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Abstracts of Scientific Papers

AMMON, ELISABETH M. **Coordinated landbird monitoring in Nevada: Lessons learned.** *Great Basin Bird Observatory, 1755 E. Plumb Lane #256, Reno, NV 89502; ammon@gbbo.org.*

Initiated in 2002, the Nevada Bird Count program covers more than 200 off-road point count routes annually. The purposes of the program include (1) long-term population trend monitoring for species for which Nevada has a large stewardship responsibility, (2) generating regional habitat models with direct applications to resource management, and (3) providing reliable measures of "ambient" bird abundances per habitat type that can be used for effectiveness monitoring of conservation projects and for site evaluations. The program has been particularly successful at integrating compatible bird inventory and monitoring efforts by a variety of resource management agencies together into a large data network, from which all partners actively benefit. One application of the program, made possible to a large degree by the help from citizen-scientists, is to generate regional bird density estimates by habitat type, which can then be used for conservation accounting purposes, such as setting quantitative goals for achieving conservation objectives, cost-benefit calculations for property acquisitions and conservation implementation projects, and assessing net benefits after habitat restoration. Further, the program has helped bring together stakeholders with a variety of backgrounds and missions, such as university researchers, private corporations, government agencies, consulting firms, and several non-profit organizations, who contribute to producing regionally applicable guidelines for habitat management. This and other collaborative monitoring and assessment programs, such as the Nevada Breeding Bird Atlas project, which was built on similar principles, provide us with perhaps the best opportunities to develop a more comprehensive understanding of bird conservation issues and current habitat threats at a landscape level.

ANDERSON, HANNAH E. **The effects of internal edges and non-native shrubs on Streaked Horned Lark nest predation.** *The Evergreen State College, 1435 12th Ave SW, Olympia, WA 98502; hannie1119@yahoo.com.*

The Streaked Horned Lark *(Eremophila alpestris strigata),* a rare subspecies of the Horned Lark, is of high conservation concern in both Oregon and Washington. The occurrence of deleterious edge effects on birds that nest within 50 m of an external edge in both forest and grassland habitats has been well documented. Streaked Horned Larks do not nest within this 50-m range, but do nest near and among light-use roads and runways, which fragment the three inland Puget prairie breeding sites examined in Washington state. Few studies have addressed internal fragmentation of this nature. Predation was the primary cause of nest failure observed during the 2002-2004 breeding seasons. I examined both the effects of edge and the invasion of the non-native shrub Scotch Broom (*Cytisus scoparius*) on Streaked Horned Lark nest predation. I quantified the distance from nest site to nearest internal edge and recorded the corresponding edge type (pavement, gravel, or dirt) for all nests (n=166) discovered during the 2002-2004 breeding seasons. In 2004, I also measured the distance from nest site to the nearest Scotch Broom plant and the estimated percent cover of Scotch Broom within a 25-m radius around the nest site (n=45). I used logistic regression to examine the relationship between nest outcome and the factors listed above. Predation of Streaked Horned Lark nests was not correlated with distance to internal edge, distance to Scotch Broom, or percent cover of Scotch Broom.

COOPER, LISA[1], ALEXANDER CRUZ[1], and HEATHER SWANSON[2,3]. **Defenses of American Robins against brood parasitism along an elevational gradient.** *[1]Department of Ecology and Evolutionary Biology, University of Colorado at Boulder, UCB 334, Boulder, CO 80309-0334; cooperla12@juno.com. [2]City of Boulder Open Space and Mountain Parks Department, P.O. Box 791, Boulder, CO 80306; swansonh@bouldercolorado.gov. [3]Presenting author.*

While some host species accept the parasitic eggs of Brown-headed Cowbirds (*Molothrus ater)* and incur the potential costs, other species present defenses against brood parasitism. These defenses may include aggression towards cowbirds or rejection of parasitic eggs from the nest. This project aimed to determine if hosts exhibit behavioral plasticity in their anti-parasitic defenses across an elevational gradient along the Colorado Front Range. We studied a population of American Robins *(Turdus migratorius),* a species known to reject parasitic eggs, at low-elevation sites where cowbirds are common and at high-elevation sites where cowbirds are rare. Robins' nests were experimentally parasitized to determine rates of egg rejection and to determine which egg parameters were most important for eliciting a rejection response. We also presented cowbird models at the nest to measure the aggressive responses of robins towards potential parasites. We found that anti-parasite defenses of robins were weaker at high-elevation sites than at lower-elevation sites. While both low- and high-elevation robins accepted mimetic robin eggs, robins at the higher-elevation sites rejected non-mimetic eggs at lower rates and were less aggressive towards a cowbird model. These results suggest that behavioral responses to cowbirds are plastic and that host species may relax anti-parasite defenses in portions of their range where cowbirds are rare or absent, even though there may be gene flow from areas where cowbirds are more common.

