



*Abstracts of the Scientific Program*  
Joint Meeting of Association of Field Ornithologists (AFO) and  
Wilson Ornithological Society (WOS)  
October 27 to 30, 2019  
Cape May, NJ

Monday morning plenary address: *Wilson Ornithological Society*  
*Margaret Morse Nice Lecture*

Dr. **Robert Curry**, Villanova University

**Transformation of familiar birds into model organisms: what chickadees can teach us.**

Much like the Song Sparrows that captivated Margaret Morse Nice, chickadees are charismatic backyard birds that we easily take for granted. Research concerning several North American chickadee species has burgeoned in recent decades, yielding insights about fundamental problems in ornithology — approaching what we have learned from their European relatives. The role of vocal behavior in chickadee mating systems has been examined thoroughly. "Our" chickadees are currently central among studies of social networks using technological tools that allow us to track movements and associations in space and time. Chickadees have contributed important insights concerning cognitive ecology and neuroethology. Long-term research within the northward-moving hybrid zone between Black-capped and Carolina Chickadees combines many of these elements, while also employing genomic approaches and Citizen Science data; this work has revealed influences of ongoing climate change and behavioral mechanisms on the dynamics of songbird hybridization. There is still much to learn from these familiar birds.

Tuesday morning plenary address: *Association of Field Ornithologists*

Dr. **Christina Riehl**, Princeton University

**Cooperative breeding in the Neotropics: important lessons from obscure players.**

The study of cooperative breeding in birds has a long history in the New World tropics, beginning with Alexander Skutch's seminal observations of helpers at the nest. Recent studies of Neotropical birds have revealed a diversity of cooperative systems, ranging from small family groups to complex societies composed of relatives and immigrants. This talk will briefly review recent studies on these systems, which form our current understanding of the different evolutionary pathways leading to various forms of cooperative breeding. We'll then focus on the communally breeding cuckoos – the anis and their allies – which breed in social groups with several unrelated co-breeders. Although this breeding system is unusual among birds, the study of communal nesting can lend important insights into fundamental reproductive trade-offs in birds. Data from a long-term field project on Greater Anis in Panama has shed light on the selective pressures favoring (and constraining) sociality, including effects of group size on reproductive fitness, mating and parental care patterns, and alternative strategies such as conspecific brood parasitism.

## Oral Presentations

**C1** **Samantha Apgar** (S) and Chris Elphick. Department of Ecology and Evolutionary Biology, The University of Connecticut, Storrs, CT 06268. **Tidal marsh bird behavioral plasticity in response to nest flooding events.** As anthropogenic stressors threaten species with extinction, phenotypic plasticity and natural selection are two potential mechanisms for species persistence. Specialist species are especially vulnerable during times of environmental change, necessitating fine scale study of their potential to respond. We are studying behavioral plasticity of four sympatric tidal marsh bird species – Saltmarsh Sparrow *Ammospiza caudacuta*, Seaside Sparrow *Ammospiza maritima*, Clapper Rail *Rallus crepitans*, Willet *Tringa semipalmata*. These species nest near the ground in tidal marshes and are vulnerable to nest failure from high spring tides. Limited evidence suggests that Saltmarsh Sparrow chicks can climb up vegetation to avoid drowning and that Clapper Rails can manipulate nest structure during floods and retrieve eggs that have flooded out. To assess the frequency and conditions under which species engage in behaviors used to mitigate nest failure during flooding, we used infrared radiation cameras to film nests during nightly high tides occurring around the full and new moons. Preliminary data confirms existing literature on what behaviors each species employs and demonstrates that rails are most frequently at nests during flooding events, whereas adult Saltmarsh Sparrow, Seaside Sparrow, and Willets are largely absent. Chicks of both Saltmarsh Sparrows and Seaside Sparrows are able to climb once they reach a certain age. This ongoing project aims to determine how much flexibility there is in the frequency and conditions under which individuals employ behaviors to combat failure from nest flooding, in order to improve the understanding of each species' status in the face of sea-level rise.

**H2** **Ian Ausprey**, Felicity Newell, and Scott Robinson. Florida Museum of Natural History, Department of Biology, University of Florida. **Eye size predicts light microenvironment use, foraging niche, and sensitivity to habitat disturbance of Neotropical cloud forest birds.** Eye size of terrestrial birds is often assumed to reflect interspecific variation in light microenvironment use and predicted to influence foraging behavior and sensitivity to habitat disturbance. However, no study has explicitly linked eye size to the actual light microenvironments used by wild birds. We hypothesized that eye size would predict (1) light intensity use, (2) foraging niche (stratum and maneuver), and (3) sensitivity to human-induced habitat modification. During 2016 – 2019 we placed light sensors on 15 species of cloud forest birds in northern Peru (N = 72 individuals), measured the lateral eye width for 135 species, and conducted point count surveys across a gradient of agricultural land use. Foraging behavior and eye size (phylogenetically corrected for body mass) predicted most of the variation in light intensity use ( $F_{4,10} = 8.312$ ,  $p = 0.003$ ,  $R^2 = 0.84$ ). Understory species had the largest eyes and used the darkest environments (<2% of total available sunlight) compared to canopy species with smaller eyes that used brighter environments (20-30% total available sunlight). Across the bird community 38% of the variation in eye size was explained by foraging stratum and behavior, with far-sighted foragers (sally/pouncers) in the understory having the largest eyes and near-sighted foragers (pick/gleaners) in the canopy having the smallest eyes. Average eye size was marginally higher for species sensitive to the two most brightly lit habitats in our system: fencerows and pasture trees. We argue that eye size is a novel functional trait contributing towards the fundamental niche of terrestrial bird species.

**G4** **Daniel T. Baldassarre**<sup>1,2</sup>, Leonardo Campagna<sup>3,4</sup>, Henri A. Thomassen<sup>5</sup>, Jonathan W. Atwell<sup>6</sup>, Miyoko Chu<sup>7</sup>, Lisa H. Crampton<sup>8</sup>, Robert C. Fleischer<sup>9</sup>, and Christina Riehl<sup>1</sup>. <sup>1</sup>Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ, USA, <sup>2</sup>Current address: Department of Biological Sciences, SUNY Oswego, Oswego, NY, USA, <sup>3</sup>Fuller Evolutionary Biology Program, Cornell Laboratory of Ornithology, Cornell University, Ithaca, NY, USA, <sup>4</sup>Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY, USA, <sup>5</sup>Institute for Evolution and Ecology, University of Tübingen, Tübingen, Germany, <sup>6</sup>Department of Biology, Indiana University, Bloomington, Indiana, USA, <sup>7</sup>Communications Program, Cornell Laboratory of Ornithology, Ithaca, NY, USA, <sup>8</sup>Kaua'i Forest Bird Recovery Project, University of Hawaii at Manoa, Hanapepe, HI, USA, <sup>9</sup>Center for Conservation Genomics, Smithsonian Conservation Biology Institute, Washington, DC, USA. **GPS tracking and population genomics suggest itinerant breeding across drastically different habitats in the Phainopepla.** Migratory birds generally divide the annual cycle between discrete breeding and non-breeding ranges. Itinerant breeders, however, reproduce twice at different geographic locations, migrating between them. This unusual flexibility in movement ecology and breeding biology suggests that some species can rapidly modulate the conflicting physiological and behavioral traits required for migration and reproduction. The Phainopepla (Phainopepla nitens), a songbird of the southwestern USA, has long been suspected to breed first in desert habitats in spring, then migrate to woodland habitats to breed again in summer. However, direct evaluation of movement and gene flow among individuals breeding in different locations has previously been logistically intractable. We deployed GPS tags on free-flying Phainopeplas in southern California, all of which migrated to woodland breeding habitats after desert breeding (an average distance of 232 km). GPS data also revealed previously unknown fall and spring stopover sites. Population genomic analyses revealed no genetic differentiation among desert and woodland breeding populations, indicating significant movement and gene flow across the region. Finally, we used random forest analyses to quantify substantial environmental differences among temporal stages. Our results provide direct evidence that individual Phainopeplas do indeed move between two drastically different breeding habitats in the same year, representing a rare and extreme example of life-history flexibility.

**M2 Priti Bangal** (1) (SP), Hari Sridhar (2), and Kartik Shanker (1). 1Centre for Ecological Sciences, Indian Institute of Science, Bengaluru, Karnataka, India, 2National Centre for Biological Sciences, Bengaluru, Karnataka, India. **Phenotypic clumping reduces with flock size in heterospecific bird flocks.** Mixed-species bird flocks (referred to as 'mixed-flocks' hereafter), are heterospecific associations among two or more insectivorous forest bird species. They are commonly seen in temperate and tropical forests, worldwide. At multiple sites across the world, these associations are known to form an important part of the bird community. Initial studies on flocks have found evidence for competition structuring composition of mixed-flocks, more recent studies have highlighted the role of positive interactions between similar species in flocks. In this study, we examine flock composition based on changing context and examine the change in phenotypic assembly of flocks with increasing flock richness. Our aim was to study the change in phenotypic clumping in body size, foraging behaviour and foraging height with increasing flock richness. Field sampling was done in Anshi National Park in the Western Ghats of tropical India. We used a combination of scan and focal sampling to collect data on flock composition and phenotypic traits. We adopt a null model approach to analyse the species traits data. We find that phenotypic clumping in flocks reduces with increase in flock richness. Less species rich flocks are made up of species more similar than expected by chance. The variation in species traits is higher, close to random in larger flocks. This pattern is stark for the trait body size, across years, but not consistent across years for foraging behaviour and foraging height. We conclude that mixed-species flocks are more deterministic at small flock richness values while large flocks resemble random phenotypic assemblages.

**G3 George F. Barrowclough.** Dept. Ornithology, American Museum of Natural History, New York, NY 10024. **Natal dispersal distances in Spruce Grouse (*Falcipennis canadensis*): Sampling bias estimation and correction.** It is extremely difficult to estimate the distribution of dispersal distances in natural populations; finite study areas introduce an observational bias making it difficult to distinguish between long-distance dispersal and mortality. This results in an under-estimation of dispersal, effective population size, and gene flow. Previously, the magnitude of the bias could be estimated only for circular study sites, but it was known that the actual extent of bias is determined by the precise size and shape of the study area. Using fast desktop computers, we have now developed a Monte Carlo integration method for estimating this bias for arbitrarily shaped sites, including those that are concave, include non-contiguous areas, or even contain observational holes. The approach provides confidence intervals as well as parametric estimates. We apply the method to results of the long-term Spruce Grouse study at Gorge Creek, Alberta. The results indicate that natal dispersal distances of both male and female grouse exceeded the dimensions of that research site. The new method can be used to improve the design of long-term population studies for conservation, genetic, or management purposes.

**A2 Audrey L. DeRose-Wilson** (1), Jacquie A. Clark (2), Nigel A. Clark (2), David Carter (3), and **Henrietta A. Bellman** (1)\*. 1Delaware Division of Fish & Wildlife, 89 Kings Hwy SW, Dover, DE 19901, 2BTO, The Nunnery, Thetford, Norfolk IP24 2PU, UK, 3.818 Union Church Road, Townsend, DE 19734 USA. **All our eggs in one basket: The importance of Mispillion Harbor, Delaware, for migratory birds.** Thousands of migrating shorebirds stopover along the Atlantic Coast during the journey to and from breeding grounds in the Arctic and sub-arctic. Over the past two decades, extensive monitoring has confirmed the disproportionately high habitat value of Mispillion Harbor to migratory shorebirds using the Delaware Bay stopover. We chronicled the history of Mispillion Harbor's emergence as critical habitat, documented its vital importance to several shorebird species in the Western Hemisphere, and considered how habitat management of the site may provide insights for management along the Delaware Bay coast. We summarized shorebird population data documenting the harbor's hemispheric habitat value in the context of shorebird and horseshoe crab population declines as well as coast wide habitat changes using mark-resight and GIS methods. Finally, we considered the long-term viability of the Mispillion site, the ongoing need for species monitoring to guide its sustainable management, the risks associated with shorebird overdependence on one site located in a coastal storm high hazard zone, and broader habitat development along the Delaware Bay coast. Protection of Mispillion Harbor is critical to several hemispheric populations of shorebirds. However, undertaking efforts to create additional high-quality sites is advised to mitigate the risks of dependence on a single site. The creation of additional high-quality sites may be a prerequisite to support future increases in shorebird populations should ongoing shorebird conservation efforts successfully result in population recovery. It may also be an indispensable tool for adaptation to habitat changes associated with sea level rise.

**F4 Henrietta A. Bellman** (1)\*, Stephanie Warshawsky (1), Evangelin VonBoeckman (1), Annabel Larsen (2), Stormy Vandeplas (2) and Audrey L. DeRose-Wilson (1). 1. Delaware Division of Fish & Wildlife, 6180 Hay Point Landing Road, Smyrna, DE 19977. 2. U.S. Fish and Wildlife Service, Prime Hook National Wildlife Refuge, 11978 Turkle Pond Rd, Milton, DE 19968. **Piping plover population increase following habitat creation in Delaware, USA: benefits for the wider recovery unit,** The Atlantic Coast Recovery Plan (USFWS 2016) was established to ensure the long-term viability of the Atlantic Coast piping plover (*Charadrius melodus*). This Plan defines three recovery units, with associated recovery goals. Delaware is part of the Southern recovery unit along with MD to SC. Although this unit has shown an increase in pair numbers since 1986 (peak 386 in 2016), it has not reached the unit's recovery goal (400 pairs). Numerous studies describe plover population growth following habitat creating processes such as storms or hurricanes. Research has also shown that plovers will use human-created habitat including engineered sandbars or beaches. In 2016 approximately 35ha of wide, sandy beach was created during a restoration project at Prime Hook Wildlife Refuge (PHNWR). There are no records of plovers breeding on Delaware Bay beaches, and Delaware's small plover population ( $\bar{x}=6$  pairs, 1989–2015) had nested exclusively on Atlantic Coast beaches. However, in 2016 one pair nested in the newly created habitat at PHNWR and since the number of pairs has increased to 14 (2019). In 2016, no chicks were produced but since then productivity has ranged from 1.08–2.25 fledglings/pair. The historic average productivity for

plowers nesting on Delaware Atlantic Coast beaches was lower (1.37 fledglings/pair, 1989–2015). We have recorded color-banded plovers which previously nested in New Jersey breeding at PHNWR suggesting secondary dispersal and movement between states. These trends observed in Delaware demonstrate the potential benefit of habitat creation for breeding plovers at the regional and population level.

**L6 Breanna L. Bennett** (1), Emily S. Burton (2), Robert J. Driver (3), Robert L. Curry (1). 1. Department of Biology, Villanova University, Villanova, PA 2. School of Biological Sciences, Washington State University, Pullman, WA 3. Department of Biology, Eastern Carolina University, Greenville, NC. **Won't you be my neighbor? Distribution of nesting pairs within a hybrid-zone chickadee population.** Parapatric Black-capped Chickadees (*Poecile atricapillus*; BCCH) and Carolina Chickadees (*P. carolinensis*; CACH) hybridize, producing viable and nonsterile offspring (HYCH), in a narrow zone from Kansas to New Jersey. Our long-term field studies in southeastern Pennsylvania and genetic analyses have shown that Carolina Chickadees are expanding northward, in association with warming winter conditions, at the expense of range-contracting Black-capped Chickadees. Here, we examine the spatial distribution within one hybrid-zone population (Hawk Mountain), as numbers of Carolina and hybrid chickadees increased between 2001 and 2018, to test whether settlement facilitated or impaired hybridization. Analysis examined whether females or males of a given genotype create genetic “neighborhoods”, i.e. geospatial clustering of certain same-genotype individuals. Evidence suggests that chickadees of all genotypes settle randomly within the population at Hawk Mountain, in a pattern that neither promoted nor impeded hybridization. The population of chickadees at Hawk Mountain also experiences a high rate of extrapair copulations, with varying numbers of extrapair offspring in nests. Further spatial analysis will reveal the pattern of extrapair paternity in the Hawk Mountain population in relation to potential extrapair mates.

**R3 Ruth Bennett\*** (1), Scott Sillett (1), Peter Marra (1, 2). 1. Migratory Bird Center, Smithsonian Conservation Biology Institute, Washington, DC 20008 2. Department of Biology and McCourt School of Public Policy, Georgetown University, 37th and O Streets NW, Washington, DC 20057, USA. **Bird-friendly chocolate: Promoting biodiversity conservation within cocoa agroforests.** The cocoa tree, native to Amazonian rainforests, is now cultivated throughout the tropics to satisfy a global craving for chocolate. Within tropical working landscapes, cocoa has long been heralded as a biodiversity-friendly farming system that supports high richness of both migratory and tropical resident bird species. However, increasing market demand for chocolate has led to the intensification of cocoa production, resulting in widespread destruction of primary forest and habitat degradation within plantations through the removal of shade trees. Understanding how cocoa farming practices impact bird richness, abundance, and diversity is the first step to building farmer and consumer-facing campaigns that promote bird conservation within cocoa agroforests. Here, we synthesize data from 34 published studies of bird diversity in cocoa agroforestry to determine what farming practices and landscape-level factors affect birds within cocoa producing regions. We find the bird community responds most strongly to the number of native tree species retained in plantations, the canopy structure, and the amount of forest retained on the landscape. Using a meta-analysis of 150 papers, we examine the relationship between on-farm yield and these important drivers of bird diversity, which indicates high yields can be maintained along with bird diversity in some situations. Finally, we discuss how these findings can be leveraged to promote bird conservation within industry-driven sustainability initiatives and third-party certifications such as Smithsonian Bird Friendly.

**O1 Kristin Bomboy** (1)(S), Dr. Jeffery Larkin (1). 1. Department of Biology, Indiana University of Pennsylvania, Indiana, PA, 15701. **Breeding ecology of *Vermivora* warblers in managed shrublands of southwestern Pennsylvania.** Golden-winged Warblers (*Vermivora chrysoptera*) and Blue-winged Warblers (*Vermivora cyanoptera*) are two closely related shrubland bird species. Both are experiencing annual population declines in Pennsylvania, and loss of early successional breeding habitat is thought to, in part, be contributing to their declines. Several studies have provided insight about breeding habitat characteristics for the more imperiled Golden-winged Warblers. However, few studies have examined breeding habitat characteristics of the Blue-winged Warbler. We studied the breeding ecology of *Vermivora* warblers in managed shrublands predominately occupied by Blue-winged Warblers. We captured and attached radio-transmitters to adult males in early May 2019 and monitored their movements throughout the breeding season. We then sampled vegetation within each male's 95% home range and 50% core territory. Blue-winged Warbler (n=13) home ranges were 4.6 times larger than core territories (10.94 ± 5.23 ha vs. 2.41 ± 1.23 ha). Core territories were dominated by shrublands and early-successional forest, while home ranges were comprised of a mix of shrublands and early-, mid- and late-successional forest. Home ranges had less grass cover and more canopy cover, forbs cover, and leaf litter than core territories. These results suggest that Blue-winged Warblers use a greater diversity of cover types during the breeding season than previously described.

**Q5 Reed Bowman** (1), Gregory T. Thompson (1), and Emily Angell (1) 1. Avian Ecology Program, Archbold Biological Station, Venus, FL 33960. **Unintended consequences of translocation: Reproductive skew and reduced effective population size in the red-cockaded woodpecker.** Translocation is an important conservation tool to rescue small, isolated populations. The infusion of new individuals can increase genetic diversity and lead to rapid population growth. However, if outbred pairs have greater fitness, this can potentially lead to high reproductive skew and unintended consequences for genetic diversity. Over nearly 20 years (1998-2016) we translocated 54 red-cockaded woodpeckers (RCW) to Avon Park Air Force Range, in central Florida. From 2004 to 2018, the population nearly doubled (22 to 42 groups), but one translocated male was especially successful, breeding for 14 years and producing 11 young that eventually became breeders – more than any other bird over 27 years of monitoring. One grandson was nearly as productive. The result of this reproductive skew is that by 2018, 33% of all

birds in our population were direct descendants of this one male, reducing the effective population size. We illustrate how mean kinship and genetic diversity changed before and throughout our period of translocations and the impact of this one lineage on the genetic health of this population. We emphasize that inbreeding resulting from high reproductive skew of outbred pairs might be especially severe in small, inbred populations, even as they grow. At present, translocation of RCWs is restricted to very small populations (< 30 groups); however, translocation for the primary goal of genetic rescue can counteract skew, reduce inbreeding and increase genetic diversity even in medium or large-sized populations.

**P5 David F. Brinker.** Natural Heritage Program, Maryland Department of Natural Resources. **Rise and fall of Northern Goshawks in the Central Appalachian Mountains: Is there reason for conservation concern in the Northeastern U.S.?** Autumn counts of dispersing goshawks at two Pennsylvania hawk watches, Hawk Mountain and Waggoner's Gap, increased from 1990 through 2001 and then declined significantly through 2018 to levels lower than the early 1990s. During the period from 1975 to 2018, at both locations, the lowest five counts occurred during the past 10 years. In the past 25 years breeding goshawks expanded into West Virginia and Maryland and then retreated from both states to central Pennsylvania and northward. The states of Pennsylvania, New York, Massachusetts, and Vermont documented declines in goshawk breeding between first and second state-wide breeding bird atlases. Average reproductive success in the central Appalachians between 2001 and 2015 was 58 percent, although in both 2009 and 2015 reproductive success fell below 20 percent. Turnover of females in breeding territories is twice that of males and at monitored territories two nesting females have been found depredated by mammalian predators. Inflection of population trend trajectory in central Appalachian goshawks occurred between 2000 and 2002 as West Nile Virus spread across the eastern U.S. Since 2000 Fisher (*Pekania penanti*) populations have increased dramatically in central Appalachian mountain states. Northern Goshawk populations in the central Appalachians may be experiencing demographic challenges resulting from addition of these two new mortality factors. Northern Goshawk populations in the central Appalachians, and possibly the northeastern U.S., may be at the point where additional conservation and research attention is warranted.

**M1 Isabel R. Brofsky (S)(1), David I. King (2), and Kimberley Peters (3).** 1. Masters Student, Department of Environmental Conservation, University of Massachusetts, Amherst, MA 01003 2. Northeastern Research Station, USDA Forest Service, University of Massachusetts, Amherst, MA 01003 3. Project Biologist, Environmental & Permitting Services, DNV GL – Energy. **Bird abundance and habitat associations on small, diversified farms in New England.** New England agriculture has become increasingly characterized by small, diversified operations that implement environmentally-conscious growing practices. With decreased chemical inputs and retention of natural habitats, these farms represent an opportunity for birds conservation. Few studies have examined bird use of farms in New England, and those that have focus on grassland habitats such as hayfields rather than small, diversified farms producing non-grassland type crops such as vegetables, fruits, and berries. Due to their small size and proximity to habitats such as shrubby or wooded hedgerows, we suspect that these farms may instead support species that breed in shrublands. We conducted point counts across 23 farms in the Pioneer Valley, MA. Our objectives were to 1) characterize bird communities, 2) quantify local bird-habitat associations, and 3) evaluate the conservation value of these farms. Our results confirmed that shrubland birds were the predominant species present, accounting for over 52% of the total observations. Bird-habitat relationships were diverse, but several species, such as Song Sparrow (*Melospiza melodia*) and American Goldfinch (*Spinus tristis*), responded positively to the presence of productive landcover such as rowcrops, while others such as Gray Catbird (*Dumetella carolinensis*) and Common Yellowthroat (*Geothlypis trichas*) were associated with woody nonproductive habitat such as hedgerows. Finally, we found that the conservation value of farms was comparable to managed shrubland habitats such as wildlife openings, clearcuts, and powerline rights-of-way. Our findings support the hypothesis that small, diversified farms are contributing beneficial habitat for priority species, as well as providing guidelines for managers or farmers interested in conserving these species.

