hazard Management (BASH) is necessary to protect human health and safety and avoid the adverse environmental impacts associated with aircraft mishaps that occur when aircraft strike birds. Although Integrated Pest Management (IPM) is more commonly applied to invertebrate pest management it may also be applied to vertebrate pest management programs such as BASH. IPM is the approach being studied for Travis AFB, California to (1) prevent bird strikes and also (2) to avoid and/or reduce adverse effects of BASH measures on wildlife. It is of particular concern that adverse effects upon federally listed species that use the flight line as habitat be avoided. Although IPM may not have been used previously for BASH management it is proposed as a future model for reducing the adverse effects of BASH measures on wildlife without reducing BASH effectiveness.

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### **A SUSTAINABLY MANAGED URBAN CALIFORNIA TIGER SALAMANDER (*AMBYSTOMA CALIFORNIENSE*) POPULATION**

**RAYMOND HASEY**, US Air Force, 411 Airman Drive, Travis AFB, CA, 94535, (707) 424-5126, raymond.hasey@us.af.mil; Co-author: H.B. Shaffer

*Conservation of Amphibians and Reptiles*

*Fri, Feb 3, 2:05 pm*

**Abstract:** A decade after the development of a small housing project, the California tiger salamander (*Ambystoma californiense*) population persists on Travis AFB Solano County, California. There may be only one other known example where a population at the urban/wildland habitat interface has persisted following urban development. This population may occupy the most geographically limited upland habitat yet described. The upland population may persist in a 15 hectare (38 acre) preserve adjacent to the development and there may be no other population described with such a limited area for upland habitat. The design, mitigation, and management measures employed may be useful to guide future efforts to sustain salamander populations when these occur immediately adjacent to urban development.

### **THE ROLE OF THE FISH AND WILDLIFE SERVICE IN IMPLEMENTING MITIGATION ON FLOOD CONTROL PROJECTS**

**JENNIFER HOBBS**, U.S. Fish and Wildlife Service, 2800 Cottage Way, Room W-2605, Sacramento, CA, 95825, (916) 414-6541, jennifer\_hobbs@fws.gov. Co-Author: **HARRY KAHLER** (presenting)

*Mitigation Measures: Challenges and Realities during Project Implementation*

*Fri, Feb 3, 8:25 am*

**Abstract:** A main part of the mission of the Fish and Wildlife Service is the conservation of fish, wildlife, plants, and their habitats by fostering collaboration and problem solving among diverse interests to advance conservation. As such, main priorities include landscape conservation, as well as preventing species extinction and achieving recovery. The Flood and Waterway Planning Branch works with U.S. Army Corps of Engineers and California Department of Water Resources on flood control projects. Flood control work typically maintains Fish and Wildlife Service involvement throughout construction. Seemingly disparate issues must be considered and balanced in a collaborative process so that the mission of the Fish and Wildlife Service is understood and realized during the construction process. Here we provide a general outline and some examples of challenges that we have dealt with when working on flood control projects in the construction phase.

### **DETERMINING THE IMPACT OF NOISE FROM ENERGY DEVELOPMENT ON GREATER SAGE-GROUSE USING COMPUTER MODEL SIMULATIONS**

**STACIE HOOPER**, University of California, Davis, One Shields Avenue, Davis, CA, 95616, (530) 406-1993, slhooper@ucdavis.edu; Co-authors: Gail Patricelli and Jessica L. Blickley

*Ecology and Management of Upland Game Birds*

*Wed, Feb 1, 3:45 pm*

**Abstract:** Greater Sage-grouse (*Centrocercus urophasianus*) populations are declining throughout their range. Many factors have been implicated in this decline, including noise from coal bed methane and natural gas development that has expanded rapidly across much of the sage-grouse habitat. In order to determine whether noise has played a significant role in these declines, we need to estimate and map the “acoustic footprint” of noise from energy exploration activities. We chose a software modeling package called NMSim, originally developed by Wyle Laboratories, which uses topographic map data, noise source amplitude measurements, and measures of other factors affecting sound propagation to build a spatially-explicit model simulating how noise spreads over the surrounding terrain. Using information about the types and locations of energy development equipment, NMSim can produce data layers describing the noise levels present in different geographic locations over time. These data layers can then be used in spatially-explicit habitat selection models to determine the role of noise in historic reductions in lek attendance, and to estimate the maximum noise threshold for sage-grouse, which is critical to

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developing effective noise exposure regulations. Our modeling approach is not limited to sage-grouse, but can be used with any wildlife species.

### **SONGBIRDS AS PROVIDERS OF ECOSYSTEM SERVICES IN VINEYARDS**

**KATHARINE HOWARD**, 1440 Union Street, Arcata, CA, 95521, (707) 694-4853, kah85@humboldt.edu

**Student Paper**

*Conservation and Management of Songbirds*

*Thu, Feb 2, 3:45 pm*

**Abstract:** Ecosystem services by wildlife can provide powerful incentives for conservation, particularly if species can be linked to natural habitat. Reduction of vineyard pests by birds can benefit wine-grape growers. I examined the hypothesis that natural habitats adjacent to vineyards provide a source of insectivorous birds, testing the prediction that predation on vineyard pests will be higher closest to natural habitat, and will be lower in the vineyard interior. I used sentinel pests to simulate an insect outbreak by pinning larvae to cardboard squares on the ground along transects in 4 different vineyards in Sonoma and Mendocino counties in northern California. There was no evidence that predation was higher along edges of vineyards adjacent to natural habitat. I did find evidence that avian predators responded quickly to a simulated outbreak of a lepidopteran larvae, with predation rates during the late summer season reaching 90.2%. Motion-sensor cameras showed that the most common predators of the sentinel larvae were western bluebirds (*Sialia mexicana*). These results suggest that vineyard managers can provide nesting habitat for bluebirds in their vineyards and increase biological pest control by songbirds during the summer months. This potentially presents a beneficial scenario for both vineyard managers and bird conservation.

### **WHERE HAVE HALF THE FOXES GONE? DETERMINING THE MECHANISMS UNDERLYING A POPULATION DECLINE IN SAN NICOLAS ISLAND FOXES.**

**BRIAN HUDGENS**, Institute for Wildlife Studies, P.O. Box 1104, Arcata, CA, 95503, (707) 822-4258, hudgens@iws.org; Co-author: David K. Garcelon

*Ecology and Management of Wildlife on Military Lands*

*Thu, Feb 2, 3:45 pm*

**Abstract:** San Nicolas Island foxes (*Urocyon littoralis dickeyi*) suffered a dramatic decline from 2009 to 2010, following island-wide removal of feral cats (*Felis catus*). Foxes have been monitored annually since 2000 on three trapping grids. Although San Nicolas Island supports higher densities of foxes of any California Channel Island, population declined 30%-50% on two grids and remained relatively stable on another. Adult survival also decreased 37% in the two grids, while increasing in the other. There was also a decrease in juvenile survival from 2009-2010 relative to previous years. We examined several possible mechanisms for the decline. Feral cat removal was ruled out because being captured in a leg-hold trap did not decrease fox survival. We could not rule out virulent disease since there was a marked increase in canine adenovirus and canine distemper exposure. However, we handled 290 foxes in 2010 to assess potential impacts of cat removal on individual foxes, and no foxes showed clinical signs of disease. We rejected a dramatic loss of food resources since fox weights did not differ between 2009 and 2010. We concluded that the most likely cause was negative density dependence in adult survival. The mechanism underlying density dependent survival rates remains unknown.

### **CALIFORNIA STATE LANDS COMMISSION - INCORPORATING EFFECTIVENESS CRITERIA INTO THE MMP**

**CHRISTOPHER HUITT**, California State Lands Commission, 100 Howe Ave, Suite 100 South, Sacramento, CA, 95825, (916) 574-1938, Christopher.Huitt@slc.ca.gov

*Mitigation Measures: Challenges and Realities during Project Implementation*

*Fri, Feb 3, 10:45 am*

**Abstract:** The staff of the California State Lands Commission (CSLC) serves the people of California by providing stewardship of the lands, waterways, and resources entrusted to its care through economic development,

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protection, preservation, and restoration. One way the CSLC serves the people of California is by developing environmental documentation to support discretionary actions and minimize or avoid potential significant impacts to the environment which often occurs through implementation of a Mitigation Monitoring Program (MMP).

During the environmental compliance phase of a project (after a project is approved), coordination and open communication is vital for full disclosure of actions that need to occur during project activities or construction. To ensure that the project proponent is fully accountable for implementation of mitigation, a clear understanding of required compliance with a full disclosure of all mitigation measures and permit conditions is required. Establishing relationships and systems for verification between agencies responsible for implementing mitigation measures helps to ensure the project proponent will comply with and be held accountable to each responsible agency overseeing those aspects of mitigation under their jurisdiction. Using and incorporating effectiveness criteria into the MMP not only assists an agency in complying with state law, but helps ensure that the outcome of the action is successful. Lessons learned from the results of the effectiveness criteria evaluation are then folded into future projects to ensure the success of planning and implementing mitigation measures of future projects.

### **RENEWABLE ENERGY IN THE DESERT SOUTHWEST: ASSESSING THE IMPACTS ON HABITAT AND GENETIC HOTSPOTS**

**RICHARD INMAN**, USGS, 160 N Stephanie St, Henderson, NV, 89074, (702) 564-4502, rdinman@usgs.gov; Co-authors: Amy Vandergast, Ken Nussear, Todd Esque, Robert Fisher, Stacie Hathaway, Kelly Barr, Megan Lahti and Dustin Wood

#### ***Renewable Energy and Wildlife Conservation***

***Fri, Feb 3, 2:05 pm***

**Abstract:** Many utility scale renewable energy development projects are currently proposed across the Mojave Ecoregion. Agencies that manage biological resources throughout this region are pressed to understand the potential impacts of these renewable energy projects and their associated infrastructure (e.g., transmission corridors, substations, access roads, etc) in terms of wildlife movement, genetic exchange among core habitat areas, and species' abilities to adapt to changing environmental conditions. Understanding these will help managers select appropriate project sites and possibly mitigate for these anticipated effects. We used habitat modeling methods to develop predictive habitat suitability maps for 15 species across the Mojave Ecoregion, and developed a habitat index to rank each of the species in terms of the impact from proposed development sites. This ranking index incorporates habitat area and suitability, and identifies a subset of species that are more 'at-risk' due to habitat loss and fragmentation. We also used isolation-by-resistance analyses to assess the importance of movement corridors for maintaining gene flow across the region, and assessed overlap in corridors among species. Areas of high genetic diversity were identified as hotspots, and were compared to current and proposed development footprints to assess their potential impacts on reservoirs of genetic diversity and genetic connectivity.

### **ENFORCEMENT AND PROTECTION MEASURES OF FISH & GAME CODE SECTION 1600-1616**

**SANDI JACKS**, California Department of Fish and Game, 1701 Nimbus Road, Rancho Cordova, CA, 95670, (916) 358-2916, SJACKS@dfg.ca.gov

#### ***Mitigation Measures: Challenges and Realities during Project Implementation***

***Fri, Feb 3, 8:45 am***

**Abstract:** The Fish and Game Code Section 1602 regulates the alteration of streambeds and lakes. This section of the Fish and Game Code gives the Department the authority to work with an entity in order to include measures for the protection of biological resources during the planning phase of a project. As a result, the Department is able to ensure that the habitat, on which the biological resources depend, will be protected during and/or re-established at the conclusion of the project. This presentation intends to provide insight on the types of projects governed by our code, the measures we include to protect natural resources and how to off-set the impacts of a project.

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### *BIRDS IN SPARTINA-DOMINATED VERSUS NATIVE SALT MARSH OF HUMBOLDT BAY, CALIFORNIA*

**MATTHEW JOHNSON**, Humboldt State University, 1 Harpst St, Arcata, CA, 95521, (707) 444-8636, mdj6@humboldt.edu; Co-author: Steven C. Hackett

*Conservation and Management of Songbirds*

*Thu, Feb 2, 3:25 pm*

**Abstract:** Invasive dense-flowered cordgrass (*Spartina densiflora*) has infested an estimated 90% of salt marshes in Humboldt Bay and the adjacent estuaries. The Humboldt Bay National Wildlife Refuge was recently awarded a \$1 million competitive allocation to carry out removal of all existing *Spartina* within refuge boundaries. Bird surveys began in 2010 to compare birds in *Spartina*-dominated and native salt marsh and to provide baseline data for future post-removal comparisons. For several bird species, especially small seed- and insect-eating songbirds, more birds were detected in *Spartina*-dominated marsh than in native marsh. Abundance of rails was as high or higher in *Spartina*-dominated marsh, while the abundance of shorebirds and waterfowl was highly variable and not strongly associated with local vegetation. Despite a lower plant species diversity, *Spartina*-dominated marsh has taller and thicker habitat structure than does native marsh, and these physiognomic attributes may provide better habitat for some birds. Nonetheless, there is considerable conservation value in removing *Spartina* to benefit endemic and locally rare plants and invertebrates. In future years, comparisons of these bird surveys with post-removal surveys will reveal a more complete understanding of the effects of this invasive grass on birds.

### *SURVIVAL OF PRONGHORN FAWNS ON THE CARRIZO PLAIN NATIONAL MONUMENT: RELATIONSHIPS BETWEEN PREDATION, HABITAT USE, AND BIRTH SYNCHRONY*

**DIEGO JOHNSON**, US Geological Survey, 160 N. Stephanie St, Henderson, NV, 89074, (925) 285-9207, diego.johnson2@gmail.com; Co-authors: Kathleen Longshore and Chris Lowrey

**Student Paper**

*Large Mammal and Big Game Ecology and Management*

*Fri, Feb 3, 9:25 am*

**Abstract:** The translocated population of pronghorn (*Antilocapra americana*), on the Carrizo Plain National Monument (CPNM) in California, has experienced a 20-year history of population decline. Pronghorn demographic information for the CPNM is limited. More importantly, nothing is known about postnatal fawn survival, a period of extreme vulnerability in which mortality ranges from 40-80% and a critical factor affecting population trends. The primary objective of our study is to identify the factors affecting fawn survival within the CPNM. Specifically, we are examining relationships between survival, predation, habitat use, and birth synchrony for this small population. During 3 field seasons we outfitted 20 newborn fawns with lightweight GPS collars, which collect precise and frequent locations during early life. Fawn mortality was relatively high and ranged from 70-83%. Of 11 fawn carcasses examined during field and laboratory necropsies, 7 showed evidence of predation, 2 died of internal infections, and 2 died of unknown causes. We found that fawns utilized habitat with greater vegetative height and lower visibility than random sites. Initial analyses for the presence of birth synchrony showed no significant difference between the number of births within quartile date ranges. Here we use our preliminary results to discuss how interactions between various fawn survival factors may contribute to population decline on the CPNM.

### *THE EMERGENCE OF BIG GAME ECOLOGY AND MANAGEMENT IN HAWAII*

**EDWIN JOHNSON**, HI Dept. of Land & Nat. Res/Div of Forestry & Wildlife, 1151 Punchbowl Street, #325, Honolulu, HI, 96812, (808) 347-7255, Edwin.D.Johnson@hawaii.gov

*Large Mammal and Big Game Ecology and Management*

*Fri, Feb 3, 8:05 am*

**Abstract:** Hawaii is a unique case among the 50 U.S. states, with ecosystems evolving independently of other land masses, with no large terrestrial mammals other than the monk seal. Even the Hawaiian monk seal (*Monachus schauinslandi*) is primarily a marine mammal, spending most of its time at sea, coming ashore to rest on beaches and utilizing fringe vegetation as shelter from storms. The only other native mammal is the Hawaiian

hoary bat (*Lasiurus cinereus semotus*) or opeapea to the native Hawaiian people, a very small mammal fitting easily in the palm of one's hand. Nevertheless, with the introduction of pigs, goats, domestic sheep, Mouflon sheep, axis deer, and black-tailed deer, all now classified as game mammals, the state has an extensive need to understand large mammal and big game ecology, and to carry out intensive, coordinated management plans. In fact, because of the non-native status of game mammals, an almost traditional conflict between hunters and "environmentalists," and a lack of a solid data base and guiding principles for wildlife conservation and management, there is very little game management or integration of game actions with the dominant mandate of natural resource agencies, the conservation of native species and ecosystems. The paper sketches the emergence of guiding principles for integrated island ecology and management of big game in Hawaii.

### **PROTOCOLS FOR SURVEYING FOR BAT ROOSTS IN TREES**

**DAVE JOHNSTON**, H. T. Harvey & Associates, 983 University Avenue, Los Gatos, CA, 95032, (408) 458-3226, djohnston@harveyecology.com

**Mitigation Measures: Challenges and Realities during Project Implementation** **Fri, Feb 3, 9:25 am**

**Abstract:** We propose survey protocols to determine if bats are roosting in trees to be removed, pruned, or coppiced. Surveys for day-roosting bats in trees are problematic because bats' tree roosts are cryptic and therefore difficult to survey for. Furthermore, tree use bat surveys using radio telemetry are expensive and often ineffective. For this protocol, trees are first rated by their potential for day-roosting habitat using a "0" to "3" score; a "0" score designates no potential for day-roosting habitat and a "3" score indicates excellent potential habitat. Scores are based on specific attributes of cavities, exfoliating bark, density and size of tree leaf clumps, tree size, habitat type, bat species' ranges, and the distance to surface water and other known day roosts. Specific bat surveys are conducted for trees scored a "3" by acoustic monitoring techniques, night vision goggles, and acoustic playback calls with mist nets for foliage roosting bats. Using this protocol, we located 2 active California myotis (*Myotis californicus*) day roosts on 60 acres comprising thousands of small trees. We also located Yuma myotis (*M. yumanensis*) and California myotis maternity colonies and day-roosting hoary bats (*Lasiurus cinereus*) and western red bats (*L. blossevillii*) at other sites.

### **BIRDS AND BUFFERS ON MILITARY LANDS IN CALIFORNIA: THE IMPACTS OF CLIMATE CHANGE AND LAND-USE CHANGE**

**DENNIS JONGSOMJIT**, PRBO Conservation Science, 3820 Cypress Dr #11, Petaluma, CA, 94954, djongsomjit@prbo.org; Co-authors: Sam Veloz and John Wiens

**Challenges of Natural Resource Management in a Changing Climate** **Fri, Feb 3, 9:25 am**

**Abstract:** Climate change is only one of several environmental changes that will threaten species and biological communities in the future. Rapid changes in land use, particularly residential development, may pose a more immediate challenge. These changes are of particular concern for environmental management on military bases, where encroachment of development from outside the fence may also compromise essential activities. Using species-distribution models, we examined the potential separate and combined effects of climate and land-use change on special-status bird species occurring on and around military installations in California. We also considered how the impacts of these changes differed when buffer zones of varying width surrounding a base were considered. Of 29 bases examined using the GDFL climate scenario, 23 had climate-induced reductions in species occurrences, 10 of which had even larger reductions due to housing change. Six bases showed climate-related increases in species occurrences, five of which had housing-related reductions that were as great as the impacts of climate. The impacts of low-density housing development became more important with increasing buffer-zone width. These results suggest that a focus on conservation planning for the effects of climate change alone may be incomplete.