DIAZ, LUIS ADRIAN[1], JULIÁN TORRES DOWDALL[2], and NICHOLAS KOMAR[3]. **Long-distance migratory birds as viral agents dispersers. Dogma or fact?** *[1]Laboratorio Arbovirus, Instituto de Virologia "Dr. J. M. Vanella", FCM, UNC. Enfermera Gordillo Gomez s/n, CP 5016, Ciudad Universitaria, Cordoba, Argentina; ladriandiaz@yahoo.com.ar. [2]Department of Biology, Colorado State University, Fort Collins, CO 80523. [3]Division of Vector-Borne Infectious Diseases, Centers for Disease Control and Prevention, Fort Collins, CO.*

The interactions between humans and migratory birds have been unfavorable for the latter. The survival of migratory birds is threatened by several human activities such as the high level of land transformation, the use of chemicals as pesticides and fertilizers, hunting, and the general contamination of the environment. Now, a new crusade has been initiated against migratory birds: We have accused them of being the responsible agent for the dispersion of pathogenic viruses. In the last decade, the number of publications about the interaction between viruses' dispersion and migratory birds has increased markedly. The introduction of West Nile Virus into America and the recent expansion of the H5N1 avian influenza are the main cause of the increased number of publication. Most of these papers report the presence of one of these viruses in a migratory species or discuss the potential risk of the viruses' dispersion by these species. But only a few papers have experimentally analyzed the migratory birds' capability to disperse viruses. Is there enough evidence to support the idea that migratory birds are long-distance agents of virus dispersion, or is it just dogma? What studies have been published on this subject, and what studies are necessary to achieve a better understanding of the dispersion of viruses by migratory birds? Is the attention these species receive justified with regard to virus dispersion? In this talk we will discuss the available information about the role of migratory bird species as dispersion agents of viruses. Additionally, we will discuss their potential importance by analyzing two models of regional- and global-scale relevance: the dispersion of arbovirus (i.e., West Nile and St. Louis encephalitis virus) and avian influenza virus (i.e., H5N1).

FARMER, ADRIAN[1], JULIÁN TORRES DOWDALL[1], and MÓNICA ABRIL[2]. **Determining shorebird wintering locations in Argentina using stable isotopes and trace elements: Problems and promises.** *[1]Fort Collins Science Center, U.S. Geological Survey, 2150 Centre Avenue, Fort Collins, CO 80526; adrian_farmer@usgs.gov, julian_torres@usgs.gov. [2]Universidad de la Patagonia, San Juan Bosco, Comodoro Rivadavia, Argentina; abril.ms@gmail.com.*

We are evaluating the use of stable isotopes to identify wintering sites of individual Neotropical migratory shorebirds in Argentina, thereby helping to identify distinct areas used by different subpopulations. In January 2002 through 2005, we collected flight feathers from shorebirds at 43 wintering sites distributed across 12 provinces in Argentina. Feathers samples were prepared and analyzed for $\delta^{13}C$, $\delta^{15}N$, $\delta^{34}S$, $\delta^{18}O$, and δD by continuous flow methods, and the concentrations of 23 chemical elements were analyzed from the feather shafts using laser ablation ICP-MS. In spite of the wide geographic spread of study sites, δD values alone did not provide a strong ability to predict a shorebird's winter origin. When other isotopes were included in the analysis, prediction accuracy increased. The addition of trace elements further improved prediction accuracy compared to the use of stable isotopes alone. Stable isotope and trace

element data can identify shorebird wintering sites in Argentina with a mean error of about 240 km. Prediction accuracy is constrained by a high degree of intra- and inter-bird variability, especially in the Pampas region, where there is wide variety of wetland/water conditions. There were also interspecific differences within sites, as well as interannual differences within some sites. These results suggest that the technique can be used, with limited accuracy, to link wintering shorebird populations with specific migration corridors and breeding sites. Future studies will focus on characterizing local shorebird movements, and characterizing isotopic landscapes to better understand sources of isotopic variability and define limitations to the technique.

FAULKNER, DOUG. **Pelagic mega-rarities of Wyoming.** *Department of Zoology and Physiology, University of Wyoming, 1000 E. University Ave., Laramie, WY 82071; dfaulk@uwyo.edu.*

Although Wyoming is a landlocked state approximately 900 miles from the Pacific Ocean, the state has recorded two pelagic mega-rarities since 2003. I discuss the events related to the field observation of these species, identification issues, and potential weather patterns that may have influenced their arrival in Wyoming. The species' names and accompanying details are purposefully being withheld here, in order to entice the audience's participation in identifying the species from photos.

FRANCIS, CLINTON D.[1], CATHERINE P. ORTEGA[2], and JOHN HANSEN[3]. **Avian community nest-site selection within piñon-juniper woodlands in northwest New Mexico.** *[1]Department of Ecology and Evolutionary Biology, University of Colorado at Boulder, Campus Box 334, Boulder, CO 80309; francisc@colorado.edu. [2]San Juan Institute of Natural and Cultural Resources, Fort Lewis College, Durango, CO 81301. [3]Bureau of Land Management, Farmington Field Office, 1235 La Plata Highway, Suite A, Farmington NM, 87401.*

We conducted this study during the summer of 2005 within the Bureau of Land Management's (BLM) Rattlesnake Canyon Habitat Management Area, San Juan County, in northwest New Mexico. The study area consists predominantly of piñon (*Pinus edulis*)-juniper (*Juniperus osteosperma*) forests with some open sagebrush-grasslands. The study included 18 2.4-ha (400-m long by 60-m wide) plots originating on active gas well pads. The ratio of piñons to junipers was 1:1.4. The density of piñons was 172 trees/ha, and the density of junipers was 234 trees/ha. We found a total of 108 nests of 21 species. Birds selected junipers for nest trees significantly more than expected from the piñon-juniper ratio. Nests in piñons had a significantly lower survival rate (0.96 nests/day, SE=0.00043) than nests in junipers (0.98 nests/day, SE=0.00002). We also found that higher nest-density sites (>3 nests/study plot) had a significantly greater proportion of junipers relative to the proportion of piñons (piñon:juniper = 1:1.5) than we found in low nest-density sites (≤3 nests/study plot; piñon:juniper = 1.3:1). Juniper as a nesting substrate is clearly important to birds, and we recommend that the unequivocal importance of junipers to birds nesting in piñon-juniper woodlands be considered when managing this habitat, particularly with regards to thinning.