**K4 Angeline Canney, Claire Ramos, Clark Jones.** Colorado State University – Pueblo. **Effects of precipitation on the avian biodiversity community on the short grass prairie.** Climate change affects organisms on every level, from the biosphere on down to the individual. One of the factors that climate change is expected to impact is precipitation particularly in the west. Precipitation in a dry environment can be the difference between organisms having a successful breeding season and an unsuccessful one. In 2018, Colorado saw one of the drier years in the short grass prairie, while in contrast, 2019, had above average precipitation. This allowed for a natural experiment to investigate the impacts of precipitation on avian communities in the shortgrass prairie. We conducted point counts at different areas in the same vicinity on the shortgrass prairie, to gain a snapshot of the biodiversity. We predicted that the drought year will show less diverse avian community than the wet year. This research will allow us to build predictions for how climate change may impact avian communities in the shortgrass prairie going forward.

**A1 Jameson F. Chace (1,2) and Micaela M. Griffin (1).** 1. Department of Biology and Biomedical Science, Salve Regina University, Newport, RI 02840. 2. Department of Cultural, Environmental and Global Studies, Salve Regina University, Newport, RI 02840. **Stopover habitat quality in a conserved urban riparian zone in Rhode Island.** High quality stopover habitats provide birds with the opportunity for rapid net energy gain as measured by an increase in avian body mass index (BMI) relative to time since dawn, when foraging begins. In this study, we measured the BMI of fall migrants from 2012-2018 in an urban riparian conservation easement Middletown, RI. Over the course of the study, 60 species were captured in mist nets at an average rate of 93.4 captures/100 net hours. The most common migrant species captured were Common Yellowthroat (*Geothlypis trichas*),

Gray Catbird (*Dumetella carolinensis*), Swamp Sparrow (*Melospiza georgiana*), Song Sparrow (*M. melodia*) and White-throated Sparrow (*Zonotrichia albicollis*). When combined, a decrease in the BMI was observed for all species as time progressed each day and over the course of the migratory season. The most common sparrow species had varying degrees of a decrease in BMI over time since sunrise. Common Yellowthroat and Gray Catbird had a slight increase in BMI as time since sunrise progressed. These results suggest the Middletown, RI site is not a quality stopover habitat for all migratory birds, and may be a stopover “trap” for some, in that it provides safe resting place in dense shrubs of primarily invasive *Rosa multiflora*, among less common natives *Myrica* and *Viburnum*, but does not support the insect and berry abundance and quality that migrants require. The implications for urban habitat conservation easements is that active management may be required to maintain quality stopover habitat.

**P1 Nathan W. Cooper (1), Peter P. Marra (1,2).** 1. Smithsonian Institution, Migratory Bird Center, Washington, D.C. 20013 2. Georgetown Environmental Initiative, Dept. of Biology, Georgetown University, Washington, D.C. 20057. **Tracking Kirtland’s Warblers across the annual cycle using the Motus Wildlife Tracking System.** Miniaturization of avian tracking technology has dramatically enhanced our understanding of migratory birds over the past two decades. The use of coded radio-tag technology in conjunction with the Motus Wildlife Tracking System now allows for continental-scale tracking of many species. From 2017 to 2019, we tagged 163 Kirtland’s Warblers on their Bahamian wintering grounds and then later detected 105 (64%) and re-sighted 99 (60%) of them on their breeding grounds in Michigan. Here, we present our early findings from this new study system. We use these data to investigate the strength of migratory connectivity between wintering and breeding grounds, the timing of spring and fall migration departure, and pre- and post-breeding movement dynamics on the breeding grounds. We found that Kirtland’s Warblers have very weak migratory connectivity indicating that birds wintering in The Bahamas migrate to locations across the entire breeding range. We also found that regardless of departure date, age, sex, and season, Kirtland’s Warblers begin migration within a narrow window of time shortly after astronomical dusk, when all celestial cues first become visible. Finally, we found that some individuals exhibit protracted pre- and post-breeding movements on the breeding grounds, which are indicative of prospecting behavior. We will discuss the conservation implications of our findings as well as the next steps in development of our study system to directly study seasonal interactions within the same individuals across the annual cycle.

**K9 Jason R. Courter(a), Ryan A. Weber(a), and Michael Watson(b).** (a) Malone University, Canton, OH 44709 (b) Holden Forests and Gardens, Kirtland, OH. **Climate-related changes in the nesting phenology and incubation periods of Tree Swallows in Northeast Ohio from 1966-2016.** To optimize nesting success birds must time reproduction to raise young during periods of high food abundance. In places where food resources are becoming available earlier in the spring, birds may also advance their lay or hatch dates. Tree Swallows (*Tachycineta bicolor*) are single-brooded, long-distance migrants that breed throughout the northern United States. Here, we assess changes in first egg dates and hatch dates of Tree Swallows (n = 1776) at the Holden Arboretum in Kirtland, Ohio, from 1966-2016, in relation to winter and spring temperatures, winter and spring precipitation values, and growing degree-day accumulations. First egg dates of Tree Swallows advanced by 5 days during our study period, but hatch dates advanced by only 2 days, indicating an approximately 3-day increase in the duration of the incubation period over time. Shorter incubation periods were associated with warmer and wetter springs and longer incubation periods were associated with increased winter precipitation. Tree Swallows also nested at higher degree-day accumulations than in the past. Advancing nesting parameters, but still nesting later relative to spring conditions, may indicate a difficulty for Tree Swallows to remain in sync with food resources, and may partially explain notable population declines reported in the past 50 years by the Breeding Bird Survey. Increasing the duration of the incubation period may be an evolutionary strategy that Tree Swallows use to nest early in response to warming climates but still retain flexibility to respond to local, and increasingly erratic, weather cues.

**B8 Lorraine Dargis and Dr. Lauryn Benedict.** Biology Department, University of Northern Colorado. **Does population density affect singing behavior of canyon wrens (*Catherpes mexicanus*)?** Female songbirds are considered infrequent singers, particularly in temperate climates. However, recent research has shown that female passerines sing in over 70% of observed species worldwide (Odom et al. 2014). Interestingly, the canyon wren (*Catherpes mexicanus*) is a species with female song that is distributed in temperate areas. Previous research has shown that this behavior is independent from male song and signals a territorial confrontation by another female, prompting song from nearby females (Hathcock and Benedict 2018). Population density has been known to increase territoriality to neighbors (Yoon et al. 2012). Therefore, we hypothesized that high population density might affect rates of female song by promoting territorial confrontations. We conducted playback experiments in two areas: Northcentral Colorado (Spring/Summer 2018) and Southeastern Arizona (Spring/Summer 2019). We hypothesized that: (1) Females in higher density AZ will sing more without playback as a result of increased social pressure. (2) Females in higher density AZ will sing more songs, have songs with wider frequency bandwidths, higher mean entropies, longer syllable durations, lower frequencies and shorter times between songs in response to playbacks. Preliminary results have shown that females do not sing more often in densely populated areas, neither spontaneously nor in response to playback. (Hypothesis 2). However, birds living in high density locations do appear to sing more aggressively. These outcomes shed light on the roles that females play in territory defense, and how and why female canyon wrens retained their song. Literature Cited: 1.) Odom, K. J., Hall, M. L., Riebel, K., Omland, K. E., & Langmore, N. E. (2014). Female song is widespread and ancestral in songbirds. *Nature Communications*, 5, 3379. 2.) Hathcock, T. J., & Benedict, L. (2018). Conspecific challenges provoke female canyon wrens to sing but not to duet. *Behavioral ecology and sociobiology*, 72(12), 196. 3.) Yoon, J., Sillett, T. S., Morrison, S. A.,

& Ghalambor, C. K. (2012). Breeding density, not life history, predicts interpopulation differences in territorial aggression in a passerine bird. *Animal Behaviour*, 84(3), 515-521.

**O3 Sarah C. Deckel (1)(S), William V. DeLuca (1), Alexander R. Gerson (2), David I. King(1)(3)** 1. Department of Natural Sciences/Environmental Conservation, University of Massachusetts, Amherst MA 01003 2. Department of Biology, University of Massachusetts, Amherst MA 01003 3. USGS Forest Service, Northern Research Station, Amherst, MA 01003. **Mechanisms that drive breeding success in Swainson's thrush (*Catharus ustulatus*) across an elevational gradient.** The factors that determine the distribution of animals is a fundamental question in ecology, which includes biotic drivers such as dietary niche, as well as abiotic drivers such as temperature and precipitation. Organisms that occupy a wide elevational range (200-1,200m a.s.l.), such as the Swainson's thrush (*Catharus ustulatus*), are potentially vulnerable and may become constricted as suitable temperature conditions and associated prey species shift in response to climate change. Previous literature has found birds that have access to suitable and sufficient diet sources may be more likely to produce larger and more successful clutch sizes. However, the fluctuation of prey species and diet due to the changing climate across the gradient throughout the breeding season have not yet been thoroughly studied. We evaluated the changes of isotopic signature ( $\delta^{13}C$  and  $\delta^{15}N$ ) within plasma of individuals and monitored breeding success across an elevational gradient in the White Mountain National Forest of New Hampshire from May-July of 2018 and 2019. Diet source will be estimated using stable isotope mixing models with insects sampled from the study site as inputs, and breeding success will be evaluated using the Mayfield approach to determine the success of life stages (i.e. eggs and nestlings). Preliminary results from 2018 show a potential shift in diet ( $\delta^{13}C$ ) occurs across the elevational gradient, however, further analysis of 2019 breeding success and isotope data is still underway. This research will help provide important implications on the resource availability songbirds depend on during the breeding season within these delicate mountain ecosystems.

**D6 Joely G. DeSimone(S), Bret W. Tobalske, and Creagh W. Breuner.** Organismal Biology, Ecology, and Evolution, University of Montana, Missoula, MT 59812. **Prepare or escape? The behavioral, physiological, and hormonal responses of a facultative migrant to declining food availability.** Migration is an evolved behavior that allows animals to take advantage of resources that are variable in time and/or space, and different migratory strategies depend on the predictability of resource variation. When food varies seasonally, obligate migrants can anticipate and prepare for migration, but it is unknown whether facultative migrants, whose movements are characteristically unpredictable in timing and destination, prepare for migration or rather escape when resources are low. Here we conducted a captive experiment to test two hypotheses about the behavioral and hormonal responses of a facultative migrant (Pine siskin; *Spinus pinus*) to declining food availability. Prepare Hypothesis: Siskins prepare for departure by increasing fuel stores, and elevations of baseline corticosterone (CORT) support increased locomotor activity. Escape Hypothesis: Siskins don't prepare for departure, body condition declines as food availability declines, and stress-related levels of CORT induce escape behavior. Throughout a 15-day experiment, we measured body composition using a Quantitative Magnetic Resonance machine, continuous locomotor activity using force perches, and baseline CORT levels among birds given ad libitum food or a slow decline, fast decline, or randomly changing amount of food. We found support for the Escape Hypothesis. Siskins' body condition declined as food declined, baseline CORT was elevated in birds with reduced lean mass, and birds showed marked increases in activity only when food availability was low. This work shows that facultative movements are physiologically distinct from seasonal, obligate migration, with food availability likely serving as a proximate cue, and birds showing little to no preparation for flight.

**I4 Emily R. Donahue (1)(S), Lee Bryant (1), Jacob Wessels (1), Joseph Youtz (1), Rhett Raibley (1), Kevin Krajcir (1), and Than J. Boves (1)** 1. Department of Biological Sciences, Arkansas State University, State University, AR 72467. **Winter behavior and diet of loggerhead shrikes (*Lanius ludovicianus*) in an intensive agricultural area of northeast Arkansas.** Native grasslands in the United States are disappearing at a rapid rate as agricultural land conversion transforms the landscape. Along with their natural habitats, grassland-associated species, such as the Loggerhead Shrike (*Lanius ludovicianus*; hereafter LOSH), are likewise in steep decline. Though few LOSH studies have focused on intensive agricultural areas, populations persist in these unlikely habitats. We monitored one such population, specifically during the under-studied, non-breeding period, to better understand how LOSH use these landscapes. LOSH in our study spent a majority of the time (81%) perched and scanning for prey items, mainly from utility wire (used 68% of the time). LOSH made about 15 foraging attempts per hour with a 58% success rate, and foraging attempts most often occurred in right-of-way grasses (39%) and bordering agricultural fields (36%). Arthropods are the main diet component, even in the winter (84%), and anurans were the most commonly cached prey items (49%) found during larder surveys. Surveys also documented various vertebrate prey species, including small mammals and invertebrate crop pests, suggesting potential benefits LOSH may provide as natural pest control agents. However, we also highlight the potential for LOSH, as predators along agricultural drainage ditches, to accumulate toxins in their systems. Understanding which prey species are seasonally important will improve risk assessment and adaptive management for LOSH populations. Future monitoring and analysis on prey items will be required to improve ecoagricultural relations and ensure the continued persistence of LOSH both in highly anthropogenic areas and, likely, throughout much of the eastern US.

**F3 Dejeanne Doublet (1)(S), Martha J Desmond (1), David H Johnson (2), and Fitsum Abadi (1).** 1. Department of Fish, Wildlife, and Conservation Ecology, New Mexico State University, Las Cruces, NM 88003 2. Global Owl Project, Alexandria, VA 22310. **Lessons Learned: Effects of translocation on burrowing owl survival and reproduction in Arizona.** Monitoring post-release outcomes of translocated animals provides vital insight that can help researchers design more effective release

programs for species of concern. We monitored outcomes of a burrowing owl (*Athene cunicularia*) translocation program in Arizona, where hundreds of owls are relocated each year from construction zones to new sites that contain artificial burrows. After a captivity period, the owls are soft-released in temporary tent enclosures in groups of 10 owls/tent from April – May. Our objectives were to (1) compare survival and nest survival of translocated and resident burrowing owls and (2) determine factors that influence the survival of the translocated owls including captivity duration, nearby owl density, and the number of males/release group). From 2017 – 2019, we used VHF radio-telemetry to determine the fates of 85 owls (43 translocated, 42 resident) across four release sites. We examined nest survival of 129 nests of translocated and resident owls during the 2017 and 2018 breeding seasons. Results indicated that translocated owls had lower annual survival ( $0.35 \pm 0.08$ ) than resident owls ( $0.80 \pm 0.07$ ). Cumulative nest survival was also lower for translocated owls than for resident owls ( $0.21 \pm 0.06$  and  $0.76 \pm 0.06$ , respectively). Survival of the translocated owls was negatively correlated with the number of males/release group and with captivity duration. We recommend releasing owls individually or as pairs as to avoid potential conflict between territorial males in the enclosures. Releases should be conducted in the fall and winter months to minimize captivity duration and allow the owls more time to establish territories prior to the nesting season.

**A9** Joshua Driscoll (1) (S), Marja Bakermans (1), and Andrew Vitz (2). 1. Department of Biology and Biotechnology, Worcester Polytechnic Institute, Worcester, MA 2. Massachusetts Division of Fisheries & Wildlife, Westborough, MA. **Wintering ground habitat selection by the Eastern Whip-poor-will.** Full annual-cycle conservation is critical for Eastern whip-poor-will (*Antrostomus vociferous*), which has declined 69% across their range since 1970. Using GPS data loggers, we characterized wintering habitat used by whip-poor-wills. In 2018, we placed GPS tags (Lotek Pinpoint-10) on twenty-one males breeding in Massachusetts and recaptured 57% (i.e., 12 males) in summer 2019. GPS tags collected data during fall and spring migration and the wintering period. On average, GPS tags collected 54 valid data points (range 36-62). There was a two-month range between arrival time to a winter territory (October 1st to December 4th), and this influenced the number of data points on each winter territory (average 22 points, range: 9-35). Data from tags indicated that these males wintered primarily in Mexico and Central America. To compare habitat in Whip-poor-will territories versus random locations, we quantified land cover (e.g., forest cover, agriculture, and development) from aerial photos at three distinct scales, including the territory, local (2-km), and landscape (5-km) scales. Most territories were small (less than 2.5 hectares) and contained a mixture of mature forest, young forest, and some included agricultural land. While most individuals occupied a single territory over the winter season, three birds occupied two territories. Habitat differences were apparent, with more development ( $P = 0.037$ ) and intensive agriculture in random compared to actual locations. As basic natural history and ecological information is lacking for this species, results from this study will support the development of full annual-cycle conservation efforts.

**C4** Diego Duran and Dr. Claire Ramos. Colorado State University-Pueblo, Communities to Build Active Stem Engagement, U.S. Fish and Wildlife. **Possible shared parental care in Lark Sparrows (*Chondestes grammacus*).** The Lark Sparrow (*Chondestes grammacus*) is songbird that breeds in the southern grasslands of North America. These birds are considered to be monogamous, however anecdotal observations suggest two female Lark Sparrows sometimes feed at the same nest. This suggests that there may be cooperative breeding in this species, which has not previously been described. Here we conducted quantitative observations of parental care in Lark Sparrows to determine if cooperative breeding is common in this population. This research was conducted at the U.S Army Chemical Depot in Pueblo County in southeastern Colorado. We mist netted the parents to the known nests, and the birds were banded with an aluminum numbered band and colored bands for identification purposes. The nests were also videotaped for two hours just after sunrise to determine what adults were feeding at the nest. In the future we plan to determine parentage of the chicks and determine whether adults feeding at the nest share parentage. If cooperative breeding is found then this suggests that Lark Sparrows may be less monogamous and less territorial than previously suggested.

**H1** Jay Falk (1)(S), Dustin Rubenstein (2), Mike Webster (1) 1. Department of Neurobiology and Behavior, Cornell University, Ithaca, NY 14850 2. Department of Ecology, Evolution and Environmental Biology, New York, NY 10027. **Expression of male coloration in immature females of a hummingbird.** Birds contain some of the most spectacular cases of sexual dimorphism in animals. The degree of this dimorphism, however, can shift dramatically with age or season. In most dichromatic species (dimorphism in plumage color), the immatures are monomorphically drab and divergence between the sexes does not occur until adulthood when males molt into an ornamented form. This ontogenetic shift is consistent with sexual selection theory predicting that ornamentation should be expressed in the sex under greater intrasexual competition, and that ornamentation can be costly during non-reproductive life stages. In a Neotropical hummingbird, the white-necked jacobin (*Florisuga mellivora*), previous studies from museum specimens had shown that females sometimes have male-typical plumage. However, a lack of banding data prohibited further understanding of the life history of this unusual trait. From 2015 to 2019 we banded white-necked jacobins captured in Gamboa, Panama and used bill corrugations to identify juveniles. Contrary to expectation, we found that this species has completely reversed ontogeny – all male and female juveniles have male-type ornamented plumage. Males molt into the same plumage type as adults, while ~80% of females shift to a drab plumage. Furthermore, evidence so far indicates that while juvenile females may shift plumage types during development, adult females maintain their plumage type through adulthood. This ontogenetic pattern is rare in animals but may provide an important system for testing hypotheses on the evolution of sexual dimorphism.



**R4 Auriel M.V. Fournier** (1), Angus J. Holford (2), Alexander L. Bond (3), Margaret A. Leighton (4). (1) Forbes Biological Station–Bellrose Waterfowl Research Center, Illinois Natural History Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign, Havana, Illinois, United States of America (2) Institute for Social and Economic Research, University of Essex, Colchester, United Kingdom (3) Ardena Research, Milton Keynes, United Kingdom (4) School of Economics & Finance, University of St. Andrews, St. Andrews, United Kingdom. **Unpaid work and access to science professions.** Across science professions there has long been a large lack of diversity in the workforce at all levels. While this has been improving slowly over the last few decades, barriers still exist that are limiting access to careers in the scientific workforce in a way that disproportionately impacts underrepresented groups. One of these barriers is unpaid work, often in the form of seasonal lab/field technician positions that are taken by early career ornithologists, during or after their undergraduate degrees. Many early career ornithologists are told unpaid work is a way of demonstrating their dedication to the field, or getting their ‘foot in the door’ towards later employment. The problem is that working unpaid full time for weeks or months is not possible for those who do not have the financial resources, which makes financial resources an unwritten requirement for unpaid jobs. We compared the success of UK university graduates with a science degree who took paid or unpaid work six-months after graduation in obtaining a high salary or working in a STEM field 3.5 years later. Taking unpaid work was associated with lower earnings and lower persistence in STEM compared with paid work. These results are important for two groups of people, those who make budgetary decisions, at the granting agency and project level, who should care about making entry into science careers at early stages accessible to all. In addition, early career ornithologists, should be fully informed about the utility of different job options available to them.

**L8 Valerie Galati**(1)(S), Lesley Bulluck (2). 1. Department of Biology, University of Richmond 2. Center for Environmental Studies, Virginia Commonwealth University. **Quantifying competition between Golden-winged and Blue-winged Warblers to assess competitive exclusion as a mechanism for recent range shifts.** Competitive interactions of closely related species are likely the result of their largely overlapping niches. Potential for these interactions could be exacerbated by the changing climate, as ranges move and novel zones of sympatry are formed. Competition between Golden-winged (*Vermivora chrysoptera*, hereafter GWWA) and Blue-winged warblers (*Vermivora cyanoptera*, hereafter BWWA) is a hypothesized contributing factor to the sharp decline of GWWA. Records show some GWWA populations decline after the colonization of an area by BWWA. Whether these declines are due to competitive dominance of BWWA is not known. Here, we examine aggressive competitive interactions of male GWWA and BWWA using staged territorial intrusions in southwest Virginia. The study area is generally considered to be in the zone of sympatry for these species, but the two are segregated by elevation, with high elevation sites occupied by GWWA and lower elevation sites occupied by both species. We hypothesize that aggressive response would be greater in BWWA, and that GWWA aggression would differ between sympatric and allopatric sites. From May to June 2019, we conducted 113 five minute trials on territorial males. We presented each focal male with either a conspecific or heterospecific trial and recorded his aggressive response. Preliminary analyses suggest that hybrids are less aggressive than BWWA and GWWA, and that both GWWA and BWWA respond more strongly to conspecific than heterospecific intruders, regardless of context. These results do not support the hypothesis that BWWA are competitively dominant to GWWA, suggesting another mechanism may be the primary cause of GWWA declines.