**ANTIBODY PERSISTENCE AFTER CANINE DISTEMPER VIRUS VACCINATION IN THE  
ENDANGERED CATALINA ISLAND FOX**

**JULIE KING**, Catalina Island Conservancy, PO Box 2739, Avalon, CA, 90704, jking@catalinaconservancy.org;  
Co-authors: Calvin L. Duncan, T. Winston Vickers and Deana L. Clifford

*Wildlife Diseases and Pathology*

*Fri, Feb 3, 2:45 pm*

**Abstract:** The island fox (*Urocyon littoralis catalinae*) population on Catalina Island, California declined by almost 90% due to a canine distemper virus (CDV) epidemic in 1999. Subsequent population recovery strategies for this highly CDV-susceptible species have included an intensive effort to administer a single dose of recombinant canarypox-vectored CDV vaccine to at least 80% of wild foxes annually. Although a CDV outbreak has not recurred since initiation of this program, annual vaccination requires financial and personnel resources that are difficult for management agencies to sustain. Accordingly, we evaluated CDV antibody titer persistence post-vaccination in order to advise managers on the optimal frequency of vaccination needed to maintain detectable antibody titers (and presumably protection from disease) in island foxes. From 2008-2010, 588 blood samples were collected from 196 foxes during population surveys. CDV antibody titers were measured by serum neutralization prior to, and at 2-, 4-, and 12-months post-vaccination. Pre-vaccine antibody titers for all foxes were <1:16, indicating no prior CDV exposure. At 2-months post-vaccination, 68% of foxes that received a single 1mL or 2 mL dose demonstrated antibody titers consistent with disease protection (>1:32), but by 4-months post-vaccination only 32% of sampled foxes had maintained titers >1:32. By 12-months post-vaccination only 5% of sampled foxes had maintained protective antibody levels. For foxes that received a booster vaccination 12 months after initial vaccination, 86% had protective antibody titers 2-months post-booster. By 12-months post-booster vaccination 61% of foxes had antibody titers >1:32. Foxes that did not receive booster vaccination had titers near pre-vaccination levels (<1:16) throughout the second year. Results indicate that annual CDV vaccination is required to maintain protective CDV antibody levels in a significant proportion of the island fox population. This study demonstrates the value of science-based monitoring to guide implementation and evaluate the effectiveness of vaccination programs for high-risk species.

**A MAMMAL'S TAKE ON THE RAPTURE HYPOTHESIS, JACOB'S LADDER, AND OTHER NOTIONS  
OF DOOM, GLOOM, AND UNIFORM CHANGE IN ALPINE ECOSYSTEMS**

**ROB KLINGER**, USGS-BRD. Yosemite Field Station-Bishop Office, 568 Central Avenue, Bishop, CA, 93514, (760) 873-5125, rcklinger@usgs.gov; Co-authors: Tom Stephenson and Sarah Stock

*Challenges of Natural Resource Management in a Changing Climate*

*Fri, Feb 3, 10:25 am*

**Abstract:** It is often assumed that warming temperatures and altered precipitation patterns will lead to loss or alteration of habitat for many alpine mammal species, ultimately resulting in decreased range, lower abundance, and possibly extirpations. The principal mechanism for the loss or alteration of habitat would be from a uniform upward shift in conifer species, with many alpine meadow areas, which provide critical habitat for most alpine mammal species, undergoing a transition to tree-dominated communities. While it is possible, and maybe even likely, that changes in alpine mammal communities will occur, the perception of the extent, direction and magnitude of these changes has been shaped principally from a climatic perspective. Climate sets broad limits on the biogeographic extent of animal and plant species ranges, but many other factors influence their regional and local distribution and abundance. Here we describe the conceptual framework and preliminary data from a multi-scale study examining changes in the distribution and abundance of five alpine mammal species in the Sierra Nevada and White Mountains of eastern California. We have hypothesized that climate-related changes in distribution and abundance of alpine mammals will be species-specific, with some species affected primarily by physiological stress, other species by changes in habitat, and others by altered forage quantity or quality. Our hypothesis does not imply that climatic shifts will result in more restricted ranges and lower abundance for all five species. Rather, some species could be unaffected or even benefit from shifts in climate. Moreover, while climate could potentially trigger changes in alpine vegetation communities, feedbacks between climate and plant-

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animal interactions could produce multiple pathways leading to alternative states for both wildlife and vegetation communities, effectively resulting in the mammals “managing their own habitat.”

### **MORPHOLOGICAL CHANGES IN TWO SISTER TAXA OF NEOTOMA IN AREAS OF ALLOPATRY AND SYMPATRY ALONG A ZONE OF SECONDARY CONTACT**

**MICHAELA KOENIG**, California Polytechnic State University, 1 Grand Ave, San Luis Obispo, Ca, 93407, (805) 459-0333, mmkoenig@calpoly.edu; Co-authors: F.X. Villablanca, M. Matocq, A. Schaffner and S. Steinmaus

**Student Paper**

**Ecology and Management of Wildlife on Military Lands**

**Thu, Feb 2, 1:45 pm**

**Abstract:** Along the Nacimiento River the ranges of two sister species of woodrats meet and form a secondary contact zone. The big-eared woodrat (*Neotoma fuscipes bullator*) and dusky-footed woodrat (*N. macrotis luciana*) meet within the river corridor on Camp Roberts military installation in Central California. Where the ranges of these sister taxa overlap, a unique opportunity is provided to examine the effects of heightened competition by examining morphological characteristics. In the spring and summer of 2010, body size and craniodental data were collected on over 1000 individual woodrats across a 12-mile transect along the Nacimiento River. Both allopatric and sympatric populations were surveyed. The patterns of morphological variation across this transition zone were examined to determine if trends are consistent with scenarios of heightened competition. A distinct cline was found showing a change in morphological characteristics across the areas of allopatry approaching areas of sympatry. Allopatric populations of each species exhibited species-specific suites of character traits that were quantified. A divergence in craniodental morphology and a convergence in body size within the area of sympatry were observed, suggesting an effect of heightened competition. A convergence in morphological traits in areas of heightened competition is rare and warrants further research.

### **MARINE "ALGAL" BLOOM TOXICITY IN WILDLIFE**

**LINDA LOWENSTINE**, U.C. Davis, School of Veterinary Medicine, Davis, CA, 95616, ljlownstine@ucdavis.edu

**Wildlife Diseases and Pathology**

**Fri, Feb 3, 3:25 pm**

**Abstract:** Harmful algal blooms (HABS) are becoming more frequent along the coasts of North America and throughout the world accompanied by reports of wild animal intoxication. Toxins produced by these blooms become concentrated in the food web and animal and human intoxications are often associated with ingestion of planktivorous fish and filter feeding invertebrates. There are at least 6 groups of toxins produced by zoo- and phytoplankton species. These toxins and syndromes associated with them in humans include: Saxitoxins and paralytic shell fish poisoning (PSP); Brevetoxins and neurotoxic shell fish poisoning; Domoic acid and amnesic shellfish poisoning (ASP); Okadaic acid and other toxins causing diarrhetic shellfish poisoning; Azaspiracid shellfish poisoning (AZP) and Ciguatera toxin and maitotoxin causing Ciguatera fish poisoning (CFP). Wildlife mortalities have been confirmed with the first four of these. Saxitoxicosis has been reported to cause mortality in mackerel, cod and salmon, sea birds, great whales and sea otters. Brevetoxicosis has caused periodic significant mortality events in manatees and deaths in marine invertebrates, fish, sea turtles, sea birds, and bottlenose dolphins. Domoic acid is most infamous for mortality events in California sea lions, but sea otters, common dolphins and great whales along with anchovies, sardines and possibly Humboldt squid have been affected. Diarrhetic shellfish poisoning has caused mortality in farmed sea scallops in the Bay of Fundy and has recently (August 2011) been described for the first time in people in the Puget Sound area, though no wildlife cases have been reported to date. Algal bloom toxicity should be strongly considered during investigations of mortality events in marine invertebrates, fish, turtles, birds and mammals. State and national (through NOAA) resources are available to aid in these investigations.

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### *HABITAT INTERACTION BETWEEN TWO SPECIES OF CHIPMUNK IN THE BASIN AND RANGE PROVINCE OF NEVADA*

**CHRISTOPHER LOWREY**, USGS, 160 North Stephanie St, Henderson, NV, 89074, (702) 564-4537, clowrey@usgs.gov; Co-author: Kathleen M. Longshore

#### *Challenges of Natural Resource Management in a Changing Climate*

*Fri, Feb 3, 10:05 am*

**Abstract:** 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, and more likely near large rocks on the southern aspects. 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 survival risks as climate temperatures rise.

### *LAND RICH, CASH POOR PUBLIC INFRASTRUCTURE HABITAT MITIGATION: AN INNOVATIVE WAY FOR PUBLIC INFRASTRUCTURE PROJECTS TO MITIGATE FOR SPECIES IMPACTS.*

**GREG LYMAN**, San Francisco Water Power Sewer, 1145 Market Street, 5th Floor, San Francisco, CA, 94103, (415) 554-1601, glyman@sfgwater.org; Co-author: Debbie E. Craven-Green

#### *Conservation Planning and Environmental Offsets: Tools for Species Recovery?*

*Wed, Feb 1, 4:25 pm*

**Abstract:** The public expects publically-owned land to be a safe haven for endangered species and public land stewards to protect sensitive habitats. Increasingly, publically-owned lands, in the form of watersheds and parks, are underfunded and unable to meet the increasing demands to combat invasive species and requirements to manage, in some cases the last known, habitat for endangered species. Use of public infrastructure mitigation funds to improve and perpetually manage public lands becomes an excellent approach for endangered species recovery. In 1999, the City and County of San Francisco (CCSF) voters initiated the Water System Improvement Program; the first major upgrade to the Hetch Hetchy drinking water supply system since environmental laws were enacted. The CCSF Water Department is investing almost \$80 million in habitat and species restoration and enhancements to aid species recovery by improving habitat connectivity, eliminating sensitive species predators, and retiring development rights on publically-owned land. The Water Department bundled mitigation from multiple infrastructure projects, creating efficient and economical habitat improvement projects at an ecosystem scale to protect sensitive and special status species habitat. Use of watershed land reduces implementation costs and provides funding for the perpetual management of sensitive habitats for endangered species.

### *PIONEERING MILITARY ENVIRONMENTAL POLICY: ORIGINS OF THE U.S. AIR FORCE CONSERVATION PROGRAM*

**JEAN MANSAVAGE**, U.S. Air Force Historical Studies Office, 20421 Swan Creek Court, Potomac Falls, VA, 20165, (202) 404-2198, mansavag@erols.com

#### *Ecology and Management of Wildlife on Military Lands*

*Thu, Feb 2, 1:05 pm*

**Abstract:** How did the Department of Defense become a successful steward of its lands? This paper first surveys the role the U.S. military played in natural resource exploration and management from 1800 through 1900. During the early twentieth century, the modern Army and its Air Corps kept this tradition through selective-cutting practices and aerial fire patrols assisting in fighting wildfires. In the 1950s, with environmentally-conscious leadership, the newly independent U.S. Air Force initiated the first tangible, official conservation program; however, not for altruistic reasons. Instead, Congressional pressure on the military services to justify land withdrawals from the public domain catalyzed DOD, with the Air Force acting as executive agent, to develop

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more effective land-management practices. Soon after passage of the Engle Act, Air Force Generals Nathan Twining and Thomas White established the modern DOD conservation program in 1956 that required all Air Force lands be managed by trained environmental professionals in cooperation with the U.S. Fish and Wildlife Service. During White's tenure Congress updated the Sikes Act in 1960, inducing all of the military services to develop similar conservation programs. Subsequently, DOD issued service-wide directives that complied with Congressional environmental legislation over the next decade.

### CAN PIKAS ADAPT TO RISING TEMPERATURES? COMPARISONS OF BEHAVIOR BETWEEN HIGH AND LOW ELEVATION PIKAS IN THE SIERRA NEVADA

CODY MASSING, USGS-BRD, 568 Central Ave., Bishop, CA, 93514, (760) 873-5071, cmassing@usgs.gov

Student Paper

*Challenges of Natural Resource Management in a Changing Climate*

*Fri, Feb 3, 8:45 am*

**Abstract:** American pikas (*Ochotona princeps*) are well adapted to cold temperatures, but they have little physiological ability to cool their bodies during warmer temperatures. Some populations of pikas may be declining due to rising global temperatures, but there is evidence that pikas may be more adaptable to climate change than people have suspected. Populations of pikas in different temperature regimes may exhibit behavioral plasticity, or have genetic differences, such that these populations have different daily activity schedules. For instance, pikas living in lower elevations exhibit more crepuscular behavior than those at higher elevations. To determine the magnitude of difference in pika behavior at different elevations I observed pikas in six low and six high elevation sites in the Sierra Nevada, in four time blocks throughout the day from August to September, 2011. I recorded specific behaviors, such as foraging and haying, and compared these activities between low and high elevation pikas at different temperatures and times of day. A preliminary analysis of one low and one high elevation site suggests that there are differences in behavior between low and high elevation populations, including more crepuscular behavior and significantly less diurnal foraging in the low elevation population.

### GENETIC HISTORY OF THE SAN JOAQUIN VALLEY WOODRAT (NEOTOMA FUSCIPES RIPARIA)

MARJORIE MATOCQ, University of Nevada, Reno, 1664 North Virginia Street, Reno, NV, 89509, (775) 784-4621, mmatocq@cabnr.unr.edu; Co-authors: Patrick Kelly, Scott Phillips, and Jesus Maldonado

*Large Mammal and Big Game Ecology and Management*

*Fri, Feb 3, 10:45 am*

**Abstract:** The San Joaquin Valley woodrat, *Neotoma fuscipes riparia*, is known from only two localities in the Central Valley of California. We sought to quantify the genetic variation held by these populations, to assess their degree of isolation, and to place this variation in the context of woodrat populations flanking the San Joaquin Valley. We quantified the spatial distribution of genetic variation across these localities using mitochondrial DNA sequence data and 14 microsatellite loci. We find that populations in the San Joaquin Valley have mitochondrial haplotypes characteristic of *Neotoma fuscipes* from the Diablo and Coast Ranges and *Neotoma macrotis* from the central Sierra Nevada. Using frequency-based and Bayesian analyses of the microsatellite data, we find that the localities are significantly differentiated from one another, but that the San Joaquin Valley localities maintain evidence of historic genomic admixture between *N. fuscipes* and *N. macrotis*. Our study suggests that diversity within the San Joaquin Valley populations is likely the result of a complex history that includes admixture between species from a time of greater habitat connectivity across the Valley.

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### **REPRODUCTION, RECRUITMENT, AND DISPERSAL OF FISHERS (*Martes pennanti*) IN A MANAGED, DOUGLAS-FIR DOMINATED FOREST IN NORTHWESTERN CALIFORNIA**

**SEAN MATTHEWS**, Wildlife Conservation Society/University of Massachusetts, 160 Holdsworth Way, Amherst, MA, 1003, (530) 351-2418, smatthews@wcs.org; Co-authors: J. Mark Higley, Kerry M. Rennie, Rebecca E. Green, Charles A. Goddard, Greta M. Wengert, Mourad W. Gabriel and Todd K. Fuller

**Student Paper**

*Conservation and Management of Carnivores*

*Wed, Feb 1, 2:05 pm*

**Abstract:** Many demographic parameters of imperiled fishers (*Martes pennanti*) in the Pacific Northwest remain poorly understood but are necessary to develop conservation strategies; here we report on fisher reproduction, recruitment, and dispersal on the Hoopa Valley Indian Reservation, California. Forty radio-collared, breeding age females exhibited denning behavior on 80 of 92 (87%) opportunities between 2005 and 2011. Fifty-five of 85 (65%) adequately monitored denning opportunities of 28 individual adult female fishers resulted in weaning. Younger adult female fishers were less likely than older females to den and wean kits. We counted 52, and extracted and marked 51, kits comprising 28 litters of 19 females between 2005 and 2008. Average litter size at extraction (4-12 weeks post birth) was 1.9 kits (27F, 24M, 1 unk.). Fourteen (12F, 2M) juveniles were captured and radio collared. Mean distances between natal dens and home range centroids of dispersing juvenile fishers was 4.0 km (range=0.8-18.0 km) for 7 females vs. 1.3 km for a male. Estimated recruitment of juveniles ranged from 0.38-0.78 for females and 0.05-0.50 for males. Our results suggest increasing female survival rates and translocation as methods to increase and expand existing fisher populations.

### **INNOVATIVE METHODS FOR THE DESIGN AND SITE ASSESSMENT OF VERNAL POOLS**

**NIAL McCARTEN**, Institute for Ecohydrology Research, 1111 Kennedy Place, Suite 4, Davis, CA, 95616, (530) 756-4257, nmccarten@ecohydrology-research; Co-authors: Kirsten Christopherson, Ruben Rosas and Maggie Christman

*Ecology and Management of Wildlife on Military Lands*

*Thu, Feb 2, 1:25 pm*

**Abstract:** Vernal pools are seasonal wetlands with complex hydrological processes related to soil, geology, landscape, and regional climate. Federal regulatory requirements for compensatory mitigation include restoring or creating vernal pools for no-net-loss. Federal agency evaluations and the results from monitoring have found that these mitigation pools do not always meet success criteria and their hydrology is often the principal deficiency. Factors relating to the success of a site include adequate catchment area and the presence of a water-restricting subsurface soil layer. We have applied innovative technology to evaluate potential sites including the use of ground-penetrating radar to identify the presence, continuity and depth of water-restricting subsurface soil layers and a global positioning system to measure the catchment area and elevation gradients. In conjunction with hydrology data from natural pool systems we determined how local climate variables, soils, and catchment area contribute to potential mitigation pool success. We will present an example from Beale AFB where we modified an existing mitigation plan using our methods. In addition, we describe how we applied technology to conduct hourly monitoring of natural and restored vernal pools and dramatically increased our understanding of the hydrological and biological success of vernal pools created for mitigation purposes.

### **ANTICOAGULANT RODENTICIDE EXPOSURE IN CARNIVORES AND PREDATORS: A REVIEW**

**STELLA McMILLIN**, California Department of Fish and Game, 1701 Nimbus Road, Rancho Cordova, CA, 95670, (916) 358-2954, smcmillin@dfg.ca.gov; Co-authors: Bob Hosea and Brian Finlayson

*Conservation and Management of Carnivores*

*Wed, Feb 1, 3:05 pm*

**Abstract:** Anticoagulant rodenticides (ARs) have been widely detected in predators and scavengers in California. Since 1993, CDFG has confirmed 284 cases of non-target wildlife being exposed to ARs. Wildlife species impacted include mountain lions, bobcats, more than a dozen raptor species, several fox species, black bear,

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kangaroo rat, wild turkey, and Canada goose (CDFG files). Monitoring studies have indicated that 79% of San Joaquin kit foxes in the Bakersfield area have been exposed to ARs (McMillin et al 2008) and 92% of raptors collected in San Diego County and 79% of the raptors collected in the Central Valley contained ARs (Lima and Salmon 2010). Monitoring studies of bobcats and mountain lions in Southern California show similar patterns: in animals collected from 1993 to 2007, 35/39 bobcats and 4/4 mountain lions contained AR residues (Riley et al 2007). Recent regulatory change from US Environmental Protection Agency may reduce the amount of AR exposure in wildlife by limiting public access to these materials. However, as some avenues of public access still remain, additional regulation may be warranted. It is important that wildlife continue to be monitored to ensure that regulations have been effective in reducing the magnitude and frequency of AR residues.