GHALAMBOR, CAMERON K.[1], T. SCOTT SILLETT[2], SUSANA PELUC[3], THOMAS E. MARTIN[4], JONGMIN YOON[5], and HELEN R. SOFAER[1]. **Avian parental care under the risk of nest predation: General patterns and exceptions.** *[1]Department of Biology and Graduate Degree Program in Ecology, Colorado State University, Fort Collins, CO 80523; cameron1@lamar.colostate.edu. [2]Smithsonian Migratory Bird Center, National Zoological Park, 3001 Connecticut Avenue NW, Washington, DC 20008. [3]Department of Biology, University of California, Riverside, Riverside, CA 92521. [4]Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, MT 59812. [5]Department of Biology, Colorado State University, Fort Collins, CO 80523.*

Variation in parental care results from differences in the fitness costs and benefits associated with providing care. In birds with dependent young in the nest, parents must weigh the benefits of providing food to their offspring against the costs of attracting the attention of nest predators. Here, we review the relationship between nestling provisioning rates and the risk of nest predation. We find a strong interspecific pattern between increasing probability of nest predation and (1) a decrease in mean nestling feeding rates, and (2) an increase in the magnitude of change in nestling feeding rates when faced with an immediate risk of predation. However, comparisons of some populations with similar rates of nest predation but very different nestling provisioning rates suggest that such correlations can be misleading without more detailed information about the predator community.

GILL, ROBERT E.[1], T. LEE TIBBITTS[1], DANIEL MULCAHY[1], BRIAN MCCAFFERY[2] DANIEL RUTHRAUFF[1], and DAVID DOUGLAS[3]. **Isn't technology grand?: Satellite tracking of Bar-tailed Godwits and Bristle-thighed Curlews between hemispheres.** [1]*U.S. Geological Survey, 1011 E. Tudor Rd., Anchorage, AK 99503; robert_gill@usgs.gov.* [2]*U.S. Fish and Wildlife Service, Box 346, Bethel, AK 99559.* [3]*U.S. Geological Survey, 3100 National Park Rd., Juneau, AK 99801.*

That a suite of shorebird species migrates across the Pacific Ocean is well known; how they accomplish such flights—greater than 10,000 km for some species—has largely been speculative. But with recent advances in satellite tracking technology, large shorebird species can now be fitted with satellite radios (Platform Transmitting Terminals or PTTs). In spring 2005, we tested PTTs on Bar-tailed Godwits in Alaska, but the units stopped transmitting prior to the migration due to transmitter failure. However, birds were subsequently seen in New Zealand and eastern Australia, demonstrating that they could complete such a flight carrying a PTT. Bolstered by this limited success, in spring 2006 we instrumented 7 Bar-tailed Godwits, 10 Bristle-thighed Curlews, and 1 Whimbrel with either redesigned battery-powered implantable or external mounted solar-powered PTTs. Units were programmed to begin a daily reporting cycle around the average departure date of the species. As of 15 August, all birds had left their nesting areas and moved to staging sites, and the PTTs were all functioning. Tracking data have shown the southern Yukon-Kuskokwim River Delta to be an important staging site for all three species, but two curlews subsequently moved to the Alaska Peninsula to stage. On 6 August, one of them embarked on its southern migration. On 13 August, after 160 hours in the air, the curlew landed in French Polynesia, a great circle distance of 8,200 km from its starting point (9,200 km from its breeding site). Satellite tracking data indicated that the flight was nonstop over at least 7,500 km, and that the bird apparently adjusted its flight path to find favorable winds en route, traveling at one point 1,000 km east of a direct route.

HARNESS, RICHARD E. and ARUN PANDEY. **Development and deployment of a Bird Strike Indicator (BSI).** *EDM International, Inc., 4001 Automation Way, Fort Collins, CO 80525; rharness@edmlink.com.*

The Bird Strike Indicator (BSI) is an automated impulse-based vibration sensing and recording tool to remotely record bird collisions or "strikes" on wires. It is a tool to monitor and study bird collisions with power lines and communication tower guy wires. BSIs record strike signatures and report these data via the Internet in real time. The first field tests of the Bird Strike Indicator occurred on national wildlife refuges (NWRs). The first test site was in Cold Bay, Alaska, on a U.S. Coast Guard Differential Global Positioning Satellite (DGPS) tower. Because bird strikes have been documented on other towers and structures in the town of Cold Bay, a bird collision monitoring program was initiated utilizing the BSI in 2005. The U.S. Fish and Wildlife Service was concerned that the tower presented a high collision risk to birds, given that the Izembek NWR is an important molting area for the Steller's Eider (*Polysticta stelleri*), listed as threatened under the Endangered Species Act. The second test is presently ongoing at the Audubon NWR in North Dakota on a transmission line with a history of bird collisions.

