

PAPER PRESENTATIONS

THE EVOLUTION OF HUMMINGBIRD COLORATION AND COURTSHIP

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Birds display an incredible diversity of exaggerated traits used for communication. The sensory drive hypothesis states that selection will favor signaling traits that can be effectively transmitted through the environment, and can interact with each other to improve transmission efficacy. We are studying how the evolutionary interactions between colorful ornaments and display behaviors led to the diversity in these traits across bee hummingbirds. We have filmed male courtship displays and plucked feathers from several species for color measurements. We then used these data to recreate each species' courtship displays, and we photographed each species' plucked feathers as we moved them through the recreated display to measure perceived male coloration. We then compared each species' plumage patch, display behavior, and perceived coloration. Our results indicate a strong negative relationship between patch size and display width. Additionally, we found that display shape is related to changes in male coloration as he displays across species. Our results demonstrate the importance of signal interactions and behavioral displays when evaluating color/trait diversity and coevolution.

GRAY HAWK EXPANSION IN THE SAN PEDRO RIVER VALLEY: HABITAT, DIET, AND DENSITY DEPENDENCE

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Models of ideal despotic distribution predict that populations of territorial animals will exhibit density dependent growth because newly arriving individuals will be relegated to inferior habitat where productivity is lower. Interference can also be a mechanism for density dependence if individuals devote more energy to territorial defense—and less to reproduction—as an area becomes more crowded. I examined these hypotheses in an expanding population of Gray Hawks (*Buteo plagiatus*) in southeast Arizona. As Gray Hawk numbers increased, pairs began to settle at higher elevations and in places with different foraging habitat. In the most recently occupied environments, pairs likely foraged in grasslands or oak woodland as opposed to mesquite bosques. I assessed vegetation and productivity in new and historical territories to determine if fecundity is declining with population growth and whether habitat heterogeneity might contribute to this pattern. I also analyzed nestling diet to assess how foraging habitat might affect the quantity and composition of prey that Gray Hawks feed their chicks. Preliminary results suggest that productivity is not lower in more recently occupied environments, though incubating females may be more vulnerable to predation in these areas. Mammals appear to comprise a greater portion of Gray Hawk diet in areas with grassland foraging habitat, while lizard prey appear to dominate in areas surrounded by mesquite.

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A LOOK AT THE SEABIRDS OF ARIZONA

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Despite being a landlocked state, Arizona's close proximity to the Gulf of California has given birders the chance to record multiple species of seabirds. Though there is no single definition of what a seabird is, I focus on the more pelagic species, including two species of shorebirds (Scolopaciade), three jaegers (Stercorariidae), three gulls/terns (Laridae), two tropicbirds (Phaethontidae), one albatross (Diomedidae), three shearwaters/petrels (Procellariidae), three storm-petrels (Hydrobatidae), one frigatebird (Fregatidae) and two boobies (Sulidae). Hurricane Newton brought several new species which are currently pending. Looking forward, several species of seabirds have occurred elsewhere in the inland Southwest and could potentially occur in Arizona as well. Although most birders associate these occurrences with tropical storms in the late summer and early fall, including recently Hurricane Newton, the causes and timing of these events are often more complex than perceived. An understanding of these factors, as well as of identification, can help prepare birders for an encounter with these species.

HURRICANE NEWTON MEETS TUCSON WILDLIFE CENTER

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Hurricane Newton swept northward over the Gulf of California during the first week of September, 2016. The well-organized remnants of the storm crossed southern Arizona and Tucson on the 6th-7th of September, and deposited diverse pelagic and near-pelagic seabird species. What is a boon to excited birders and biologists is a major tragedy to these birds. Several individuals were presented to Tucson Wildlife Center for urgent veterinary care. As a modern and cutting-edge facility, Tucson Wildlife Center was ready for many situations but an influx of pelagic seabirds was never on the training agenda. This presentation will discuss the species involved; the veterinary care and planning; interpretation of a rare natural weather event on wildlife rescue, care and reintroduction; and the lessons learned.