### **SPECIES GUIDED RESTORATION FOR MULTI-OBJECTIVE PROJECTS**

**TREVOR MEADOWS**, River Partners, 580 Vallombrosa Ave, Chico, CA, 95926, (209) 521-1700, tmeadows@riverpartners.org; Co-authors: J.E. Hammond and F.T. Griggs

*Conservation Planning and Environmental Offsets: Tools for Species Recovery?* **Wed, Feb 1, 1:45 pm**

**Abstract:** Wildlife conservation through implementation of habitat restoration is frequently challenged by varying habitat requirements of wildlife species; a challenge that is compounded when restoration is implemented in dynamic systems, such as riparian zones in the Western United States that historically exhibited a patchwork of habitat types across a landscape. To ensure restoration projects continue to meet the goals of improving habitat conditions for wildlife and meeting the needs and objectives of human populations, River Partners employs a unique strategy to habitat restoration through specialized planning tools and on the ground monitoring of site specific conditions. These tools allow restoration practitioners to design habitat tailored to specific habitat requirements of wildlife. These planning tools allow practitioners to produce a network of habitat types across the landscape that support biotic diversity and simultaneously meet the needs of mitigation requirements, flood conveyance, recreation, or other project specific goals or requirements. River Partners has utilized these planning tools on restoration projects that target sensitive wildlife species including riparian brush rabbit (FE), valley elderberry longhorn beetle (FT), and many riparian obligate species including neotropical migratory birds and wintering songbirds among others.

### **NRCS CALIFORNIA COLLABORATIVE SAGE-GROUSE CONSERVATION THROUGH SUSTAINABLE RANCHING**

**THOMAS MOORE**, USDA-NRCS, 430 G Street, #4164, Davis, CA, 95616, (530) 792-5652, thomas.moore@ca.usda.gov

*Ecology and Management of Upland Game Birds* **Wed, Feb 1, 4:05 pm**

**Abstract:** As part of the NRCS Sage-Grouse Initiative (SGI), NRCS California has been working with ranchers and our federal, state, and local partners to conserve greater sage-grouse populations and sustain working ranches. Several large-scale threats facing sage-grouse are the same factors impacting the sustainability and productivity of grazing lands. Starting in 2010, NRCS began offering additional technical and financial assistance to ranchers across 11 states to reduce threats common to sage-grouse conservation and sustainable ranching. In 2010, SGI funded practices implemented on private lands and ranchers' public lands allotments mostly targeted juniper removal and several structural practices. In 2011, we increased our collaborative efforts with federal partners, particularly the Bureau of Land Management (BLM) to address sage-grouse threats but also incorporate grazing management guidelines consistent with local multi-partner strategies. NRCS provided technical and financial assistance on juniper removal and several structural practices, while BLM worked with ranchers to modifying grazing management on their allotments. This coordinated effort between BLM and NRCS demonstrates the interagency collaboration to address sage-steppe resource issues and our ability to leverage funding and technical assistance. This creates a seamless land management strategy to conserve sage-grouse and sustain ranching at the landscape scale across private and federal lands.

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### *WINTERING AND MIGRATING SHOREBIRD RESPONSES TO ENHANCEMENT EFFORTS AND UNINTENTIONAL WATER LEVEL MANIPULATIONS AT POND SF2*

**STACY MOSKAL**, USGS/SJSU, 505 Azuar Drive, Vallejo, CA, 94592, (707) 333-5327, smoskal@usgs.gov;  
Co-authors: L. Arriana Brand, John Y. Takekawa and Scott A. Shaffer

**Student Paper**

*Ecology and Management of Shorebirds*

*Wed, Feb 1, 4:05 pm*

**Abstract:** The salt ponds of the San Francisco Bay are important to large numbers of migrating and wintering shorebirds. The South Bay Salt Pond Restoration Project proposes to convert 50 to 90% of the 6100 ha of former salt ponds to tidal marsh. A major challenge is to maintain the abundance of migratory and wintering shorebirds in a smaller footprint of ponds. A possible way to maintain abundances is through pond enhancements such as island construction. During 2009-2010, Pond SF2 was enhanced by creating 30 islands and opened to tidal flow. To assess how non-breeding shorebirds responded to SF2 enhancements, we surveyed birds within 50-m gridcells weekly from October 2010 to May 2011. Preliminary results indicated that only 14% of non-breeding shorebirds observed in the pond were using the islands. However, if the pond bottom was exposed (via unintentional water level manipulations) when high tides covered the mud flats, 23% of all small shorebirds were foraging and 40% were roosting on the pond bottom. Thus, exposure of the pond bottom may be more important for non-breeding shorebirds than is the availability of islands. A second year of field observations will include a water manipulation experiment to examine this management option.

### *PLANNING FOR CLIMATE CHANGE FOR NEVADA'S KEY HABITATS AND SPECIES OF CONSERVATION PRIORITY*

**LARRY NEEL**, Nevada Dept. of Wildlife, 1100 Valley Road, Reno, NV, 89512, (775) 688-1525,  
neel@ndow.org; Co-authors: Louis Provencher, Jennifer Newmark, Jon Sjoberg, Kristen Szabo and Jock Young

*Challenges of Natural Resource Management in a Changing Climate*

*Fri, Feb 3, 11:05 am*

**Abstract:** The Nevada Department of Wildlife (NDOW) was charged with the development Nevada's Wildlife Action Plan to continue to receive federal funds through the State Wildlife Grants program. Conservation partners in the original planning process included the Nature Conservancy, Lahontan Audubon Society, and the Nevada Natural Heritage Program. The Wildlife Action Plan was approved by the U.S. Fish and Wildlife Service in 2005. NDOW and our conservation partners identified a need to develop a plan revision to address potential impacts of climate change and other emerging stressors on Nevada's fish, wildlife, and habitats. NDOW is again partnering with the original planning team, and also the Great Basin Bird Observatory to develop this climate change revision to the plan. This presentation will discuss our work with multiple stakeholders to assess key habitats and species most likely to be affected by climatic shifts. Ecological modeling and species assessments have been integrated into the development of effective strategies for managing and mitigating impacts to ensure ecosystem resiliency across the changing landscape. Primary focus will center on preventing species from being listed through the assessment of the status and needs of wildlife and their habitat and the initiation of action before critical thresholds are crossed.

### *SURVIVAL AND REPRODUCTIVE SUCCESS OF CAPTIVE-REARED AND OILED WESTERN SNOWY PLOVERS IN CENTRAL CALIFORNIA*

**KRISTINA NEUMAN**, PRBO Conservation Science, PO Box 2707, Aptos, CA, 95001, (831) 332-0631,  
kneuman@prbo.org; Co-authors: Lynne E. Stenzel and Jenny L. Erbes

*Ecology and Management of Shorebirds*

*Wed, Feb 1, 2:25 pm*

**Abstract:** We compared reproductive success and survival rates of two sample populations of snowy plovers (*Charadrius nivosus*): 1) captive-reared (2001-2010) and 2) oiled (1996-2010), with the local, wild California population. Wintering snowy plovers were oiled in two events at Ocean Beach in San Francisco, CA: the 1996 Cape Mohican spill and the 2007 Cosco Busan spill. Oiled snowy plovers were not cleaned, so we examined if

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leaving plovers oiled had a measurable negative impact on survival ( $n = 28$ ) and reproduction ( $n = 4$ ) following the spills. We also examined the post-release survival ( $n = 46$ ) and reproduction ( $n = 15$ ) of snowy plovers that were propagated from salvaged eggs, reared in captivity at the Monterey Bay Aquarium, and released onto Monterey Bay beaches. Our results will measure the costs of oiling and the conservation benefit of captive-rearing of snowy plovers and help to inform decisions about capturing oiled plovers in the event of future oil spills.

### **THE IMPACT OF RADIO COLLARS ON SURVIVAL AND BEHAVIOR OF MALE GREATER SAGE-GROUSE**

**DANIEL NONNE**, University of Nevada-Reno, 1664 North Virginia Street, Mailstop 186, Reno, NV, 89557, (302) 345-6168, dnonne@gmail.com; Co-authors: Jim S. Sedinger and Erik J. Blomberg **Student Paper**

*Ecology and Management of Upland Game Birds*

*Wed, Feb 1, 1:45 pm*

**Abstract:** Radio collars are commonly used to monitor greater sage-grouse (*Centrocercus urophasianus*). Although radio-collars are normally considered relatively benign, there has been little research done to quantify potential effect on survival and behavior of greater sage-grouse. We captured and banded male sage-grouse at 13 lek sites in Eureka Co, NV, from 2003-2011, and attached 22g necklace-style radio-collars to a subset of males. Males were recaptured during normal trapping activities, as well as resighted using color-bands while displaying on leks. This resulted in a capture-recapture dataset based on 832 unique individuals, 63 of which were fit with radio collars. We constructed a Cormack-Jolly Seber recoveries only model in Program MARK, where the presence of a radio-collar was included as a time-varying covariate for each individual. Preliminary analysis suggests evidence of a strong negative effect of radio-collars on both annual survival and presence on spring breeding grounds. We plan to increase our sample of radio-collared birds over the next year to improve survival estimates for this analysis; however these preliminary results suggest that researchers should exercise caution when using radio-collars to monitor male greater sage-grouse.

### **HABITAT CONSERVATION AND SPECIES RECOVERY IN ALAMEDA AND CONTRA COSTA COUNTIES**

**BRAD OLSON**, East Bay Regional Park District, P.O. Box 5381, Oakland, CA, 94605, (510) 544-2622, bolson@ebparks.org

*Conservation Planning and Environmental Offsets: Tools for Species Recovery?*

*Wed, Feb 1, 4:05 pm*

**Abstract:** Historically conservation planning and environmental restoration in Alameda and Contra Costa counties has been conducted using primarily local public funds and some private mitigation dollars. Public funding was primarily focused on single acquisitions with informal consideration given to habitat conservation and species recovery. More recently, coordinated efforts, such as the East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan and the East Alameda County Conservation Strategy have promoted a more comprehensive regional approach to species recovery through land acquisition, restoration and long-term conservation of natural habitats. The East Bay Regional Park District is participating in both of these conservation efforts and is implementing several acquisition and restoration projects. These include acquisition of 7,259 acres of preserve lands and development of four restoration projects in conjunction with the East Contra Costa County Habitat Conservancy and acquisition of 2,431 acres at Pleasanton Ridge Regional Park in central Alameda County in partnership with several organizations, including the Priem and Moore foundations. These projects are all contributing to the recovery of special-status species, such as the California tiger salamander, California red-legged frog, San Joaquin kit fox and Alameda whipsnake. They are also protecting critical linkages in wildlife corridors of the East Bay.

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### **NOVEL DISEASE DISCOVERY OF THE FEDERALLY ENDANGERED AMARGOSA VOLE (MICROTUS CALIFORNICUS SCIRPENSIS)**

CAITLIN OTT-CONN, Department of Veterinary Medicine and Epidemiology, UC Davis, 1320 Tupper Hall University of California, Davis, Davis, CA, 95616, (530) 754-9740, cnotconn@ucdavis.edu; Co-authors: Deana L. Clifford, Tammy Branston, Leslie Woods and Janet E. Foley

**Student Paper**

*Wildlife Diseases and Pathology*

*Fri, Feb 3, 1:25 pm*

**Abstract:** Despite being listed as endangered in California in 1980 and federally in 1984, the Amargosa vole (*Microtus californicus scirpensis*) has received little conservation or research attention, and faces high extinction risk due to low population size potentially exacerbated by habitat degradation and infectious disease. While conducting population assessments in 2010, California Department of Fish and Game biologists observed voles with swelling, necrosis, and loss of tissue associated with an orange substance present on the ears and genitalia. Disease was observed with varying severity on 61/151 (40%) captured voles; was present at multiple sampling sites; and most prevalent in high quality habitat. Examination of one carcass and three ear pinna biopsy specimens revealed ulcerative dermatitis with mites identified in the orange material associated with focal epidermal necrotic lesions. This is the first documented disease for the Amargosa vole. Currently, we are determining the mite species' identity, and reservoir. As part of a collaborative state and federal agency-academia ecological assessment we will determine the prevalence, distribution and impact of this, and other infectious diseases in the Amargosa vole population and among sympatric small mammals. Studying this novel disease will assist with the conservation and research attention needed to avoid Amargosa vole extinction.

### **THE EVOLUTION OF MITIGATION – A COMMITMENT TO CONTINUAL IMPROVEMENT**

STEPHANIE PARSONS, ESA, 2600 Capitol Avenue, Suite 200, Sacramento, CA, 95816, (916) 564-4500, sparsons@esassoc.com

*Mitigation Measures: Challenges and Realities during Project Implementation*

*Fri, Feb 3, 8:05 am*

**Abstract:** The development of biological mitigation measures that are later carried out in the field begins in the early planning stages of a project. Measures included in the environmental review document must be both feasible and effective to ensure targeted species of wildlife and associated habitat are properly protected. Mitigation written with an adaptive approach and which incorporates the field experience and lessons learned shared by biological monitors, designers/engineers, CEQA and NEPA authors, and regulatory agency staff often allows for the highest degree of species protection while still being implementable in the field. A collaborative process that includes a careful evaluation of lessons learned between those parties through the life of a project is a win for wildlife and the habitat it depends upon.

### **PACIFIC GAS AND ELECTRIC COMPANY'S SUCCESSFUL IMPLEMENTATION OF A HABITAT CONSERVATION PLAN (HCP) FOR OPERATION AND MAINTENANCE ACTIVITIES**

KAYLA PASCHAL, PG&E, 3401 Crow Canyon Rd, San Ramon, CA, 94583, (510) 332-0368, kmpm@pge.com

*Conservation Planning and Environmental Offsets: Tools for Species Recovery?*

*Wed, Feb 1, 3:45 pm*

**Abstract:** In 2008, the U. S. Fish and Wildlife Service and the California Department of Fish and Game issued a multi-species, 30-year HCP permit to PG&E for routine O&M activities to comply with federal and state Endangered Species Acts. This HCP is unique in that it primarily addresses small-scale temporary effects that are dispersed over a large geographic area. The HCP enables PG&E to conduct O&M activities in the San Joaquin Valley while minimizing, avoiding, and compensating for possible direct, indirect, and cumulative adverse effects ('disturbances') on threatened and endangered species. The permit is complex and requires tracking all ground disturbing O&M activities, implementing multiple avoidance and minimization measures and quantifying their effects. Successful implementation has required the creation of an ambitious HCP Work Management System building on elements of existing asset and environmental management systems. The effect has been to reengineer

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business systems and gradually transform corporate culture, especially where HCP-defined work activities can disturb covered species. The long-term goal is to expand the HCP coverage for PG&E's entire service area by 2013.

### **INCORPORATING THE IMPACTS OF NOISE POLLUTION INTO GREATER SAGE-GROUSE CONSERVATION PLANNING**

**GAIL PATRICELLI**, University of California, Davis, Dept. Evolution and Ecology, 2320 Storer Hall, UC Davis, Davis, CA, 95616, (530) 754-8310, GPatricelli@ucdavis.edu; Co-authors: Jessica L. Blickley and Stacie L. Hooper

#### ***Ecology and Management of Upland Game Birds***

**Wed, Feb 1, 3:25 pm**

**Abstract:** The impacts of introduced noise on wildlife have been studied less than many other consequences of human activities, but a growing body of literature suggests that noise impacts are significant and widespread. These impacts range from mild to severe, including damage to the auditory system, masking sounds important to survival and reproduction, chronic stress and the associated physiological responses, startling, interference with mating, and population declines. We will discuss the mechanisms by which noise may impact wildlife with an emphasis on the effects of noise pollution on greater sage-grouse. We will also discuss the adequacy of current noise regulations in sage-grouse habitat. Finally, we will discuss our ongoing work to develop a method for predicting the "acoustic footprint" of human activities on the landscape using NMSim, a freeware program already used by multiple federal agencies. Designation of the greater sage-grouse as a candidate species under the Endangered Species Act highlights the need to develop biologically-based noise regulations as well as tools that allow wildlife managers to incorporate the noise impacts of current and proposed anthropogenic development on sage-grouse populations.

### **SEMI-COLONIAL NESTING IN THE SNOWY PLOVER**

**ALLIE PATRICK**, Humboldt State University, 1440 Union Street, Arcata, CA, 95521, (707) 672-3909, alliepatrick@gmail.com; Co-authors: Mark A. Colwell and Wendy J. Pearson

**Student Paper**

#### ***Ecology and Management of Shorebirds***

**Wed, Feb 1, 1:25 pm**

**Abstract:** Social attraction has been shown to influence the settlement of first-time breeding Snowy Plovers (*Charadrius nivosus*) at a variety of spatial scales and the term "semi-colonial" has been used to describe their breeding dispersion. We used an 11-yr dataset to evaluate the extent to which plovers nested closer to one another than expected by chance, and how dispersion varied with population size. We also used data from individually- marked males to assess whether individuals were consistent in their proximity to other breeding plovers across years. Each year, plovers nested in distinct clusters but solitary breeding pairs were also apparent. All nests considered, 22% of nests were <100 m from the nearest breeding pair and 18% were >1000 m from the nearest breeding pair. The number of breeding plovers in our northern California study areas ranged from 19 to 63 during 2001- 2011. Nearest neighbor distance (between nests) varied little across years (with average nearest neighbor distance varying between 350 m and 2 km), with the exception of 2009, when we had a low of 19 breeding adults and the average distance between nests was 5 km.

### **NEST SUCCESS, MATE FIDELITY AND DISPERSAL IN SNOWY PLOVERS (CHARADRIUS NIVOSUS)**

**WENDY PEARSON**, Humboldt State University, 1 Harpst Street, Arcata, CA, 95521, (707) 953-2825, wjp6@humboldt.edu; Co-author: Mark A. Colwell

**Student Paper**

#### ***Ecology and Management of Shorebirds***

**Wed, Feb 1, 2:05 pm**

**Abstract:** The long breeding season and sequentially polygamous mating system of the Snowy Plover (*Charadrius nivosus*) presents an opportunity to examine breeding dispersal in association with factors that affect an individual's experience. I used nest locations of male and female Snowy Plovers breeding in northern coastal

California over a 10-year period to examine the effects of nest success, mate fidelity, residency, exclosures, and age on within- and between-season breeding dispersal distance. Within-season, females moved a median distance of 2.2 km (0.4 - 5.8) after changing mates; males moved a median of 0.9 km (0.3 - 2.5). Between-seasons, plovers moved the shortest distances when they retained a mate from the prior year and were successful in hatching eggs (males = 0.2 km [0.1 - 0.5], females = 0.3 km [0.1 - 2.3]). When mate change was coupled with nest failure in the prior year, females moved a median of 13.0 km (2.6 - 37.5) as compared to a median of 2.6 km (1.1 - 6.4) moved by males. Most plovers remained within a "site." This creates conservation challenges since breeding sites are managed by different federal, state, and local agencies with site-specific management concerns (e.g., predators, humans).

### **EMERGING PATHOGEN DISCOVERY**

**PATTY PESAVENTO**, School of Veterinary Medicine, 1 Shields Ave., Davis, CA, 95616, (530) 752-1166, papesavento@ucdavis.edu; Co-author: Leslie W. Woods

#### ***Wildlife Diseases and Pathology***

***Fri, Feb 3, 1:05 pm***

**Abstract:** An emerging infection is one that has newly appeared in the population, or one that has existed but is altered in incidence, geographic range, or character. An emerging pathogen can be a novel pathogen or a previously recognized pathogen either in a novel species, or one with enhanced virulence. In general, pathogen emergence is rare, but our manipulations and crowding of the environmental space contributes to their incidence. Collaboration among behaviorists, epidemiologists, clinicians, biologists, and/or diagnosticians is a powerful way to recognize emerging patterns of disease. Once a pattern is identified, there are many methods of discovering newly emergent pathogens. Traditional pathology, which uses light and electron microscopy to estimate tissue reaction and tropism, is vital in recognition of new diseases and ultimately in defining the association of pathogens with disease. Advances in molecular biology, refinements of DNA amplification, and the proliferation of computational power have greatly aided in pathogen. Metagenomics and/or ultradeep sequencing can tackle problems like new pathogens, polymicrobial infections, pollutant impact, or virus potentiation of the host immune system. For those of us engaged in animal and ecosystem health, our vigilance will be successful if we are attentive to all these avenues of disease and pathogen discovery.