KOTLIAR, NATASHA. **Avifaunal responses to fire along a burn severity gradient in montane and subalpine forests of the Rocky Mountains.** *U.S. Geological Survey, 2150 Centre Ave., Bdlg C, Fort Collins, CO 80526; tasha_kotliar@usgs.gov.*

The diversity of climate and topography across the Rocky Mountains has resulted in a broad spectrum of fire regimes ranging from frequent, low-severity fires to infrequent crown fires. Variation within and among systems also contributes to differences in post-fire spatial heterogeneity. I examined avian responses to a gradient in burn severity for seven recent burns in montane and subalpine forests in Colorado, New Mexico, and Arizona representing the full spectrum of fire regimes. A broad range of responses to increasing burn severity was detected: (1) large significant declines, (2) weak, but significant declines, (3) no significant density changes, (4) peak densities in low- or moderate-severity patches, (5) weak, but significant increases, and (6) large significant increases. Most species exhibited either positive or neutral density responses to fire effects across all or portions of the severity gradient (responses 2-6); the apparent tolerance to fire by most of the avifauna was consistent across all forest types. Although many species showed consistent strong positive or negative responses to severe fire, several species exhibited variation across burns. Sensitivity to forest gap size may contribute to variation in response among burns and among

species within foraging/nesting guilds. At Cerro Grande, the availability of pre-fire data allowed analysis of post-fire community changes; pre- and post-fire communities were similar except in high-severity patches. Species richness was similar pre- and post-fire even at the highest burn severity because the number of species absent in severely burned forests was balanced by the number of species that only occurred in these patches post-fire. These results indicate that management targeting the full range of natural variability, including severe fire where appropriate, is needed to provide dynamic habitat conditions for a diverse array of species.

MCISAAC, HUGH. **Prairie Falcon attack methods and success rates against pigeons.** *Department of Biological Sciences, University of Denver, 2190 E. Iliff Ave., Denver, CO 80208; hmcisaac@du.edu.*

During the course of studying navigation in homing pigeons over the last several years I have observed numerous attacks by Prairie Falcons (*Falco mexicanus*). These observations have enabled me to characterize the methods and success rates of Prairie Falcon attacks on a single prey species, the Rock Pigeon (*Columba livia*). Observations were taken between 2003 and 2006 from six locations in Boulder and Jefferson counties in Colorado. Homing pigeons were released one at a time and tracked with 10x50 binoculars until they vanished from view. The pigeons were experienced in navigation and were well conditioned to fly the distances from the sites of release back to the home loft in Golden, CO, on the order of 20–26 km. The navigation studies did not involve manipulation of the pigeons, and, thus, they flew unencumbered and normally. During my studies I tracked several thousand pigeon flights, and have obtained 70 records of pigeon / Prairie Falcon interactions. Sixty of these interactions involved attacks by falcons on pigeons. I estimate that falcons successfully captured 18.3% of the pigeons that they attacked. Most (81.4%) of the attacks involved single female falcons. This was significantly greater than the 6.8% of attacks by single males, while 11.9% of the attacks involved tandem attacks by males and females attacking together. Successful attacks included significantly more attempts to reach the pigeon (mean=4.00) than did unsuccessful attacks (mean=2.16). Most attacks (83.3%) included at least one plummet dive from above the pigeon. This was significantly greater than the percentage of attacks that included parabolic dives (48.3%) and relatively level chases (46.7%). Additional attack characteristics, and pigeon defensive responses, will be reviewed.

MOSKWIK, MATTHEW and MARGARET A. O'CONNELL. **Male and female reproductive strategies in the polygynous Bobolink.** *Department of Biology and Turnbull Laboratory of Ecological Studies, Eastern Washington University, 39015 Madison Road, Elk, WA 99009; mpmoskwik@hotmail.com.*

Most species of birds are socially monogamous; however, approximately 8% of bird species are polygynous. By mating polygynously, females lose paternal care, but might gain access to a superior territory or male. We examined five factors that affect polygyny in Bobolinks: territory size, perching sites, predation rate, insect abundance, and vegetation composition and structure. Our study site was located in the Pend Oreille River Valley in northeast Washington state. Artificial perching sites were placed in the field, male territories mapped, nests located and monitored, and vegetation assessed from May to mid-July 2003. Approximately 55% of males were polygynous, and 45% were monogamous. Females arrived on the study site in three temporal waves that we categorized as monogamous (first wave), primary (second wave), and secondary (third wave) females. Monogamous territories had higher caterpillar densities, higher herbaceous coverage, and were smaller in size than polygynous territories, reflecting the patchy vegetation of the study site. The first wave of females selected small territories and were monogamous. The second wave of females selected remaining, large territories. The third wave of females mated polygynously on these larger territories. Monogamous females fledged the most young. In contrast, polygynous males fledged more young than monogamous males. Males defended large areas with perches in order to maximize chances of mating polygynously.

NEMETH, NICOLE[1] and RICHARD BOWEN[2] **Avian immunity to West Nile Virus.** *[1]Department of Microbiology, Immunology and Pathology, Colorado State University, 3801 West Rampart Rd., Foothills campus, Fort Collins, CO 80523-1683; nnemeth@colostate.edu. [2]Department of Biomedical Sciences, Colorado State University, 3801 West Rampart Rd., Foothills campus, Fort Collins, CO 80523-1683; rbowen@colostate.edu.*