**Q3 Gregory A. George** (1), Scott Godshall(1). Delaware Valley University, 700 E. Butler Ave, Doylestown, PA 19801. **Quantifying method based variability in population estimates of the Cerulean Warbler (*Setophaga cerulea*).** The Cerulean Warbler (*Setophaga cerulea*) is a small, insectivorous, Neotropical migrant that breeds in mature deciduous forests of eastern North America. They were once a common forest warbler until the population began to decline in the mid 1900s. Cerulean Warblers prefer mature deciduous forests with a diverse canopy structure including tall, large diameter, trees with an open under-story. Historically, Cerulean Warblers were primarily associated with mature floodplain forest, like the Delaware Water Gap National Recreation Area. Throughout their range, this habitat type has experienced substantial losses as floodplain forests have largely been converted to farmland. Northeastern Pennsylvania is one of the few areas showing growth in Cerulean Warbler population densities. This study examined how song rate variation might influence estimates of territory density. Two methods of determining population densities were compared. The first was traditional spot-mapping procedures. Second, an audio lure playback was used to elicit a response from territorial birds. We alternated between traditional spot-mapping and spot-mapping assisted with audio playback for eight survey bouts per method during four breeding seasons (2015-2018). Results showed a significant difference, across all years, between detection rates based on the two methods when compared using non-parametric procedures. The audio playback method resulted in the identification of more territories compared to traditional spot-mapping. Additionally, a territory accumulation analysis determined territory audio playback to be approximately twice as efficient compared to traditional methods. Conservation implications from this project might assist in more accurate population estimates for this species of concern.

**C8 Douglas E. Gill**(1), Daniel M. Small(2), Maren E. Gimpel(2) 1. Department of Biology, University of Maryland, College Park, MD 20742 2. Center for the Environment and Society, Washington College, 210 Cross Street, #101, Chestertown, MD 2162. **Measuring clutch success: 16 Years in Maryland Grasshopper Sparrows.** We compared several measures of clutch success of 736 clutches of Eastern Grasshopper Sparrows, *Ammodramus savannarum pratensis*, which colonized restored coastal grasslands in Maryland in 1999-2014. We deduced the status of clutches on days not observed and determined the day the first egg was laid in 83.5% of the clutches, the hatch-day in 90.6%, and the certain fates of 97.0%. The completed reconstructions of every nest history eliminated several biases that plagued previous computations. All measures were highly

correlated across the variable years. Surprisingly, the traditional Apparent Success, the ratio of known and probable successes over total nests observed is not biased as previously suspected and provides the most accurate representation of population-level clutch success. The average  $\pm 95\%$  CL Apparent Success of our MD Grasshopper Sparrows over 16 years was  $62.1 \pm 4.4\%$ , which was insufficient to sustain our colony. Clutch sizes decreased during the multi-brooded breeding season. Clutch success was not dependent on clutch size. The distributions of clutch success and failure were indistinguishable across the breeding season. Clutches discovered in nestling stage were more likely to fledge than those found during incubation, but daily clutch survival was significantly higher ( $99.1 \pm 0.3$ ) in egg stage than in nestling stage ( $94.6\%$ ). The sudden 265 predation and weather events that destroyed entire clutches were not random among the 13653 clutch days. The misleading and badly defined term “exposure days” of the widely used Mayfield (1961, 1975) Method caused many erroneous values of nest success in the literature.

**B9** **Eliza M. Grames**(1)(S), Piper L. Stepule(2), Benjamin T. Ranelli(1) and Chris S. Elphick(1) 1. Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT 06269. 2. Department of Mathematics, University of Connecticut, Storrs, CT 06269. **Separating behavioral processes underlying song patterns into component parts with self-exciting point process models.** Songs arise from two processes: 1) unprompted singing to attract a mate or establish territorial boundaries, and 2) responding to other songs. These processes can be modeled with a Hawkes self-exciting point process model, such as those used to model financial market trading and earthquake aftershocks. In a Hawkes model, a song at time  $t$  arises from a Poisson process with rate ( $\lambda t$ ) composed of an intrinsic background rate ( $\mu$ ) and a conditional intensity ( $\gamma t$ ) based on the history of songs prior to time  $t$ . The conditional intensity is governed by self-excitement ( $\alpha$ ) and decay ( $\beta$ ) rates, corresponding to the need to countersing and the costs of singing (e.g. energy expenditure and predation risk). The rates of background singing, self-excitement, and decay are all expected to decline across the breeding season as pairs form, males learn neighbors’ songs, and costs of singing increasingly outweigh the benefits of mate attraction and resource defense. To test our predictions, we fit Hawkes models to time series of Ovenbird (*Seiurus aurocapilla*) songs and then modeled the parameters using date, forest size, and caterpillar abundance as predictors. Our results suggest that there is a rapid shift in the trade-off between resource defense and costs of singing, and that singing rates are primarily influenced by changes in neighbor responses across the breeding season, rather than by mate attraction or habitat features. Because Hawkes models decompose song patterns into underlying processes, they enable analysis of the trade-off between the costs and benefits of singing.

**J2** **Jose O. Grisales-Jimenez** and Dale E. Gawlik. Florida Atlantic University. **Evidence for a daily re-assessment of micro-habitat by wading birds.** The ability to track fluctuating resources is a prominent feature in the evolution of many species and communities, particularly in dynamic ecosystems. In the Florida Everglades, foraging patches are formed as the marsh dries and prey are concentrated into shallow pools. Thus, under normal drying conditions, new foraging patches always occur at lower elevations than at previous foraging patches, and birds are assured of finding suitable foraging habitat in the general proximity of a previous day’s foraging site without “prospecting”. However, prey species are mobile, so we hypothesized that at small spatial scales wading birds must prospect daily to find high quality sites. We tested this hypothesis by quantifying the movement patterns from 555 observations of eight species of free-ranging wading birds (White Ibis, *Eudocimus albus*; Wood Stork, *Mycteria americana*; Snowy Egret, *Egretta thula*; Glossy Ibis, *Plegadis falcinellus*; Great Egret, *Ardea alba*; Tricolored Heron, *E. tricolor*; Great Blue Heron, *A. herodias*; and Little Blue Heron, *E. caerulea*) as they arrived each morning for 12 days at an experimental foraging site in Palm Beach County, Florida, 1997. If birds rely on knowledge of foraging conditions from the previous day but resampled habitat at small spatial scales each morning, then we expected to see their movement rate follow a quadratic pattern with time since sunrise. We also tested for a positive linear movement response, suggesting that birds returned to a foraging site and did not prospect until prey were depleted in their initial foraging patch. We tested for a negative linear response suggesting that birds prospected each morning without regard to previous foraging conditions. The number of birds moving among the individual ponds (0.2-ha each) within the experimental site was recorded at one-minute intervals with measurements from 36 to 109 minutes after sunrise. The movement pattern was modeled as a linear model with mixed effects. The possible responses were evaluated using Akaike’s information criterion (AICc). Results supported the quadratic model as the best fit to wading bird movements, suggesting that birds used both previous knowledge of foraging conditions and small-scale sampling of the habitat daily.

**K3** **Shanan Hamilton** (1)(S), Erika Mayette-Draper (1), Jeremy J. Kirchman (2) and Dr. Joel Ralston (1) 1. Department of Biology, Saint Mary’s College, Notre Dame, IN 46556. 2. New York State Museum, Albany, NY 12209. **The effects of climate change on body size in the Red-bellied Woodpecker (*Melanerpes carolinus*).** Climate determines the limits of species’ distributions and influences geographic patterns of morphological characteristics within species. Therefore, recent changes in climate might affect species’ distributions as well as geographic patterns of morphology. The Red-bellied Woodpecker (*Melanerpes carolinus*) has undergone a recent and rapid geographic expansion, while concurrently the positive correlation between body size and latitude (i.e. Bergmann’s Rule) seems to have weakened. We hypothesized that this breakdown of Bergmann’s Rule is due to climate driven changes in natural selection. We used Maxent to model climate suitability for the Red-bellied Woodpecker during winter conditions across its range for every year from 1900 to 2015. We measured wing chord for 283 male and 193 female museum specimens spanning that same time period, and used a simple linear regression to quantify the relationship between climate suitability and wing chord for both males and females. We interpreted periods of low suitability as periods of stronger selection on body size and hypothesized that specimen from those periods would be larger. We found a greater number of hypothesized selective events at higher latitudes compared to lower latitudes, but this pattern

weakened over time with climate change. Additionally, as predicted, we found a negative relationship between climate suitability and body size in both sexes, though this was only significant in males. Our results support our hypothesis that changes in morphology in Red-bellied Woodpeckers are due to climate driven changes in natural selection.

**E3 Jessica L. Herzog (1)(S) and Ronald J. Kendall (1)** 1. The Wildlife Toxicology Laboratory, The Institute of Environmental and Human Health (TIEHH), Texas Tech University, Lubbock, Texas, 79416. **Parasite surveys of passerine birds and Northern Bobwhite Quail (*Colinus virginianus*) in the Rolling Plains Ecoregion.** Eyeworms (*Oxyspirura petrowi*) are heteroxenous nematodes being investigated as contributors to the decline of Northern Bobwhite (*Colinus virginianus*; hereafter bobwhite), an iconic North American game bird. These parasites are of particular concern in bobwhite from the Rolling Plains of Texas, where researchers have documented infection rates as high as 90%. Eyeworms have also been documented in Curve-billed Thrasher (*Toxostoma curvirostre*) and Northern Mockingbird (*Mimus polyglottos*) from this ecoregion, likely due to their diet including the insect intermediate hosts of eyeworms. However, these reports were compiled from incidental bycatch and few comprehensive studies into the extent of parasitism in these passerines exist. Thus, these reports may overlook the potential for these passerines to serve as reservoir hosts or means of dispersal for eyeworms, thus introducing eyeworms to naive populations. In order to investigate this possibility and further document parasitism in various songbirds as well as bobwhite, we conducted full parasite surveys on bobwhite, Northern Mockingbird, Curve-billed Thrasher, and Northern Cardinal (*Cardinalis cardinalis*). Birds were trapped at three study sites from March to October using baited walk-in double funnel traps. Specimens were necropsied and both endo and ectoparasite prevalence was assessed. Our assessments showed shared infection of eyeworm between all species thus, contributing additional reports to findings of eyeworm in Curve-billed Thrasher and Northern Mockingbird and is the second report we know of concerning eyeworm in Northern Cardinal. Our findings are a valuable baseline for future studies given the passerines' potential to disperse these parasites and serve as reservoir hosts.

**L4 Taylor M. Heuermann (S), Robert L. Curry.** Department of Biology, Villanova University, Villanova, PA 19085. **Inter- and intra-specific variation in boldness behavior of hybridizing Black-capped and Carolina chickadees.** Animal personality, behavior that is consistent within but variable between individuals, influences evolution in both static and dynamic environments. As climate change introduces novel challenges at a rapid rate, understanding animal response mechanisms to change becomes increasingly important. Our research program focuses on interactions between Black-capped Chickadees (*Poecile atricapillus*; BCCH) and Carolina Chickadees (*P. carolinensis*; CACH) across a northward-moving hybrid zone in southeastern Pennsylvania. We investigated boldness in both pure and mixed chickadee populations. To elicit boldness responses, we used a motorized woodpecker decoy as a simulated usurpation/predation threat at active chickadee nests. Most assays elicited a pair response, but video recording allowed for individual-level behavioral measures. With respect to vocal response, birds breeding in the two pure species populations responded differently from each other (BCCH bolder), while birds breeding in the mixed population exhibited intermediate boldness that was statistically indistinguishable from birds in either pure population. Principal component analysis indicated no difference between populations with respect to spatial response of breeding pairs. Based on current results, we conclude that Black-capped chickadees are bolder than Carolina chickadees (on average producing fewer "dee" notes in their alarm calls) and that hybrid chickadees exhibited intermediate boldness consistent with genetic influences on expression. Genotypic analysis underway of the SNP830 polymorphism in *DRD4*, a personality-related gene, aims to determine whether a relationship exists between variation in boldness response and *DRD4* genotype.

**B5 Rebecca Hill (1)(S) and Bernard Lohr (1).** 1. Department of Biological Sciences, University of Maryland Baltimore County, Baltimore, MD 21250. **Grasshopper Sparrow call development during the nestling period.** Nestling songbirds often produce begging calls to elicit adult feeding. Hatchlings grow to fledglings that are nearly the size of adults within a few days or weeks while they remain in the nest. Rapid syringeal development likely parallels the rapid changes in nestling size and, as a consequence, changes in the acoustic structure of begging calls are expected. Relatively few studies, however, have documented such changes in begging call development over the entire nestling period. Grasshopper Sparrows (*Ammodramus saviannarum*) have a nestling period that lasts 8 to 9 days. We recorded calls from wild and laboratory-reared Grasshopper Sparrow nestlings and measured 21 call parameters. As nestlings aged, their calls increased in duration and peak frequency. Calls contained relatively few frequency and envelope modulations from post-hatch day 1 to day 6, but both increased from day 6 to day 9. Lab-reared nestlings showed the same acoustic changes as field-reared nestlings, but these changes occurred earlier in development. We suspect this change in timing may be related to more ideal / less stressful rearing conditions in the lab. Our results are generally consistent with those found in other studies. Duration increased in calls of all other species studied, and peak frequency increased in half those species. However, frequency modulations decreased in the few other species measured for that feature. Our results suggest that as nestlings grow the size and activity of the vocal apparatus and respiratory tract can support a longer, higher, and generally more complex call.

**A6 Tereza Hromádková (1,2) (SP), Václav Pavel (2), Jiří Flousek (3), Martins Briedis (4,5).** 1. Department of Zoology, Faculty of Science, University of South Bohemia, Branišovská 31a, 370 05, České Budějovice, Czech Republic 2. Centre for Polar Ecology, Faculty of Science, University of South Bohemia, Branišovská 31a, 370 05, České Budějovice, Czech Republic 3. The Krkonoše Mountains National Park, Dobrovského 3, 543 01, Vrchlabí, Czech Republic 4. Department of Zoology, Palacký University, tř. 17. listopadu 50, 77146 Olomouc, Czech Republic 5. Swiss Ornithological Institute, Seerose 1, CH-6204, Sempach, Switzerland. **The ecology of the longest migration: facilitation by wind patterns and ocean productivity.** Migratory birds

adjust their migration behaviour to various environmental factors encountered en route. This helps to reduce their energy expenditure and increase their chance to survive. In this study, we used geolocator tracking of long-distance migratory Arctic Terns (*Sterna paradisaea*) breeding in Svalbard, Norway to test how individual migration routes and stopover sites are adapted to take advantage of prevailing wind patterns and food availability along the flyway. During both migration seasons, birds profited from tailwind support along their chosen migration routes. The tailwind support was, however, considerably stronger during the northbound spring migration leading to overall faster migration speed and shorter migration duration compared to the southbound migration (mean migration duration: southbound = 77 days, northbound: 51 days; mean wind support: southbound = 0.4 m s<sup>-1</sup>, northbound = 2.2 m·s<sup>-1</sup>). Moreover, the individual migration speeds during the northbound migration were positively correlated with wind support. Stopover sites were typically found in areas with high ocean productivity compared to migration corridors that passed over relatively barren areas. The stopover duration was on average 22 days longer during the southbound migration than during the northbound migration largely accounting for seasonal differences in migration duration. Our results indicate that Arctic Terns adjust their migration pattern according to the prevailing environmental conditions en route. During the southbound migration, they prioritize fuelling at food-rich stopovers regions, whereas during the northbound migration, they prioritize fast migration speed taking advantage of tailwind support.

**F2** **Mina Izaki**(1,2)(S) and Tomohiro Deguchi(1,3). 1.Department of Regional Resource Management, University of Hyogo, Toyooka, Hyogo 6680814 2.Division of coexistence with the Oriental White Stork, Toyooka city Government, Toyooka, Hyogo 6688666 3,Hyogo Park of the Oriental White Stork, Toyooka, Hyogo 6680814. **Reintroduction of the Oriental White Stork (*Ciconia boyciana*): Habitat restoration and placement of artificial nest poles.** The endangered Oriental White Stork (*Ciconia boyciana*) is about 1000 – 2499 birds in the world. In Japan, people grew conscious of the rapid decline of the stork population, therefore our organizations started a captive breeding project in 1963, planning to release storks into the wild when they reach a certain number. The variety of conservation efforts has been conducted through an industry-government-academia collaboration. Overcoming various issues, Hyogo Park of the Oriental White Stork started to reintroduce the storks in 2005. Agricultural modernization was one of the main causes of storks' extinction, which was triggered by the pesticide contamination of prey animals. Before the stork reintroduction, the government worked in close collaboration with local farmers to modify those methods and make them suitable for storks. The farming methods, Stork Friendly Farming, are widely spread in Toyooka city and contribute to the successful breeding of storks. Another important part is the placement of artificial nest poles. Lot of nest poles have been placed around Toyooka, but only 50% of the whole number is occupied. Therefore, we are now relocating the nest poles considering storks' behavior and their habitat use. Storks' habitat is currently spreading other cities where there are no nest poles. In such cases, storks tend to build their nest on top of power poles, producing a negative impact on both their safety and human activities. We refer to a successful case on relocation of the artificial nest pole based on our empirical study.

**H6** **Jerome A. Jackson** and Bette J.S. Jackson. Department of Marine and Ecological Sciences, Florida Gulf Coast University (JAJ) Department of Biological Sciences Florida Gulf Coast University (BJSJ). **The diverse adaptations, functions, and consequences of the Anhinga's tail.** The Anhinga's tail is unusual for its length and for corrugations on the outer vane of the two central rectrices, but the adaptive significance of these characteristics and the diversity of functions of the Anhinga's tail have rarely and only casually been suggested or described. We studied Anhingas in south Florida, with extensive observations of them in four habitats: a large water impoundment with no adjacent trees, a canal with no adjacent trees, a small pond with adjacent trees, and a natural forested swamp. In addition to observations, we photographically documented Anhinga tail characteristics and use throughout the year in both sexes and in adults and fledglings. In addition to adaptations and functions described by others, we documented several other uses of the Anhinga's tail including use as a predator deterrent, as a brake in landing in dense vegetation, and as a jet-ski-like device to enable selection of a safe site to enter the water. We found the extent of feather corrugations on both the innermost rectrices and on the innermost tertiaries to be less in juveniles than in adults. We will discuss the possible causes of these corrugations and their potential adaptive value.

**K10** **Jill E. Jankowski** (1,2), Matthew Gasner (3), Keiller O. Kyle (4), Anna Ciecka (5) and Kerry N. Rabenold (6,7). 1. Department of Zoology, University of British Columbia, Vancouver, BC Canada 2. Biodiversity Research Centre, University of British Columbia, Vancouver, BC Canada 3. Winnipeg, MB Canada 4. The Nature Conservancy, Baltimore, MD USA 5. Western EcoSystems Technology, Inc, Bloomington, IN USA 6. Department of Biological Sciences, Purdue University, West Lafayette, IN USA 7. Purdue Climate Change Research Center, Purdue University, West Lafayette, IN USA. **Species distributions, interactions and population variability in a Neotropical cloud forest: forecasting the reassembly of Monteverde's bird community.** Tropical mountains have among the most diverse bird communities globally, where species ranges are constrained to narrow zones due to strong habitat affinities and interspecific interactions. Montane bird communities within Central America harbor high concentrations of endemic species and may be particularly vulnerable to climate change. Yet, few studies have examined inter-annual changes in abundance in tropical populations, a demographic factor critical to understanding population trajectories. We highlight findings from a multi-year survey of >70 species in Monteverde, Costa Rica to estimate population trends given inter-annual variation in abundance and to forecast how this community could be impacted by climate change. We examine how species may differ in their response to warming given their current distribution, population variability and interspecific interactions. Our survey design had high power to detect strong trends (10% per year); power to detect weaker trends was reduced and depended on the percentage of points a species occupied. The mean coefficient of variation for populations in our study (0.30) was similar to that observed in other tropical locations. Across the gradient, species occupying

drier forest at lower elevations are likely more tolerant to warming and drying effects, as these communities differ little between forest-interior and edge habitats. High-elevation communities show the largest disparity in composition between forest edge and interior, implying that cloud forest species are less tolerant of warming and drying. Interspecific interactions between congeners with abutting elevational ranges suggest that competitive dominance of low-elevation species could accelerate distribution shifts. Endemics, which tend to avoid forest edges and drier habitats, may be further constrained with expected warming. Even with relatively low population variability, as reflected in our multi-year survey, the combined effects of changing forest environments and interspecific interactions could restrict high-elevation tropical species to shrinking ranges on mountaintops. Effective monitoring of tropical bird communities will require standardized efforts with strategies employing study designs that differ in their allocation of sampling effort for rare and common species.

**16 Julie A Jedlicka.** Missouri Western State University. **Three methods to uncover diets of insectivorous birds foraging in temperate and tropical agricultural lands.** Determining the ecosystem function of high-order predators is critical for evaluation of food web interactions. Insectivorous birds are abundant predators in many ecosystems yet because they forage upon such small taxa, it remains largely unknown whether birds are providing ecosystem services in the form of pest control or disservices by preying upon predaceous arthropod species, functioning as intraguild predators. I provide a detailed look into three approaches used to quantify the ecosystem services provided by insectivorous birds comparing stomach-content analysis to more recent molecular scatology methods. In Mexican shade-coffee farms strong annual changes in diets from year to year and across shade management systems highlighted the importance of long-term studies and emphasized the plasticity of insectivorous and omnivorous birds to respond to fluctuations of arthropod populations. In California vineyards, adult and nestling Western Bluebirds (*Sialia mexicana*) were found to consume mostly herbivorous insects, primarily from the orders Hemiptera and Lepidoptera, representing over half (56%) of the prey items. Intraguild predation (of predator or parasitoid arthropods) represented only 3% of adult and nestling dietary items. Finally, I present a case study of recent work analyzing the arthropod diets from insectivorous birds foraging in Kenyan coffee farms. The focus is to determine whether bird foraging is providing avian-induced ecosystem services by testing whether three different pest species are consumed from a variety of different bird species.

**F5 Erik I. Johnson\*** (1), Katie B. Barnes (1), Sarah Bolinger (2), Kiah Williams (3), Samantha Collins (4) 1. Audubon Louisiana, National Audubon Society, Baton Rouge, LA 70808 2. Department of Biology, University of Louisiana, Lafayette, LA 70504 3. Department of Ecology and Evolutionary Biology, Tulane University, New Orleans, LA 70118 4. The Wetlands Institute, Stone Harbor, NJ 08247. **Least Tern, Wilson's Plover, and Common Nighthawk responses to beach renourishment in Louisiana: Building climate resiliency or ecological traps?** Beach-nesting birds face ever increasing challenges because of sea level rise, increased storm intensity, unbalanced predator populations, human disturbance, and development. In Louisiana, a collapsing estuarine delta is exacerbating these threats, with 2,000 mi<sup>2</sup> of land converted to open water since 1932. In response, over \$1 billion in barrier island and shoreline restoration investments are often touted as also benefiting birds. We tested the hypothesis that restoration improves nesting success in three conservation priority species at three restored and six unrestored sites between 2016 and 2018. Storm surge pressures varied each year, with 2017 being the most intense and frequent, and 2016 and especially 2018 being less so. We located and tracked nests every 3-7 days, and developed daily nest success models in Program MARK to examine the relative importance of year and restoration status. Least Terns (*Sterna antillarum*) benefited from increased elevation at restored sites in 2017 when storm surge was most intense, but had lower success on restored beaches than on unrestored beaches in 2016 and 2018, driven by increased nest depredation. Wilson's Plovers (*Charadrius wilsonia*) and Common Nighthawks (*Chordeiles minor*), however, had slightly higher nesting success on restored beaches in each year, and model rankings indicated that year (i.e., storm surge risk) was a more important predictor of nest success variation than restoration status. Although dune renourishment reduced storm surge risk to nesting birds, predator management coinciding with dune restoration could more effectively maximize the value of restoration projects for Least Terns and possibly other colonial-nesting species.