### **BEHAVIOR OF A NEST PREDATOR: ATTRACTING AND DETERRING COMMON RAVENS AND AMERICAN CROWS**

**SARA PETERSON**, Humboldt State University, 1 Harpst St, Arcata, CA, 95521, (707) 362-0244, Sara.Peterson@humboldt.edu; Co-author: Mark A Colwell

**Student Paper**

#### ***Ecology and Management of Shorebirds***

***Wed, Feb 1, 4:45 pm***

**Abstract:** American Crows and Common Ravens are one of the leading limiting factors to the breeding success of the federally listed as threatened Western Snowy Plover. I examined corvid behavior in response to the use of effigies, a non-lethal predator control method, in the breeding habitat of the largest population of plovers within Humboldt County, CA. I used paired control and treatment plots with food to test the effectiveness of reducing corvid activity in the presence of an effigy. The data collected thus far suggests that the use of effigies reduces corvid activity in the vicinity of an effigy. This is the first scientific study to examine the effectiveness of corvid effigies in relation to Snowy Plovers. This study is still in progress and the results presented are preliminary.

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### *IDENTIFICATION OF OCCUPIED HOME RANGES USING TRAVEL DISTANCES, CHANGES IN SPEED AND FINAL SETTLEMENT OF TRANSLOCATED FISHERS (MARTES PENNANTI)*

**ROGER POWELL**, North Carolina State University, Department of Biology, North Carolina State University, Raleigh, NC, 27695, (218) 235-8808, newf@ncsu.edu; Co-author: Aaron N. Facka

*Conservation and Management of Carnivores*

*Wed, Feb 1, 1:25 pm*

**Abstract:** We hypothesized that we could identify the “ghost home ranges” (home ranges of unidentified animals) of fishers using the distances and speeds of newly translocated fishers. We tested this hypothesis on fishers that were translocated into the Northern Sierra Nevada between 2009 and 2011. We estimated the locations of fishers using satellite and ground-based telemetry following release and through the development of their home ranges. Fishers released in the first year averaged maximum movements from their release point of 10 + 6.2 SD km for females and 33 +19.3 km for males. The centers of their home ranges averaged 3.5 +1.54 km from the release point for females and 32.8 +19 km for males. Maximum moves for fishers released in the second year averaged 13.5 +4 km for females and 22.2 +19 km for males. Released females that encountered an established home range moved at an average speed of 125 +124 m/hr whereas other females averaged 42 + 44 m/hr. In contrast, females released in year 1 averaged 38 + 39 m/hr in the days following release. In support of our hypothesis we observed fishers moving through 6 home ranges that we later identified as being occupied by fishers.

### *QUANTIFYING HABITAT QUALITY AND STANDARDIZING MITIGATION IN EASTERN ALAMEDA COUNTY*

**TROY RAHMIG**, ICF International, 75 East Santa Clara Street, Suite 300, San Jose, CA, 95113, (408) 216-2814, trahmig@icfi.com

*Conservation Planning and Environmental Offsets: Tools for Species Recovery?*

*Wed, Feb 1, 3:25 pm*

**Abstract:** The East Alameda County Conservation Strategy was developed by nine local jurisdictions and state and federal regulatory agencies. The purpose of this strategy was to create conservation goals and objectives for 15 focal species and all natural communities in the 270,000 acre study area. Two primary tools were developed to ensure that future species habitat losses are appropriately mitigated in terms of habitat quality and location. First, a simple habitat quality scoring system was developed for the 15 focal species. This scoring system is used at project impact sites and proposed mitigation sites. By comparing the habitat quality scores of the impact site and the mitigation site interested parties can determine whether a species impact is being functionally mitigated. A mitigation adjustment factor was developed that rewards project proponents for mitigating in higher quality habitat by allowing for less total mitigation acreage. Second, standardized mitigation ratios were developed to provide incentives for mitigation to occur in areas that are more important to species recovery than areas being lost. The end result is a process by which interested parties can be sure that mitigation lands fully mitigate project impacts and can aid in species recovery.

### *FACTORS INFLUENCING THE DISTRIBUTION AND ABUNDANCE OF SHOREBIRDS IN MANAGED WETLANDS OF THE SACRAMENTO VALLEY, CALIFORNIA*

**MATTHEW REITER**, PRBO Conservation Science, P.O. Box 747, Pescadero, CA, 94060, (760) 417-9997, mreiter@prbo.org; Co-authors: Catherine Hickey, Mike Wolder, Jennifer Isola, Mike Carpenter and Joe Silveira

*Ecology and Management of Waterfowl and Wetlands*

*Thu, Feb 2, 3:05 pm*

**Abstract:** The spatial distribution of wintering shorebirds in the Sacramento Valley of California is largely influenced by the distribution of flooded post-harvest rice and managed wetlands. Successful management of these habitats is important to meet shorebird population objectives and requires understanding the factors driving shorebird occurrence. On managed wetlands shorebird habitat management occurs at a fairly localized spatial scale (<1 - 2 km). The effectiveness of these management actions to attract shorebirds is largely unknown but

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may vary due to annual variation in the availability of habitat in the surrounding landscape. We employed long-term shorebird monitoring data from six refuges on the Sacramento Valley National Wildlife Refuge Complex in hierarchical regression models to evaluate factors from multiple spatial scales influencing the abundance of shorebirds using the managed wetlands in early winter (November - December) between 2000 and 2010. We considered multiple variables and used classified satellite images to estimate the total amount of flooded rice and other wetlands surrounding each wetland unit. Our results provide guidance for wetland managers when evaluating the effectiveness of their management actions for shorebirds, as well as a predictive model set that can be used in an adaptive management framework.

### PREVALENCE OF TRICHOMONAS GALLINAE IN CALIFORNIA BAND-TAILED PIGEONS AND THE POTENTIAL IMPACTS ON POPULATION HEALTH: A PRELIMINARY ANALYSIS

**KRYSTA ROGERS**, California Department of Fish and Game, 1701 Nimbus Road, Suite D, Rancho Cordova, CA, 95670, (916) 358-1662, krogers@dfg.ca.gov; Co-authors: Yvette A. Girard, Nadira Chouicha and Christine Kreuder Johnson

#### *Wildlife Diseases and Pathology*

*Fri, Feb 3, 2:25 pm*

**Abstract:** Band-tailed pigeons range from southern Alaska to South America, with two subspecies occurring in the United States. Over the past 40 years, band-tailed pigeon populations have been declining throughout their range. Reasons for this decline may include habitat loss, fluctuations in food availability, and low reproductive rate. The impact these factors have on band-tailed pigeons may be complicated by Trichomoniasis, a disease caused by the protozoan *Trichomonas gallinae*. In California, Trichomonas-related mortality events have been documented since the late 1980's where hundreds to thousands of pigeons die in a single event in a given year. Our research was undertaken to evaluate the significance of this disease by establishing prevalence and genetically differentiating between strains recovered from band-tailed pigeons. Oral swabs were collected from pigeons between June and October 2011 and inoculated into an InPouch TFTM culture kit (BioMed Diagnostics, White City, OR, USA) for the detection of *T. gallinae*. Samples include live-trapped (n = 80) and hunter-harvest (n = 9) pigeons from 8 counties; live pigeons (n = 38) held at wildlife rehabilitation centers from 4 counties; and pigeons (n = 16) submitted for necropsy from 8 counties. InPouch™-positive samples include 1 live-trapped pigeon (1/80; 1%) and 5 live pigeons sampled at rehabilitation centers (5/32; 16%). Sixty-eight percent (11/16) of the pigeons submitted for necropsy were test-positive for trichomonad parasites including 89% (8/9) of adults and 43% (3/7) of juveniles. Preliminary analysis indicates that in addition to the large-scale Trichomonas-related die-offs, band-tailed pigeon populations also suffer from a relatively persistent loss of individuals from the population throughout the year due to infection with *T. gallinae*.

### WHAT WE KNOW SO FAR ABOUT THE SECOND SIERRA NEVADA RED FOX POPULATION

**BEN SACKS**, UC Davis, Canid Diversity and Conservation Unit, VGL, One Shields Ave/Old Davis Rd, Davis, CA, 95616, (530) 754-9088, bnsacks@ucdavis.edu; Co-authors: Mark Statham, Chris Stermer, Jocelyn Akins, Preston Alden, Cate Brown, Adam Rich, Sherri Lisius and Esther Burkett

#### *Conservation and Management of Carnivores*

*Wed, Feb 1, 4:25 pm*

**Abstract:** Most native red foxes (*Vulpes vulpes*) in the western contiguous United States are restricted to the highest elevations in major mountain ranges. Along the Pacific Crest, these mountain red foxes have declined in abundance over the past several decades. This talk addresses the most endangered subspecies, the Sierra Nevada red fox (*V. v. necator*), which occurred historically throughout the high elevations of California's Sierra Nevada and southern Cascade Mountains (including Oregon), but declined precipitously during the late 1900s. This subspecies' status is unknown in Oregon and currently occurs in two known isolated remnant populations in California: the "Lassen population," estimated at <20 breeding individuals, and >100 km to the south, the "Sonora Pass" population, thought extirpated until August 2010, when a red fox was photographed there and genetically confirmed to be native. Since this rediscovery, we have conducted follow-up snow-tracking, camera surveys, and noninvasive genetic sampling of this population to better assess its size and extent. Preliminary findings are

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presented, including minimum numbers of individuals, range extent, spatial relations to coyotes, and genetic and resampling indicators of population size. Implications are discussed in the context of continuing research, hurdles, and conservation concerns.

### **HABITAT USE BY LONG-BILLED CURLEWS IN CALIFORNIA'S CENTRAL VALLEY USING SATELLITE TELEMTRY**

**KRISTIN SESSER**, Humboldt State University, 1017 4th Street, Woodland, CA, 95695, (707) 695-3583, kristinsesser@gmail.com; Co-authors: Mark A. Colwell, Nils D. Warnock, Gary W. Page, T. Lee Tibbitts

*Ecology and Management of Waterfowl and Wetlands*

*Thu, Feb 2, 2:05 pm*

**Abstract:** A significant number of the world's population of Long-billed Curlews winter in California's Central Valley amidst a variety of human-altered habitats. We studied the non-breeding habitat use of 10 (5 male, 5 female) Long-billed Curlews over three years using satellite telemetry. Individual curlews varied in their use of space and corresponding habitat use. Curlews were site faithful to a general area, but use of individual fields within that area changed by season and year. Male curlews exhibited stronger site fidelity than females. We used resource utilization functions to examine variation in individual habitat use during diurnal and nocturnal periods. Curlews used a variety of agricultural habitats, including alfalfa, rice, and irrigated pasture. Within individual home ranges, females concentrated their use in some habitats, whereas males used all habitats within their home range equally. During the day, female curlews used alfalfa more than other available crop types within their home range while at night they used alfalfa and short field crops more than other available crop types. Most curlews also used areas of lower road density during the day than at night. Long-billed Curlews are highly dependent on agriculture and understanding how they use this resource will be important in this dynamic landscape.

### **BANK SWALLOW POPULATION AND HABITAT STATUS- DECLINING TRENDS ON THE MIDDLE SACRAMENTO RIVER**

**JOSEPH SILVEIRA**, U.S. Fish & Wildlife Service, 752 County Road 99 W, Willows, CA, 95988, (530) 934-2801, joe\_silveira@fws.gov; Co-authors: Jennifer E. Isola, Neil M. Carpenter, Michael A. Wolder, Adam W. Henderson and Gregory H. Golet

*Conservation and Management of Songbirds*

*Thu, Feb 2, 3:05 pm*

**Abstract:** The Bank Swallow (*Riparia riparia*), BANS, is a colonial-nesting State Threatened species and focal and indicator species for riparian floodplain conservation planning and modeling initiatives. Most known colonies occur on the eroding banks of the Sacramento and Feather Rivers. The cooperative BANS colony survey is conducted annually, in early June, by the U.S. Fish and Wildlife Service, California Department of Water Resources and California Department of Fish and Game. Total burrows on the middle Sacramento River (Red Bluff to Colusa) have fluctuated since 1999, from 19,170 in 2001 to 10,662 in 2010, indicating a declining population trend. Recently, burrows declined 34.4% from 2009 to 2010, and then increased 9.8% in 2011. The three-year average for the 2010 (2008–2010) and 2011 (2009–2011) surveys resulted in 13.5% and 13.3% reduction in burrows, respectively. The single largest factor in declining BANS colony populations is river bank stabilization (i.e., agency rip-rap armament and private rock and rubble). Surveys by the California Department of Water Resources Northern Region Office show nearly 45% of the eroding banks of the middle Sacramento River have been armored. Modeling indicates that removing bank armor is necessary to prevent extirpation of the BANS on the middle Sacramento River.

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### **EFFECTS OF DIET COMPOSITION ON HOME RANGE SIZE IN FISHERS IN CALIFORNIA**

**KEITH SLAUSON**, Pacific Southwest Research Station, 1700 Bayview Drive, Arcata, CA, 95521, (707) 825-2931, kslauson@fs.fed.us; Co-author: William J. Zielinski

*Conservation and Management of Carnivores*

*Wed, Feb 1, 1:05 pm*

**Abstract:** Carnivores must establish and defend home ranges that provide sufficient habitat to support their annual prey requirements. Key prey species can have disproportionate effects on foraging behavior and space use during seasonal periods of prey scarcity. For species like the fisher (*Martes pennanti*), where foraging behavior cannot be directly observed, fine scale foraging and diet characterization is best achieved by reconstructing diet from the contents of feces. To evaluate the hypothesis that key prey species affect fisher home range size in California we first characterized the diet of the fisher populations from two regions of California, using 242 scats collected in coastal northwestern California and 214 scats from the southern Sierra Nevada. We then compared these results to those from the 5 other diet studies of fishers in California to characterize the frequency, biomass, and relative importance of major prey species. Finally, we evaluated the extent to which variation in key prey species in the diets of fishers explained variation in home range sizes estimated in the populations where both home ranges and diets have been characterized.

### **EFFECTS OF FUELS TREATMENTS AND THINNING ON PACIFIC MARTENS IN THE SOUTHERN CASCADES OF CALIFORNIA: PRE-TREATMENT RESULTS**

**KEITH SLAUSON**, Pacific Southwest Research Station, 1700 Bayview Drive, Arcata, CA, 95521, (707) 825-2931, kslauson@fs.fed.us; Co-author: William J. Zielinski

*Conservation and Management of Carnivores*

*Wed, Feb 1, 2:25 pm*

**Abstract:** The objective of this study is to determine whether and how fuels treatments and thinning affect Pacific martens (*Martes caurina*) and their key winter prey species. We will compare marten use of 3 study areas before and after treatments, and report here the pre-treatment results (2008 – 2011). We evaluated summer habitat use by the locations of scats detected by dogs and winter habitat use by recording tracks in snow. Hair snares were also used in winter to collect DNA samples to identify individuals for the purpose of estimating population size and spatial distributions. Scat detector dogs systematically sampled each study area in September, resulting in the collection of a total of >1,000 scats; 115 in the High Grouse, 290 in the Hoffman and > 700 in the Pumice study areas. In winter, marten trails were backtracked on 141 occasions and 42 scats were collected. Snow tracking and the results of scat analysis highlight the importance of snowshoe hare (*Lepus americanus*) and Douglas squirrel (*Tamiasciurus douglasii*) in the winter diet and close association of these species, and marten foraging behavior, to complex physical structure (large logs and live branches of small diameters conifers) near the snow surface.

### **THE WHOLE ENCHILADA**

**TODD SLOAT**, Fall River Resource Conservation District, P.O. Box 83, McArthur, CA, 96056, (530) 336-5456, tsloat@citlink.net; Co-authors: Kit Mullen and Jonathan Kusel

*Renewable Energy and Wildlife Conservation*

*Fri, Feb 3, 2:25 pm*

**Abstract:** A new large scale collaborative is applying the community forest model and a collaborative, all-lands management approach to reduce risk of catastrophic fire and restore the land, use renewable energy (i.e. biomass) and develop a restoration economy that creates jobs and improve local communities. The collaborative is known as the Burney Hat Creek Community Forest and Watershed Group, involving a diverse stakeholder group, focused on two watersheds. Strong private partnerships have been developed as well as partnerships between the federal and state land managers to reduce conflict and litigation and advance long- and short-term goals focused on restoration of 70,000 acres of forest structure and 4,000 acres of meadow. Initial modeling has estimated a total of 950,000 ccf tons of biomass can be removed which would be used by local mills to generate energy, and

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reduce the high risk of catastrophic wildfire by 37% while adding over 200 jobs over a ten year period. Restoration will improve habitat and improve conditions for wildlife species such as the spotted owl, northern goshawk, and native rainbow trout. A multiparty monitoring program is being developed not only to assess wildlife benefits but also water-related benefits to forest and meadow restoration, and socioeconomic impacts.

### **MEADOW RESTORATION IN THE UPPER PIT RIVER REGION: LESSONS LEARNED, BARRIERS, AND NOVEL, LARGE-SCALE PROJECTS**

**TODD SLOAT**, Fall River and Pit Resource Conservation District, P.O. Box 83, McArthur, CA, 96056, (530) 336-5456, [tsloat@citlink.net](mailto:tsloat@citlink.net)

***Conservation Planning and Environmental Offsets: Tools for Species Recovery?*** **Wed, Feb 1, 2:05 pm**

**Abstract:** Like many meadows throughout the Sierras and Cascades, those in the upper Pit River region are dysfunctional for a multitude of reasons. Fortunately, many of these meadows can be restored, and with new statewide and regional emphasis on ecological restoration and all-lands management, the combination of interest and funding has this region poised to implement numerous large and unique projects. Nevertheless, many barriers threaten the pace of restoration such as economics, lack of information, philosophical differences, permitting processes, and lack of planning funds. However, in the resolution of these barriers lies the potential for unique opportunities. Understanding the causes of degradation and general geomorphology principles such as entrenchment creates an environment that fosters successful projects as well as builds a diverse group of partners working toward a common goal. Several meadow restoration projects, some implemented, others in various planning stages, will be discussed to demonstrate successful large-scale meadow restoration conservation planning and implementation.

### **WIND, WINGS, AND WILDERNESS—DECISION SUPPORT FOR MINIMIZING ECOLOGICAL IMPACTS OF WIND ENERGY DEVELOPMENT IN THE SOUTHERN SIERRA AND TEHACHAPIS**

**JERRE STALLCUP**, Conservation Biology Institute, 1216 Leisure Lane, Frazier Park, CA, 93225, (760) 634-1590, [jastallcup@consbio.org](mailto:jastallcup@consbio.org); Co-authors: Susan Antenen, Wayne D. Spencer, Nancy L. Staus, Allison Anderson and James R. Stritholt

***Renewable Energy and Wildlife Conservation*** **Fri, Feb 3, 1:25 pm**

**Abstract:** The Tehachapi Wind Resource Area has been identified as the priority wind area for achieving California's 33% renewable energy goal by 2020. Currently, wind projects are evaluated on a project-by-project basis, without regard to regional impacts. However, new federal guidelines recommend landscape-scale screening in evaluating potential cumulative effects on landscape connectivity and population-scale impacts to both terrestrial and volant species. CBI is working with public land managers to develop a science-based regional planning framework that will facilitate decision-making on siting of wind energy facilities. I will present our approach for developing a spatially-explicit and transparent decision-support tool to characterize areas where wind energy development presents low, medium, and high potential for conflict with vulnerable species and habitats. CBI will also develop a spatially explicit web-based tool that will allow users to analyze potential impacts of development footprints on mapped conservation values. The objectives are to (1) work with public land managers and permitting agencies to develop a science-based regional conservation strategy for increasing wind-energy development compatibility with conservation of ecological values, and (2) institute more transparent criteria and approaches for permitting of wind energy applications, as well as conservation of areas and ecosystem functions critical to long-term ecological resilience.