PARTNERS IN FLIGHT LANDBIRD PLAN REVISION: WHAT IT MEANS FOR ARIZONA

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Partners in Flight has revised its 2004 North American Landbird Conservation Plan, and the 2016 version is now available. New analyses of Breeding Bird Survey data, eBird data, and other data sources provide a new view of the vulnerability of landbirds. The new "half-life" analysis presents information on the length of time until current species' populations will decline by half. For example, Bendire's Thrashers will decline by 50% in only 18 years at the current rate of decline. The Partners in Flight "Watch List" and a new grouping of vulnerable birds titled "Common Birds in Steep Decline" are highlighted. Both lists point to urgent conservation needs in Arizona's desertscrub and grassland habitats. Information is presented on a continental level as well as on a Bird Habitat Joint Venture level.

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PRELIMINARY FINDINGS: GOLDEN EAGLE NESTING PHENOLOGY (*AQUILA CHRYSAETOS*)

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In Arizona, the Golden Eagle (*Aquila chrysaetos*) has been largely unstudied. Beginning in 2011, the Arizona Game and Fish Department (AZGFD) began surveying Golden Eagle occupancy throughout the state. Nesting phenology and productivity data were collected for seasons 2011 thru 2014. Preliminary analyses show courting ranges from February 3 to March 23--with the average being February 19, the mean-date for egg-laying is February 26, and the incubation period ranges from March 3 to April 7. The mean-date for hatching is April 1, and the nestling period ranges from April 29 to June 1. Fledging occurs mainly between June 11 and July 5. Occupancy for individual nests was 30% and pair productivity was 38% collectively for all four seasons. These are preliminary findings relating to a larger study of Golden Eagles nesting in Arizona. Establishing a foundation timeline for Golden Eagle nesting phenology is important for any future studies, especially those involving the impact of global environmental change. By building a model to relate climate parameters, we can better understand how the effects of future climate change might influence nesting throughout the state. These findings, coupled with occupancy and productivity data, will assist the AZGFD to generate better conservation action and policy recommendations.

A RECOVERY EFFORT: CALIFORNIA CONDOR DISTRIBUTION, BREEDING AND CHALLENGES IN THE SOUTHWEST POPULATION

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Few species have been monitored and studied as closely as the California Condor. Since The Peregrine Fund began releasing condors into the wilds of northern Arizona in 1996, its range, breeding activity and population size have all significantly increased. In the early years, bird movements were limited to the Vermilion Cliffs, their natal area and location of the condor release site. As the population has grown and matured, the range has expanded to the South Rim of the Grand Canyon, the Kaibab Plateau and into southern Utah. Using conventional very high frequency (VHF) transmitters and the Global Positioning System (GPS), biologists are now able to clearly see patterns in seasonal movement that directly correlate to breeding behavior and food availability. While the highest number of potential breeding pairs and nesting attempts in the program's history were recorded in 2016, the population still faces many challenges to becoming self-sustaining. The leading cause of death and biggest limiting factor to population growth continues to be lead poisoning. Lead fragments found in gut piles and carcasses in the field pose a serious threat to the California Condor as well as other scavenging raptors. The Peregrine Fund is working with state wildlife agencies to address this issue in an effort to forge social and cultural change within the hunting community.

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A SUMMARY OF BIRD MONITORING OF RESTORATION SITES ON THE LOWER COLORADO RIVER

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Since 2005, the Lower Colorado River Multi-Species Conservation Program (LCR-MSCP) has been developing restoration sites along the Lower Colorado River, with cottonwood-willow, mesquite, marsh and backwater habitats represented. These sites have provided new areas of native habitat for breeding and migrating birds. The LCR-MSCP has monitored birds at these restoration sites and at existing habitat along the entire river. Bird monitoring includes surveys for southwestern Willow Flycatchers, Yellow-billed Cuckoos, marsh birds like the Ridgway's Rail, and other riparian breeding birds such as Summer Tanagers and Arizona Bell's Vireos. Productivity and survivorship are being tracked at bird banding stations through the Monitoring Avian Productivity and Survivorship (MAPS) Program. These surveys have gathered a large dataset on bird use at both restoration sites and the entire LCR as a whole. As the acreage of restoration sites increases on the river, they will play an increasing role in providing habitat for the bird community on the LCR and are designed to offset losses of habitat from diverting and delivering water to communities and agriculture.