**D3 Natalia M. Kauffman,** Clark Jones, Claire W. V. Ramos. Colorado State University - Pueblo CBASE U. S. Fish and Wildlife. **Possible evidence of itinerant breeding in Lark Buntings.** The Lark Bunting (*Calamospiza melanocorys*) is a migratory, nomadic songbird, native to short-grass prairie regions. Unfortunately, Lark Bunting populations are declining at a rate of 3.1 percent per year. Currently, Lark Buntings are known to have unpredictable populations from year to year, which makes accurate population estimation difficult. The purpose of this study was to quantify the population of Lark Buntings during the breeding season in southeastern Colorado. The area of study is on the southwestern limits of the breeding range for the Lark Buntings and consists of short-grass prairie, with sagebrush and cactus as the most distinct vegetation in the habitat. To record population, point counts were conducted from early April through July, with the birds identified by sight and sound and males displaying was also recorded. In addition, nests were found and observed for activity throughout the season. The males were first observed in early May, with the females observed shortly after, in mid-May. Male displays were the most frequent from mid-May to the end of May, but dropped sharply in early June. While males were still observed in the area, the population of males sharply declined in early June and gradually decreased until late August. Males were no longer observed by early July. Females were observed through early July, but observed populations diminished. This data suggests that after a breeding attempt failed, the Lark Buntings continued further north before trying again. However, further observations would be needed to support the possibility Lark Buntings practice itinerant breeding behavior.

**L9 Heather Kenny** (S)(1), Anna Kashmanian (1), Sarah Weber (1), Ryan Lauzardo (1), Elizabeth McLaughlin (1), John Swaddle (1), Dan Cristol (1). 1. Department of Biology, William & Mary, Williamsburg, VA 23185. **Investigating the behavioral response of bold and shy eastern bluebirds to experimental traffic noise.** Previous research on eastern bluebirds (*Sialia sialis*) showed that bluebirds nesting in louder areas fledge fewer chicks than those in quieter areas. The current study investigates potential behavioral mechanisms to explain this observation. We evaluated whether wild bluebird individuals 1) exhibited consistent and correlated behavioral traits (i.e. “animal personality”), and 2) whether there was a relationship between behavioral measures and noise conditions. We sampled 74 adult bluebirds breeding in nest boxes at six public parks near Williamsburg, VA from April-July, 2019. Personality was assessed using repeated observations of neophobia (fear of a novel object) and aggression towards a tree swallow specimen on four separate days during the nestling stage of the nesting cycle. Nestling feeding rate was measured to assess whether individuals differed in feeding rate under varying noise conditions. The ambient sound level was measured at each nest box, and on nestling day 8 a small speaker was mounted near each nest box to experimentally manipulate the local noise conditions. Approximately half of the nest boxes were randomly assigned to receive looped traffic noise while the other half received silent controls. Individual birds appeared to be consistent across time in aggression behaviors but not neophobia, and feeding rate was not influenced by noise treatment. Sites differed in their ambient noise levels, and there was a trend for louder sites to have birds with higher aggression and lower neophobia. These results can help local park managers make informed decisions about future nest box placement and noise abatement needs.

**O6 Joanne L Kingsbury** (1)(S), G Matt Davies (1), Chris Tonra (1), Ross Macleod (2). 1. School of Environment and Natural Resources, Ohio State University, Kottman Hall, 2021 Coffey Road, Columbus, OH, 43202. 2. Institute of Biodiversity Animal Health and Comparative Medicine, Glasgow University, Graham Kerr Building, Glasgow, Scotland, G12 8QQ. **Threatened birds, dynamic habitats and disturbance: Understanding links between disturbance, habitats and birds across the Cerrado grassland gradient.** In the Beni savannas of Bolivia, vegetation dynamics within the cerrado-grassland transition zone are driven by interacting ecological and agricultural disturbance processes, specifically flooding, fire and cattle grazing. In turn, bird communities are influenced by the prevailing vegetation physiognomies produced by these processes. Here, we present results of a study investigating how the distribution and habitat use of avian cerrado-grassland specialists is influenced by habitat structure and disturbance history. We focus on three key conservation species, the cock-tailed tyrant, *Alectrurus tricolor*, black-masked finch, *Coryphaspiza melanotis*, and wedge-tailed grass-finch, *Emberizoides herbicola*. Findings suggest that cock-tailed tyrants specialize on tall open grassland with infrequent woody vegetation and are associated with habitat features indicative of annual flooding. Black-masked and wedge-tailed grass finch were more generalistic, but similarly tended to associate with tall grass areas in addition to seeding/fruitletting vegetation. Abundance analysis indicate that the declining species under study may have greater sensitivity to agricultural disturbance than the more common wedge-tailed grass-finch. Prescribed burning is likely integral for the conservation of avian communities within this region, but scale and frequency are likely important considerations. In addition, a range of post-burn stages may be required to retain wider avian communities within protected areas where biodiversity conservation is a principal management goal. Our results are helping to inform management protocols for protected areas like the Barba Azul Nature Reserve, while contributing knowledge that will help to develop more sustainable, wildlife-friendly approaches to agriculture in the wider Beni.

**A10 Alicia Korpach** (1)(S), Christina Davy (1,2), Alex Mills (3), Kevin Fraser (1). 1. Department of Biological Sciences, University of Manitoba, Winnipeg, Manitoba 2. Wildlife Research and Monitoring Section, Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario 3. Department of Biology, York University, Toronto, Ontario. **Investigating individual consistency at multiple spatiotemporal scales in migrating Eastern Whip-poor-wills (*Antrostomus vociferous*).** Consistency in annual, seasonal, or diel movements allow animals to structure their use of space and time. to predictably find resources and mates, maintain territories, and avoid predators. Migrating birds may improve fitness by reusing familiar routes and stopover sites, and by timing departures and arrivals to coincide with relatively fixed cues such as prey cycles. Yet, considerable variation in repeatability in migratory timing and routes has been observed both within and among species. Advances in GPS tracking allow us to more fully investigate the mechanisms for individual and population-level variation in the migratory movements of small birds. We tracked the fall migrations (2-8 daily locations) of 23 Eastern Whip-poor-wills (*Antrostomus vociferous*), of which four were tracked over two successive fall migrations. Preliminary results indicate relatively high repeatability in the dates of reaching the winter range in comparison to other landbirds that have been repeat-tracked (Repeatability score = 0.7), and we found no evidence of reuse of specific stopover sites by any of the birds. Time density analyses of Whip-poor-will activity levels reveal diel consistencies that vary with moonlight, and we discuss the possibility of individual-specific diel activity patterns. Consideration of the internal clocks of individual Whip-poor-wills may help to explain variation in movements that cannot be explained by exogenous factors, such as lunar synchrony. By applying consistency analyses to fine-scale tracking data at multiple spatiotemporal scales, we gain a better understanding of how much flexibility migratory birds may have to confront changes in their environment.

**K8 Kozlovsky, D.Y.\***, Branch, C.L.^, Pitera, A.M.+ , & Pravosudov, V.V.+ \*Department of Biology, Villanova University, Villanova, PA ^Laboratory of Ornithology, Cornell University, Ithaca, NY +Ecology, Evolution and Conservation Biology Doctoral Program & Department of Biology, University of Nevada, Reno, Reno, NV. **Annual climate extremes and reproduction in chickadees inhabiting different elevations.** Mounting evidence suggests that we are experiencing rapidly accelerating global climate change. Understanding how climate change may affect life is critical to identifying species and populations that are vulnerable. Most current research focuses on investigating how organisms may respond to gradual warming, but another effect

of climate change is extreme annual variation in precipitation associated with alternations between drought and unusually heavy precipitation, like that exhibited in the western regions of North America. Understanding climate change effects on animal reproductive behaviour is especially important, because it directly impacts population persistence. Here, we present data on reproduction in nest-box breeding, resident mountain chickadees inhabiting high and low elevations in the Sierra Nevada across 5 years. These 5 years of data represent the full range of climatic variation from the largest drought in five centuries to one of the heaviest snow years on record. There were significant differences in most reproductive characteristics associated with variation in climate. Both climate extremes were negatively associated with reproductive success at high and low elevations, but low-elevation chickadees had worse reproductive success in the largest drought year while high-elevation chickadees had worse reproductive success in the heaviest snow year. Considering that the frequency of extreme climate swings between drought and snow is predicted to increase, such swings may have negative effects on chickadee populations across the entire elevation gradient, as climatic extremes should favour different adaptations. Alternatively, it is possible that climate fluctuations might favour preserving genetic variation allowing for higher resilience. It is too early to make specific predictions regarding how increased frequency of extreme climate fluctuation may impact chickadees; however, our data suggest that even the most common species may be susceptible.

**E1 Kevin J. Krajcir (1)(S),** Alix E. Matthews (1), Alex J. Worm (1), and Than J. Boves (1). 1. Arkansas State University Department of Biological Sciences, Jonesboro, AR 72401. **Environmental context mediates the functional relationship between feather mites and their hosts.** Several studies have considered how vane-dwelling feather mites influence the body condition, reproduction, and survival of their hosts. However, there are conflicting conclusions about the nature of the bird-feather mite symbiosis (i.e. parasitic, mutualistic, or commensal). These inconsistencies may result from the limited scopes of previous studies including one or few host study species and sites considered and the inability of these limited studies to account for environmental interactions. To address these shortcomings, we evaluated how mite abundance related to host body condition and apparent annual survival within and across hosts in various environmental contexts. We captured and banded individuals of seven New World warbler species from across their breeding ranges to assess their feather mite load and body condition. We then attempted to resight individuals during the following breeding season to assess apparent annual survival. We constructed models to test if mite abundance was related to body condition and apparent annual survival and to evaluate if environmental factors (microhabitat, geography, and climate) mediated these relationships. We found that feather mite abundance was negatively related to body condition with meaningful interactions of elevation, latitude, and host microhabitat altering this negative relationship. However, no such trends were found to affect the apparent survival of individuals. These context dependencies may help explain why the functional nature of this symbiosis has been difficult to generalize and warrants further studies involving more species and larger sample sizes. This work could also have implications for other symbiotic systems, especially as anthropogenic changes threaten these interactions.

**B6 Andria Kroner (1)(S),** Henry Fandel (1), Renee Robinette Ha (2), Anne Clark (1) 1. Department of Biological Sciences, Binghamton University, Binghamton, NY 13902 2. Department of Psychology, University of Washington, Seattle, WA 98195. **Pair associated variation in alarm call acoustics of wild Mariana Crows (*Corvus kubaryi*).** The Mariana Crow (*Corvus kubaryi*), a small island-endemic corvid, exists only on Rota, a small (89km<sup>2</sup>) island in the western Pacific. Despite its very small range, the population shows evidence of genetic population structuring, which, due to this species' very low population size, is of conservation concern. Bird vocalizations may be both genetically and culturally influenced, and thus could provide insight into the maintenance of genetic boundaries. To understand how calls might reflect these genetic subgroups, we analyzed acoustic variation with respect to sex, pair and genetic sub-group in alarm calls recorded in similar contexts on territories of banded wild pairs. Preliminary results show that genetic sub-group does not explain call variation, but, instead, paired individuals resemble each other in multiple characteristics of the alarm call. These results suggest that a) calls may be flexibly adjusted well into adulthood in Mariana Crows, b) calls may function in pair identity and c) calls are unlikely to act as a barrier to dispersal.

**F1 Rina Kuwabara(1)(s),** Tomohiro deguchi(1,2), Ezaki Yasuo(1,2). 1. Department of Regional Resource Management University of Hyogo, Toyooka, Hyogo 6680814 2. Hyogo Park of the Oriental White Stork, Tyooka, Hyogo 6680814. **Characteristics of non-breeders in the Japanese Oriental White Stork (*Ciconia boyciana*) reintroduced population.** Oriental White Storks (*Ciconia boyciana*: OWS) were once broadly distributed over the Far East but the Japanese breeding population became extinct in 1971. For the population recovery, Hyogo Park of the Oriental White Stork started to reintroduce birds in Tajima region in 2005. We found OWS is a monogamous and territorial species and the non-breeders are non-territorial solitary birds (floaters), and some birds (satellites) are permitted to stay within the territory by the owner. Understanding of the non-breeders is important for the elucidation of social structure and conservation of OWS but the details are unknown. We studied the distribution of floaters and relationship between breeding pairs and satellites. Firstly, we compared the ratio of occurrence inside to outside Tajima region (ca. 1,000 km<sup>2</sup>) between breeders and solitary adults when they were immature. The proportion of occurrence inside Tajima was significantly more in breeders than solitary adults. Secondly, we compared the ratio of occurrence inside to outside territorial area (mean: 1.17 km<sup>2</sup>) for breeders between before and after pairing. The proportion of occurrence inside territorial area, as a matter of course, was significantly more after than before pairing. Finally, we observed interactions between a breeding pair and a satellite. The satellite defended the territorial area with breeding pair from conspecific intruders. Stay of the satellite at the nest site was significantly longer in non-breeding than in breeding seasons. Our results suggest that floaters become breeders and satellites through some kinds of experience, recognition and site fidelity.

**G1 David A. La Puma\***, Robert Fogg, Sheldon Blackshire, Casey Halverson, Michael Lanzone. Cellular Tracking Technologies. **The Internet of wildlife-connecting technology and wildlife to answer the big conservation questions of today and tomorrow.** Connectivity in our everyday lives is something we all have gotten used to, both consciously and subconsciously. Whether it's the watch on your wrist uploading data to the web and then providing you analyses on your phone, or your phone triggering a connected device in your home when you cross an invisible geofence, we use connected networks every day. Until now wildlife tracking devices have been designed to work within a single platform (GSM, ARGOS, etc.), where every device communicates directly with a specific network. The Internet of Wildlife (IoW) leverages each organism in the network to intelligently collect and send information from one organism to the next allowing researchers to collect biological data never before possible. For example, with IoW small passerines transfer data to turtles, otters to gulls, whales to albatrosses; bigger animals can transmit to the internet and/or satellites so that the entire multi-species data stream ultimately reaches the researcher. This kind of intelligent data mesh network enables remote tracking of the smallest organisms. The IoW mesh network leverages existing network infrastructure, thereby reducing the need to deploy costlier infrastructure specific to certain type of wildlife tag, e.g., ICARUS. The CTT IoW will revolutionize how animal movement data are collected and how researchers and wildlife work together to answer big questions and ultimately help conserve species world-wide.

**C5 Rebekkah L. LaBlue**, Raymond M. Danner. Department of Biology & Marine Biology, University of North Carolina Wilmington, Wilmington, NC 28403. **Sweating the speckles: darker Least Tern (*Sternula antillarum*) eggs become hotter under direct solar radiation.** Eggs are markedly vulnerable to thermal challenges. Despite the wide interspecific variation in eggshell appearance, current knowledge surrounding pigment thermoregulatory function does not adequately address how coloration in the visible spectrum affects heating. The color-mediated heating hypothesis posits that darkly pigmented eggs heat more quickly than lighter pigmented ones. Previous studies have explored this hypothesis using artificial eggs to compare data among different species with mixed results, but there is no support from intraspecific studies. The eggs of shorebirds deserve special attention because solar radiation poses a significant overheating risk on embryos. Eggshells were collected from a Least Tern (*Sternula antillarum*) breeding colony on Lea-Hutaff Island, North Carolina, during summer and monitored in timed, variously lighted trials with thermal imagery to track heating; overall coloration was assigned using median luminance values from standardized photographs. Results show that darker eggs heat more significantly than lighter ones, which could influence individual development and survival.

**G2 Michael Lanzone\***, Robert Fogg, Sheldon Blackshire, David A. La Puma, Casey Halverson Cellular Tracking Technologies, Rio Grande NJ. **High-resolution tracking of small organisms with Motus-compatible transmitters.** Until now, studies of small animal movement ecology were limited to labor-intensive VHF with transmitters weighing >1 g and having a short battery life. Development of the Motus Wildlife Tracking System allowed small bird species to be tracked at continental scales by leveraging large collaborative base station networks. These base stations, operated by numerous independent researchers, detect tagged birds as they pass within a certain distance of each station. However, these stations only localize to an approximate distance from the base station, and when a series of antennas is present, direction of flight. Cellular Tracking Technologies has developed an affordable Motus-compatible system (CTT InSight™) that allows individual tags to be localized at a fine-scale. This system consists of a grid of miniature base stations (nodes) that receive signals from each tag and transmits those data to a receiving base station. The receiving base station stores and transfers the data to the CTT cloud server where accurate, fine-scale locations are calculated. When a grid of nodes is setup at a study site, GPS-comparable spatial resolutions of 3-20m can be achieved. We will present several case studies from small passerines, including Yellow-rumped Warbler, and young Diamondback Terrapins. In these studies, we were able to detect fine-scale movements at high temporal resolution (2 s) allowing us to better understand detailed habitat and space use. We demonstrate how this affordable system can be used for tracking fine-scale movements of small animals while also fitting within the broader continent-scale Motus migration network.

**L7 Joshua B. LaPergola** (1)(2)(3)(S). 1. Cornell Lab of Ornithology, Ithaca, NY 14850 2. Department of Neurobiology and Behavior, Cornell University, Ithaca, NY 14853 3. Current address: Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ 08544. **Ecological drivers of colonial nesting in the Hispaniolan Woodpecker (*Melanerpes striatus*).** Explaining intra- and inter-specific variation in sociality requires not only an understanding of the fitness consequences of group living but also the underlying ecological factors that influence group size. Here I test the hypothesis that colony size of the Hispaniolan Woodpecker (*Melanerpes striatus*) is driven by a shortage of suitable nesting sites, which I call the "habitat-mediated aggregation" hypothesis. I demonstrate that royal palms (*Roystonea hispaniolana*), a key nest substrate, are themselves not limiting, but dead palms, which host larger colonies than live palms, are relatively rare. Colony size was also positively associated with the number of cavities on a palm, but this relationship exhibited a steeper slope for colonies on dead palms than colonies on live palms due to a greater incidence of flooded cavities and, to a lesser extent, heterospecific use in live palms. New cavities were more frequently built in dead palms, and colony size consistently increased on palms after the trees died. Cavities in dead palms took less time to excavate and were immune to flooding, which caused nearly half of all nest failures on live palms. First nests in a season had earlier first egg dates when in old cavities than in newly constructed cavities, but first nests did not differ significantly in first egg date between live and dead palms. These results suggest that availability of both dead palms, which are a superior nesting substrate, and old cavities, which accumulate on palms, influence variation in Hispaniolan Woodpecker colony size, supporting the habitat-mediated aggregation hypothesis.



**A5 Kara Lefevre\*** (1), Beth Fors (2), and Adam DiNuovo (3). 1. Florida Gulf Coast University, Fort Myers, FL 33965 2. Eckerd College, St. Petersburg, FL 33711 3. Audubon Florida, Naples, FL 34113. **Tracking the movement of Black Skimmer fledglings at breeding colonies on the Gulf of Mexico.** North America's largest colonies of the Black Skimmer (*Rynchops niger*) are found on Gulf of Mexico beaches in southwest Florida. This seabird is classified as endangered in New Jersey and as a species of special concern in North Carolina and Florida, with population declines due largely to intensive development of coastal breeding habitat. Although the northern half of the species' distribution — i.e., for the North American subspecies *R. niger niger* — is well-established, much remains to be learned about its movement dynamics. As a complement to knowledge that is accumulating from traditional banding studies in many areas of the eastern United States, we are using manual and automated radio-telemetry to investigate the movement of fledglings from two important breeding areas on Florida's Gulf Coast: one in Pinellas County (St. Pete's Beach and Indian Shores) and one in Collier County (Tigertail Beach on Marco Island). Flight-capable chicks were fitted with digitally-encoded VHF "nanotags" at age approximately 3 weeks of age during July-August of the 2017 (N=13) and 2018 (N=23) breeding seasons. This presentation will summarize tracking data and share lessons learned from our preliminary research using the Motus Wildlife Tracking Network. Ultimately this study will augment the understanding of regional movement patterns and support management targets for the conservation of Black Skimmer populations.

**N6 Will Lewis** (1)(S), Robert Cooper (1), and T. Scott Sillett (2). 1) Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA 30602 2) Migratory Bird Center, Smithsonian Conservation Biology Institute, Washington, DC 20013. **Long-term demographic changes of Black-throated Blue Warblers (*Setophaga caerulescens*) from across the breeding range.** Climate change is leading to range shifts in many species towards more northerly latitudes and higher elevations but a better understanding of the impacts on demography is needed to predict the consequences of climate change. We hypothesized that climate change may be impacting productivity through effects on local food supplies, which we tested by comparing long-term datasets of Black-throated Blue Warblers (*Setophaga caerulescens*) breeding at the range-core in New Hampshire and near the low-latitude breeding limit in the southern Appalachians. Breeding birds at low elevations in the southern Appalachians are likely to be extremely vulnerable to climate change due to being near the low-latitude and low-elevation breeding limit and so should exhibit the strongest demographic changes. Temperatures generally increased and precipitation decreased in the southern Appalachians compared to in the range-core. Breeding populations held steady or slightly increased in the range-core but in the southern Appalachians were stable at the highest elevations and declined at the lowest elevations. Both food biomass and nestling mass strongly declined at low elevations in the southern Appalachians concurrent with population declines. These results are broadly consistent with the hypothesis that climate change is influencing these populations and suggest that the mechanism may be through reductions in food abundance and nestling mass, which could lead to reduced first-year survival and/or recruitment. Our long-term monitoring effort has provided a potential pathway through which climate change may be causing population declines and highlights the need for continued monitoring of bird populations in these areas.

**J1 Marae C. Lindquist** (1)(S), Raymond M. Danner (1), Evangelyn L. Buckland (1), and John P. Carpenter(2). 1. Department of Biology and Marine Biology University of North Carolina Wilmington 2. North Carolina Wildlife Resources Commission. **Characterizing movements of Saltmarsh and Seaside Sparrows on wintering grounds using radio telemetry.** There are large gaps in knowledge regarding the wintering populations of Saltmarsh Sparrows (*Ammodramus caudacuta*, SALS) and Seaside Sparrows (*Ammodramus maritima*, SESP). Both species are losing essential marsh habitat due to sea level rise, development, and other anthropogenic forces and are listed as Species of Greatest Conservation Need on state Wildlife Action Plans and the USFWS will determine if SALS should be federally listed as Threatened or Endangered in 2023. During the winters of 2019 and 2020 we are researching SALS and SESP in Southeastern North Carolina to estimate density, abundance, space use, and site fidelity. We are using a combination of mark recapture and radio telemetry. Our first objective is to describe the movements of SALS and SESP throughout the winter. For the first objective we have 3 hypotheses: 1) SALS and SESP daily movements will track the tidal cycle; 2) SALS and SESP will have high site fidelity and 3) SALS and SESP will have consistent and specific habitat use. Based on our preliminary results we have seen support for all three hypotheses. Our second objective is to use the data collected for the first objective, combined with mark-recapture data to estimate density and abundance of SALS and SESP at our study sites. During the 2019 field season we banded 140 SESP and 13 SALS and deployed 20 radio tags. For the conclusion of this project we aim to provide pertinent information to aid with the conservation of both saltmarsh and seaside sparrows.