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### **TRENDS IN WINTER SHOREBIRD ABUNDANCE ON A CENTRAL CALIFORNIA ESTUARY OVER A FORTY YEAR PERIOD**

LYNNE STENZEL, PRBO Conservation Science, 3820 Cypress Drive, Suite 11, Petaluma, CA, 94954, lstenzel@prbo.org; Co-authors: Gary W. Page and Matthew E. Reiter

#### ***Ecology and Management of Shorebirds***

***Wed, Feb 1, 3:45 pm***

**Abstract:** We examined long-term changes in the abundance of shorebirds on 445 ha Bolinas Lagoon, Marin County, California. We conducted comprehensive censuses of Bolinas Lagoon for shorebirds from 1971-1994, for other waterbirds from 1972-1993, and for all waterbirds from 1998 to 2011. Numbers of few species were stable over the 40 years. Dunlin, the most common shorebird in the early years of monitoring, declined precipitously in the later years. Several species of larger shorebird: American Avocet, Whimbrel, Long-billed Curlew and Marbled Godwit increased over the same period. We will discuss these changes in the context of changes in waterbird composition at the site, changes in the physical characteristics of the estuary, and auxiliary information from other sites in the Pacific Flyway.

### **PIKAS IN THE HOT ZONE: SURVEYS AT THE RANGE PERIPHERY**

JOSEPH STEWART, California Department of Fish and Game, 1701 Nimbus Road, Rancho Cordova, CA, 95670, joaaelst@gmail.com; Co-author: David H. Wright

**Student Paper**

#### ***Challenges of Natural Resource Management in a Changing Climate***

***Fri, Feb 3, 9:05 am***

**Abstract:** The American Pika (*Ochotona princeps*) has been flagged as a bellwether of climate warming and petitioned for listing under the California Endangered Species Act. Data from the Great Basin suggest that recent population extirpations and upslope range contractions are the result of warming temperatures. Whether the species range has contracted upslope outside of the Great Basin has remained unclear. In 2009 and 2010 we resurveyed historic pika record locations in the northern Sierra Nevada and found that pikas persisted at, or near, most record locations. We did not detect a significant upslope range contraction, but did find a significant habitat size effect. In 2011, we conducted an additional 75 surveys for pikas, concentrating survey effort near the lower elevation limit for the species. In most regions surveyed we found relict pika fecal pellets at lower elevations than extant pikas. Additionally, we launched two pilot studies to validate or refute research method assumptions; (1) that a single temperature sensor can be used to characterize the temperature of a talus field, and (2) that "perched" pika fecal pellets (those that rest above the angle of repose via adherence) are indicative of current year pika occupancy. Data suggest that both hypotheses are false.

### **BAT DIVERSITY AND MANAGEMENT AT MARINE CORPS BASE CAMP PENDLETON**

DREW STOKES, San Diego Natural History Museum, P.O. Box 121390, San Diego, CA, 92112-1390, (619) 255-0293, dstokes@sdnhm.org; Co-author: JAMES ASMUS (presenting)

#### ***Ecology and Management of Wildlife on Military Lands***

***Thu, Feb 2, 3:05 pm***

**Abstract:** Marine Corps Base Camp Pendleton provides important coastal habitats for bats in southern California. A recent basewide survey detected up to 13 bat species. Surveyors documented a group of about 30 pallid bats, which included a breeding female, night roosting within 3 miles of the ocean; this is a rare observation in coastal southern California due to the abundance of human development. Future survey efforts may include radio tagging to the maternity roost for pallid bats on base. A biologist from base resolves wildlife conflicts of bats living in buildings by performing humane exclusion outside of the pupping season. Vegetation and habitat management projects on Camp Pendleton that provide benefits for bats include restoration of native vegetation communities, guzzler maintenance, bat box installation, and moist soil management in water percolation ponds.

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### **BUILDING REGIONAL SHOREBIRD CONSERVATION FROM THE FARM LEVEL**

**KHARA STRUM**, PRBO Conservation Science, 3820 Cypress Drive #11, Petaluma, CA, 94954, ,  
kstrum@prbo.org; Co-authors: C. Alex Hartman, Monica Iglecia, Rodd Kelsey, Catherine Hickey and Matthew  
E. Reiter

*Ecology and Management of Waterfowl and Wetlands*

*Thu, Feb 2, 4:05 pm*

**Abstract:** Over 90% of natural wetland habitat has been lost in California's Sacramento Valley yet this region still supports 42% of all shorebirds wintering in the Central Valley. One reason for the abundance of shorebirds is winter flooded rice fields, which provide 85% of available flooded habitat in the region and are used by 13 species of shorebirds. In collaboration with the rice industry and rice growers, we developed a suite of innovative practices, compatible with productive rice farming, to enhance the habitat value of post-harvest rice fields for wintering and migrating shorebirds. To evaluate the conservation benefits of these practices, we initiated a 7-year research plan in 2009. Our partnership with the rice industry and rice growing community led to an opportunity to integrate the newly developed shorebird-friendly rice field management practices in an NRCS pilot incentive program and further shorebird conservation in California's Central Valley.

### **EFFECTS OF PREDATION RISK ON INCUBATION BEHAVIOR IN WATERFOWL**

**MONICA STUPACZUK**, Department of Wildlife, Fish, and Conservation Biology, University of California, Davis, Davis, CA, 95616, (714) 916-1829, mjstupaczuk@ucdavis.edu; Co-authors: Kevin M. Ringelman and John M. Eadie

**Student Paper**

*Ecology and Management of Waterfowl and Wetlands*

*Thu, Feb 2, 1:05 pm*

**Abstract:** Females must make tradeoffs in investing in either current or future offspring. By studying incubation behavior we can measure female investment. Predation risk may alter female investment in current offspring by reducing expected benefits. To assess the effects of both direct and indirect predation risk on incubation behavior in waterfowl we analyze data collected from iButton temperature loggers. iButtons were placed in the nests of female Mallards (*Anas platyrhynchos*) and Gadwalls (*Anas strepera*) on Grizzly Island in California's Suisan Marsh in the spring of 2009 and 2010. To address how females respond to direct evidence of predation, we compare the frequency and duration of off-bouts from the nest before and after partial depredations. To address how incubating females respond to broad scale predation risk, we compare the frequency and duration of off-bouts in high and low predation fields.

### **RESTORATION SITE SELECTION: CONSIDERATIONS TO MAXIMIZE THE SUSTAINABILITY OF RESTORATION AND MEET SPECIES RECOVERY GOALS**

**GREG SUTTER**, Westervelt Ecological Services, 600 North Market Blvd., Ste. 3, Sacramento, CA, 95834, (916) 646-3644, gsutter@westervelt.com; Co-author: Greg DeYoung

*Conservation Planning and Environmental Offsets: Tools for Species Recovery?*

*Wed, Feb 1, 1:05 pm*

**Abstract:** The success of restoration projects requires properties that are linked to conservation core areas and corridors, that have the physical capacity for the re-establishment or repair of natural processes, and that contribute to regional biodiversity goals. However, the sustainability of these projects also requires careful consideration of other factors in site selection, including real estate restrictions, political priorities, regulatory constraints, and surrounding land uses. These constraints may be the most difficult to overcome of all the factors in site selection. Yet, they should be considered in any long-term recovery strategy.

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### TRANSLOCATION OF CALIFORNIA RED-LEGGED FROG (*RANA DRAYTONII*)

**PATRICIA TATARIAN**, Wildlife Research Associates, 1119 Burbank Avenue, Santa Rosa, CA, 95407, trish@wildliferesearchassoc.com; Co-authors: Thomas Newcomb, Bert Mulcahey, Jose Setka and Jessica Purificato

*Conservation of Amphibians and Reptiles*

*Fri, Feb 3, 1:45 pm*

**Abstract:** We translocated 28 California red-legged frogs (*Rana draytonii*) (CRF) during two separate East Bay Municipal Utility District dam improvement projects between February and September, 2008. The translocation was approved by the U.S. Fish and Wildlife Service under the Biological Opinions for the San Pablo Dam seismic retrofit project and the Upper San Leandro Dam spillway restoration project. In both cases CRFs were relocated from the permanent wetlands located directly below the dam spillway structure. All individuals were PIT tagged and 15 individuals were radio-transmitted. Weekly locations of individuals with radio transmitters were recorded using GPS and some individuals were recaptured and the transmitter attachment verified. As part of an on-going radio-telemetry study, individuals were captured in subsequent months. Nine frogs, five female and four males, were translocated 3.5 kilometers from the USL spillway to a stock pond with an existing CRLF population. Twelve frogs, six males, two females and four juveniles, were translocated from the San Pablo project area to one of three watershed stock ponds 2.6-5 kilometers from the spillway. Of the 15 CRF translocated, one was believed to have been predated on, two shed their transmitters and were never recaptured, and one shed its transmitter, but was recaptured one year later at the translocation pond. Ten frogs remained at the ponds between 15 and 396 days after translocation.

### CALIFORNIA'S AMPHIBIAN AND REPTILE SPECIES OF SPECIAL CONCERN

**ROBERT THOMSON**, Center for Population Biology, University of California, One Shields Avenue, Davis, CA, 95616, rcthomson@ucdavis.edu; Co-authors: **AMBER N. WRIGHT (presenting)** and H. Bradley Shaffer

*Conservation of Amphibians and Reptiles*

*Fri, Feb 3, 4:05 pm*

**Abstract:** The Amphibian and Reptile Species of Special Concern (ARSSC) document plays an important role in management and conservation planning for California's native herpetofauna. We updated the 1994 ARSSC document in collaboration with the California Department of Fish and Game (CDFG). Working with a Technical Advisory Committee, we determined that 74 of California's 218 taxa warranted evaluation for ARSSC status. We evaluated taxa based on metrics designed to capture the geography of declines, changes in population biology over time, key ecological attributes associated with risk, and estimates of future impacts. We solicited feedback on our initial assessments over a 60 day public comment period, during which our website was viewed by over 800 people. Forty-six taxa met our criteria for inclusion as ARSSC. Thirty-five taxa retained ARSSC status, 11 are new, and 15 are no longer considered ARSSC. Frogs and toads ranked highest in conservation concern, followed closely by turtles. Taxa that rely on aquatic habitats ranked higher than terrestrial taxa. Southern ecoregions tended to have more ARSSC taxa than northern ecoregions. The draft final ARSSC document including peer-reviewed species accounts and range maps is currently under review by CDFG and others.

### DEVELOPMENT OF AN AMPHIBIAN AND REPTILE CONSERVATION AND MANAGEMENT STRATEGY IN CALIFORNIA

**BRIAN TODD**, University of California, Davis, One Shields Ave., Davis, CA, 95616, (530) 752-1140, btodd@ucdavis.edu; Co-authors: Betsy Bolster and Aaron Lotz

*Conservation of Amphibians and Reptiles*

*Fri, Feb 3, 3:25 pm*

**Abstract:** California has a rich assemblage of native amphibians and reptiles. More than half of the state's amphibian species have special status (53%) and a similar proportion of reptiles fall into this category (39%). Many species that do not have formal status receive little or no management attention and the laws and policies regarding many special status species are often complex or could be more easily discerned. Additionally, both

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common and special status species face daunting management challenges that may include climate change, habitat loss, diseases, introduced species, environmental contamination, or unsustainable take. Given these concerns, there is an urgent need to evaluate the current management framework for these taxa in California and to develop a more comprehensive management strategy to guide future conservation decisions. We also plan to review existing management and regulatory code to evaluate possible areas for improvement. Here, we provide an overview of the proposed process for the development of this management and conservation strategy and solicit input from interested parties and participants.

### SALMON POISONING DISEASE IN TROUT IN THE LASSEN NATIONAL FOREST

**RICHARD TODOROFF**, Department of Wildlife, Humboldt State University, PO Box 4508, Arcata, ca, 95518, (707) 822-1173, richard.todoroff@humboldt.edu; Co-authors: Tom Rickman and Richard N. Brown

*Wildlife Diseases and Pathology*

*Fri, Feb 3, 2:05 pm*

**Abstract:** Salmon poisoning disease is a fatal illness of canids caused by the bacterium *Neorickettsia helminthoeca*. A complex cycle involving the snail *Juga (Oxytrema) silicula*, the fluke *Nanophyetus salmincola*, and salmonid fish intermediate hosts supports pathogen persistence, but the fluke metacercariae and the pathogen are carried in infected fish which may migrate or be translocated outside the endemic range of the snail. The Lassen National Forest is outside the published range of natural cycles, but anecdotal reports of salmon poisoning disease in local pet dogs and concern for the threatened Sierra Nevada red fox prompted this investigation. A cross-sectional prevalence study was done in which we sampled 333 trout from 8 sites within the Lassen National Forest. Microscopy was used to assess the presence of *Nanophyetus* metacercariae in kidney halves of 133 of the larger fish, and metacercariae of *Nanophyetus salmincola* found in 80 (59.7%) of these samples provide presumptive evidence that *Neorickettsia* occurs in these watersheds. Polymerase chain reactions are being used to detect and characterize the neorickettsial infection status of all fish.

### SHARING THE BAY: CAN WATERBIRDS AND TRAIL USERS COEXIST?

**LYNNE TRULIO**, San Jose State University, One Washington Square, San Jose, CA, 95192-0115, (408) 924-5445, lynne.trulio@sjsu.edu; Co-authors: Jana Sokale, Heather White, Caitlin Robinson-Nilsen and Kevin Lafferty

*Ecology and Management of Shorebirds*

*Wed, Feb 1, 4:25 pm*

**Abstract:** Waterbirds face many challenges--for example, pollution and climate change--in their nesting and over-wintering environments. Around the San Francisco Bay, waterside trails are very popular with the public and tourists, but these trails could be another stressor in birds' lives. Of concern are migratory shorebirds and waterfowl that spend the winter foraging in ponds and tidal wetlands located adjacent to trails. In addition, the snowy plover, a threatened shorebird that nests in dry ponds at the edge of the San Francisco Bay, needs protection from disturbance during the sensitive breeding season. We conducted studies investigating the effect of trail use on waterbirds and found the response of birds is both species and situation dependent. For example, we found the abundance, species richness and proportion of foraging migratory shorebirds showed little difference between sites adjacent to existing trails versus non-trail sites. However, both nesting snowy plovers and migratory waterfowl reacted strongly when exposed to new trail use. Factors in birds' responses are considered. Findings from this research are meant to provide managers with tools to design waterside trails that can protect birds from trail use disturbances while allowing people to enjoy the beauty of the wetlands.

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### **DISCONTINUOUS HABITAT OCCUPANCY BY SENSITIVE MAMMALS IN THE SOUTHERN SAN JOAQUIN VALLEY**

**CHRISTINE VAN HORN JOB**, CSU-Stanislaus, End. Spp. Rec. Prog., P.O. Box 9622, Bakersfield, CA, 93389, (661) 835-7810, cvanhornjob@esrp.csustan.edu; Co-authors: Brian L. Cypher, Craig M. Fiebler, Scott E. Phillips, Erin N. Tennant, Tory L. Westall and Alexandra Y. Madrid

**Large Mammal and Big Game Ecology and Management**

**Fri, Feb 3, 10:05 am**

**Abstract:** Numerous sensitive species occur in the southern San Joaquin Valley of California. These species are primarily relegated to the edges of the valley where most remaining habitat occurs. A common assumption is that this habitat is occupied and supports populations of most species. During 2008-2010, we had an opportunity to conduct surveys for sensitive mammal species in much of the remaining habitat that rims the southern end of the valley. These included lands owned by oil companies and BLM in southwest, The Wildlands Conservancy in the south, and Tejon Ranch in the southeast. San Joaquin kit foxes (*Vulpes macrotis mutica*) were common in the southwest, not detected in the south, and rarely detected in the southeast. Giant kangaroo rats (*Dipodomys ingens*) were occasionally detected in the southwest, and not detected in the south or southeast. San Joaquin antelope squirrels (*Ammospermophilus nelsoni*) were common in the southwest, detected in one location in the south, and not detected in the southeast. Other species of concern exhibited similar distributional patterns. Observed patterns are likely a function of habitat conditions and habitat connectivity. Consequently, populations of sensitive species may be more limited than expected and increased protections for occupied habitat are warranted.

### **USING ENVIRONMENTAL CLUSTERING TO EXAMINE THE POTENTIAL REGIONAL EFFECTS OF CLIMATE CHANGE ON BIRDS ON MILITARY LANDS IN CALIFORNIA**

**SAM VELOZ**, PRBO Conservation Science, 3820 Cypress Dr. #11, Petaluma, CA, 94954, sveloz@prbo.org; Co-authors: Dennis Jongsomjit and John Wiens

**Challenges of Natural Resource Management in a Changing Climate**

**Fri, Feb 3, 10:45 am**

**Abstract:** Western states are characterized by huge environmental diversity. This is especially true of California, where conditions range from cool, wet coastal forests to blisteringly hot and dry deserts. Using species-distribution models to project the potential impacts of climate change in the face of such variety is challenging. As part of a study of the effects of future climate change on bird species on military lands in California, we used hierarchical clustering algorithms to group installations according to (1) current and projected future environmental conditions, and (2) current and projected future bird-community composition. Clearly defined clusters of installations emerged in both analyses. The assignment of installations to clusters differed somewhat between the environmental and the bird-community clusterings, and shifts of some installations in the future projections suggested that desert conditions are likely to become more widespread in the future in terms of bird communities. The clustering together of installations based on current and future environments and bird communities suggests that similar approaches to environmental management might be undertaken on those installations, arguing for greater collaboration among installations and military branches.

### **THE REALITIES OF COMPLIANCE ENFORCEMENT**

**JON WAGGONER**, AECOM, 2020 L Street, Suite 400, Sacramento, CA, 95811, (916) 414-5863, Jon.Waggoner@aecom.com

**Mitigation Measures: Challenges and Realities during Project Implementation**

**Fri, Feb 3, 10:05 am**

**Abstract:** Compliance monitoring is an important component of a project's environmental commitments. Monitors can provide additional assurance for the agencies that measures are being followed. They can help owners make informed decisions and provide a line of communication between all parties. Most importantly, they document actions that occur on the project site and provide documentation of mitigation compliance. One would

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think that monitoring would be fairly straightforward; after all there was a large investment of time producing the environmental documents and obtaining all of the required permits. The goal is to protect important natural resources. Commitments should be clearly spelled out and relatively easy to implement. Is this really the case? This presentation will focus on the role of the biological field monitor. Monitors often encounter many of the same difficulties that law enforcement professionals have in keeping the peace. You are the “cop” to some and the “protector” to others. The rules never seem as clear once you are out on the “street” and to get work done you have to be part of the “team.” We’ll look at how these difficulties can be overcome as well as how situations might be improved upon.