Our objectives include characterizing the duration of protective immunity to West Nile Virus (WNV) in adult birds, as well as passively acquired WNV immunity in chicks. First, House Sparrows (*Passer domesticus*) were experimentally inoculated with WNV to induce immunity. At six-month intervals, sparrows are caught and antibody levels measured, while a subset is challenged with WNV to determine immune protection against morbidity, mortality, and viremia. We have also monitored antibody levels of 17 raptors for a 3.5-year period following natural WNV infection. Second, eggs and chicks from WNV seropositive Chicken (*Gallus gallus domesticus*) hens were tested for the presence of maternally-derived WNV antibodies. We documented the decay of maternal antibody in chicks over time, as well as the protective nature of these antibodies against morbidity, mortality, and viremia. All viremia profiles were determined through Vero cell plaque assay and antibody levels by plaque reduction neutralization. Thus far, results indicate that antibodies last at least one year post-inoculation in sparrows and raptors, and remain protective against morbidity, mortality, and viremia in sparrows. Over the first year following infection, antibody levels declined 4- to 32-fold in most sparrows. All eggs and chicks derived from seropositive chicken hens were WNV maternal antibody positive. Maternal antibodies were no longer detectable in chicks by 4-5 weeks post-hatch, but remained protective against viremia until 6 weeks post-hatch in some birds. One-day post hatch seronegative chicks succumbed to WNV and reached relatively high viremia levels, while their seropositive counterparts showed no clinical signs and did not develop viremia. These results have implications for WNV transmission and survivability of birds re-exposed to WNV, and chicks born of seropositive mothers, and should be considered in the interpretation of WNV serosurveys of free-ranging birds.

NIELSEN, LORI A.[1] and KENNETH R. WILSON[2]. **Clear Channel of Northern Colorado Slab Canyon KQLF-FM Avian Monitoring Project.** *[1]EDM International, Inc., 4001 Automation Way, Fort Collins, CO 80525; lnielsen@edmlink.com. [2]Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO 80523; kenneth.wilson@colostate.edu.*

As the U.S. demand for wireless communication and broadcasting has increased over the last few decades, the number of communication tower structures has risen. The potential for bird collisions from antennae operation has come under increasing scrutiny by regulatory agencies, the communication industry, avian specialists, environmental groups, and the public. Clear Channel of Northern Colorado proposed to construct a 500-foot FM broadcasting tower along the Front Range in Larimer County, Colorado. As part of the permitting conditions, the county required an avian collision study for a minimum of two years. This avian monitoring program was the first to examine collision risk from the operation of a broadcasting tower to both resident and migratory birds in Colorado. The monitoring plan incorporated weekly surveys, use of remote-control cameras, a scavenger removal study, and a surveyor bias study. Surveys were conducted weekly from July 2002 to July 2004, conditions permitting. Because of the isolated location, remote-controlled cameras were installed to monitor the tower site. Initially, three digital IP-addressable netcams were suspended on the tower structure. Each camera was housed in a climate-controlled pod. Weather conditions relative to recorded bird mortalities were examined, and survey biases were incorporated to better estimate the total bird mortalities during the two-year period. The Clear Channel KQLF-FM broadcasting tower study in northern Larimer County provided information and insight into avian interactions with a 500-foot radio tower using unique survey methods. These data will aid Larimer County in future tower review and siting.

OESTERLE, PAUL, JEFFREY HALL, ROBERT MCLEAN, and LARRY CLARK. **Cliff Swallows as a sentinel in West Nile Virus surveillance**. *United States Department of Agriculture, Animal and Plant Health Inspection Services, Wildlife Services, National Wildlife Research Center, 4101 La Porte Avenue, Fort Collins, CO 80521; paul.t.oesterle@aphis.usda.gov.*

Cliff Swallows (*Petrochelidon pyrrhonata*) often nest over water and within mosquito habitat, leading to high rates of potential exposure to West Nile Virus (WNV) from infected mosquitoes. As insectivores, Cliff Swallows are also potentially exposed to WNV via the oral route, as some birds have become infected through ingestion of infected prey. In addition, mud nests of cliff swallows are co-inhabited by a hematophagus parasite, the Swallow Bug (*Oeciacus vicarious* [Hemiptera: Cimicidae]). These bugs have transmitted WNV experimentally, and bugs collected locally from vacant nests have tested positive for WNV RNA. Because of the biology of Cliff Swallows as well as their parasites, this ecosystem may represent a useful tool in identifying potential WNV hotspots prior to human epidemics. This would allow

health officials to target localized areas for mosquito control, possibly eliminating the need for aerial application of insecticides. Since 2003, we have been sampling adult and nestling Cliff Swallows, as well as Swallow Bugs from swallow nests for WNV. Within designated colonies, nestlings are sampled serially; blood and oral swabs are collected every 3–7 days throughout nesting seasons. Adults are captured with mist nets following the same sample collection protocol. Samples are tested for the presence of WNV and WNV antibodies. In 2003, results demonstrated that WNV peaked in swallow nestlings approximately 5 weeks prior to peak WNV activity in humans. Since then, in an effort to validate the use of Cliff Swallows as a surveillance tool, >9,000 samples from Cliff Swallows have been collected from colonies in northern Colorado. It does not appear that Cliff Swallows are adversely affected by WNV, but may develop a high enough viremia to infect mosquitoes. In addition, we are further examining the potential role of Swallow Bugs in the transmission and maintenance cycle of WNV.