**B4 Bernard Lohr** (1)\* and Sara A. Kaiser (2, 3). 1. Department of Biological Sciences, University of Maryland Baltimore County, Baltimore, MD 21250. 2. Center for Conservation Genomics, Smithsonian Conservation Biology Institute, Washington, D.C. 20008. 3. Lab of Ornithology, Cornell University, Ithaca, NY 14850. **Geographic song variation in migratory and sedentary subspecies of Grasshopper Sparrows in North America and the Caribbean.** Signals that are culturally inherited, such as learned vocalizations, can act as behavioral barriers to gene flow and diverge rapidly across island populations. We investigated geographic song variation in the Grasshopper Sparrow (*Ammodramus savannarum*), a declining songbird with both migratory and sedentary subspecies. Grasshopper Sparrows sing two song types – every male sings the "buzz" song, especially early in a breeding cycle, and only paired males sing the "warble" song, mostly later in a breeding cycle. Birds also sing a combination song (buzz followed by warble) when transitioning between these songs. The buzz song consists of several brief introductory notes followed by a longer, rapidly-modulated sequence of very brief notes or note complexes, followed by a final short note.

We compared North American buzz songs with those of four Caribbean subspecies (*A. s. borinquensis*, Puerto Rico; *A. s. intricatus*, Hispaniola; *A. s. savannarum*, Jamaica; and *A. s. caribaeus*, Bonaire). We found that Caribbean songs have fewer note types and discrete song sections and show greater similarity within populations and across subspecies than North American songs. Each Caribbean subspecies has a typical buzz song type (although *A. s. savannarum* has two) and songs are individually distinctive. *A. s. caribaeus* (the rarest subspecies studied) have the most distinct songs. Their songs showed the most rapid modulation rate, the least inter-individual variation, and birds sang the combination song type almost exclusively. Further research will examine concordance between song and genetic variation of Caribbean Grasshopper Sparrows to determine the distinctiveness of Caribbean subspecies.

**H4 Michael P. Lombardo**, Patrick A. Thorpe. Biology Department Grand Valley State University Allendale, MI 49401. **The factors that affect Tree Swallow egg mass vary yearly.** The initial investment that a female bird makes in an offspring is her production of its egg. The size of this investment can have important evolutionary consequences for both the female and her offspring. Between 2008-2016, we measured the masses of 1977 Tree Swallow eggs laid in nest boxes in west Michigan to investigate the factors associated with egg mass. Breeding female age class did not influence egg mass. Overall, eggs that hatched weighed significantly more than those that did not. Eggs laid later in the season weighed significantly more than those laid earlier in the season. Egg mass was not affected by clutch size but egg mass significantly increased with position in the laying sequence. While there was high repeatability of egg mass for the 81 females that bred multiple times between 2008-2016, narrow sense heritability of egg mass was low but the sample size of mothers and daughters was small. There were statistically significant correlations, both positive and negative, between female morphological characteristics and egg mass in some years and not others. Similarly, the relationships between egg mass and environmental variables (e.g., air temperatures, daily rainfall) were statistically significant in some years but not during others. In summary, both biotic and abiotic factors were associated with Tree Swallow egg mass, but none had a statistically significant effect every year. These results reinforce the importance of long-term studies for identifying the causes of selection that shape the life-history characteristics of songbirds.

**N3 Kelsie A. Lopez** (1,2) (SP), Daniel M. Hooper (1,2), Irby J. Lovette (1,2). 1. Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, New York 14853, USA 2. Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850, USA. **Mitochondrial DNA suggests potential for Z-W chromosome involvement in reproductive isolation between subspecies of the Long-tailed Finch.** The Long-tailed Finch (*Poephila acuticauda*) comprises two subspecies that differ markedly in bill color: the western yellow-billed, *P. a. acuticauda*, and the eastern red-billed, *P. a. hecki*. A phenotypic hybrid zone containing orange-billed birds exists where the ranges of the two subspecies meet. We studied genetic differentiation across their species range to understand the extent of admixture between subspecies. Geographic admixture clines for the mitochondrion, Z chromosome, autosomes, and bill color were constructed using samples collected across an 1,800 km transect. MtDNA was first sequenced for 52 individuals in order to evaluate genetic differentiation between subspecies. Phylogenetic analysis indicates a subspecies divergence time of 0.47 MYA (0.32-0.66, 95% HPD). Mitochondrial haplotype network analysis revealed two reciprocally monophyletic subspecies clusters separated by 22 fixed differences. All genetic cline models support a center of admixture ~350 km west of the center of bill color admixture. The observed geographic discordance between clines suggests that bill color may be in the process of introgressing east from yellow-billed *acuticauda* into red-billed *hecki*. The concordant locations and narrow widths of Z chromosome and mitochondrial clines suggest that both may contribute to reproductive isolation between subspecies. Since the mitochondrion and W chromosome are maternally inherited, the location of these clines may be indicative of Z-W interactions. We find that genetic exchange between subspecies is most limited at sex-linked loci. We speculate that this is possible due to the accelerated accumulation of reproductive incompatibilities and chromosomal inversions on the sex chromosomes compared to the autosomes.

**L10 Emilie R. Luttman** (1)(S) and John A. Smallwood (1). 1. Department of Biology, Montclair State University, Montclair, New Jersey, USA. 2. Department of Biology, Montclair State University, Montclair, New Jersey, USA. **Reproductive Success Increases with age in American Kestrels, especially in breeding males.** Age-related differences in reproductive success have been well documented in many species of birds. In this study we examined 669 nesting attempts by American Kestrels (*Falco sparverius*) from a population that bred in nest boxes in northwestern New Jersey, 1995 to 2018. We tested the hypothesis that older kestrels would have greater nesting success than those during their first reproductive attempt. Clutch size, hatching rate, and the number of chicks that survived to fledging varied significantly and positively with age for both male and female breeders. These trends were associated with the date of clutch initiation and amount of parental attentiveness. Older birds initiated clutches earlier than those in their first breeding attempt and were more likely to be observed in the vicinity of the nest site, especially during the incubation and nestling periods. The relationship between age and breeding success was much more pronounced in males than in females. This difference is consistent with the behavioral role that each sex has during a breeding attempt. After laying a clutch, the female performs most of the incubation and she broods the young chicks. In contrast, the male provides food to the female prior to and during egg laying and throughout incubation, and to the entire family until the chicks no longer are brooded by the female. Pairs in which both adults were older had significantly greater nesting success than mixed or young pairs, and we never observed an older female paired with a male in his first reproductive attempt.

**N4 Andrew C. Lydeard** Murray State University, National Science Foundation SUPERB Scholarship Program, the United States Forest Service, the Hancock Biological Station, and the Watershed Institute. **A multi-taxon Bioassessment of the Land Between the Lakes Recreation Area: Do riparian bird, fish, and macroinvertebrates correlate to predict ecosystem quality?** Birds are important bioindicators and have recently been the focus in rapid bioassessment projects to assess disturbance within an ecosystem. The Land Between the Lakes Recreation Area (LBL), located in Kentucky and Tennessee, remains one of the largest protected forest tracts in the eastern United States and is an important area that provides ample opportunity to study the diversity and integrity of the many riparian ecosystems within the area. I have recently begun sampling bird, fish, and insect communities of 25 streams within LBL to calculate an Index of Biotic Integrity score (IBI) for each organismal group within each stream reach. IBI values will be used to grade the disturbance of each site, and test whether avian IBI values are well-correlated with aquatic organisms within the same riparian zone. I predict comparing terrestrial IBI scores with aquatic IBI scores will detect more subtle differences in riparian zone quality than by using a single IBI alone. This study will help demonstrate the importance of analyzing multiple facets of an ecosystem to preserve threatened ecosystems in the wake of anthropogenic disturbances. Additionally, the survey data obtained from avian survey data will be compared to historical records and will provide a critical snapshot of these ecosystems that will serve as a reference for future conservation efforts within the region.

**N5 Rachael P. Mady** (1)(2)(SP), Wesley M. Hochachka (1), David N. Bonter (1)(2). 1. Cornell Lab of Ornithology, 159 Sapsucker Woods Rd, Ithaca, NY 14850 2. Department of Natural Resources, Cornell University, Fernow Hall, Ithaca, NY 14853. **The effect of supplemental food availability on avian space use.** Millions of people feed wild birds and this supplemental resource has profound implications for many species. To better understand the effects of supplemental feeding, researchers have compared birds with constant access to food to those without access. However, the availability and predictability of supplemental food varies, with some people filling their feeders daily while others do so more sporadically. As food availability and predictability change, a bird's space use patterns should change as well. To determine how space use varies with supplemental food availability and predictability, we surveyed bird species with access to experimental feeders at sites that provided constant, pulsed, or no access to supplemental food. We conducted these surveys at two locations — near and far from the feeder — within each site to determine differences in space use between and within sites. We found that the presence of supplemental food spatially anchored each species, with more birds at sites with food compared to sites without food. Within sites, there were more birds within 50 m of feeders with food available compared to ~200 m away. We also found that feeders providing constant access to food continually attracted birds while feeders providing pulsed access to food only attracted birds when food was available. There was no difference between the number of birds attracted to the feeders with constant access and the feeders with pulsed access when food was available. The immediate presence and not overall availability and predictability of supplemental food determined space use by our study species.

**B10 Sean M. Mahoney** (1)(SP), Matthew W. Reudink (2), Bret Pasch (1) and Tad C. Theimer (1). 1. Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ, 86001, USA 2. Department of Biological Sciences, Thompson Rivers University, Kamloops, BC, Canada. **Assessing geographic variation in song structure and plumage coloration in the Willow Flycatcher (*Empidonax traillii*) species complex.** Animals communicate their fitness as potential mates through various modalities including acoustic and visual signals. Divergence in these signals can be an important driver in speciation and can lead to reproductive isolation when characters between populations become too different for populations to recognize each other as the same species. Rigorously quantifying character divergence has recently gained more attention in ornithology, specifically with species of conservation concern such as the endangered Southwestern Willow Flycatcher (SWFL, *Empidonax traillii extimus*), a subspecies of the Willow Flycatcher (*E. traillii*). The subspecies designation was largely based on genetics, because the mtDNA C-haplotype is more frequent in SWFLs. However other aspects of the SWFL's biology such as song and plumage coloration are incompletely known and have therefore been used to challenge its subspecific and endangered status. We assessed character divergence among willow flycatchers by 1) quantifying subspecific song structure differences, 2) tested for subspecific song recognition in male flycatchers using simulated territory intrusion playback experiments, and 3) assessed plumage differences among flycatcher subspecies by measuring spectral reflectance on museum specimens using spectrophotometry. We found 1) song differed among subspecies and SWFLs sang the most unique song, 2) individual birds responded more aggressively to songs that were structurally more similar to their own during playback experiments, and 3) subspecies exhibited plumage differences, with SWFLs occupying a unique tetrahedral colorspace relative to the other subspecies. Our results suggest SWFL song and plumage may be diverging and therefore deserve continued protection under the Endangered Species Act.

**J5 Eric L. Margenau.** West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, School of Natural Resources, Morgantown, WV. **Managing forest birds in forested rights-of-way landscapes.** Forest alteration from energy infrastructure (ROWS; e.g., pipelines) is one of the biggest challenges facing managers today. Open canopy and limited under-story vegetation within ROWs benefits some young forest-associated birds, but periodic maintenance within ROWs limits suitability for many species due to the lack of mid- and under-story vegetation structure. Consequently, we implemented forest management adjacent to ROWs via small-sized tree cuttings (0.5–1.4 ha; hereafter “cut-back border”) to create vegetation conditions suitable for the suite of young forest species. Cut-back border plots consisted of a combination of three widths (15, 30, and 45 m) and two harvest intensities (4.5 and 14.0 m<sup>2</sup>/ha basal retention) along 11 ROWs throughout West Virginia. We tested community-level responses of young forest and mature forest species, and population-level responses of three young forest species (Chestnut-sided Warbler [CSWA; *Setophaga pensylvanica*], Eastern Towhee [EATO; *Pipilo erythrophthalmus*], and

Indigo Bunting [INBU; *Passerina cyanea*] to cut-back borders using point counts conducted from one year pre-treatment to two years post-treatment. Young forest and mature forest guild richness increased from pre-treatment to two years post-treatment in all cut-back border treatments. Abundances of all three young forest species (CSWA, EATO, and INBU) increased from pre-treatment to two years post-treatment in the wider (30 and 45m), heavier cut (4.5 m<sup>2</sup>/ha) plots. These results indicate that conditions created via cut-back borders along ROWs benefit young forest and mature forest bird species. Additionally, this study provides a framework for conservation of songbirds in areas with widespread ROW infrastructure.

**K5 Samuel Merker**, Richard Chandler. Warnell School of Forestry and Natural Resources at the University of Georgia. **Identifying global hotspots of trailing-edge population diversity: A case study of the Southern Appalachian Mountains.** Climate change is causing the ranges of many species to shift poleward and to higher elevations. Trailing-edge populations (TEPs) near the low-latitude edge of a shifting range are predicted to be at high risk of climate-induced extinction, but conservation efforts are hindered by a lack of information about the global distribution of TEPs. We used a large spatial dataset on the ranges of nearly all extant avian species to identify potential hotspots where TEPs represent a large proportion of the total avifauna. We identified potential TEP hotspots by isolating and overlaying low latitude regions of species' ranges, and computing the proportion of total species richness in a location comprised of low-latitude populations. We identified potential hotspots on all continents other than Antarctica. Potential TEP diversity was highest near the equator, low-latitude margins of mountain ranges, desert edges, and along coastlines. Because a potential TEP hotspot might not be an actual TEP hotspot if the low-latitude populations are not declining, information on population trends is necessary for confirmation. As a case study, we focused on one of the identified hotspots, the Southern Appalachian Mountains, where our analysis indicated that 30 bird species have potential TEPs. Even though more population studies have been conducted in the Appalachian Mountains than in most of the other potential hotspots that we identified, there was insufficient information available from the high elevations where these species occur to make strong inferences about population declines. Our research highlights the need for a concerted effort to gather more information about population trends in the regions we identified as potential hotspots of TEP diversity.

**A4 Samuel Merker** (1,2)(S), Arthur Nelson (2), William Clark (2), Sam Orr(2), Paul Napier (2), Bob Studholme (2), Eugene Biglin (2), Steve Felch (2), Paul Engman (2), Arthur Nelson (2), Olin Allen (2), Mandy Matthews (2). 1) Warnell School of Forestry and Natural Resources, University of Georgia, 180 E. Green Street, Athens, GA, 30601 2) Cape May Raptor Banding Project, Cape May, NJ. **A Brief History of the Cape May Raptor Banding Project – 52 years of continuous data on migratory raptors on the east coast of the United States.** The Cape May Raptor Banding Project is the largest and one of the longest running raptor banding project in the United States. It is also one of the longest running raptor banding projects in the world. Beginning in 1967 the CMRBP has actively trapped migrating birds of prey from late August to early December. Over this time period the project is responsible for 152,942 individual captures. The project has captured over 15 migratory raptor species and documented several rarities from other continents. Some of these individuals have been recaptured either in Cape May or in other parts of the county or world, making it one of the most robust fall migration capture-recapture projects. The history of the project, the value of the data, and the published science will be presented. Furthermore, we explore over 50 years of capture trends and how through interactions with the public the project has provided valuable education on raptor natural history.

**L3 Olga Milenkaya** \*(1), Aubrey Crowell (2)(S), Kaveh Eden (2)(S), and James L. McKay (3) 1. Biology Department, Warren Wilson College, Asheville, NC 28815 2. Biology Department, Young Harris College, Young Harris, GA 30582 3. 15 Avondale Road, Asheville, NC 28803. **Just a few Carolina chickadees respond adaptively to competitive house wren in area of relatively recent contact.** Human activities are rearranging species into novel communities where populations that evolved in isolation are now interacting for the first time, potentially harming native species. House wrens (*Troglodytes aedon*) began breeding in northern Georgia in the mid-1900's, and they may be outcompeting Carolina chickadees (*Poecile carolinensis*) for limited nest cavities. We asked, how do chickadees respond to house wrens in an area of relatively recent contact between the two species? We hypothesized that chickadees do not behave defensively against house wrens. Because many songbirds approach threats, we predicted that chickadees would similarly not approach models of a non-threatening mourning dove nor that of the house wren. We used a within-subject design to present each nesting pair of chickadees with both models, and we estimated the approach distance of chickadees to the models every 10 seconds during these two 10-minute trials. We compared their preference for approaching one model over the other, as well as their proximity. Most chickadee pairs did not approach either model, but among the few that approached only one of the two models, there was a significant preference for approaching the house wren. Among pairs where at least one bird approached any model, they did so to a closer distance when inspecting the house wren compared to the mourning dove. Our hypothesis that chickadees are fully naïve to house wrens was not supported, but since most chickadees did not approach the house wren model at all, the population overall remains poorly suited for this novel interaction.

**M3 John A. Moretti** (1)(2)(S) and Eileen Johnson (1) 1. Museum of Texas Tech University, Texas Tech University, Lubbock, TX, 79409. 2. Jackson School of Geosciences, University of Texas, Austin, TX, 78712. **Late Pleistocene birds of the Macy Fork local fauna, Southern High Plains, Texas.** The Pleistocene-Holocene boundary is marked by significant alterations to the composition and distribution of the mammalian and herpetofaunal communities in the North American Great Plains. The Pleistocene-Holocene record of birds in the Great Plains is less well documented. This situation leaves the response of the avian

community to the biotic and abiotic changes of the late Quaternary little known and poorly understood. Ongoing investigations of late Pleistocene alluvial deposits in Garza County, Southern High Plains, Texas, have produced a rich skeletal assemblage containing 63 vertebrate taxa. This sample from 11,500 - 11,000 radiocarbon years before present is collectively termed the Macy Fork local fauna. The local fauna contains a diverse avian sample, comprised of 14 taxa. Upland forms, such as *Athene*, *Molothrus*, and *Bartramia*, are present. More numerous are wetland forms, including multiple anatids, rallids (*Fulica*, *Porzana*, *Rallus*), shorebirds (*Tringa*, *Himantopus*), and a grebe (*Podilymbus*). These wetland taxa are of particular significance. Wetland habitats degrade across the Southern High Plains during the middle Holocene and again during the past century, yet most late Pleistocene wetland forms persist in the extant regional avifauna. Today, Macy Fork charadriiform shorebirds in the extant fauna are seasonal migrants to the Southern High Plains. Occurrence of these shorebirds in the Macy Fork local fauna informs on the establishment of extant migratory and breeding ranges while hinting at potential distinctive late Pleistocene patterns. In total, the Macy Fork assemblage contributes to the natural history of the Great Plains avifauna with new evidence of late Pleistocene species composition and biogeography.

**R5 Sara Morris, Andrew Stewart.** Canisius College. **Biology Boot Camp: Helping biology students hit the ground running.** As faculty members, we often struggle to help students recover from poor performance in our courses. Students who are performing poorly often must address issues related to study habits, the ability to complete assignments at an appropriate level, a lack of comprehension of course material, a lack of depth of subject area knowledge, a lack of communication with the course instructor, and/or insufficient awareness of campus support services. At Canisius, faculty members teaching introductory biology classes were concerned about students who were motivated to succeed, but who did not fully understand the rigor of college science classes and were unprepared for the high school-to-college transition. To address this need, we developed the Biology Boot Camp program ("Bio BootCamp"). Our program occurs during the three days immediately prior to new student orientation and is open and advertised to all students enrolled in our introductory biology course, regardless of major. We provide a combination of academic and social events in order to engage students and break down barriers to learning. Academic sessions include sample lectures, how to read science texts, note taking, how to study for quizzes and exams, how to take quizzes and exams, time management, and an introduction to support systems. Social activities include an icebreaker, a "meet the faculty" panel, a campus tour for science students, a potluck dinner with the faculty, and a game night. Students have reported that boot camp eased anxiety about the transition to college life and helped them prevent common first semester pitfalls.

**C7 Gretchen N. Newberry (1), David L. Swanson (2)** 1. PhD graduate (2018), Department of Biology, University of South Dakota, Vermillion, South Dakota, 57069 2. Faculty, Department of Biology, University of South Dakota, Vermillion, South Dakota, 57069. **Nest success, heat tolerance and nest microclimate of rooftop nesting Common Nighthawks (*Chordeiles minor*) in an agriculturally dominant landscape.** Natural nesting habitat for Common Nighthawks (*Chordeiles minor*) in the Northern Prairie region of North America is in decline due to row-crop conversion. We tested the suitability of an alternative nesting habitat, urban rooftops. Climate trends toward increasing summer temperatures, decreasing cloud cover and increasing humidity might make rooftops unsuitable for nesting habitat. Mean daily minimum, average and maximum operative temperatures (Te) at rooftop nest sites in 2016-2017 were 26.3, 31.7, and 36.3 °C, respectively, with a 71.1 °C extreme maximum Te. We monitored 50 rooftop nests in southeastern South Dakota from 2015-2017. Like many nightjars, 7- to 14-day old nighthawk chicks were extremely heat tolerant. Evaporative water loss rates rapidly increased at temperatures above 44.1 °C in humid conditions (i.e. up to 16 °C dew point), a threshold exceeded for up to 57% of the breeding season. Chicks had similar evaporative water loss rates to adult nightjars at 51°C (2.44 g H<sub>2</sub>O h<sup>-1</sup>). However, baseline corticosterone levels increased in chicks acutely exposed to high ambient temperatures, suggesting that these temperatures were stressful. In addition, low hatching (0.252) and fledging (0.262) success rates, similar to those for other declining nighthawk populations, and a negative association between ambient temperature and hatching success, suggest that future microclimate trends may make rooftops unsuitable for nesting. We recommend conservation of grasslands and heterogeneous landscapes of row crops and grazed pastures to promote nighthawk occurrence in this region where row crops predominate.

**P6 Timothy O'Connell\* (1), Anna Matthews (2), Brittany Simons (1), and James Giocomo (2)** 1. Department of Natural Resource Ecology and Management, Oklahoma State University, Stillwater, OK 74078 2. Oaks and Prairies Joint Venture, American Bird Conservancy, Austin, TX. **Temporal variability in abundance estimates for breeding birds in the Oaks and Prairies.** Populations and assemblages of organisms vary in space and time. Variability can result from changes in vital rates that correlate with population trajectory, from immigration and emigration to other populations, or both. This variability can belie relative stability among different species, potentially indicating those most responsive to land use changes or extremes of temperature and precipitation. Quantifying such variability, however, requires a long-term commitment to monitoring that includes sampling with methods to permit calculation of individual detection rates for species and observers. We sampled breeding birds from approximately 1000 points in a 10-county region of central Oklahoma to provide baseline estimates of population and distribution for the Oaks and Prairies Joint Venture. Sampling was modeled after the North American Breeding Bird Survey, with roadside point counts sampling grasslands, pastures, croplands, urban areas, forests, etc. along a 40-km route. Through the first five years of monitoring, we found wide interannual variability in detection-corrected density estimates among species, including estimates for the abundant and widespread Dickcissel and Eastern Meadowlark similar in magnitude to that of the notoriously variable Northern Bobwhite. Shrub-associated species, e.g., Painted Bunting, were less variable than

grassland obligates; populations for all grassland obligates in Oklahoma, plus those sampled from a larger 30-county region in Texas, indicated persistent declines.