### **RESOURCE SUBSIDIES TO RIPARIAN SONGBIRDS: USING COMPOUND-SPECIFIC STABLE ISOTOPE RATIOS TO CHARACTERIZE DIET IN TREE SWALLOWS**

**ROBERT WALSH**, University of California, Davis, Dept. WFCB, Academic Surge Bldg., 1 Shields Avenue, Davis, CA, 95616, (661) 993-7569, rgwalsh@ucdavis.edu

**Student Paper**

*Conservation and Management of Songbirds*

*Thu, Feb 2, 2:25 pm*

**Abstract:** In riparian ecosystems, many songbirds rely on aquatic food resources. Emergent aquatic insects, in particular, provide a key nutritional subsidy to birds. In studies of Tree Swallows, we have found aquatic insect prey consumption in birds nesting up to a half-kilometer away from water, and these insects may comprise the majority of the diet for birds nesting close to streams. Apart from direct sampling of prey items, we have used stable isotope ratios of essential amino acids to characterize the diet of swallows. This non-invasive approach reveals the ultimate source of protein--aquatic or terrestrial--from which birds build their tissues. The methods we present are applicable to studying the diet of other species of birds. By understanding the timing and magnitude of aquatic insect use by riparian songbirds, it may be possible to better anticipate how changes in hydrologic regimes, pesticide use, or land cover will affect birds via changes to the aquatic insect prey base.

### **COST-EFFECTIVE WETLAND MANAGEMENT: EXPERIMENTAL EVALUATION OF MOIST-SOIL MANAGEMENT TECHNIQUES IN THE CENTRAL VALLEY**

**NATALIE WASHBURN**, UC Davis, One Shields Avenue, DAVIS, CA, 95616, (818) 389-1043, nbwashburn@ucdavis.edu; Co-authors: John M. Eadie, Brian Olson and Dean Kwasny

*Ecology and Management of Waterfowl and Wetlands*

*Thu, Feb 2, 3:45 pm*

**Abstract:** The 90% loss of California’s historic wetlands heightens the importance of the remaining waterfowl habitats in the Central Valley. Due to increasing costs for wetland managers, a need exists to allocate management efforts efficiently while still producing high quality habitat. For the past four years (2007-2010), we have examined the effects of timing and duration of summer irrigations on wetland production using large-scale (1.5 acre) replicated plots at the Roosevelt Ranch in the Sacramento Valley. Experimental irrigations began in 2007 with response variables including seed production and water costs. Over the past 2 years (2009-2010), we have included estimates of invertebrate production. Mosquito vector control districts in California are mandated to limit mosquito production through a combination of best management practices or application of insecticides. Application of these control measures can be expensive and costs of abatement may be passed on to wetland managers. These costs are a significant factor for wetland irrigation during the summer months. Our study aimed to quantify invertebrate and seed production under different summer irrigation regimes. We hope this information will inform wetland managers in the Central Valley, contribute to the creation and maintenance of quality wetland habitat, and support thriving waterfowl populations in California.

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### **HARVEST OF TULE GREATER WHITE-FRONTED GEESE AT SACRAMENTO NATIONAL WILDLIFE REFUGE COMPLEX, 2000-2010.**

**MELANIE WEAVER**, California Department of Fish and Game, 1812 Ninth Street, Sacramento, CA, 95811, mweaver@dfg.ca.gov; Co-authors: Daniel R. Yparraguirre, J. Gregory Mensik and Mike A. Wolder

*Ecology and Management of Waterfowl and Wetlands*

*Thu, Feb 2, 1:25 pm*

**Abstract:** Tule greater-white fronted geese are one of the more rare subspecies of geese in North America. On their core wintering range, this subspecies mixes with the more numerous subspecies, Pacific greater-white fronted geese, increasing the difficulty of implementing effective monitoring programs and the complexity of harvest management decisions. We evaluated the harvest of tule geese on the core wintering by obtaining morphological measurements from 4,872 hunter-shot greater white-fronted geese at the Sacramento National Wildlife Refuge Complex during the 2000-01 to 2010-11 waterfowl hunting seasons to identify subspecies composition in the harvest. We used generalized linear models (GLZ) to estimate the proportion of tule geese in the daily harvest. Harvest of tule geese ranged from 3.3 - 37.2% of the total greater white-fronted goose harvest, but has not exceeded 10% since 2003. By using daily probabilities and harvest numbers from the refuges, the estimated annual harvest ranged from 41 (SE = 5) – 171 (SE = 4) tule geese. We found that the current levels of restrictions appear adequate in protecting tule geese on public lands; however, it remains unknown how subsequent possible liberalizations of hunting regulations may impact population dynamics.

### **INTERNET SURVEY OF CURRENT DEER MANAGEMENT ISSUES**

**KENT WEBB**, San Jose State University, 13315 Simon Lane, Los Altos Hills, CA, 94022, (408) 924-1348, g.webb@sjsu.edu

*Large Mammal and Big Game Ecology and Management*

*Fri, Feb 3, 8:25 am*

**Abstract:** Using the automated search tool Google Alerts, the internet was scanned every day throughout the year for new information related to deer. About 17,000 news stories and other web pages were examined for significant content, providing a sample of about 6,500. About 25 percent of the information related to deer hunting, 19 percent related to general deer management, 17 percent related to urban deer management, 16 percent related to deer and vehicles collisions, 7 percent were related to deer resistant plants, and 5 percent were related to disease of deer such as chronic wasting disease. Short excerpts of pertinent information from the most significant articles with a link to the original article have been stored on a publically available and searchable web site as an information resource for anyone interested in deer or deer management. This presentation summarizes the major threads of information that were identified on topics such as urban deer management, the decline of western deer populations, predator management, hunter management, efforts to reduce deer vehicle collisions, deer litigation and legislation.

### **LAKE ELEVATION AND THREE INDICES OF REPRODUCTIVE SUCCESS IN AECHMOPHORUS GREBES**

**RENEE WEEMS**, UC Davis, California Institute of Environmental Studies, 1901 Spinnaker Dr., Ventura, CA, 93001, (661) 361-5154, reweems@ucdavis.edu; Co-authors: Kristofer M. Robison and Daniel W. Anderson

**Student Paper**

*Ecology and Management of Waterfowl and Wetlands*

*Thu, Feb 2, 2:25 pm*

**Abstract:** Western and Clark's Grebes (*Aechmophorus occidentalis* and *A. clarkii*, respectively) are seasonal seabirds who migrate to inland lakes and reservoirs to breed. The factors affecting the reproductive success of these two species are still largely unknown. Lake elevation has been suggested as a potential abiotic factor affecting their nesting ability. Using an information-theoretic approach, we analyzed a long-term dataset to assess the relationship between inter-annual lake elevation changes and the reproductive success of these two species at two Northern California lakes. Several reproductive indices were analyzed, each summarizing separate aspects of

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these bird's reproductive ecology. Models containing only lake elevation parameters received the most support and explained the most variation of two of our reproductive indices Productivity ( $YY \cdot Ad^{-1}$ ) and the Breeding Adult Ratio ( $Ad \text{ w}/YY \cdot [Total \text{ Ad}]^{-1}$ ) but had no effect on Average Brood Size ( $YY \cdot Pair^{-1}$ ). Our results indicate that lake elevation is an important factor affecting a lake's population-level reproductive success, but is not a determinant of individual nest fate. These findings underscore the importance of careful consideration of over-water nesting bird ecology in wetland management.

### **A TOOL FOR PREDICTING BAT ACTIVITY AND INFORMING MITIGATIONS AT WIND ENERGY FACILITIES**

**THEODORE WELLER**, USDA Forest Service, Pacific Southwest Research Station, 1700 Bayview Drive, Arcata, CA, 95521, (707) 825-2955, tweller@fs.fed.us; Co-author: James A. Baldwin

*Renewable Energy and Wildlife Conservation*

*Fri, Feb 3, 1:05 pm*

**Abstract:** Fatalities of migratory bats, many of which use low frequency (<35 kHz; LowF) echolocation calls, have become a primary environmental concern associated with wind energy development. Accordingly, strategies to improve compatibility between wind energy development and conservation of bat populations are needed. We combined results of continuous echolocation and meteorological monitoring at multiple stations to model conditions that explained presence of LowF bats at a wind energy facility in southern California. We used a site occupancy approach to model nightly LowF bat presence while accounting for variation in detection probability among echolocation detectors and heights. However, we transposed the spatial and temporal axes of the conventional detection history matrix such that occupancy represented proportion of nights, rather than monitoring points, on which LowF bats were detected. Detectors at 22 m and 52 m above ground had greater detection probabilities for LowF bats than detectors at 2 m above ground. Occupancy of LowF bats was associated with lower nightly wind speeds and higher nightly temperatures, mirroring results from other wind energy facilities. Nevertheless, we found that building separate models for each season and considering solutions with multiple covariates resulted in better fitting models. We demonstrate the use of a tool which allows visualization of multiple environmental variables to predict bat presence that be used to improve efficiency of turbine operational mitigations. Increased mitigation efficiencies could lead to greater use of mitigations at wind energy facilities with benefits to bat populations.

### **LONG-TERM NESTING TRENDS FOR CALIFORNIA LEAST TERNS AND WESTERN SNOWY PLOVERS AT A SMALL BEACH ON THE CENTRAL COAST OF CALIFORNIA**

**CARIE WINGERT**, Rincon Consultants, Inc., 1530 Monterey St. Suite D, San Luis Obispo, CA, 93402, (805) 547-0900, cwingert@rinconconsultants.com; Co-authors: Jennifer M. Turner, Nancy W. Fox Fernandez, Steven J. Hongola and Duane Vander Pluym

*Ecology and Management of Shorebirds*

*Wed, Feb 1, 1:05 pm*

**Abstract:** Since the 1970's nesting California least terns (*Sterna antillarum browni*) and Western Snowy Plovers (*Charadrius alexandrinus nivosus*) have been monitored at Ormond Beach in Ventura County, California. This approximately two-mile-long beach is under multiple ownership and is open to the public. The nesting colonies at Ormond Beach are relatively small; however, the protection of smaller nesting areas may be vital to the long-term preservation of these species. We present a review of long-term nesting trends at this small nesting area and present recommendations for future research and management of this nesting area.

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### **FERTILIZER RESEARCH FUNDED BY THE CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE TO REDUCE ENVIRONMENTAL IMPACTS**

**DALE WOODS**, CDFA Feed and Fertilizer, 1220 N St, Sacramento, CA, 95814, (916) 900-5236, dale.woods@cdfa.ca.gov

#### ***Wildlife Diseases and Pathology***

***Fri, Feb 3, 3:45 pm***

**Abstract:** The California Department of Food and Agriculture maintains a program designed to fund and coordinate research that will advance the environmentally safe and agronomically sound use and handling of fertilizer materials. The program, the Fertilizer Research and Education Program (FREP) was established by agricultural statute in 1990. A mill assessment on the sale of fertilizing materials provides funding for research and education regarding the use and handling of commercial and organic fertilizers, including, but not limited to, any environmental effects. The mill assessment currently generates close to \$1 million per year for fertilizer research. Most of FREP's original work was concerned specifically with identifying and prioritizing the most nitrate-sensitive groundwater areas in California and, second, working with public agencies, growers and industry to develop, demonstrate and promote the most effective ways to reduce nitrate contamination from agriculture. The focus has expanded to include research on many of California's important cropping and environmentally sensitive cropping systems including almonds, tomatoes, cotton, citrus, winegrapes, horticulture, lettuce and other cool-season vegetables. The program is currently summarizing the nearly 20 years of funded research into a web based database to make research more accessible to growers and crop advisors, hopefully reducing impacts on the environment.

### **HOME RANGES AND ANNUAL FOOD HABITS OF RINGTAILS (BASSARISCUS ASTUTUS) IN THE SUTTER BUTTES, SUTTER COUNTY, CALIFORNIA (2008-2010)**

**DAVID WYATT**, Sacramento City College - Biology Dept, 3835 Freeport Blvd, Sacramento, CA, 95822-1386, (916) 531-0953, wyattd@scc.losrios.edu; Co-authors: Kathleen M. Norton, Michael Starkey, Sarah West and Brian Brown

#### ***Conservation and Management of Carnivores***

***Wed, Feb 1, 3:25 pm***

**Abstract:** Eleven seasonal home ranges were determined for eight ringtails in the Sutter Buttes (2008-2010). The Sutter Buttes are a small volcanic mountain range (ca 200 km<sup>2</sup>) and is one of the largest parcels of undeveloped land in the Central Valley. Home range sizes were consistently small compared to other studies (mean of 3.65 ha for the eleven home ranges). Other studies in similar habitats had substantially larger home ranges (range: 12-85 ha). The extremely small home ranges resulted in questions regarding how the ringtails survive in the area. Thus, the food habits of ringtails were examined by dissecting 461 ringtail scats collected monthly for one year (2010) from the Sutter Buttes. A sequence of available food resources occurs monthly for the ringtails. Of considerable interest is the dominating presence of oak mistletoe for half of the year. Insects (Orthoptera and Coleoptera) were also prevalent food items throughout the year. Mammals comprised only a small percentage of the food items during the study. The sequential availability of food items through the year provides a possible explanation for the small home ranges. In addition, it helps to stress the importance of a large, intact ecosystem in maintaining diversity and wildlife abundance.



# POSTERS



**CARNIVORE DISTRIBUTIONS IN RELATION TO ROADS ON THE SIERRA NATIONAL FOREST, CALIFORNIA**

**JODI BERG**, SNAMP Fisher Project - CNR, University of CA, Berkeley, 51354 Old Corral Ranch Rd, Oakhurst, CA, 93644, (865) 207-0933, jodster1980@yahoo.com; Co-author: Rick A. Sweitzer

**Abstract:** Roads are associated with wildlife mortality through a combination of collisions with vehicles and hunter access to wildlands. Roads may also contribute to habitat degradation and fragmentation, resulting in reduced species diversity. Conversely, many animal species use roads as travel corridors, thereby improving foraging efficiency. Remote cameras have made the difficult task of determining the distribution of elusive carnivores easier and more cost-effective. As part of a larger study on the biology of Pacific fishers on the Sierra National Forest, we used automatic cameras in a standardized framework to survey for fishers and other carnivores during October 2007 to October 2010. The most common carnivore detections were black bear, fisher, gray fox, ringtail, marten, coyote, bobcat, and mountain lion, in that order. Our purpose in this effort is to investigate overall patterns in distribution of the common carnivores in the region in relation to distance to roads and road type/use level. We will use program PRESENCE to calculate species-specific detection probabilities, and to assess how distance to roads, road type, road use level, and other biotic and abiotic factors contribute to observed patterns in occupancy and habitat use by these forest carnivores.

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

**ERIK BLOMBERG**, University of Nevada, Reno, 1664 North Virginia Street, Reno, NV, 89557, (775) 622-2137, ejblomberg@gmail.com; Co-authors: Simon R. Poulson, James S. Sedinger and Daniel V. Nonne

**Student Poster**

**Abstract:** Low chick survival during early growth has been implicated in recent declines of greater sage-grouse (*Centrocercus urophasianus*). We developed a novel method for analyzing chick diet using stable isotopes of carbon and nitrogen in feather tissue, which allowed us to quantify the relative dietary contributions of plant versus invertebrate materials, and reconstruct a post-hatch dietary timeline. We collected secondary feathers from sage-grouse chicks in Eureka County, Nevada, when they were 28 days old. Feathers were sectioned into subsamples that corresponded to sequential periods of growth, and isotopic composition of  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  was analyzed for each subsample. Overall, chick diets were comprised of a greater proportion of invertebrate (61%) compared to plant (39%) diet items. Plant contributions to diet increased with sample age, but during the 4th week of growth chicks still consumed invertebrates as a slightly greater proportion of their diet. We detected substantial spatial variation among broods with respect to the relative contribution of plants versus primary consumer invertebrates versus higher order invertebrates, suggesting habitat may substantially influence diet composition. This approach is advantages over traditional methods (i.e., crop contents) because it is non-lethal, and can therefore be tied to subsequent survival of the chick.

**HOT AND COLD SPOTS OF SNOWY PLOVER BREEDING**

**JUSTIN BRICE**, Humboldt State University, 1371 Marcum Rd, Nicolaus, CA, 95659, (530) 701-7705, jdb139@humboldt.edu; Co-authors: Allie Patrick and Mark A. Colwell

**Student Poster**

**Abstract:** The Snowy Plover population (*Charadrius nivosus*) in Humboldt County, CA has had chronically low reproductive success owing to predation of eggs and chicks by native predators (e.g., Common Raven, *Corvus corax*). Here, we use a "hotspot analysis" with a Geographic Information System (GIS) to characterize breeding areas on a continuum of high and low fledgling success. Several sites consistently had low fledgling success (i.e., cold spot) despite active management efforts in most years. By contrast, hot spots occurred along areas of the lower Eel River, where management was limited. We suggest that alternative methods of management be used to

increase plover productivity and grow the population, which is currently sustained by immigrants from breeding sites elsewhere along the Pacific coast.

*DISTRIBUTION AND ESTIMATED FECUNDITY FOR FEMALE BLACK BEARS (URSUS AMERICANUS) IN THE SIERRA NEVADA MOUNTAINS, CALIFORNIA, USING IMAGES FROM AUTOMATIC CAMERAS*

**JOSEPH BRIDGES**, SNAMP Fisher Study - CNR - UC Berkeley, 51354 Old Corral Ranch Road, Bass Lake, CA, 93644, (541) 740-8281, bridgesj@berkeley.edu; Co-author: Rick A. Sweitzer

**Abstract:** The distribution of black bears in California is expansive, with a range encompassing most mountains of the state including the Sierra Nevada. California's black bear population has doubled since the 1980s, and hunting is used to manage the species and gather data on the population from teeth extracted upon harvest. Even though black bears are large, they are difficult to enumerate for detecting trends in population size. Approximately forty percent of California's black bears reside in the Sierra Nevada, where they are commonly detected during surveys for less common forest carnivores. During an ongoing study of Pacific fishers in the Sierra National Forest, we used automatic cameras to survey an approximate 1200 km<sup>2</sup> study area from October 2007 to October 2010. Black bears were the most common large mammal detected; we obtained more than 103,000 photographs of bears, which suggested it might be possible to estimate female reproduction based on numbers of cubs with adult females. In this paper we will estimate female black bear fecundity from cub counts, while also contrasting patterns of habitat use between reproducing female bears and large bears without cubs. These data will be presented in the context of black bear management in California.

*PHYSICAL AND CHEMICAL FACTORS THAT AFFECT DIVERSITY OF AQUATIC INVERTEBRATES IN VERNAL POOLS IN SACRAMENTO COUNTY, CALIFORNIA*

**ANGELA CALDERARO**, CSUS and PMC, 2116 15th St, Sacramento, CA, 95818, (510) 301-7820, angelacalderaro@comcast.net

**Abstract:** Ecologists strive to understand the processes that drive diversity patterns within ecosystems. These patterns may be driven by habitat characteristics such as physical factors and chemical factors in conjunction with dispersal capabilities. The local community factors and between community factors may predict why species assemble or co-occur within a given space. A useful approach for understanding how these various factors determine species diversity is the study of metacommunities. Because the study of metacommunities involves both the interactions within individual communities and the dispersal patterns between communities, it allows ecologists to better understand the relative roles of local- and regional-scale processes on diversity. This study examined in situ relative effects of various physical and chemical factors on aquatic invertebrate communities within vernal pools in eastern Sacramento County. Physical factors that may affect diversity within the pools include connectivity (via surface water), temperature, and surface area. Chemical factors that may affect diversity within vernal pools include dissolved oxygen content, pH, electrical conductivity, and total dissolved solids. LIDAR data was used in conjunction with the ArcHydro model to determine water flow and subbasins at the study sites. LIDAR is a remote sensing technique that uses a laser mounted to an aircraft to measure vertical height of a land surface (elevation). The study design included a minimum of one block of two connected pools and two isolated pools selected from each study site for a total of four blocks (sites) and sixteen pools.