OYLER-MCCANCE, SARA J.[1,2], FINDLEY A. RANSLER[1], LEAH K. BERKMAN[1], and THOMAS W. QUINN[1]. **A rangewide genetic comparison of Trumpeter Swans using mitochondrial and nuclear markers.** *[1]Rocky Mountain Center for Conservation Genetics and Systematics, Department of Biological Sciences, University of Denver, Denver, CO 80208. [2]U.S. Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Bldg C, Fort Collins, CO 80526-8118; sara_oyler-mccance@usgs.gov.*

The natural range of Trumpeter Swans (*Cygnus buccinator*) has been divided into two populations, the Pacific Coast Population (PP) and the Rocky Mountain Population (RMP), for management purposes. Little is known about the distribution of genetic variation across the species' range, despite increasing pressure to make difficult management decisions regarding the two populations and flocks within them. Of particular interest is the identification of any unique population or flock, and a comparison of genetic diversity across the range. To address these issues, we used rapidly evolving genetic markers (mitochondrial DNA sequence and data from 17 nuclear microsatellites) to screen samples collected from across the species' range. Data from both markers revealed a significant difference between the PP and RMP, with the Yukon Territory as a likely area of overlap. Additionally, we found that the two populations have similar levels of genetic diversity, suggesting that the PP underwent a genetic bottleneck similar in severity to the one documented previously in the RMP. Both genetic structure and diversity results reveal that the Tri-State (WY-MT-ID) flock is not genetically different from the Canadian flock of the RMP and need not be treated as a unique population from a genetic standpoint.

RYAN, THOMAS and TRACI CADDY. **Habitat preferences of California Least Terns nesting in a human-dominated landscape in Venice Beach, California.** *Foothill Associates, 24961 The Old Road, Suite 102, Stevenson Ranch, CA 91381; tom.ryan@foothill.com.*

California Least Terns (*Sterna antillarum browni*) re-established a nesting colony at Venice Beach, Marina del Rey, California in 1977. Since re-establishment, this colony has supported up to 16.6% of breeding pairs and over 30% of fledglings statewide. Recently, productivity has declined, failing in 2002, 2004, and 2005. Failures were attributed to predation by American Crows (*Corvus brachyrhynchos*), human-related disturbance, and fluctuations in local populations of Northern Anchovy (*Engruulis mordax*). In March 2006, a new expanded enclosure was erected by the California Department of Fish and Game, doubling the size of the enclosure. We removed vegetation from an overgrown 20 x 40-m grid within the colony. The colony returned to productivity in 2006. We detected 384 nests, producing 597 eggs and approximately 300 fledglings. We found that terns placed their nests in larger numbers at distances greater than 40 m from the new fence and in areas with 1-40% vegetation cover and vegetation 1-10 cm tall. Nests with the highest productivity and lowest predation rates were also found under these conditions. Terns placed more nests and had higher productivity in the vegetation removal area compared with adjacent areas.

SCHULTZ, CHRIS[1], KIM POTTER[2,5], JOE DOERR[2], CAROLYN GUNN[3], and RICH LEVAD[4,5]. **Distribution, abundance, and nest-site characteristics of Black Swift in the southern Rocky Mountains.** *[1]San Juan National Forest, Columbine Ranger District and Field Office, 367 Pearl St., Bayfield CO; cschultz@fs.fed.us. [2]White River National Forest, Rifle Ranger District, 0094 County Road 244, Rifle, CO 81650; kmpotter@fs.fed.us; jdoerr@fs.fed.us. [3]P.O. Box 791, Dolores, CO 81323;*

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Over a period of nine years, researchers from the U.S. Forest Service and Rocky Mountain Bird Observatory identified more than 450 potential Black Swift nest sites in the Southern Rocky Mountain region of Colorado and northern New Mexico. We surveyed 389 of the sites, searching for evidence of occupation by Black Swifts and evaluating each site on the degree that it met six nest-site characteristics — water flow, relief, presence of nest niches, shading, aerial access, and the presence of moss. Our surveys increased the inventory of known nest sites from 34 to 106, expanded the known range of the species in the southern Rockies, and produced an abundance estimate of approximately 350-500 breeding pairs. Statistical analysis of nesting characteristics is currently being completed. Black Swift ranks as a high priority on many conservation lists, notably a number of Forest Service sensitive-species lists and Partners in Flight bird conservation plans. The *Birds of North America* species account indicated that fewer than 100 nest sites had been identified range-wide, and locating nest sites is consistently listed as a high-priority research need. This study substantially adds to the inventory of known sites and is providing a model for ongoing surveys in other parts of the species' range.

SKAGEN, SUSAN K., AMY A. YACKEL ADAMS, and JULIE A. SAVIDGE. **Fecundity and juvenile survival in Lark Buntings: Insights into population declines.** *United States Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Building C, Fort Collins, CO 80526; susan_skagen@usgs.gov.*

Lark Bunting (*Calamospiza melanocorys*) populations are declining across the high plains of Colorado, yet causes of these declines remain largely unknown. To determine if population limitation occurs during breeding, we evaluated the stability of a population of Lark Buntings using population-specific values for fecundity and post-fledging survival. During 2001-2003, we estimated fecundity (n=67 females) and daily post-fledging survival (n=206, 82 broods) using radio-telemetry to track females and radio-telemetry and color bands to track fledglings. Collectively, the 67 females built 112 nests; 34 were second nests and 11 were third nests. Daily nest survival estimates were similar for initial and later nests with overall nest survival of 30.7% and 31.7%, respectively. Nest predation was the most common cause of failure (92%). Conservative and liberal estimates of mean annual fecundity were 0.96±0.11 and 1.24±0.09 female offspring/female. The model-averaged product of the 22-day post-fledging survival was 0.360±0.08 in 2001 and 0.276±0.08 in 2002. Capture and radio-marking did not affect survival of nests or fledglings, but severe drought negatively influenced post-fledging survival. Recently-fledged young (ages ≤3) experienced markedly lower survival, demonstrating the vulnerable nature of this time period. Given fecundity and juvenile survival estimates for this population, annual adult survival values of 71-77% are necessary to achieve a stable population. Because adult survival of prairie passerines ranges between 55-65%, this study area may not be capable of sustaining a stable population in the absence of immigration. We contrast our population assessment with one that assumes indirect values of fecundity and juvenile survival. To elucidate limiting factors, estimation of population-specific demographic parameters is desirable. We present an approach for selecting species and areas for evaluation of population stability.