**B3** **Karan J. Odom**\*1, Kristal E. Cain<sup>2</sup>, Michelle L. Hall<sup>3</sup>, Naomi E. Langmore<sup>4</sup>, Jordan Karubian<sup>5</sup>, Erik D. Enbody<sup>5</sup>, John Jones<sup>5</sup>, Jenéle L. Dowling<sup>6</sup>, Ana Leitão<sup>3</sup>, Sonia Kleindorfer<sup>7</sup>, Christine Evans<sup>7</sup>, Allison Johnson<sup>8</sup>, Emma I. Grieg<sup>1</sup> and Michael S. Webster<sup>11</sup>. Cornell Lab of Ornithology, and Department of Neurobiology and Behavior, Cornell University, 159 Sapsucker Woods Road, Ithaca, NY 14850, USA 2. University of Auckland, School of Biological Sciences, Auckland 1010, New Zealand 3. School of BioSciences, University of Melbourne, Melbourne, Australia 4. Division of Ecology and Evolution, Research School of Biology, Australian National University, Canberra, Australia 5. Department of Ecology and Evolutionary Biology, Tulane University, New Orleans, LA, USA 6. Osprey research and education program, Montana Natural History Center, and the Division of Biological Sciences, University of Montana, MO, USA 7. College of Science and Engineering, Flinders University, Adelaide, South Australia, Australia 8. Department of Ecology & Evolution, University of Chicago, Chicago, IL, USA. **Sex role similarity and sexual selection shape male and female song structure in fairy-wrens.** Bird song complexity is often thought to evolve through sexual selection on males to attract females, yet in many species both sexes sing. Previous research on male song suggests songs are most elaborate at high latitudes, owing to increased competition for mates and resources during short, synchronous breeding seasons. In contrast, at lower latitudes song elaboration and male-female song dimorphism may be reduced because longer breeding seasons and year-round territoriality may select for similar sex roles in parental care and territory defense. While both sets of selection pressures are likely to shape global distributions of bird song in both sexes, studies seldom take both into account. We examined song elaboration and dimorphism between males and females in 15 populations of nine species of Australian songbirds, the fairy-wrens (genus *Malurus*, Maluridae). We examined the relationships between both song elaboration (in both sexes) and sexual dimorphism, and variation in extra-pair paternity, brood size, breeding synchrony, adult survival, male feeding rates, group size, breeding density, and latitude. We predicted that more elaborate song in both sexes would be associated with increased sexual or social competition, and that song dimorphism would be greatest when sex-roles diverge and song is used for sex-specific functions. Our results suggest that increased song elaboration in both sexes is associated with greater sexual competition: song variability increased with increasing latitude and populations with greater breeding synchrony had more variable, faster paced songs. We also found evidence that sex-role similarity drives male-female song similarity: male and female songs were most similar at tropical latitudes, when males provide proportionately more care, and when groups sizes are small (breeding pairs have no or few helpers). Taken together, these results suggest that song structure in both females and males is shaped by both sexual selection, and selection pressures that mediate sex-role similarity.

**D4** **Ashley Olah** (1)(S), Kim Grveles (2), Sarah Warner (3), Davin Lopez (2), Christine A. Ribic (4), Anna M. Pidgeon (1). 1. SILVIS Lab, Department of Forest and Wildlife Ecology, University of Wisconsin-Madison, 1630 Linden Drive, Madison WI 53706, USA. 2. Wisconsin Department of Natural Resources, 101 S Webster Street, Madison, WI 53707, USA. 3. United States Fish and Wildlife Service, 505 Science Drive, Madison, WI 53711, USA. 4. U. S. Geological Survey, Wisconsin Cooperative Wildlife Research Unit, University of Wisconsin, Madison WI 53706, USA. **Movement patterns, habitat use, and survival of dependent Kirtland's warbler fledglings in Wisconsin.** Kirtland's warblers (*Setophaga kirtlandii*), an endangered songbird that typically breeds in young, wildfire regenerated forests of jack pine (*Pinus banksiana*) in a restricted range within northern lower Michigan, recently expanded into red pine (*Pinus resinosa*) dominated habitat in Wisconsin and Canada. Red pine dominated habitat patches are suitable for successful nesting, however it is unknown how red pine dominated habitats may influence fledgling survival. Little is known about how fledglings utilize and move through habitat during the dependent period. We characterized habitat use, survival, and movement patterns of Kirtland's warbler fledglings in red pine dominated habitat in Wisconsin. Fledglings used areas with lower herbaceous vegetation height and bare ground cover, and greater foliage height diversity and cover of low tree branches. Cumulative survival decreased from 0.86 at 7 days old to 0.38 at 28 days old after which it remained constant. The estimated daily survival rate increased from 0.31 to 1.0 when distance to trees decreased from 7.4 m to 1.0 m. Distances moved away from nests increased as fledglings aged, and was greater for female-attended fledglings. Areas used during the dependent period increased in size from 1.28 ha during the first two weeks out of the nest to 5.44 ha from 28 days onwards, the average area used during the dependent period was 2.2 times larger than the territories of the fledgling's fathers', and overlapped 49% of father's territories. Overall, use of red pine dominated plantations does not negatively impact survival of Kirtland's warbler fledglings during the dependent period.

**Q4** **Kevin E. Omland**, Janine Antalffy, Scott Johnson, Michael Rowley, Colin Studds Omland - UMBC Antalffy - UMBC Johnson - Bahamas National Trust Rowley - Villanova University Studds - UMBC. **Conservation biology of the Bahama Oriole: Incomplete data can lead to destructive conservation actions.** Reliable information on the biology of endangered species is crucial to allocation of resources and successful management strategies. The Bahama Oriole (*Icterus northropi*) is a critically endangered species currently restricted to just Andros. Previous research suggested a population of fewer than 300 individuals that nested almost exclusively in developed habitats in introduced coconut palms. However, we have documented extensive breeding populations deep in pine forests, with nests in both Caribbean Pine and in native understory palms. Widespread point counts across all habitats suggests that the population likely includes several thousand individuals. Native pine forests are clearly crucial to this species as we have documented that the vast majority of the species lives in pinelands. The Bahama Oriole provides a dramatic case study of how incomplete data can lead to misguided conservation actions. Sufficient funding for basic scientific research on poorly studied endangered species is crucial to mitigating extinction risk.

**M4** **Kiirsti Owen** (1)(SP), Dan Mennill (1). 1. University of Windsor, 401 Sunset Ave. Windsor, Ontario, Canada, N9B 3P4. **Bird communities in an endangered tropical ecosystem: a bioacoustic approach to monitoring forest recovery.** As anthropogenic disturbances continue to alter forests around the world, forest regeneration is important for ensuring the persistence of diverse bird species. Restoration monitoring is critical to understanding how birds respond to forest regeneration and to assess the effectiveness of restoration efforts. In northwestern Costa Rica, significant efforts have been made over the past four decades to protect remaining patches of tropical dry forest and restore surrounding areas resulting in a mosaic of forests in different stages of regeneration. Using bioacoustic monitoring, we recorded bird communities at 62 sites throughout tropical dry forests of the Guanacaste Conservation Area, Costa Rica. We compared bird species diversity and abundance to forest age and structure. Our results show that bird species diversity and abundance increase with measures of forest maturity, including age, canopy cover, and tree species richness. Therefore, these maturing forests are home to an increasing number of birds that comprise an increasingly diverse community. In addition to acoustic recordings, we resampled 30 point-count sites in a section of forest in Santa Rosa of the Guanacaste Conservation Area. Bird communities of this regenerating forest were first surveyed in 1996, when the forest was approximately 40 to 60 years post-restoration; our resampling occurred with 23 years of further habitat maturation. Our results show that species richness and abundance were similar between sampling years, although bird community composition changed. Our research uses emerging technology to monitor restoration initiatives in tropical dry forests while furthering our understanding of how bird communities respond to changing habitats.

**I3** **Facundo X. Palacio** (1)(S), and Mariano Ordano (2). 1. División Zoología Vertebrados, Museo de La Plata, Universidad Nacional de La Plata, B1900FWA La Plata, Buenos Aires, Argentina 2. Instituto de Ecología Regional, Universidad Nacional de Tucumán, Consejo Nacional de Investigaciones Científicas y Técnicas (IER-UNT-CONICET), 4107 Yerba Buena, Tucumán, Argentina. **How do plants set the table for birds? Frugivorous birds as natural selection agents on fruit display traits.** Since Darwin, a major challenge in evolutionary ecology has been to understand how mutualistic interactions between plants and animals drive the evolution of plant phenotype. The biological market between frugivorous birds and fleshy-fruited plants is no exception, and whether birds exert natural selection on phenotypic fruit traits has been long subject to debate. We assessed the role of birds as natural selection agents on fruit display traits in three plant populations from Argentina: *Psychotria carthagenensis* (n = 72 plants), *Vassobia breviflora* (n = 104 plants), and *Celtis ehrenbergiana* (n = 100 plants). We measured fruit and seed traits (mean and subindividual variation) and applied multivariate analyses of natural selection using the number of bird visits per hour as measure of relative fitness. We detected a positive directional selection on mean fruit diameter in *P. carthagenensis*, and a positive directional selection on fruit crop size and stabilizing selection on CV fruit diameter in *V. breviflora*. We also detected correlational selection on fruit trait combinations in *C. ehrenbergiana* (large crops with small fruits, and large fruits with low fruit size variation had higher plant fitness). Our results show that that birds act as natural selection agents on fruit display traits in nature. Overall, bird-mediated selection on fruit display traits may be more common than previously thought and, in the long term, might potentially drive microevolutionary changes on plant phenotype.

**M5** **Halie Parker** (1)(S), Dr. Jeffery L. Larkin (1). 1. Department of Biology, Indiana University of Pennsylvania, Indiana, PA, 15701. **A comparison of vegetation structure, species composition, and avian abundance within ungulate-excluded and unexcluded timber harvests.** Deciduous forests of eastern North America have been negatively impacted by excessive white-tailed deer browsing over the past several decades. Previous studies have provided insight regarding how deer-driven changes in forest structure, tree species composition, and microhabitat negatively impact forest birds. However, such studies have used relatively small plot sizes with low replication, which limits the transferability of their findings to operational-scale timber harvests. We studied the influence of white-tailed deer browsing on vegetation structure and avian abundance in paired fenced and unfenced regenerating timber harvests. Average number of woody stems/1m radius plot was  $11.2 \pm 4.4$  stems in fenced harvests and  $6.9 \pm 4.0$  in unfenced harvests. A lower proportion of Oak (*Quercus* spp.) stems in fenced harvests were browsed (15.8%) compared to 90.4% in unfenced harvests. Similarly, more Red Maple (*Acer rubrum*) stems were browsed in unfenced harvests (94.5%) than in fenced (21.5%) harvests. Our vegetation analyses revealed that fenced harvests had more >1.5m tall saplings and *Rubus* spp., and less grass cover than unfenced harvests. We also found that fenced harvests had greater horizontal vegetation and a taller average height of woody stems than unfenced harvests. The average number of bird species per point did not differ between fenced ( $13.3 \pm 2.4$  species) and unfenced ( $13.1 \pm 2.9$  species) harvests. However, the abundances of some individual species differed between fenced and unfenced harvests. Initial findings from this study suggest deer-induced impacts on vegetation in regenerating timber harvests can have considerable impacts on abundances of some forest birds.

**J3** **Nathaniel Scott Parkhill** (1)(SP), Dr. Margaret Brittingham (1), Dr. David Miller (1), and Justin Vreeland (2). 1. Department of Ecosystem Science and Management, Penn State University, University Park, PA 16802 2. Pennsylvania Game Commission, Southcentral Regional Office, Huntingdon, PA 16652. **Wood thrush nest-site selection suggests the importance of uneven aged forest processes in mature oak forests.** Wood thrush (*Hylocichla mustelina*) have declined dramatically in recent decades with habitat loss within Eastern North American breeding grounds identified as a major cause of decline. Existing forest management guidelines for wood thrush describe broad forest conditions in which wood thrush are found. Finer scale approaches are needed to understand preferred areas within suitable forest stands in order to develop targeted silvicultural approaches to wood thrush management. The objective of this study was to model wood thrush habitat selection within suitable stands in order to develop targeted forest management guidelines. We conducted point counts at 241 survey points within 27 predominately oak stands across 6 study sites in Central Pennsylvania in the summers of 2018 and 2019. We

measured forest structure at each survey point, nest site, and paired points 50 meters from nest sites in order to determine home range and nest-site selection. We detected wood thrush at 66.4% of our survey points and located 164 active wood thrush nests across the two field seasons. Nest sites had lower basal area ( $p=0.003$ ), higher understory ( $p<0.001$ ) and midstory ( $p<0.001$ ) cover, and lower canopy closure ( $p=0.044$ ) than paired points 50 meters from nest sites. Additionally, 70% of nests were placed in shade tolerant species with witch hazel, beech and maple saplings comprising the majority of host species. These results suggest that silvicultural techniques which emulate uneven aged forest processes such as natural gap formation might increase availability of nest site structural conditions within the predominately even aged forests of Central Pennsylvania.

**F6** **Katie L. Percy\***(1), Nicole Michel (2), Lindsay Nakashima (1), and Erik I. Johnson (1). 1. Audubon Louisiana, National Audubon Society 2. Science Division, National Audubon Society. **Can coastal restoration projects preserve Bald Eagle (*Haliaeetus leucocephalus*) breeding habitat in the Barataria Basin of Southeast Louisiana?** Louisiana is in the midst of a land loss crisis. About 2,000 mi<sup>2</sup> have been lost since the 1930s, and another 4,120 mi<sup>2</sup> may be lost over the next 50 years. In response to this crisis, the state has developed a Comprehensive Master Plan for a Sustainable Coast. Predicting responses by wildlife species to restoration projects helps inform these planning efforts, yet the 2017 Master Plan does not include a bird species that is representative of the upper estuary. Our objective was to evaluate potential for the Bald Eagle (*Haliaeetus leucocephalus*) to serve as a useful indicator of freshwater wetland health, and to develop a model that could be used to test four future land change scenarios. We used aerial nest survey data collected by the Louisiana Department of Wildlife and Fisheries and restricted the dataset to the Barataria Basin. We modeled the relationship between Bald Eagle nest occurrence and landcover using boosted regression trees (BRTs). Model performance was strong (BRT models explained a mean  $54.4 \pm 0.1\%$  of the deviance in nest occurrence) indicating positive associations of eagle nest data with fresh forested wetlands, freshwater marsh, and float marsh. Projected into the future, the suitability of Barataria Basin for nesting Bald Eagles was higher in 20 and 50 years with restoration action compared to without restoration action, although suitability decreased between 20 and 50 years both with and without restoration action. Our modeling efforts suggest that aggressive restoration action is needed, including the implementation of Mississippi River diversions, to sustain one of the highest densities of nesting eagles in Louisiana.

**O5** **Maia Persche** (S)(1), Anna Pidgeon (1). 1. Department of Forest and Wildlife Ecology, University of Wisconsin-Madison, Madison, WI 53706. **Resilient habitat for forest birds: the influence of topographic position in a temperate deciduous forest.** As invertebrate life cycle phenology advances due to earlier spring leaf-out, insectivorous forest birds are vulnerable to mismatches between food supply and demand. It is possible that areas with complex topography, and thus a variety of thermal conditions, may support a greater variety of plant and invertebrate phenological rates and stages within close proximity. We examined the effects of topographic position on the phenology of a tri-trophic system over two years from spring through mid-summer, hypothesizing that trophic mismatches are less likely to occur in cool microsites. At stream gorge and upland sites in the Baraboo Hills of the US Midwest, we recorded leaf-out timing of over 700 deciduous trees, measured weekly changes in invertebrate biomass on understory foliage, and conducted bird point counts to assess avian species richness and density. In stream gorges, cooler temperatures were associated with delays in leaf-out timing relative to upland sites. Invertebrate biomass was similar between stream gorges and uplands, and did not exhibit strong seasonal peaks, in contrast to other temperate zone sites where phenological mismatches have been reported between birds and invertebrates. Insectivorous bird species richness was greater in stream gorges and was positively related to Lepidoptera larvae biomass in the understory, but avian density was equal between uplands and stream gorges. These results suggest that trophic mismatches between birds and invertebrate prey are unlikely at this site, and despite having cooler microclimates, delayed leaf-out, and higher avian species richness, stream gorges do not currently provide more invertebrate food resources than uplands.

**C9** **Sylvia D. Powell**, and Stefan Woltmann. Department of Biology, and Center of Excellence for Field Biology, Austin Peay State University, Clarksville, TN 37044. **Louisiana Waterthrush (*Parkesia motacilla*) nest placement patterns and nest predator identities in central Tennessee.** Nest predation risk influences nest site selection in birds. In preliminary observations of Louisiana Waterthrush (*Parkesia motacilla*) in central Tennessee, we observed adults carrying food and nesting material into 1st-order often-ephemeral streams (smaller tributaries) from comparatively higher order permanently flowing stream channels (main stems) where adults foraged. However, Louisiana Waterthrush nests typically are described as being in streambanks near flowing water (i.e., main stems). We asked whether smaller tributaries provide nest sites with lower predation risk than main stems. Using three Button Quail (*Coturnix chinensis*) eggs as surrogates for a clutch of waterthrush eggs, we tested for a difference in predation likelihood at artificial nests ( $N=48$ ) placed along smaller tributaries versus main stems. We used camera traps ("game cams") to monitor half of the artificial nests. We also searched for natural nests along smaller tributaries and main stems 2018-2019 and found 18 of 24 natural nests along smaller tributaries. We monitored 14 of 17 active natural nests with camera traps. Predation was relatively low at both artificial (11/48 predated) and natural (3/17 predated and 2/17 abandoned) nests. We also used multivariate analyses to explore potential nest site selection within breeding territories by comparing habitat characteristics at all natural nests ( $N=24$ ) to paired random locations. We found no effect of stream classification (main stem vs smaller tributaries) on likelihood of predation at artificial nests. We discuss alternative hypotheses for the disproportionate number of natural nests along smaller tributaries versus main stems.



**R1 Claire Varian Ramos**, Makenna Fair. Colorado State University – Pueblo. **Offspring sex ratios do not reflect adult sex ratios in Lark Buntings.** Individuals can increase their fitness by preferentially producing offspring of a more advantageous sex. Maternal condition, adult sex ratio, social structure, and offspring cost may all influence sex ratio biasing decisions in birds. Lark Bunting (*Calamospiza melanocorys*) populations in Colorado have been observed to have male biased adult sex ratios, but the source of this bias has not been established. Here we determined primary sex ratios for the first time in this species. We collected samples from nestlings at the Pueblo Chemical Depot in southeastern Colorado and determined sex genetically. Although the adult sex ratio for this population was apparently male, nestlings had a female biased sex ratio. It is possible that females produced the rarer sex to increase reproductive opportunities for their offspring, or that our field site was not optimal habitat, females were in poor condition, and thus produced the less costly sex with lower reproductive variance. Lark Buntings have declined in Colorado by 2.5% per year over the last fifty years, so understanding the sex ratio bias in this species may be important for long-term conservation of this species.

**C10 Lucas J. Redmond.** Department of Biology, Penn State Schuylkill. **Seasonal variation in clutch size and egg mass in Gray Catbirds.** Birds generally exhibit low levels of fecundity and heavily invest in relatively few offspring per breeding attempt. Allocation of resources into the yolk of eggs represents an important energetic investment, especially in smaller species in which a clutch of eggs could represent half or more of female body mass. Not surprisingly, variation, both within- and among-species, in clutch size and egg mass has received much attention. We studied seasonal variation in clutch size and egg mass of Gray Catbirds breeding on and around the Penn State Schuylkill campus in eastern Pennsylvania from 2016 to 2019. We found that clutch size, but not egg mass, declined across the breeding season and was larger in first broods compared to later broods. Within later broods, females whose first nest was successful laid larger eggs than females whose first nest failed. Although the interval between laying first and later clutches for females that were initially successful was longer than that for females who initially failed, there was no difference in the number of days that elapsed between the end of the first nesting attempt and the start of the second for the two groups of females. Nest failure would certainly reduce fitness, but our results suggest there may be carry-over effects of failure onto future breeding attempts that could result in further fitness costs.

**P3 Kelsey Pangman** and Leonard Reitsma. Department of Biological Sciences Plymouth State University, Plymouth, NH 03264. **Group selection harvest increases avian diversity on an American Tree Farm in west-central New Hampshire.** Disturbance-dependent bird species have declined in many northern temperate forests due to multiple factors including loss of habitat, forest maturation, and reduction in biotic agents of disturbance. Forestry creates disturbance and can balance recruitment of early succession species while sustaining density and productivity of the pre-harvest community. We designed a harvest intended to strike that balance by laying out 16 small (0.3 – 1.5ha) group selections that opened 12% of the canopy of a 46ha American Tree Farm. We conducted point counts from 2011 (only year pre-harvest) to the present at 30 point count stations. We marked and monitored reproductive success of three early-succession and three forest-interior species in 2011-2013 and then again in 2017-2018. Bird diversity as detected at point counts during four 5-min sampling intervals each season was significantly greater in the last two years than in all previous years. Reproductive success varied across years likely due to weather, mast and consequent nest predator densities. Nest success was generally high in the early years. Fewer pairs fledged young in more recent years, but the nest success did not differ between early and later succession species. The 5-6 year lag in the increase in diversity is consistent with other findings most probably due to regeneration time. We documented no nest parasitism and no cowbirds on point counts. The small size of these canopy openings and the extensive surrounding contiguous forest likely contributed to achieving a balance in sustaining forest-interior species' productivity and recruiting successfully reproducing early succession species.

**H5 Matthew W. Reudink** (1)(S), Genevieve Ward (1), Stephen Joly (1), and Sean Mahoney (2). 1. Department of Biological Sciences, Thompson Rivers University, Kamloops, BC V2C 3H8 2. Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ 86011. **Age and weather influence feather coloration in mountain bluebirds.** Plumage coloration plays a critical role in both inter- and intrasexual communication. A substantial body of work has been dedicated to understanding the role of ornamental plumage traits in signaling, though less work has examined how color changes over time within individuals and populations, especially with birds exhibiting structural (as opposed to carotenoid) coloration. Using a 9-year dataset, we asked how the UV-blue plumage coloration of Mountain Bluebirds changes as individuals age by examining both population-level differences across age classes and within-individual changes over time. Next, we asked how weather conditions experienced during molt the year preceding capture influenced population-level ornamentation. Finally, we examined both age and weather to ask how these two factors interact to influence individual plumage signals. Our data demonstrate clear age-related changes within both male and female Mountain Bluebirds, as well as weather-related variation in plumage ornamentation, likely mediated by effects on individual condition during molt.