A multiple regression analysis was used to compare the relationship between several independent or predictor variables (the physical and chemical factors) and a dependent or criterion variable (species diversity). Connectivity was not significantly related to overall diversity over the four sample periods; however, connectivity was significant (among many other physicochemical factors) for non-arthropod richness and crustacean density. Dissolved oxygen was positively related to overall species richness, whereas total dissolved solids and pH were negatively related to the Shannon-Weiner diversity index. Water quality (as in low electric conductivity and total dissolved solids) was important in determining greater species diversity, except for non-arthropods (snails and flatworms). The vernal pool aquatic communities are verifiably linked within the landscape. Even though surface

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water connectivity was not a driving force for the majority of taxa within the pools (crustaceans and insects), the pools are linked in the ability of these species to disperse in this temporary aquatic environment. Although richness of non-arthropods was related to connectivity, many other physicochemical factors contributed to the model of non-arthropod richness. Overall diversity of the pools measured by the Shannon-Weiner index was closely related to electrical conductivity, a measure of water quality. For this reason, maintaining the health of these ecosystems by avoiding water quality impacts associated with development and stormwater runoff is imperative to maintain the diversity and stability of these sensitive habitats.

### *RODENT FORAGING BEHAVIOR IN COASTAL DUNES*

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**Student Poster**

**Abstract:** Fear in prey can be more important to an ecosystem than direct kills by predators. Fear can influence prey's choice of feeding on a food patch and risk predation or miss out on that feeding opportunity as a trade-off for safety. We measured this optimal foraging theory using giving-up density (GUD) experiments. GUD trays were placed in coastal dunes in Arcata, CA between June and August. We examined the effect of vegetative cover and moon phase on GUD of rodents. Two grids of 25 trays each were placed in European Beachgrass (*Ammophila arenaria*) present and absent habitats. This was replicated for six days in three study areas. We hypothesized that predation risk should increase in open habitats and under greater light conditions by testing predictions that GUDs would (1) be higher in the absence of *A. arenaria*, and (2) increase with increasing moon phase. When comparing all three study areas, there was no effect of habitat on GUD. However, GUDs were significantly higher in *A. arenaria* absence on two of three study areas. Contrast to predictions, GUDs were negatively correlated with moon phase. Rodents are predominant predators of invasive seeds in this ecosystem, understanding their foraging habitat selection has important conservation implications.

### *SEASONAL USE PATTERNS OF REST SITES BY AMERICAN MARTENS IN THE LASSEN NATIONAL FOREST*

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**Abstract:** American martens are members of the weasel family (Mustelidae), and are associated with structurally complex, high elevation, late-seral coniferous forests in the Cascade and Sierra Nevada mountain ranges. Martens utilize, as rest sites, structures and habitat elements that are typical of late-seral forests, including large-diameter live and dead trees, snags, stumps, and large woody debris (e.g. logs). These sites primarily provide thermoregulatory benefits between periods of foraging and traveling, as well as protection from predators. We radio-tracked 21 individual martens from October 2009 to October 2011, and collected data from 72 rest site structures. The data was analyzed to reflect use patterns of rest sites, relative to season (snow or snow-free), location (above-ground/snow, below ground/snow), and microsite (e.g. cavity, subnivean space). We then investigated weather data from the period of interest (including maximum and minimum temperature data, precipitation/snowfall, and wind), in order to correlate rest site use patterns to fluctuations in daily weather.

### *RESPONSE OF LARGE MAMMALIAN PREDATORS TO RIPARIAN CORRIDOR RESTORATION IN THE SACRAMENTO RIVER NATIONAL WILDLIFE REFUGE*

**VASILISSA DERUGIN**, San Francisco State University, 3455 Ross Road, Palo Alto, CA, 94303, (650) 815-5328, vderugin@sfsu.edu; Co-authors: Gretchen LeBuhn, Joseph Silveira, Edward F. Connor and Gregory H. Golet

**Abstract:** Growing awareness of the ecological implications of habitat fragmentation has sparked efforts to restore connectivity between isolated habitat patches. For this purpose, habitat conservation initiatives increasingly focus on the restoration of "corridors," parcels of land that promote the connectivity necessary for

organisms' movement. Most studies of organisms' responses to corridor restoration focus on species at the lower trophic levels. Top predators (often, keystone species) have received less attention. Riparian corridor restoration in the Sacramento River National Wildlife Refuge provides an opportune setting to investigate the use of corridors by large mammalian predators. In Colusa, Glenn and Tehama Counties, we are investigating mammalian predator use of 17 riparian corridor units that vary in age since restoration. The effects of habitat patch size are also being assessed. We use remote cameras to collect data on predator species richness and detection frequency. We hypothesize that predator species richness and detection frequency will be higher in larger habitat patches, and that they will be positively correlated with restoration age. Preliminary data analysis suggests that restoration age, indeed, may affect predator species richness. Our study will help guide restoration strategies by indicating how time and landscape context affect predators' return to restored locations.

### *ENDANGERED SPECIES MANAGEMENT AT THE U.S. ARMY'S POHAKULOA TRAINING AREA, HAWAII ISLAND*

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**Abstract:** At the Army's Pohakuloa Training Area (PTA) on the Island of Hawaii, the Natural Resource Office (NRO) implements a wildlife management program for native and endangered Hawaiian wildlife species. PTA is the single largest live-fire and maneuver training area in Hawaii and is critical for maintaining Army combat readiness. To effectively achieve PTA's primary mission - to successfully train soldiers by providing a safe, modernized, major training area - compliance with regulatory mandates negotiated between the Army and the US Fish and Wildlife Service is essential. PTA NRO is required to survey, monitor and manage four endangered species: the Hawaiian Goose, the Hawaiian Hawk, the Hawaiian Petrel and the Hawaiian hoary bat. Active management is used to ensure the safety of Hawaiian Geese on live-fire ranges and to reduce military training interruptions. After two major survey efforts, data conclude Hawaiian Hawks do not reside at PTA, but may occasionally use the installation. PTA NRO acoustically monitors Hawaiian Petrels and Hawaiian hoary bats. Additionally, PTA NRO annually monitors forest birds listed on the Migratory Bird Treaty Act. Information generated from the wildlife management program demonstrates compliance with regulatory commitments and assists the Army to maintain training capacity at PTA.

### *PROJECTED IMPACTS OF CLIMATE CHANGE, URBANIZATION, AND WATER MANAGEMENT SCENARIOS ON ECOLOGY AND HABITATS OF WATERBIRDS IN THE CENTRAL VALLEY*

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**Abstract:** The Central Valley of California contains some of the most important habitats for waterfowl, shorebirds, and other waterbirds in North America. Waterbird habitats in the Central Valley are dependent on precipitation and snow pack for water supplies. Global climate models indicate substantial changes in temperature and timing and amounts of precipitation in watersheds of the Central Valley, translating into temporal and spatial variations in many of the driving forces that define the availability and productivity of waterbird habitats. Food availability is a key factor limiting waterbirds during migration and winter, and impacts body condition and other aspects of waterbird ecology. We developed Central Valley landscape change scenarios based upon precipitation, temperature patterns, and resulting water supplies projected from downscaled climate models, urbanization, and water management scenarios and investigated impacts on habitats and ecology of waterfowl and other waterbirds. Phase I modeling completed for the Butte Basin portion of the Central Valley indicates that under some scenarios, water supplies will not be adequate to maintain habitat at the levels necessary to support Central Valley Joint Venture goal populations of waterfowl and result in late-winter food deficits for waterfowl and other waterbirds. We report relative contribution of climate and other factors to the outcome of each modeling scenario and discuss management options for adapting conservation programs.

**CAMERA TRAPPING OF THE COYOTE (*CANIS LATRANS*) AND OTHER MAMMAL SPECIES ON THE WIND RIVER RANCH, NEW MEXICO**

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**Student Poster**

**Abstract:** There is a continuous destruction of biodiversity in the southwestern region of the United States, which has reinforced the need for research and monitoring. Coyotes (*Canis latrans*) extend throughout North America surviving on a wide variety of food resources including the desert cottontail (*Silvilagus audubonii*), whose population also covers most of southwestern United States. Methods used to assess richness and abundance of species include direct and indirect techniques. Eighteen camera traps were used on the Wind River Ranch (WRR) and Fort Union Ranch at 98 stations in the grasslands, pinyon juniper, and riparian habitats. Sites were allocated as baited (with one of two bait types) and unbaited. We recorded 176 photos of 13 mammal species in 110 nights during the winter and summer seasons of 2007 and 2008, respectively. A Spearman's correlation tested the hypothesis (1), that the number of new species photographed will not vary with additional trap-nights (TNs), indicated ( $p = .0001$ ), thus rejecting the null hypothesis. Seventy-seven nights or 1386 TNs were used to photograph the 13 mammal species, although there are 24 mammal species large enough to be identified by cameras at the ranch. There was a significant difference in the number of target species (coyotes and cottontails) photographed by habitat-type and by season; hypothesis (2b), and no difference in the total number of species photographed by habitat and by season; hypothesis (2a). When testing hypothesis (3a), more species were photographed at baited sites than at unbaited (control) sites ( $p = .0002$ ). There was no difference between two types of bait used at the baited sites - hypothesis (3b).

**CORRELATION BETWEEN COLOR, BODY CONDITION, AND DIET IN THE LESSER GOLDFINCH**

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**Student Poster**

**Abstract:** The relationship between winter plumage coloration and fitness is not well understood in the lesser goldfinch (*Spinus psaltria*). Bright plumage is thought to be a true indicator of body condition because consuming high quality forage forms brighter plumage. Understanding the correlation between color, body condition, and diet can provide insight into the evolutionary context of the three traits. We collected body measurements, pictures of plumage, dietary information, and blood of goldfinches to assess their correlation. We assessed body condition by correcting mass with body size to get an idea of how color reflects the body conditions of the goldfinch. In addition, we collected blood samples to run stable isotope analyses to assess the importance of diet. We predict that plumage coloration will be a true indicator of good body condition. Our results will help explain the importance of plumage coloration in evaluating the fitness of lesser goldfinches.

**POPULATION GENETICS OF THE YELLOWSTONE BISON: IMPLICATIONS FOR MANAGEMENT AND CONSERVATION**

**FLORENCE GARDIPEE**, U.S. Fish and Wildlife Service, 2800 Cottage Way, W-2605, Sacramento, CA, 95825, (916) 414-6675, flo\_gardipee@fws.gov; Co-authors: Rick Wallen, Sally Painter and Gordon Luikart

**Abstract:** The objectives of this study were to assess genetic diversity of the Yellowstone bison and determine whether the two geographically distinct breeding areas represent significant differences in genetic diversity. We used genetic data obtained through non-invasive fecal DNA sampling and data collected from radio-collared adult females. Analyses of mitochondrial DNA revealed two haplotypes revealed highly significant genetic differentiation between the northern and central breeding herds, with a much higher frequency of haplotype 8 within the northern range ( $F_{ST} = 0.402$ ,  $P < 0.001$ ). Analysis of 17 microsatellite allele frequencies revealed relatively low levels of subdivision between the central and northern range breeding groups ( $F_{ST} = 0.020$ ,  $P = \ll 0.05$ ). Our results provide evidence for two genetically distinct breeding herds due to strong female fidelity to natal breeding ranges. Low microsatellite  $F_{ST}$  values indicate that gene flow between the two breeding ranges

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may have occurred over many generations and is likely facilitated by movement of males among ranges. Management decisions should recognize population subdivision and seek to preserve the genetic integrity of the two breeding herds. We recommend continued monitoring of genetic diversity, facilitation of near equal sex ratios, and preservation breeding group abundance at near equal values as well.

### **MACROPARASITES IN GREATER YELLOWSTONE BISON**

**FLORENCE GARDIPEE**, U.S. Fish and Wildlife Service, 2800 Cottage Way, W-2605, Sacramento, CA, 95825, (916) 414-6675, flo\_gardipee@fws.gov; Co-author: Marty Kardos

**Abstract:** Infectious diseases represent a major threat to the persistence of wildlife populations globally, and may pose significant threats particularly to the conservation of wild ungulates. Heterogeneities in macroparasite infections exist among wild ungulate hosts with most individuals harboring small numbers of parasites, while fewer animals may harbor the greatest parasite burdens. Fecal samples were collected from 473 bison in Yellowstone and Grand Teton National Parks. Fecal egg counts (eggs per gram) were conducted using the McMasters salt flotation technique. We used statistical and graphical approaches to draw inferences regarding factors related to parasite infection in bison. Our analyses revealed significant heterogeneities in parasite infection among bison with respect to age, sex, location, and nutritional status. Our study provides insight into factors that may play a significant role in generating heterogeneities in macroparasite infection among Greater Yellowstone bison, and other wild ungulates. Differences in nutritional status due to quality of vegetation among habitats or supplemental feeding may have crucial implications for susceptibility to diseases, and may amplify the Th1/Th2 immune function trade-offs.

### **DISTRIBUTION, DIEL ACTIVITY, AND INDICES OF ABUNDANCE FOR FOUR SPECIES OF SQUIRRELS LIVING IN SYMPATRY IN THE SIERRA NATIONAL FOREST, CALIFORNIA**

**TAYLOR GORMAN**, UC Berkeley, 111 Giannini Hall, Berkeley, CA, 94720-3100, (559) 642-4539, gormantr@berkeley.edu; Co-author: Rick A. Sweitzer

**Abstract:** Mid-elevation forests of the Sierra National Forest support populations of multiple species of squirrels, including Douglas squirrel (*Tamiasciurus douglasii*), northern flying squirrel (*Glaucomys sabrinus*), California ground squirrel (*Spermophilus beecheyi*), and western gray squirrel (*Sciurus griseus*). Squirrels represent an important food source for many carnivores, including the California-protected Pacific fisher (*Martes pennanti*) and American marten (*Martes americana*). Since October 2007, the Sierra Nevada Adaptive Management Project (SNAMP) Pacific fisher study has used automatic cameras to survey for forest carnivores and squirrels across an approximately 1200 km<sup>2</sup> study area within the Bass Lake Ranger District bordering Yosemite National Park. Our camera survey protocol has proven effective for detecting squirrels, with 89,750 squirrel photos captured across 577 distinct 1-km grid cells thus far. This paper will provide a detailed assessment of squirrel detections as a function of season, diel period, elevation, and habitat associations towards an improved understanding of how animals within a similar foraging guild partition resources. Further, our protocol was designed to attract squirrels for estimating relative abundance across the study area. Data on indices of abundance will be presented and discussed in relation to the distribution of fishers and American marten in the region.

### **THE EFFECTS OF BIRD AND BAT ARTHROPOD PREDATION ON SAPLING BLACK COTTONWOODS IN THE CONTEXT OF RESTORATION**

**SACHA HEATH**, Humboldt State University, 1 Harpst St., Arcata, CA, 95521, (760) 223-6895, sachakheath@gmail.com; Co-author: Matthew D. Johnson

**Student Poster**

**Abstract:** Phytophagous arthropod consumption by birds and bats can induce cascading effects that reduce plant damage or accelerate plant growth. We examined tri-trophic interactions between birds and bats, arthropods, and sapling black cottonwoods (*Populus balsamifera ssp. trichocarpa*) along two streams undergoing restoration at Mono Lake, California, USA. We built mesh cages (exclosures) over black cottonwood saplings to remove the

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direct effects of bird and bat predation on arthropods. Over 12 weeks during the growing season, we compared arthropod density and biomass, herbivore-caused foliage damage, and shoot growth between saplings inside the exclosures and paired control saplings to which birds and bats had access. Avian foraging surveys conducted in the riparian vegetation along the streams revealed that 49 percent of foraging attacks were made in black cottonwoods compared to other substrates but that only four percent of black cottonwood foraging attacks occurred in saplings comparable in height to experimental saplings. Contrary to predictions, bird and bat predation did not significantly reduce the density or biomass of arthropods, even when analyses were restricted to certain arthropod groups (i.e., herbivores, predators and parasitoids, leaf chewers). It followed that bird and bat exclusion did not significantly increase herbivore-caused leaf damage or decrease sapling shoot growth.

### *BEHAVIORAL OBSERVATIONS OF WESTERN RED BATS (LASIURUS BLOSSEVILLII) FROM A MATERNITY ROOST IN A VALLEY OAK (QUERCUS LOBATA) IN THE SUTTER BUTTES, SUTTER CO., CA*

**CHANDRA JENKINS**, Sacramento City College - Biology Dept, 3835 Freeport Blvd, Sacramento, CA, 95822-1386, (916) 747-7319, myotis1@comcast.net; Co-authors: Daniel P. Neal, Kathleen M. Norton, David T. Wyatt, Elizabeth D. Pierson and William E. Rainey

**Abstract:** The western red bat is a foliage-roosting species with a broad distribution through the western U.S., Mexico, and Central America. While having a wide distribution, occurrences are extremely patchy and few actual records exist throughout its range. In 1998, the Western Bat Working Group examined all western bats to determine their status and the western red bat emerged as a species of primary concern in all occurrence regions. As part of a radiotelemetry study (2011), a female western red bat was radiotracked to her day roost. This roost was located in a large Valley oak and contained two adult females and five juveniles. Over 14 hrs of nighttime infrared video (four nights) and 3 hrs of daytime video (three days) were obtained. These videos were examined to record behaviors of the adult and juvenile bats. Of particular interest was the observation of two adult female bats in the roost. It had been thought that adult western red bats are solitary, thus the presence of two adult bats in this roost raises interesting questions regarding the social dynamics of this maternity roost. Behaviors between the two adult bats, adult behavior with the juveniles, and behavior among the juvenile bats are documented.

### *A HIGH SCHOOL INTERNSHIP PROGRAM FOR THE WILDLIFE AND FORESTRY DEPARTMENTS OF THE HOOPA VALLEY TRIBE*

**SEAN MATTHEWS**, Wildlife Conservation Society, 160 Holdsworth Way, Amherst, MA, 1003, (530) 351-2418, smatthews@wcs.org; Co-authors: Ryan Matilton, Robert Buckman, Brandon Colegrove, Justi Colegrove, Blake Hostler, Hawk Lane and J. Mark Higley **Student Poster**

**Abstract:** Indigenous lands in North America contain a rich abundance of wildlife across a wide variety of landscapes. Although many indigenous groups relate their community well-being with the health of the natural world and look to sustain their wildlife and wild lands, few indigenous individuals have training in modern wildlife and habitat management skills necessary to meet this goal. The Hoopa Valley Tribe, in cooperation with the Wildlife Conservation Society, is developing a high school internship program to inspire Hoopa High School students to attend college and pursue professional careers with the Tribe's wildlife and forestry departments. Students begin the program the summer after their sophomore year and advance through the program as a cohort over three consecutive summers. A team of wildlife and forestry employees serve as instructors. The first year of the program involves an introduction to field-skills and shadowing professional staff. During their second year, interns rotate between existing department projects. Interns also develop and give an oral presentation to the Tribal Council. During the third year, interns select a particular specialization and create a DVD presentation. Our goal is to fill many of the professional level positions within the Tribe's natural resources programs with qualified Tribal members.