SPATIAL ECOLOGY OF THE LOWER COLORADO RIVER VALLEY POPULATION OF GREATER SANDHILL CRANES

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The Lower Colorado River Valley Population (LCRVP) of greater Sandhill Cranes (*Antigone canadensis tabida*) is among the smallest and least studied population of Sandhill Cranes in North America. We equipped 18 greater Sandhill Cranes on two study sites in southwest Arizona and southeast California to assess the spatial ecology of the LCRVP. Our goal was to assess three objectives regarding LCRVP greater Sandhill Crane spatial ecology: overwinter space use and habitat selection at two scales (population, social group), and identification of migratory pathways and areas of migration importance (AMIs). Ten groups had > 85% overlap with their home range from the previous year. All home ranges partially overlapped, and six groups overlapped 100% with at least one home range from another group. The home ranges reported were larger than home range estimates in previous Sandhill Crane studies, indicating resources on wintering grounds are not arranged in space that minimized home ranges. Our results indicated that roosting locations were the principal driver of resource selection at both spatial scales and are likely a limiting factor for the overwintering LCRVP. Fall and spring migration corridors covered similar areas, but the fall corridor was a straighter and more direct path between breeding and wintering areas while the spring corridor was 50 km wider. We identified 16 AMIs over the four migration events; the Mojave National Preserve, Pahranaagat National Wildlife Refuge and Wayne E. Kirch Wildlife Management Area were the most used AMIs.

POSTER PRESENTATIONS

POPULATION AND DENSITY ESTIMATES OF BREEDING BIRDS IN THE SONORAN DESERT AND RIPARIAN HABITATS OF ARIZONA

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In Arizona, continental-scale bird monitoring programs such as the North American Breeding Bird Survey (BBS) do not adequately sample major bird groups, including species that: 1) breed in riparian habitats, and 2) Sonoran Desert species that breed earlier or later than most BBS surveys are conducted. Coincidentally, multiple species from these two habitats are represented on Arizona's Species of Greatest Conservation Need (SGCN) list, which means that many of Arizona's priority species are poorly monitored. To address this gap, the Arizona Game and Fish Department and partners implemented a study to estimate population size and density of breeding birds in Arizona's Sonoran Desert and riparian habitats. A total of 17 species (12%) on the SGCN list regularly nest in the Sonoran Desert, and many more species (47, or 32%) on this list nest in riparian habitat. We used multiple criteria to define the study area for each habitat and stratified random sampling to select survey plots. To estimate detection rates we used double sampling, by which all plots are surveyed rapidly (i.e., infrequently) and a random subset is surveyed intensively (i.e., more often). For the Sonoran Desert we recorded 15,909 birds of 74 breeding species, and estimated population size and density for 10 of the 17 SGCN species. We estimated the total population size in the study area at about 30 million birds, with an overall density of 437 birds/km². For the riparian habitat, we recorded 34,748 birds of 197 breeding species, and estimated population size and density for over 100 species, 23 of which were SGCN. Total population size in the study area was estimated at about 1.5 million birds, with a density of about 1,950 birds/km². Repeating these surveys over time will provide long-term trend data that can inform conservation and adaptive management at relevant scales.

PRESCRIBED FIRE, RESOURCE OBJECTIVE FIRE AND WILDFIRE EFFECTS ON AMERICAN THREE-TOED WOODPECKER HABITAT IN ARIZONA

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Prescribed burning and naturally ignited "resource objective" fires are used by land managers to manage fuels, as tools for ecosystem restoration, and to help reduce the size and severity of wildfires in ponderosa pine and ponderosa pine/Douglas-fir forests. These ecosystems are the preferred habitat for the American Three-toed Woodpecker in Arizona. A recent study in these forest types showed that the woodpeckers prefer areas with moderate burn severity that contain a mix of unburned to severely burned trees. Large snags (≥ 30 cm diameter) for nesting, and trees averaging 63 cm for foraging, are critical habitat components. We combined Monitoring Trends in Burn Severity (MTBS) and field plot data to analyze woodpecker habitat created by 105 prescribed fires, resource objective fires, and wildfires covering nearly 610,000 hectares. Moderate severity fire comprises 23% of wildfire landscapes, 12% of resource objective fire landscapes, and only 1% of prescribed fire landscapes. Although wildfires

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create the greatest amount of moderate burn severity areas, resource objective fires—because they occur during conditions that generally do not allow them to become extremely large or to become threats to human life and structures—are likely the best compromise to meet both American Three-toed Woodpecker habitat requirements and forest restoration targets.

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