**B1 Sean Roach\*** (1), Kendra DeMerchant (1), and Morgan Nesbitt (1). 1. Department of Psychology, University of Saint John New Brunswick, Saint John, NB E2L 4L5. **Division of labor: the communicative functions of Hermit Thrush (*Catharus guttatus*) song components.** The songs of some songbird species can be divided into categories with distinct functions, as with the Type I and II songs of some wood warblers. In other cases, individual elements or components within the same songs may be specialized for different aspects of signaling, such as short-range versus long-range communication. This may be the case in Hermit Thrush (*Catharus guttatus*), where males sing 6-14 different song types, each composed of an introductory whistle followed by a more complex series of notes. Converging evidence suggests that the introductory note functions primarily in

long-range communication. In eastern populations, the song types within individual repertoires vary greatly in frequency, with introductory notes spanning from 2000 to 5000 Hz. However, introductory notes are seldom observed within a window of about 3000–4000 Hz, which coincides with the frequency spectrum of two common congeners that sing whistled songs, black-capped chickadees (*Poecile atricapillus*) and white-throated sparrows (*Zonotrichia albicollis*); this may reflect a song structure adaptation to avoid masking by conspecific songs with similar acoustic properties. The post-introductory portions of songs exhibit no such gap, fitting a role in closer-range communication. In further support of this division, males respond to territorial conspecific playback by frequently dropping the introductory note and singing only the post-introductory portions of their song types, a behaviour not seen during spontaneous singing. The implications of these results, as well as plans for future work aiming to better understand the functions of the two hermit thrush song components, will be discussed.

**K6 Connor J. Rosenblatt\*** (1)(S), Stephen N. Matthews (1), Robert J. Gates (1), and William E. Peterman (1). 1. School of Environment and Natural Resources, The Ohio State University, Columbus, OH 43202. **Modeling population dynamics of Northern Bobwhite (*Colinus virginianus*) in response to future changes in winter weather.** Climatic conditions can exert a powerful influence on the population dynamics of a species. While most research has focused on how future changes in climate conditions may affect a species, less research has examined how extreme weather events can affect a species. The Northern Bobwhite (*Colinus virginianus*; hereafter bobwhite) has undergone widespread declines, and previous research has shown that in northern parts of its range, large snowfall events cause high winter mortality rates, accelerating population declines. In this study, we model the future population trajectory of a declining bobwhite population in Ohio in response to different frequencies of small, medium, and large snowfall years. To do this, we use an integrated population model, which is a novel modeling technique that allows us to combine multiple sources of data to model the current population trajectory, and project it 10 years into the future. Our results indicate that if the future snowfall distribution conforms to current conditions, bobwhites are predicted to decline by 14.3% per year. However, if the frequency of large snowfall years increases, bobwhites may decline by 16.5% per year, while if the frequency of small snowfall years increases, the rate of decline would be reduced to 4.9% per year. These results demonstrate how winter weather can directly influence population dynamics of a species, and how if there are more years with low amounts of snowfall than high amounts, it may be possible to stabilize bobwhite populations in Ohio through proper habitat management.

**L5 Michael Rowley** (S), Christine Eldredge, Christopher Roche, Matthew Dula, Robert Curry Department of Biology, Villanova University, Villanova, PA 19085. **How does irruption impact the social structure of Carolina and Black-capped chickadees?** Changes in community composition may impact how social relationships are organized both between and within species. During ‘irruption’ years, Black-capped Chickadees (BCCH) temporarily penetrate the range of Carolina Chickadees (CACH) as winter visitors, potentially disrupting group structure among resident CACH. We hypothesized that irruptive BCCH would form groups separate from resident CACH, with the two viewing each other as unfamiliar competitors. We compared social interaction data collected from two Pennsylvania field sites (Great Marsh, GM; Nolde Forest, NF) during two seasons (irruption and non-irruption). At GM, CACH formed fewer social connections with one another when BCCH were present (i.e., irruption year). In the same year, BCCH integrated into CACH groups at GM but preferentially associated with each other at NF. BCCH integration into CACH groups also varied by time period (i.e., between months within a single season) at GM. While variation in the interspecific social group structure may be caused by differences in species discrimination in relation to location and time of year, more research is needed to understand the underlying source of variation. Spatial and temporal variation in social networks involving single or multiple species necessitates replication across multiple sites and time periods to encompass a broad range of social patterns.

**H3 Ernesto Ruelas Inzunza.** Universidad Veracruzana, Instituto de Biotecnología y Ecología Aplicada, Xalapa, Veracruz, Mexico 91090. **Wing form and function are rooted in the evolutionary history of Neotropical birds.** The morphology of the bird wing defines characteristics of their flight. Wing shape and flight performance have been the focus of numerous investigations. Most of them, however, have taken place in the temperate region, where wings are subject to other factors affecting their shape, such as migration. This presentation has a two-fold purpose: (1) provide wing shape, airspeed, and energy expenditure estimates for Neotropical birds and (2) “map” these data to a multilocus phylogeny in order to establish how deeply rooted in their evolutionary history are wing form and function. With data from 71 species (347 individuals) from Costa Rica, I calculated wing-loading (WL) and aspect ratio (AR) of these birds as well as 10 reference long-distance migrants. The mean WL of Neotropical birds is 20.73 N m<sup>-2</sup>, 23% larger than that of migrants. The wings of sedentary birds are also less pointed: their AR is 15% lower than that migrants. Next, I used these data to estimate true airspeed and the mechanical power needed to reach it. Airspeeds ranged from 16–21 m/s<sup>2</sup>-1; energy cost ranges from 0.2–1.9 watts. Last, I used GenBank data to build a concatenated tree using three mtDNA regions. When mapping wing shape and flight performance to their phylogeny, I found many features are closely related to their position in this tree. This means a sedentary bird’s dispersal ability, regional movements, foraging ability, and other ecological features intimately linked to wing shape and flight performance are preserved, phylogenetically rooted traits over evolutionary time.

**E6 Nicholas J. Russo** (1)(S), Carole A.S.-J. Cheah (2), Chris S. Elphick (1), Nathan P. Havill (3), Morgan W. Tingley (1). 1. Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT 06269 2. Valley Laboratory, Connecticut Agricultural Experiment Station, Windsor, CT 06095 3. Northern Research Station, United States Forest Service, Hamden, CT 06514. **Spring bird migration as a dispersal mechanism for a forest insect invasion.** Birds act as long-distance dispersal agents

for plants, animals, and other organisms during migration, and can contribute to the range expansion of invasive species. The hemlock woolly adelgid (*Adelges tsugae*) is a largely sessile, invasive insect that decimates eastern hemlock forests and relies on vectors to continue spreading northward. Since dispersing adelgid nymphs (“crawlers”) are most abundant from late April to late May in the Northeast U.S., we investigated the potential for birds to disperse this invasive insect over long distances during spring migration. We experimentally tested two modes of adelgid crawler transfer between hemlock branches and mounted passerine specimens, collecting crawlers from the birds’ feathers after a period of contact with infested branches. Crawler transfer was greater when birds actively brushed against an infested branch than when they simply perched, and transfer rates peaked in May, coinciding with the phenological peak emergence of adelgid crawlers. We also sampled the plumage of wild birds captured in Connecticut hemlock forests over two years of crawler activity and found significantly more crawlers on birds during spring migration than during the subsequent breeding seasons. The crawler load of sampled birds mirrored the phenological variability in crawler abundance in the forests of capture. Finally, we confirmed experimentally that crawlers move off bird plumage and settle on uninfested hemlock foliage. Our results implicate an influence of avian ecology and life history in the dispersal of this destructive, invasive insect.

**B7 Robert Ryan**, Stefan Woltmann. Center of Excellence for Field Biology and Biology Department, Austin Peay State University, Clarksville TN, 37044. **Geographic and subspecies variation in the song structure of the Seaside Sparrow, *Ammodramus maritimus*.** Geographic variation in song is common in temperate passerines, but previous studies exploring song variation in Seaside Sparrows have not examined song at a range-wide scale. We analyzed the song structure of nine subspecies of Seaside Sparrow to describe how song varies geographically and ask whether variation in song structure aligns with subspecies designations. We gathered songs from the collections of the Macaulay Library, Borror Institute of Sound, Florida Natural History Museum, and Xeno-Canto, and also recorded songs at several sites in Texas. The song of the Seaside Sparrow has a distinctive two-part structure consisting of an introduction, composed of a warble containing a variety of syllables, followed by a terminal buzz. Descriptive measures of song such as duration, minimum, and maximum frequency were recorded for the introduction and the terminal buzz. We also recorded the total number of syllables in the introduction, and the pulse period for the terminal buzz. Finally, each syllable from every song was categorized into one of six syllable types, then grouped by specific identity within each type. Using ANOVAs and PCA we explored if songs clustered geographically based on elements of song structure, syllable composition, or syllable identity. The variation observed did not partition by subspecies designation, but some features of the song do vary geographically.

**R2 María Juliana Benítez Saldívar (1)(2) \***, Carolina Isabel Miño (3), and Viviana Massoni (1) <sup>1</sup>Instituto de Ecología, Genética y Evolución - IEGEBA. Universidad de Buenos Aires - UBA / Consejo Nacional de Investigaciones Científicas y Técnicas - CONICET. Ciudad Autónoma de Buenos Aires, Argentina. <sup>2</sup>Current address: Instituto Multidisciplinario de Biología Vegetal - IMBIV, Universidad Nacional de Córdoba –UNC / Consejo Nacional de Investigaciones Científicas y Técnicas - CONICET. Córdoba, Argentina. <sup>3</sup>Instituto de Biología Subtropical - IBS, Universidad Nacional de Misiones - U.Na.M. / Consejo Nacional de Investigaciones Científicas y Técnicas - CONICET. Posadas, Misiones, Argentina. **Song and delayed plumage maturation: assessing their effect on extra-pair paternity in the Saffron Finch.** Males’ plumage coloration and song could be relevant for female mate choice, and affect males’ opportunities to gain extra-pair paternity (EPP). Saffron Finches (*Sicalis flaveola pelzelni*) are socially monogamous Thraupidae; males show delayed plumage maturation: second-year (SY) males are drab female-like, while after-second-year (ASY) males are overall golden yellow. Given that SY males are fully capable of mating and raising broods, we compared their ability to obtain EPP with that of ASY males at Chascomús, Argentina. Parentage was assigned to 198 nestlings from 54 broods across three breeding seasons and we found moderate extra-pair paternity rate per season. We obtained plumage color and paternity data from 47 males, and song recordings from 26 of those males. Using generalized linear mixed models we examined, separately, the relationship between loss of paternity of at least one nestling in the males’ social broods and success in siring extra pair nestlings in other nests with song and plumage coloration variables. We included males’ body condition, breeding synchrony, brood size, and proportion of SY males within the assemblage in a given season as predictors in the models. Paternity gain was not significantly explained either by males’ plumage or song traits. The song model that better explained paternity loss included male condition and syllable duration (males producing longer syllables lost paternity to males singing shorter syllables). Therefore, males’ plumage coloration may not play a relevant role in females’ mate choice, but syllable duration may influence their paternity loss.

**G6 Sarah Sargent (1,2)** and Laura Marie Koitsch (1,2) <sup>1</sup>Erie Bird Observatory, 301 Peninsula Dr, Erie, PA 16505 <sup>2</sup>National Audubon Society (formerly). **Contrasting movements of Blackpoll Warblers and Swainson’s Thrushes through a semi-urban environment during spring migration.** Stopover areas adjacent to migration barriers such as large water bodies are intensively used by long-distance migrants during annual migrations. In 2016 and 2017 we used nanotags to study the local movements of Blackpoll Warblers (*Setophaga striata*) and Swainson’s Thrushes (*Catharus ustulatus*) in May near Erie, Pennsylvania, during their stopovers on the southern shore of Lake Erie. In 2016 we tagged and released birds where they were captured on Presque Isle State Park (PISP). In 2017 we transported birds from PISP to release locations in five parks differing in landscape setting (urban, suburban, rural) prior to tagging and release. In both years, birds were located daily using a hand-held receiver for as long as possible. In both years, Blackpoll Warblers (N = 5, 11) moved readily through a range of urban, suburban and rural environments after release, while Swainson’s Thrushes (N = 3, 3) moved very little after release, despite opportunities to do so. Most birds were also subsequently detected by the Motus network after continuing their migration. Observations of substrate selection of the two species during migration suggests that vegetation structure in urban and suburban areas may

allow Blackpoll Warblers to use more areas than Swainson's Thrushes. This has conservation implications for stopover habitat protection and restoration.

**I2 Paul Schilke** (1)(S) Anna Pidgeon (1). 1) Silvius Lab, Department of Forest and Wildlife Ecology, UW-Madison. **Emergent aquatic insect abundance structures bird communities in a northern Wisconsin forest.** Populations of flying insects and aerial insectivorous birds have experienced significant population declines since 1980. The cause of these declines is not well understood. We sought to determine how important emergent aquatic insect food resources from lakes and streams are to forest breeding birds in northern Wisconsin. We assessed bird abundance during the breeding season by conducting 5-minute point counts at paired points near lakeshores and at inland locations. Each point was surveyed 5-7 times each year in 2014-2016. We assessed flying insect abundance around bird count locations by placing sticky traps at 7 points along transects placed perpendicular to lakeshores and overlapping bird survey points. Aerial insectivorous birds were typically more abundant in areas that had a higher average abundance of aerial insects; however, the importance of insect abundance also varied among different aerial insectivorous birds. Percent forest and distance to lake were also important determinants of aerial insectivore abundance. Our results suggest that aerial insectivores cue in on lakeshore areas where aerial insects are often more abundant than in inland forested areas.

**J6 David L. Sherer** (1)(2)(S), Patrick Bohlen (1), and Reed Bowman (2). 1. Department of Biology, University of Central Florida, Orlando, FL 32816 2. Avian Ecology Program, Archbold Biological Station, Venus, FL 33960. **Natal territory conditions predict habitat preference along a fire-history gradient during pre-dispersal forays by juvenile Florida Scrub-Jays.** Florida Scrub-Jays (FLSJ; federally Threatened) are non-migratory, cooperatively breeding birds endemic to fire-maintained Florida scrub habitat. Lifetime reproductive success is highest among individuals breeding in habitat burned within the last 10 years. However, such habitat is scarce and competition for it as breeding space is likely intense. Although survival and fecundity decline in later-successional habitats, some birds settle there, perhaps to avoid competition. We investigated how behavioral phenotype (personality; bold-shy), natal habitat quality, body condition, and relative territory location (core vs. periphery) influence extra-territorial foray behavior across a mosaic of habitat in various fire-history stages. Our study system was a population of individually-marked FLSJs on 1,214-ha of managed land at Archbold Biological Station in Highlands County, Florida. We hypothesized that exploration by pre-breeding FLSJs in habitat with heterogeneous fire history is assortative to reduce competition, and to potentially match habitat to natal territory characteristics or suites of behavioral attributes. We measured off-territory movements of 118 individual yearling FLSJs engaged in pre-dispersal forays across a sampling grid during three breeding seasons, and compared fire history of explored vs. unexplored habitat to classify preference using Manly selection ratios. These data, paired with fire history records, allowed us to create and compare models of exploratory behavior underlying searching patterns during pre-breeding forays. Our results indicate significant variation in habitat preference by individual FLSJs during forays, driven by natal habitat quality and the abundance of overgrown habitat on the natal territory.

**Q1 Matthew B. Shumar\*** (1, 2) and Stephen N. Matthews (1). 1. School of Environment and Natural Resources, Columbus, OH 43210 2. Ohio Bird Conservation Initiative, Columbus, OH 43210. **A comparison of traditional and autonomous methods for detection and monitoring of nightjars.** As autonomous recording units (ARUs) become widely available at reduced costs, there is increased interest in replacing or augmenting traditional field surveys with recording systems. Autonomous recorders have several advantages over traditional surveys in that observer biases can be minimized while the sampling period can be maximized. Previous studies have shown mixed results for detection and classification of vocalizations, particularly in areas with diverse avian communities or high species abundance. However, ARUs have much potential for detecting species with loud, consistent vocalizations, as well as those with high levels of song output such as many nightjar species. Using commercially available ARUs, we compared fully manual and semi-automated examination of acoustic recordings with traditional field surveys. We established an array of points in southeastern Ohio in which we conducted 6-minute point counts (n=30) for Eastern Whip-poor-wills (*Antrastomus vociferous*) while simultaneously recording counts with the ARUs. Recordings were searched for whip-poor-wills manually by listening to recordings through a set of headphones and automatically by employing a detection algorithm in the R statistical computing environment. We found that traditional surveys were significantly better at determining the abundance of whip-poor-wills at each point, however there was no difference between traditional and autonomous techniques when assessing locations for the presence of birds. Our research suggests that automated systems have great potential for documenting the presence and periods of activity for the Eastern Whip-poor-will and can fill these vital information gaps for this species of concern as we develop conservation strategies to support nocturnal aerial insectivores.

**K7 Alexandria Sinker**, Clark B. Jones, Claire W. V. Ramos. **Effects of drought on sex biasing in Cassin's Sparrows (*Peucaea cassinii*).** Fisherian sex ratio theory states that sexual selection leads to an equal investment in male and female offspring, causing most species to have equal amounts of males and females. However, some situations may arise when it benefits a female to produce females whose reproductive success may be less impacted by their condition. The Cassin's Sparrow (*Peucaea cassinii*) is a migratory, grassland sparrow that breeds on the plains of Colorado. Populations of Cassin's Sparrows in Colorado have been declining by approximately 3% per year in recent years. The plains of Colorado are subject to years of extreme drought which impact nesting success of Passerine birds and may also become more frequent as the climate changes. Here we investigate the effects of drought on the primary sex ratio in Cassin's Sparrows. We predict that chicks produced during drought years will be more likely to be female than chicks produced during years with higher rainfall.

Hatchlings will be captured from the nests and sexed genetically using W and Z chromosome markers. The results showed no significant difference between the sex ratios of the two seasons. However, there was a significant difference in the overall nest success showing that drought conditions are negatively affecting the Cassin's Sparrow. It may be that female Cassin's Sparrow are unable to manipulate their sex ratio or that conditions in the nest do not influence adult reproductive success.

**A8** **Aaron A Skinner** (1)(S), Jay Wright (1), Stephen Matthews (1)(2), Chris Tonra (1). 1 School of Environment and Natural Resources, The Ohio State University, Columbus, OH 43210, USA 2 Northern Research Station, USDA Forest Service, Delaware, OH 43015, USA. **Using GPS-tracking to fill knowledge gaps in the full annual cycle of an elusive aerial insectivore in steep decline.** Migratory insectivorous birds have seen some of the largest declines of any avian group in North America. The Eastern whip-poor-will (hereafter: whip-poorwill) is no exception: it has declined nearly 70% over the last 50 years, but the reasons behind these declines are largely unknown. Whip-poor-wills spend roughly two-thirds of the annual cycle in migration and on the winter grounds, yet these periods have been little studied, limiting our ability to design effective conservation strategies. Whip-poor-wills winter primarily in Central America, a region that has experienced high rates of agricultural expansion and intensification in a time period concurrent with their declines. Agriculture adversely affects insect abundance and alters insect population composition, as well as causes habitat loss and landscape fragmentation, thus, implicating agricultural practices as a possible factor in their decline. In this study, we recovered high-resolution GPS tags from 11 Whip-poor-wills from two sites in Ohio. We identified important wintering areas and the migratory routes they took, illuminating a poorly known aspect of their annual cycle. In addition, we combined spatial data from the tags with available landcover data to examine habitat utilization, and determine how winter habitat characteristics affect Whip-poor-will winter home range size and overwinter trophic position. This work will fill important knowledge gaps regarding the Whip-poor-will annual cycle, informing future conservation plans for this once common bird as well as for other migratory insectivores. This data will supplement a similar study to be deployed in 2019 and 2020, more than quadrupling the number of tags deployed.

**J7** **Joseph Smith** and Michael Kilpatrick. Wildlife Restoration Partnerships, P.O. Box 784, Cape May, NJ 08204. **Use of salt marsh by wintering Ipswich sparrows for feeding and roosting.** The winter ecology of the Ipswich Savannah sparrow is poorly understood. This understanding is essential for determining habitat requirements and for identifying limiting factors during this period that can inform conservation efforts. The core wintering population occurs between NJ and VA, and coastal dunes are considered to be the sparrow's primary habitat. Transect surveys during winter 2017-18 on an Atlantic Coast barrier island in New Jersey indicated that Ipswich sparrows frequently occur in salt marsh in addition to dune habitat. In the winter of 2018/19, we radio-tracked 9 sparrows at this site from December through April. Birds occupied stable, overlapping home ranges for much of the winter that spanned a range of coastal habitats including dunes, saltmarsh and transitional areas between the two. 60% (7/11) of birds were encountered at least once in *Spartina alterniflora* saltmarsh. Five of these birds exhibited near-exclusive use of salt marsh. Of the nine birds tracked to roost sites, six of these crossed a 0.5 km-wide tidal channel to roost on short-form *Spartina alterniflora* saltmarsh while the remaining birds roosted within or near diurnal home ranges in dunes or transitional habitat. These results indicate that the availability of a mosaic of coastal habitats may be important for both feeding and roosting. Additional research is needed to understand the relative importance and quality of coastal habitats used by these sparrows in order to gain a clearer understanding of limiting factors during winter.

**L1** **Victoria K. Solis** and Ben R. Skipper. Department of Biology, Angelo State University, San Angelo, TX 76909. **Extra-pair paternity in the Bewick's wren.** Social monogamy with extra-pair paternity has been frequently observed in passerines. With the exception of house wrens (*Troglodytes aedon*), where extra-pair paternity has been frequently observed, extra-pair paternity has not been studied in most other North American wrens. For the Bewick's wren (*Thryomanes bewickii*), extra-pair reproductive behaviors have been suggested, but not confirmed genetically. We performed a two-year study of extra-pair paternity in Bewick's wrens nesting in nest-boxes in central Texas. Near the fledging date, blood samples from 12 complete family units, consisting of 66 nestlings and 24 putative parents were collected. Extra-pair paternity assessment is ongoing with microsatellite loci identified from other wren species. To date, all family groups have been visually scored using chromatograms at four loci, however, determining parentage using only four loci is premature. An additional 12 loci are currently being evaluated for use in parentage assignment. A complete parentage analysis for Bewick's wrens will be forthcoming. If extra-pair paternity is documented, we will explore male immunocompetence (hemoparasite load) as an explanatory factor leading to cuckoldry.