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### **FORAGING AND ROOSTING BEHAVIOR FOR A MALE AND FEMALE WESTERN RED BAT (*LASIURUS BLOSSEVILLII*) IN THE VICINITY OF THE SUTTER BUTTES, SUTTER AND BUTTE COUNTIES, CA**

**DANIEL NEAL**, c/o Sacramento City College - Biology Dept, 3835 Freeport Blvd, Sacramento, CA, 95822-1386, (916) 747-4086, daniel.p.neal@gmail.com; Co-authors: Chandra L. Jenkins, David T. Wyatt, Kathleen M. Norton, William E. Rainey, Elizabeth D. Pierson, Emma Mullins, Sarah West, Carmen Hirkala, Brian Brown and Mandi Raley

**Abstract:** One adult male and one adult female western red bat were radiotagged and tracked over multiple nights in the Sutter Buttes area (2011). The Sutter Buttes are one of the few large, contiguous areas of undeveloped habitat remaining in the Central Valley. The bats were tracked to their roost sites and to their foraging areas. The male was using a day roost of multiple vine species consisting of a mixture of California wild grape poison oak, and pipe vine. This vine cluster was suspended in the canopy of an oak. The male was also found night roosting in a mixture of Fremont cottonwood and Goodding's willow. The female consistently day roosted in a maternity roost in the canopy of a large Valley oak returning to the same roost to night roost. Both bats were radiotracked to their foraging areas over multiple nights. Both bats traveled a considerable distance from their day roosts (up to 10 km from their roosts). They also had remarkably consistent nightly foraging core areas over the wetlands at the Gray Lodge Wildlife Area. The distances traveled by the bats suggest that wetlands are critically important for these bats and by extension, possibly for other bat species.

### **THE INFLUENCE OF DISTURBANCE ON GREATER SAGE-GROUSE NEST SURVIVAL**

**DANIEL NONNE**, University of Nevada-Reno, 1664 North Virginia Street, Mailstop 186, Reno, NV, 89512, (302) 345-6168, Co-authors: Jim S. Sedinger, Erik J. Blomberg and Mike T. Atamian **Student Poster**

**Abstract:** The range-wide decline in greater sage-grouse (*Centrocercus urophasianus*) populations has often been attributed to human disturbance in western North America. Recently, there has growing concerns on the potential impacts of disturbance due to the increase in energy development in sage-grouse habitat. Our study was designed to document the influence of a power line constructed in eastern Nevada on sage-grouse demographic rates. We captured and radio collared female sage grouse during the spring at 13 lek locations (March- May) in Eureka County NV, from 2005-2011. Females were monitored at least once a week during the nesting season (March-June), and twice a week after a nest was found until it terminated. We constructed a nest survival model in Program MARK using numerous vegetative, spatial, temporal, and observer effect variables as individual covariates. Model-averaged daily survival for the study area was 0.951 (SE  $\pm$ 0.01). Daily nest survival rate the day after a hen was flushed was significantly lower than on a day the hen was not flushed, 0.893 (SE  $\pm$ 0.02) and 0.953 ( $\pm$ 0.01), respectively. However, overall nest survival between a nest that was flushed and one that was not flushed was not substantially different, 0.158 (SE  $\pm$ 0.01) and 0.169 (SE  $\pm$ 0.01).

### **MOVEMENT PATTERNS AND MIGRATION DISTANCES IN AN UPLAND POPULATION OF CALIFORNIA TIGER SALAMANDER (*AMBYSTOMA CALIFORNIENSE*)**

**SUSAN ORLOFF**, Ibis Environmental, Inc, 340 Coleman Dr, San Rafael, CA, 94901, (415) 459-3441, Sue@ibisenvironmental.com

**Abstract:** During five winter breeding seasons (October–April, 2000–2005), I investigated the migratory movements of an upland population of California Tiger Salamander (*Ambystoma californiense*) in Contra Costa County, California. I used a drift fence and pitfall trap array to partially enclose a proposed 27-ha housing project and capture migrating adult and juvenile salamanders. The study objective was to assess movement patterns and migration distances for upland life stages during an effort to translocate all captured salamanders and reduce their mortality from future development at the study site. I recorded substantial numbers of adult and juvenile *A. californiense* (90–417 annually) farther from breeding ponds than previously reported. The majority of salamanders were captured at least 800 m from the nearest breeding pond while a smaller number of salamanders were captured as far as 2.2 km from the nearest breeding pond. The study indicates that recent recommendations

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to protect 630 m of upland habitat adjacent to breeding ponds may leave large portions of upland life stages at risk. Adults appeared to exhibit fidelity to upland habitat, returning close to the initial point of capture. In situations where translocation is used to remove salamanders from upland habitats subject to development, results suggest it may take several years to successfully relocate a high proportion of individuals in the population.

### *EFFECTS OF NEST TEMPERATURE VARIATION ON VIABILITY AND SEX DETERMINATION OF WESTERN POND TURTLES*

**BRENDAN PHILLIPS**, Sonoma State University, 1801 E. Cotati Ave, Rohnert Park, CA, 94928, (916) 879-4949, philbren@seawolf.sonoma.edu; Co-authors: Nicole Christie, Nick Geist, Wendy St. John, Zannie Dallara and Kristine Ward

**Student Poster**

**Abstract:** Gravid female western pond turtles (*Emys marmorata*) were tracked with telemetry to locate nesting sites in June and July of 2010 and 2011 at a Lake County CA nesting ground. After nest construction, we removed the nest plug and recorded egg position and dimensions. I-Button sensors were then placed at various levels within 38 nest chambers to record temperatures within the nests every hour. Eggs and sensors were recovered at 70 days (past sex determining period) and placed in an incubator until hatched. Our data indicate that nest locations as well as egg position within the nest affected mean temperature and degree of temperature fluctuation experienced by each egg. Diel temperature variation had significant effects on viability and incubation duration. Daily temperature fluctuation within most nests commonly exceeded 20 degrees C, and eggs positioned higher in the nest experienced significantly higher temperature fluctuation than those at the bottom. Most nests experienced temperatures that exceeded 40 degrees C for several hours each day, conditions our previous studies indicate are well above the lethal threshold at constant temperature incubation. Hatchling sex ratios in 2010 were biased toward females in the majority of the nests, with males produced only in cool, mild nests.

### *IMPACTS OF NON-MOTORIZED RECREATION ON MESO- AND LARGE MAMMALS IN THE SAN FRANCISCO BAY ECOREGION*

**MICHELLE REILLY**, Northern Arizona University, 2905 N. Alta Vista Dr, Flagstaff, AZ, 86004, (775) 443-5118, mlr326@nau.edu

**Abstract:** Large and medium-sized mammals, and carnivores in particular, play important roles as dominant herbivores and as top-down regulators. Because many carnivores and larger mammals are area-sensitive and cannot cross inappropriate habitat, these animals are ideal focal species for design of wildlife corridors. Corridor planners and managers in particular need answers to questions such as: Does non-motorized recreation compromise utility of corridors for these mammals? Is there a "safe distance" from trails that could inform where trails can be located in corridors? This research will determine whether certain levels of hiking and bicycling in natural areas have significant impacts on habitat use by carnivores, deer, and other wildlife. This 3-year study will quantify the impact of non-motorized recreation on large & medium sized mammals (rabbits and larger) by sampling locations in the San Francisco Bay Area Ecoregion that span the full spectrum of non-motorized recreation and other variables that could obscure or exaggerate the effects of recreation. The study will produce written recommendations to locate trails and manage hiking in a way that does not degrade habitat value of protected areas.

### *CALIFORNIA GULL PREDATOR MANAGEMENT AND ENDANGERED CALIFORNIA LEAST TERN REPRODUCTIVE SUCCESS ON SAN FRANCISCO BAY, CALIFORNIA*

**DAVID RIENSCH**, East Bay Regional Park District, 2950 Peralta Oaks Ct., Oakland, CA, 94605-0381, (510) 544-2319, driensche@ebparks.org; Co-authors: Christopher L. Kitting, Tierra C. Groff, Sharon Dulava and Douglas A. Bell

**Abstract:** Gull predation is known to be an important source of egg and chick mortality for many waterbirds and can impact recovery efforts for special status species. From 2005 to 2011, we studied nesting success of a newly

established California least tern (*Sternula antillarum brownii*) colony at Hayward Regional Shoreline in San Francisco Bay and the effects of implementing a California Gull (*Larus californicus*) predator control program. No gull management was undertaken prior to 2007. We evaluated the effectiveness of gull management and removal by monitoring tern hatching and fledgling success annually. California Gulls were the most abundant aerial predator (97%). We recorded 3,769 predatory gull-tern interactions and the presumptive take of 26 tern eggs and 23 chicks. Although there was no statistically significant change in gull predatory behavior, gull management efforts resulted in significantly improved tern breeding success (Numbers of nests, eggs, chicks, and fledglings). From 2007 to 2011, this colony produced a total of 242 successful nests and 291 fledglings, an average nesting density of 196 nests per ha, and an average of 1.07 fledglings per breeding pair. We discuss the difficulties of lethal control and suggest the importance of human presence for reducing gull predation at the site.

**FOOD AVAILABILITY FOR THE YELLOW-BILLED CUCKOO ALONG THE SACRAMENTO RIVER**

**MATTHEW ROGERS**, California State University Chico, Holt Hall Room 205 CSU, Chico, CA, 95929-515, (530) 680-1261, mrogers8@mail.csuchico.edu; Co-authors: Colleen Hatfield, Donald Miller, Chrissy Howell, Raymond Bogiatto and Joe Silveira **Student Poster**

**Abstract:** Though the Yellow-billed Cuckoo has a broad geographic distribution in the U.S. it has a limited distribution in the western U.S. and is an endangered species in California. The Sacramento River in central California historically supported the highest populations of Yellow-billed Cuckoos in the state. Though previous studies have shown cuckoos are found in restored habitat, population numbers have not increased in spite of concerted efforts to restore cuckoo habitat, especially along the Sacramento River. There is a pressing need to better understand why population numbers are not rebounding. One possible explanation is that available food is not sufficiently abundant or of the right composition to support more birds. This study investigates the food availability and composition for cuckoos along the Sacramento River. I am sampling for arboreal insects in the restored habitats as well as remnant forest sites with and without cuckoos in order to determine whether prey availability varies by habitat type and bird presence. This is the first study of food availability for Yellow-billed Cuckoos in the U.S, and it could give us insight into why this species continues to decline along the Sacramento River.

**FOR THE BIRDS: GUZZLER USE BY RESIDENT AND MIGRATORY AVIANS IN THE DESERT NATIONAL WILDLIFE REFUGE IN SOUTHERN NEVADA**

**SARA SCHUSTER**, U.S.Geological Survey, 160 N Stephanie St, Henderson, NV, 89074, (702) 564-4631, schuster@usgs.gov; Co-authors: Kathleen Longshore and Lindsay Smythe

**Abstract:** Water is a scant resource in the desert southwest, yet many species depend on its availability. In the Desert National Wildlife Refuge, Nevada, guzzlers are considered critical for maintaining desert bighorn sheep (*Ovis canadensis nelsoni*). However, these water sources are also used by resident and migratory bird species. To evaluate the importance of these water sources for wildlife, we installed motion-activated digital trail cameras at 11 guzzlers within the refuge during August 2009. Here we present data on use of guzzlers by bird species for four of these sites. We found that at least 31 species of birds used the guzzlers, seven of which were raptors. Fourteen species were migrants, using the guzzlers only seasonally while 18 species were present year-round. Behavior at the guzzlers included drinking, bathing, preening, and interspecies interactions. Townsend's and magnolia warblers, both uncommon to this area, were among those documented. Continuous monitoring of these cameras will provide information regarding species' presence in the refuge and can be an indicator of change in distribution due to environment, climate, or other factors.

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### LOCAL AND LANDSCAPE INFLUENCES ON SANDHILL CRANE HABITAT SUITABILITY IN THE SACRAMENTO VALLEY, CA

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**Student Poster**

**Abstract:** Wetland restoration and rice production in California's Sacramento Valley has maintained wintering habitats for sandhill cranes (*Grus canadensis*) in the midst of development and agricultural conversion over the last century. This study was designed to pinpoint key variables influencing crane habitat suitability, in order to guide recovery actions for the California-threatened Greater Sandhill Crane (*Grus canadensis tabida*). Nocturnal roosting surveys were performed over two wintering seasons within the Sacramento National Wildlife Refuge Complex. Crane presence, abundance, and habitat information was collected, and wetland micro-topography was modeled in GIS to analyze hydrology. A predictive model of crane use of roosting areas is being developed based on local habitat (e.g., water levels, vegetation structure) and landscape characteristics (e.g., disturbance levels, land cover types). Initial results indicate a range of shallow water depths suitable to maintain crane usage. To assess crane foraging habitat selection relative to habitat availability and current agricultural practices, a biweekly 77-km survey through the Butte Basin was conducted and compared with historical data. Results show a significant increase in waste-rice management techniques, with foraging cranes displaying a preference for post-harvest rice that is unaltered or shallowly flooded, as multiple rice management techniques appear to diminish crane foraging value.

### NEST SITE FIDELITY AND MICROHABITAT SELECTION IN A NORTHERN CALIFORNIA POPULATION OF WESTERN POND TURTLES (*EMYS MARMORATA*)

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**Abstract:** We conducted field observations in late May through early July of 2008, 2009, 2010 and 2011 on a population of western pond turtles (*Emys marmorata*) living in a semi-permanent vernal lake in Lake County, CA. Gravid females captured during daily visual surveys had morphometric data recorded, and were marked by scute notching, fitted with radio telemetry transmitters, and returned to the pond in order to monitor nesting behaviors. Gravid females were noted exiting the pond and tracked visually and/or with telemetry to potential nest sites in well-drained upland areas on the NE side of the lake. Nests were constructed between 2 - 300 meters from the edge of the pond in relatively exposed areas covered with annual grasses. GPS coordinates were recorded for all successful nesting attempts, and percent ground cover estimates were made. Analyses of a 4-year database of nesting activity indicate a percentage of nesting females in this population of *E. marmorata* exhibit philopatry, with several individuals returning to nest in the same location in multiple years. We also analyzed how a range of environmental parameters of nest site microhabitat; e.g., distance from pond, percent ground cover, and nest temperature, affect hatching success.

### TICKS FROM FISHERS (*MARTES PENNANTI*) AND RINGTAILS (*BASSARISCUS ASTUTUS*) AT THE HOOPA VALLEY INDIAN RESERVATION

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**Abstract:** Fishers (*Martes pennanti*) and ringtails (*Bassariscus astutus*) are both species of conservation concern in California. The United States Fish and Wildlife Service identified disease as one of five factors that may be limiting fisher survival within the West Coast Distinct Population Segment. There have been relatively few published studies addressing disease, and much remains to be learned about tick-borne diseases of fishers and ringtails. Ticks were collected from fishers and ringtails during population monitoring at the Hoopa Valley Indian Reservation from 2004-2011. 2208 ticks were identified as one of four species: *Ixodes pacificus*, *Ixodes rugosus*,

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*Dermacentor variabilis* and *Ixodes woodi*. We evaluated patterns of the number of ticks of these species removed during different seasons and different years. The identification of tick species from fishers and ringtails establishes a baseline of knowledge of the ticks infesting these hosts, and provides specimens for ongoing assessment of pathogens infecting these ticks and of potential tick-borne disease risks for these carnivores.

### NEST SURVIVAL OF TRICOLORED BLACKBIRDS IN CALIFORNIA'S SAN JOAQUIN VALLEY

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**Abstract:** The tricolored blackbird (*Agelaius tricolor*), a colonially-nesting species that breeds almost exclusively in California's Central Valley, is considered a Species of Concern by the State of California and the U.S. Fish and Wildlife Service (USFWS). Loss of wetland nesting habitat has caused the species to breed in non-native substrates, most notably in silage fields associated with dairies. These fields are usually ready to harvest before tricolored blackbird colonies have fledged young, prompting the USFWS to pay farmers to delay harvests. The relative nesting success of tricolors breeding in silage fields is unknown, however, and it is possible that these blackbirds experience higher nest survival in native marsh vegetation. If so, conservation efforts might be better directed toward enhancing or expanding marsh habitat to encourage birds to establish colonies in more natural habitat. In 2011 we monitored 681 tricolored blackbird nests in natural and agricultural habitats using small temperature data loggers (Thermochron I Buttons). Recording the temperatures of nests at regular intervals allowed us to remotely but accurately monitor nest activity with minimal disturbance to nesting birds. By comparing nest temperatures to ambient temperatures we were able to determine how many days each nest was active. We modeled nest survival in Program MARK using nest site, habitat type, initiation date, nest height, water depth, number of active nests within 1 meter, and colony population as covariates.

### HOME RANGE SIZE AND FORAGING HABITAT SELECTION OF NORTHERN SPOTTED OWLS AND BARRED OWLS IN THE CALIFORNIA REDWOODS REGION

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**Abstract:** The continued decline of the northern spotted owl (*Strix occidentalis caurina*) has been a challenge for resource managers faced with the recovery of this threatened species. Although habitat loss and degradation initially prompted listing the spotted owl, recent evidence suggests that competition from the barred owl (*Strix varia*) is now a primary threat to spotted owl populations. However, much of the information on barred owls is limited to incidental observations collected during spotted owl surveys, and consequently little is known about their foraging ecology in areas of co-existence. Because of this limited scientific information, we used radio telemetry to obtain nocturnal foraging locations for 10 spotted owls and 16 barred owls in the Redwood National and State Parks (RNSP) and adjacent timberland in northern California during 2008-2011. Preliminary results suggest that barred owls in northern California occupied smaller home ranges and foraged more often than expected in mature, structurally complex forest stands, whereas spotted owls occupied larger home ranges and foraged in regenerating forest stands and edge habitat on managed timberlands. Further investigation of habitat associations for both species will allow resource managers to determine the degree of habitat separation between spotted and barred owls in areas where they co-exist.

### RESTORING CALIFORNIA RED-LEGGED FROG HABITAT ON MILITARY TRAINING LANDS

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**Abstract:** The California red-legged frog (*Rana dratonyii*) is a federally threatened species endemic to California. This species has been extirpated or nearly extirpated from 70% of its former range throughout the Central Valley and Sierra Nevada foothills. At present, California red-legged frogs are known to occur in 243

streams or drainages in 22 counties, primarily in the central coast of California. On Camp San Luis Obispo (CSLO) - a California National Guard training installation - California red-legged frogs occur in almost every pond with summer water depth greater than 2.0 feet. Two events in the mid-1990s, a forest fire and a switch to a rotational grazing system, caused two spring-fed ponds (and former important breeding sites) to fill with sediment and become overgrown with vegetation. The CSLO Environmental Office proposed habitat enhancement at the two ponds, including removal of sediment and vegetation, reseeding with native vegetation, and stabilizing exposed soils. Activities occurred at the ponds in 2008 and 2011. To date, annual surveys have confirmed the restoration of breeding habitat, but further maintenance will likely be required before the projects can be deemed successful.

### ***INVASION OF WEST NILE VIRUS IN SACRAMENTO COUNTY AND IMPACTS TO THREE RESIDENT BIRD POPULATIONS***

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**Abstract:** West Nile Virus (WNV) was first detected in migrant bird populations in Sacramento County in the summer of 2004. We documented the spread of the virus from migrant to numerous resident bird species by testing blood samples of birds caught in mist nets on the Stone Lakes National Wildlife Refuge. To help understand the impacts of the spread and establishment of a novel pathogen such as WNV in wild bird populations, we compared capture and recapture abundance data and presence of WNV antibodies from constant effort mist netting program and bait traps pre- and post-WNV invasion in three resident bird populations: house finch, scrub jay, and wren. The house finch and wren followed a pattern of initial exposure, rapid spread, die-off (drop in capture abundance), presence of antibodies in survivors, subsequent rebound in capture abundance to levels above pre-invasion for 2-3 years, followed by a return to pre-WNV invasion capture abundance levels in 2010. The scrub jay demonstrated a different pattern with capture abundance dropping by half the same year WNV was detected and remaining 60% to 80% below average capture rates for five years. Jay abundance levels returned to pre- WNV invasion levels in 2010.