SMITHSON, SCOTT. **Breeding biology and habitat use of the Orange Bishop and the Nutmeg Mannikin in southern California.** *Mission Springs Outdoor Education, 1050 Lockhart Gulch Rd., Scotts Valley, CA 95066; smithson@missionsprings.com.*

The Orange Bishop (*Euplectes franciscanus*) and the Nutmeg Mannikin (*Lonchura punctulata*) are commonly sold cage birds that established local populations in the Los Angeles Basin during the mid-1990s. I investigated their breeding biology from 1997 to 1999, color-marking 236 bishops and 211 mannikins at four study sites and collecting data on breeding seasons, habitat use, nest success, dispersal, and population size. Bishops nested from June to November, their breeding activity coinciding with the seeding of exotic Barnyard Grass (*Echinochloa crus-galli*). Mannikins nested from February to November, with two peaks of breeding in March and July that coincided with the seeding of several other annual grasses, as well as Barnyard Grass. Bishops commonly anchored their nests to Barnyard Grass (54.3%), and mannikins preferentially nested in pines (62.9%). Of 38 bishop nests monitored, 36.8% were successful. An analysis of 13 mannikin nests yielded a 61.5% success rate. I recorded juvenile and adult movements between study sites in both species. At the end of 1998, I estimated minimum population sizes of bishops and mannikins in the Los Angeles Basin at approximately 600 and 700 birds, respectively. Their

breeding success and demonstrated mobility may be causes for concern over the possibility of future ecologic and economic impacts.

SPARKS, ROB. **Analysis of vegetation data for monitoring breeding birds in the Shortgrass Prairie (BCR 18): Cassin's Sparrow (*Aimophila cassinii*).** *Rocky Mountain Bird Observatory, 230 Cherry Street, Fort Collins, CO 80521; rob.sparks@rmbo.org.*

Rocky Mountain Bird Observatory monitors breeding birds in the shortgrass prairie regions of Nebraska, Colorado, Kansas, and Oklahoma. Cassin's Sparrow breeds in areas with scattered shrubs and grass cover within this region. Point-count data from this monitoring program were used to develop a generalized linear model using likelihood ratios and Akaike's Information Criterion (AIC) to model habitat use by this species. A negative binomial distribution was used to develop the final model using two variables, proportion of grass height greater than 15 cm and percent shrub cover, a factor variable with four levels (<1%, 1-3%, 3-10%, and >10%). The negative binomial distribution accounted for over-dispersion in the count data. Regression coefficients for shrub cover categories 1-3%, 3-10%, and >10% are significant (α=0.05) in the model. This species prefers shrub cover >10% (μ=2.08, SE=0.15) followed by 3-10% (μ=1.52, SE=0.11), then 1-3% (μ=1.16, SE=0.08), and avoids areas with <1% shrub cover (μ=-1.85, SE=0.92). Conservation efforts for this species within this study area should be focused in areas of shrub cover from three percent or greater with a mosaic of grass cover greater than 15 centimeters.

SWANSON, HEATHER and STEPHEN GERMAINE. **Forestry, agriculture, and recreational development effects on birds of Boulder Open Space: Using science to inform management decisions.** *City of Boulder Open Space and Mountain Parks Department, P.O. Box 791, Boulder, CO 80306; swansonh@bouldercolorado.gov.*

The City of Boulder Open Space and Mountain Parks Department (OSMP) manages 42,000 acres of open space in and around the city of Boulder, Colorado. The topographic and habitat diversity on these lands support a diverse community of birds, including many of conservation concern. These open space lands are managed for a variety of purposes including recreation, agriculture, and environmental protection. To examine the interaction of these multiple goals, OSMP has undertaken a variety of studies examining the impacts of forestry treatment, trail development, and agricultural hay harvest on bird communities. The goals of these studies are to provide scientific information to better understand the interaction between management decisions and native wildlife; inform future planning efforts; and guide conservation activities. We used spot mapping, distance sampling, and nest monitoring to determine bird community response to trail installation, thinning, and prescribed burning. We have collected baseline information to characterize the bird community present before construction of a multi-use trail and have found that bird communities appear to be responding positively to forestry activities. In addition, we map irrigated hayfields each year to provide recommendations on timing and location of haying to best protect target species. These results, combined with other scientific information, much of it collected on OSMP lands, are being used to inform management decisions to balance the multiple purposes of Boulder Open Space including conservation of the bird community. The data collected from these studies and our experiences using it in decision making also provide important information for other land management agencies striving to make scientifically-based management decisions.

UTT, AMY C.[1], NANCY C. HARVEY[2,3], WILLIAM K. HAYES[1], and RONALD L. CARTER[1]. **The effects of rearing method on social behaviors of mentored captive-reared juvenile California Condors.** *[1]Department of Earth and Biological Sciences, Loma Linda University, Loma Linda, CA 92350; amycutt@gmail.com. [2]Center for Reproduction of Endangered Species, San Diego Zoo, P.O. Box 551, San Diego, CA 92112-0551. [3]Current address: 6509 Harrier Rd., Nanaimo BC V9V 1V9 Canada.*

Hand-reared and parent-reared captive-bred California Condor (*Gymnogyps californianus*) juveniles were studied prior to their release into the wild. Behavioral data were collected during social interactions within two cohorts of juveniles (n=11) and their adult mentors (n=5). The purposes of this study were to (1) document the social behaviors of mentored juvenile California Condors and (2) compare social behaviors for two different rearing methods (parent- versus hand-reared) during two phases of the mentoring process (San Diego Wild Animal Park versus release site). Dominance relations were examined for both cohorts, with the first (h'=0.70) and second (h'=0.63) cohorts both exhibiting moderate linear relationships. Rearing

method had no effect on dominance among the juveniles. Of the 17 behaviors examined by 2x2 ANOVAs, two significant interactions between rearing method and location were found: Parent-reared condors pulled feathers ($P=0.015$; partial $\eta^2=0.50$) and fed alone ($P=0.008$; partial $\eta^2=0.57$) more often at the zoo and less often at the release pens than did the hand-reared condors. In addition, parent-reared birds were more likely to be near another bird ($P=0.012$; partial $\eta^2=0.52$) and to receive contact aggression ($P=0.031$; partial $\eta^2=0.42$), regardless of location, than hand-reared birds. The effect size for 16 of the 17 behaviors was greater for rearing method than for location (two-tailed sign test, $P<0.001$). Although social behaviors between the two rearing groups were similar in most respects, this study is the first to document measurable differences between hand- and parent-reared captive-bred California Condor juveniles.

UTT, AMY C.[1], NANCY C. HARVEY[2,3], WILLIAM K. HAYES[1], and RONALD L. CARTER[1]. **Factors associated with behavioral problems and survival following release of captive-reared California Condors.** *[1]Department of Earth and Biological Sciences, Loma Linda University, Loma Linda, CA 92350; amycutt@gmail.com. [2]Center for Reproduction of Endangered Species, San Diego Zoo, P.O. Box 551, San Diego, CA 92112-0551. [3]Current address: 6509 Harrier Rd., Nanaimo BC V9V 1V9 Canada.*

The purpose of this study was to evaluate factors that possibly influence the success of captive-reared California Condors released to the wild. Two questions were particularly pertinent: (1) Are hand-reared juveniles less successful than parent-reared juveniles? and (2) Does adult mentoring help to ameliorate the potential behavior and survival problems thought to be associated with the hand-rearing method? Rearing data were obtained from the San Diego Wild Animal Park and the Los Angeles Zoo and release data were extracted from the California Condor Studbook and from interviews and surveys of release-site officials. All birds were captive-reared and subsequently released into the wild. Two dichotomous outcomes — behavior (either normal or "misbehavior" that included affiliation with humans or man-made structures) and survival in the wild — were tested after 1 year and after 2 years to assess learning and adjustment to life in the wild. The outcomes were subjected to binary logistic regression using six predictor variables: sex, rearing facility, rearing method (parent-reared and hand-reared), mentoring (0-736 d; mean=97 d), age at release (180-1110 d, mean=374 d), and established population size at release site (0-30; mean=11.4). Rearing facility and rearing method significantly affected behavior during the first year after release ($P=0.02$ and 0.008 respectively), with San Diego and hand-reared birds exhibiting misbehavior more often. However, after two years, no predictors were significant. Mentoring significantly enhanced first-year survival ($P=0.001$), whereas both mentoring and established population size enhanced 2-year survival ($P=0.001$; $P=0.022$ respectively). Survival was independent of sex, rearing facility, rearing method, and age at release. These data suggest that most hand-reared juveniles can cope well following release and that mentoring may be especially crucial for captive-reared California Condors released in the wild.

WALSH, JOHN[1], TY TUFF[2], ALEXANDER CRUZ, and JAMESON F. CHACE. **Nest defense and nest attentiveness may explain differential parasitism frequencies in two suitable cowbird hosts.** *Department of Ecology and Evolutionary Biology, University of Colorado at Boulder, Boulder, CO 80309-0334 [1]Current address: Department of Biology and Biomedical Sciences, Salve Regina University, Newport, RI 02840; sordidulus@yahoo.com. [2]Presenting author: ty.tuff@colorado.edu.*

The Brown-headed Cowbird *(Molothrus ater)* is an obligate, generalist brood parasite that reduces the reproductive success of many of its hosts. The variability in parasitism frequency that can occur among hosts in the same location and habitat may depend on factors such as host quality, abundance, and the behavior of a host at or in the vicinity of the nest. We examined the breeding biology of Western Wood-Pewees *(Contopus sordidulus)* and Plumbeous Vireos *(Vireo plumbeus)* and their interactions with cowbirds in Colorado Front Range Ponderosa Pine habitat. These two species often nest in close proximity, yet sustained different levels of parasitism (<5% and approximately 50%, respectively). We examined (1) egg acceptance via experimental parasitism, (2) aggression at the nest using cowbird and control models, and (3) nest attentiveness, in order to account for the differences in parasitism frequencies. Pewees accepted all eggs placed into the nests, and both species were aggressive towards cowbird models, pewees being significantly more aggressive towards the cowbird model than the control (House Sparrow, *Passer domesticus*). Pewees and vireos exhibited significantly different patterns of nest attentiveness. Pewees were usually found foraging 10 to 20 m from the nest and vireos were often 30 m or greater from the nest for extended periods. Aggressive nest defense and pattern of nest attentiveness may serve as effective parasite defense for the pewee.