**K2** **Austin R. Spence** (1)(S), Jacob B. Socolar (1), Andrew N. Stillman (1) & Morgan W. Tingley (1). 1. Ecology and Evolutionary Biology, University of Connecticut, 75 N. Eagleville Road, Unit 3043, Storrs, CT, 06269, USA. **Population response to temperature and precipitation across 156 North American passerine distributions.** Extreme events are becoming more frequent as climate change increases the mean and variability of global temperatures. Despite strong evidence that temperature and precipitation affect avian distributions, we know very little about the different effects of mean and extreme temperature and precipitation on bird populations, and how responses may vary across a species' geographic range. We used North American Breeding Bird Survey (BBS) data to ask how changes in interannual weather affected yearly population changes of 156 passerine bird species across their ranges from 1980–2016. Using daily climate surfaces, we calculated local breeding-season temperature and precipitation, as well as anomalies, for each year. We combined climatic data with the following year's population and modeled the effects of climate on each species' local population change. We hypothesized hot temperatures and high precipitation would be worse for birds in the hot or wet portion of their breeding distribution, as extreme weather

here may push birds close to their physiological limits. Contrary to our hypotheses, breeding temperatures and precipitation do not show strong relationships to interannual population changes across birds' North American distributions. Future analyses using this approach will compare the effect of breeding season temperatures to those seen during July and August, as the hottest part of the year may have more severe effects. As extremes become more common with continuing climate change, it is imperative to understand how species will react at both the population level and at larger spatial scales.

**E4 Naima C. Starkloff (1,2)(S), Wendy C. Turner (1), Alyssa M. Fitzgerald (1,2,3), Ellen S. Martinsen (4), Jeremy J. Kirchman (2)** 1. Department of Biological Sciences, University at Albany, State University of New York, Albany, NY 12222 2. Department of Ornithology, New York State Museum, Albany, NY 12230 3. Department of Ecology & Evolutionary Biology, University of California Santa Cruz, Santa Cruz, CA 95064 4. Department of Biology, University of Vermont, Burlington, VT 05405. **Effects of host phylogeny and elevation on avian malarial parasite dynamics in *Catharus* thrushes in eastern North America.** The factors determining infection patterns of parasitic organisms differ across geographic and taxonomic scales, but generally are poorly known. The persistence of a vector-borne parasite is a consequence of its own abiotic and biotic tolerances as well as the presence of both its vector and host that are under the bounds of their own limitations. Mountains provide the perfect natural laboratory to examine the persistence of parasites across environmental gradients. We determine the factors affecting the diversity, infection rate and community structure of three genera of avian malarial parasites. We sampled blood and tissue from adults of four species of passerines during the breeding season from 80m to 1731m elevation in the Catskill, Adirondack, Green, and White Mountains: *Catharus bicknelli* (n=114), *C. fuscescens* (n=114), *C. guttatus* (n=98) and *C. ustulatus* (n=90). We screened birds for infections using nested-PCR and sanger sequencing. We used mixed-effects models and ordination analyses to quantify the effects of elevational zone (high versus low), host relatedness and site on the infection rate, parasite diversity and parasite community structure. Leucocytozoon parasites are more prevalent and diverse than Plasmodium parasites in *Catharus* thrushes, while Haemoproteus parasites rarely occur. Closer related thrush species have more similar parasite communities than more distant species, despite not geographically overlapping. Preliminary findings suggest that host phylogeny determines Plasmodium infection rates while elevation determines Leucocytozoon infection rates. Additionally, parasite diversity does not vary by host or elevation. To our knowledge, this is the first study to approach malarial dynamics from an avian genus perspective.

**M6 Thomas K. Stevens (1)(S), Amanda M. Hale (1), and Dean A. Williams (1).** 1. Department of Biology, Texas Christian University, Fort Worth, TX 76129. **Using time-to-detection to model occupancy in songbirds in an urban bottomland forest.** Violations of the closure assumption in traditional occupancy models are common in avian studies, as birds are mobile species. We applied a single visit method that uses time-to-detection to model the occupancy of a songbird community in an urban bottomland hardwood forest. We searched 5-hectare plots for 30 minutes, during which the searcher moved freely recording the initial time of detection for each species. We used Lidar derived forest structure, habitat maps, habitat width, and wetness gradients to model the occupancy of forest songbirds, and background noise, habitat type, time, and date to model detectability. We accounted for false presence errors by obtaining a portion of detections where no false presence could occur by recording vocalizations of birds during searches, and independently reviewing the recordings for examples where clear identifications could be made by aural and visual examination. Between May 15th and July 15th, of 2018 and 2019 we searched 273 plots, recording 45 species. Occupancy ranged from 94% in abundant, adaptable species like the Carolina Chickadee to 14% in habitat specialists like the Prothonotary Warbler. Average detection times ranged from 2.5 minutes in abundant and vocally active species like the Northern Cardinal to 12 minutes in less numerous and vocally inactive species like the Yellow-billed Cuckoo. We are currently analyzing how effective the covariates are at measuring occupancy and detectability. We will use our results to provide recommendations for field techniques and modelling approaches in avian studies using time-to-detection to model occupancy.

**C6 Andrew N. Stillman (1)(S), Rodney B. Siegel (2), Robert L. Wilkerson (2), Matthew Johnson (3), Christine A. Howell (4), and Morgan W. Tingley (1).** 1. Ecology & Evolutionary Biology, University of Connecticut, 75 N. Eagleville Road, Unit 3043, Storrs, CT 06269, USA 2. The Institute for Bird Populations, P.O. Box 1346, Point Reyes Station, CA 94956, USA 3. USDA Forest Service, Plumas National Forest, Quincy, CA, USA 4. USDA Forest Service, Pacific Southwest Research Station, 800 Buchanan St., Albany, CA 94710, USA. **Nest site selection and nest survival of Black-backed Woodpeckers after wildfire.** Black-backed Woodpeckers (*Picoides arcticus*) are highly associated with recently burned forests in western North America where they specialize on resources present in dead and dying trees. We evaluated the influence of habitat and nest tree characteristics on Black-backed Woodpecker nest site selection in post-fire forests and tested the effects of these same covariates on nest survival. Between 2011 and 2018, we monitored 118 Black-backed Woodpecker nests in northern California and used hierarchical Bayesian models to examine the influence of habitat characteristics on nest site selection and nest survival. Black-backed Woodpeckers showed strong nest site selection relationships for all the biotic variables that we measured: woodpeckers selected moderately-sized trees in areas of high snag density burned at high severity, but also in areas relatively close to low severity or unburned edges. However, only nest initiation date affected nest survival, with decreased survival in late-season nests. While our results demonstrate that habitat characteristics guide nest site selection in Black-backed Woodpeckers, these same habitat characteristics did not appear to impact nest survival in post-fire forests. In addition, our results suggest that management actions aimed at maintaining populations of Black-backed Woodpeckers should prioritize pyrodiverse habitats that include dense stands of snags within ~500 m of forest that burned at low severity or remained unburned.

**J9** **Martin J. Pfeiffer** (1), Scott H. Stoleson (2)(S), David Brinker (3), John S. Stanovick (4), and Collin Shephard (5). 1. U.S.D.A. Forest Service, Northern Research Station, Madison, WI 2. U.S.D.A. Forest Service, Northern Research Station, Irvine, PA. 3. Maryland Department of Natural Resources, Natural Heritage Program, Catonsville, MD 4. U.S.D.A. Forest Service, Northern Research Station, Newtown Square, PA. 5. U.S.D.A. Forest Service, Allegheny National Forest, Warren, PA. **Habitat Use by Northern Goshawks in the Allegheny National Forest, Pennsylvania.** Northern Goshawks (*Accipiter gentilis*), a reclusive raptor of northern forests, have declined throughout the southern portions of its range, likely due to climate change, habitat loss, increased depredation, and high sensitivity to West Nile Virus. Extirpated from most of its Appalachian range, the last stronghold for goshawks here remains the Allegheny National Forest (ANF) of northwestern Pennsylvania. To better inform regional management and conservation, we used goshawk monitoring data from the ANF for 2004-2019 to assess habitat characteristics and potential effects of management activities. We compared habitat variables from 26 goshawk territories to 47 unused locations at 2 functional spatial scales: primary fledging areas (PFA = 200 m buffer around nest clusters) and Summer Foraging Areas (SFA = 3 km circle around nest clusters). Univariate tests suggested habitats within PFAs differed significantly from random areas in percent conifer cover, stand age, elevation, aspect, and area in core forest. Further, PFAs included significantly fewer oil/gas wells and access roads than did random samples. In contrast, SFAs did not differ consistently from random areas in any respect. Our preliminary results suggest goshawks require large areas of core forest containing conifers for primary nesting areas, and avoided areas with extensive energy development. Foraging areas did not differ from unused areas on the ANF and typically included substantial areas of recent timber harvest, which probably support important prey species such as Ruffed Grouse and snowshoe hare. Our next steps include combining variables into multivariate models to identify the best predictors of goshawk habitat.

**B2** Kirstie Savage(1,2), Jeong Sep Sihm (2), Scott K. Robinson(4), **Christine M. Stracey\***(1,5). (1) Environmental Studies and Department of Biology, Westminster College, Salt Lake City UT 84105 (2) Present address: Department of Life Sciences, Georgia State University-Perimeter College, Clarkston, GA, 30021 (3) Department of Mathematics, Guilford College, Greensboro, NC 27410 (4) Florida Museum of Natural History, Gainesville, FL 32610 (5) Current address: Department of Biology, Guilford College, Greensboro, NC 27410. **Classification of alarm calls of nesting Northern Mockingbirds by predator type.** The alarm calls of many vertebrates encode predator-specific information such as the type of predator or the urgency of the threat. These types of alarm calls have been referred to as functionally referential because the call is only produced in a specific context and it elicits specific behaviors from the recipients. The pervasiveness of functionally referential alarm calls across bird species, however, remains to be established. In this study, we first classified Northern Mockingbird (*Mimus polyglottos*) alarm calls and then assessed if parental birds produced different alarm calls for different predators. To classify alarm calls we first isolated parental calls that preceded nest predation events from mockingbird nest camera footage and analyzed them using Raven Pro. To determine if the alarm calls were predator-specific we compared the frequency of alarm call type to predator type, which included both terrestrial and aerial species. We identified nine different alarm calls, of which one was given exclusively in association with snakes and two were given almost entirely in association with cats. In response to American Crows (*Corvus brachyrhynchos*), mockingbirds mainly produced a fourth alarm call, which was also frequently associated with Cooper's Hawks (*Accipiter cooperii*). The remaining five alarm calls were associated with Cooper's Hawks. While we have preliminary evidence for predator-specific alarm calls in the Northern Mockingbird, many of these calls are also given in other contexts, such as in intraspecific interactions. These results highlight the complexity of animal communication and the need to further develop theoretical frameworks to incorporate this complexity.

**C2** **Katherine Straley** (1)(SP), David I. King (2), Paige S. Warren (3). 1. Organismic and Evolutionary Biology Program, UMass Amherst, Amherst, MA, 01003 2. USDA Forest Service Northern Research Station, UMass Amherst, Amherst, MA, 01003 3. Department of Environmental Conservation, UMass Amherst, Amherst, MA, 01003. **Hard-working parents: Provisioning of Wood Thrush nestlings in suburban forest fragments.** Animals in suburban ecosystems experience novel environmental changes, which can alter their behavior. Behavioral flexibility can contribute to species persistence under these new pressures. Food for breeding birds may be a limiting factor in suburban forest fragments, as suburban habitats often experience decreases in insect biodiversity, abundance, and biomass due to the increase of invasive or ornamental plants. When food is limited, parents are faced with a tradeoff between investment in current reproduction versus personal maintenance and survival, and they must choose where to allocate time and resources. Parents may respond by adjusting brood size, altering nestling diet to optimize nutrition, and/or altering provisioning at the nest. The Wood Thrush (*Hylocichla mustelina*), a declining forest nesting species, breeds in both suburban forest fragments and contiguous forests (hereafter referred to as rural). We compared Wood Thrush nestling condition in suburban forest fragments versus rural forests, testing whether differences behavior between these forest types might have implications for nestling body condition. We estimated body condition of nestlings during the 2015-2017 breeding seasons. We measured provisioning rate by analyzing video recordings collected at the nest. Our results show that nestlings from suburban forests do not differ significantly in their body condition from rural nestlings. However, adults nesting in suburban forest fragments provision at significantly higher rates than their rural counterparts, possibly in response to lower quality food sources. Ongoing studies in the lab will quantify the differences in availability of food resources between the two habitat types and whether this influences nestling diet.

**D5** **Young Ha Suh** (1, 2, 3)(S), Michelle L. Dent (3), John W. Fitzpatrick (1, 2), and Reed Bowman (3). 1. Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY 14853. 2. Cornell Lab of Ornithology, Ithaca, NY 14850. 3. Avian Ecology Program, Archbold Biological Station, Venus, FL 33960. **Alternative pathways to success: transient dispersers in a cooperative breeding corvid.** Natal dispersal, the process of moving from natal to breeding territory, is integral for species distribution and population dynamics. Despite its importance as a crucial life-history trait, dispersal is often simplified as an unconditional, single parameter while it is more likely to be condition-dependent with three distinct stages: departure, transience, and settlement. We focused on the transient stage of dispersal and its potential drivers in a wild population of Florida Scrub-Jays *Aphelocoma coerulescens*, a cooperatively breeding corvid. Using 34 years of demography information, we found that a third of successful dispersers were nonbreeding helpers at other territories before they ultimately acquired a breeding territory. We hypothesized that these “transient” dispersers were more likely to have dispersed from natal territories of low quality or when these birds were subordinate to their siblings. We used generalized linear mixed models to test natal territory attributes and within-group dominance associated with the transient strategy. Natal territory quality had little effect on dispersal strategy; however, socially dominant jays within their group were less likely to be transient dispersers and more likely to disperse directly. Transient dispersers dispersed earlier and ultimately settled farther from their natal territory than direct dispersers, but lifetime reproductive success did not differ based on dispersal strategy. We compared this population residing in contiguous habitat to one in a fragmented habitat to test whether elevated risks in the unsuitable habitat matrix affected dispersal decisions. Our results suggest that Florida Scrub-Jays have condition-dependent dispersal strategies that assist in successful natal dispersal.

**A7** **Jessica M. Tatten** (S) (1), David I. King (1,2), Michael Akresh (1,3). 1. Department of Environmental Conservation, UMass, Amherst 01003 2. U.S. Forest Service Northern Research Station, Amherst, MA 01003 3. Antioch University New England, 40 Avon St, Keene, NH 03431. **Priority bird migration at an inland stopover site using nanotags.** Migrating songbirds stopover to rest and replenish their fat reserves, and suitable stopover habitat is vitally important to their survival and success securing territories at their breeding and wintering grounds. Identifying and protecting stopover locations is essential to conserving these species across the full annual cycle, yet there remain significant knowledge gaps regarding the utilization of stopover sites and fine-scale movements during migration, particularly at inland stopover areas. This study investigated the factors that influence stopover duration and departure decisions of ten priority songbird species at inland sites within the Silvio O. Conte National Fish and Wildlife Refuge in the Northeastern United States during two fall and spring seasons in 2015 and 2016. Stopover duration was estimated for 103 individuals (30 = spring, 73 = fall). Body condition, as indicated by fat/mass was the best predictor of stopover duration in spring, and day of year best predicted duration in fall. Spring birds captured with significant fat loads, and larger masses made shorter longer stopovers, elucidating that leaner birds need more time to refuel. Average fall stopover duration (5.5 days,  $\pm$  4.4 SE) was significantly longer than spring (3.66 days,  $\pm$  4.16 SE), and our model results suggested that birds captured later in the season made longer stopovers. Duration also differed by banding site and species. Uncovering patterns of movement, and identifying and protecting these areas of importance within the refuge may help influence the continued survival and reproduction of these declining migratory species.

**D2** **Eric Nathan Thompson** (S)(1), Michael Fleming (1), and Lucas J. Redmond (1). 1. Department of Biology, Penn State Schuylkill, Schuylkill Haven, PA 17972. **Breeding dispersal in Gray Catbirds.** Breeding dispersal is defined as the movement of individuals from one breeding site to another in successive years. Dispersal has been studied in several bird species and some distinct patterns regarding variation in dispersal distance have been identified. For example, females are expected to disperse longer distances than males between years. Further, when returning after a successful nesting attempt, birds will express higher nest site fidelity and disperse shorter distances than individuals that were unsuccessful in their previous attempt. We documented breeding dispersal in an eastern Pennsylvania population of Gray Catbirds. Catbirds are socially monogamous songbirds that nest in high density on our study site which is located in an urban gradient of habitat patches of varying suitability to catbirds. Our analyses indicated that male catbirds tended to disperse shorter distances than females. When both sexes were combined, there was no difference in breeding dispersal between successful and failed individuals. However, when we divided individuals into groups based on sex and nest fate in the previous year, we found that females who were previously successful dispersed farther than previously successful males and both failed males and females. Overall, despite frequent efforts to locate as many banded birds as possible, return rates of banded adults were relatively low which highlights the difficulty of studying dispersal and related phenomenon in a population of songbirds as dispersing adults very likely moved out of our study site and could not be found in following years.

**J10** **Morgan W. Tingley** (1), Andrew N. Stillman (1), Robert L. Wilkerson (2), Sarah C. Sawyer (3), and Rodney B. Siegel (2)  
1. Ecology & Evolutionary Biology, University of Connecticut, 75 N. Eagleville Road, Unit 3043, Storrs, CT 06269, USA 2. The Institute for Bird Populations, P.O. Box 1346, Point Reyes Station, CA 94956, USA 3. USDA Forest Service, Pacific Southwest Region, Vallejo, California 94592, USA. **Black-backed woodpecker occupancy in burned and beetle-killed forests: disturbance agent matters.** In the western United States, the black-backed woodpecker (*Picoides arcticus*) is a “snag specialist”, found predominantly in burned montane forests. Recently, unprecedented large tracts of drought-stressed forest in the Sierra Nevada and Southern Cascades of California have succumbed to bark beetle outbreaks. While this could potentially be a boon for snag-dependent species, it is unclear whether the resulting snag forests provide sufficiently high-quality habitat for black-backed woodpeckers. We tested for differences in black-backed woodpecker occupancy between fire- and beetle-killed forests, and whether key environmental relationships driving woodpecker occupancy differed between stands affected by the two



disturbance agents. Between 2016 and 2018, we surveyed for black-backed woodpeckers during 4,448 surveys at 75 burned and 113 beetle-killed forest stands throughout the black-backed woodpecker's range in California. Controlling for environmental variables that can affect habitat quality, the odds of black-backed woodpeckers occurring in burned forests were predicted to be 12.6 times higher than in beetle-killed forest. Occupancy in burned forest also differed in its relationship to several environmental variables relative to occupancy in beetle-killed forest. Our results demonstrate that for this disturbed-habitat specialist, disturbance agent matters; bark beetle outbreaks do not create habitat equal to that created by fire. Given the likely increased magnitude and extent of bark beetle outbreaks in the future, further work is needed to assess the role of beetle-killed forests in population dynamics of black-backed woodpeckers beyond the first decade after disturbance.

**G5 Christopher M. Tonra**<sup>1\*</sup>, Michael T. Hallworth<sup>2</sup>, Than J. Boves<sup>3</sup>, Jessie Reese<sup>4</sup>‡, Lesley P. Bulluck<sup>4</sup>, Matthew Johnson<sup>5</sup>, Cathy Viverette<sup>6</sup>, Katie Percy<sup>7,8</sup>, Elizabeth M. Ames<sup>1</sup>, Alix Matthews<sup>3</sup>^, Morgan C. Slevin<sup>3</sup>, R. Randy Wilson<sup>9</sup>, Erik I. Johnson<sup>7,8</sup>. <sup>1</sup>School of Environment and Natural Resources, The Ohio State University, Columbus, OH, USA <sup>2</sup>Smithsonian Conservation Biology Institute, Migratory Bird Center, Washington, DC, USA <sup>3</sup>Department of Biological Sciences, Arkansas State University, Jonesboro, AR USA <sup>4</sup>Department of Biology, Virginia Commonwealth University, Richmond, Virginia, USA <sup>5</sup>Audubon South Carolina, National Audubon Society, Charleston, SC, USA <sup>6</sup>Center for Environmental Studies, Virginia Commonwealth University, Richmond, Virginia, USA <sup>7</sup>Audubon Louisiana, National Audubon Society, Baton Rouge, LA, USA <sup>8</sup>Louisiana Bird Observatory, Baton Rouge Audubon Society, Baton Rouge, LA, USA <sup>9</sup>Migratory Bird Field Office, U.S. Fish and Wildlife Service, Jackson, MS, USA ‡Current address: West Virginia Division of Natural Resources/Natural Resource Conservation Service, Summersville, WV USA ^ Current address: Department of Biology, The University of Texas at Tyler, Tyler, TX USA. **Concentration of a widespread breeding population in few critically important nonbreeding areas: Migratory connectivity in Prothonotary Warbler.** One of the greatest challenges to informed conservation of migratory animals is elucidating spatiotemporal variation in distributions. Without such information, it is impossible to understand full annual cycle ecology and effectively implement conservation actions that address where and when populations are most limited. We deployed and recovered light-level geolocators (n = 34) at six breeding sites in North America across the breeding range of a declining long-distance migratory bird, the Prothonotary Warbler (*Protonotaria citrea*). We sought to determine migratory routes, stopover location and duration, and the location of overwintering grounds. We found that the species exhibits a large-scale, east-west split in migratory routes and weak migratory connectivity across their range. Specifically, almost all individuals, regardless of breeding origin, overlapped in their estimated wintering location in northern Colombia, in an area 20% the size of the breeding range. Additionally, the majority of individuals across all breeding locations concentrated in well-defined stopover locations in Central America while en route to Colombia. Although error inherent in light-level geolocation cannot be fully ruled out, surprisingly, much of the estimated wintering area included inland areas, despite the fact that Prothonotary Warblers are considered a specialist on coastal mangroves in winter. Based on these results, conservation efforts directed at very specific nonbreeding geographical areas will potentially have benefits across most of the breeding population. Our findings highlight the importance of using modern technologies to validate assumptions about little studied portions of species' annual life cycles, and the need to distribute sampling across species ranges.

**O4 Evalynn M. Trumbo** (1)(S), Michael P. Ward (1,2) and Jeffrey Brawn (1). <sup>1</sup>. Department of Natural Resources and Environmental Sciences, University of Illinois, Urbana, Illinois, USA <sup>2</sup>. Illinois Natural History Survey, Prairie Research Institute, University of Illinois, Champaign, Illinois, USA. **Post-fledging survival, behavior, and habitat use of an endangered species: the Golden-cheeked Warbler.** Understanding associations between habitat and the demography of endangered wildlife is essential for effective management of the full life-cycle. Understanding this relationship is further complicated by the fact that different habitat features may have different impacts across various life-stages of an individual, particularly fledglings in birds. Specific habitat features, such as canopy cover and tree composition may influence survival in that different habitat provides cover from predators and foraging substrate. Thus, we studied survival and behaviors of endangered golden-cheeked warbler (*Setophaga chrysoparia*) fledglings in Texas. To do this, we monitored nests until fledging and deployed one VHF transmitter per nest (n=8 and n=15, for 2017 and 2018, respectively). We tracked fledglings ~4 weeks after fledging and sampled vegetation at fledgling locations. Fifteen of 23 (65%) fledglings survived at least 32 days (the life of the transmitter's battery). Using Program MARK and linear mixed models we estimated post-fledgling daily survival rates and period survival, and modeled fledglings' relationships with differences in habitat, behavior, and an individual's age. Fledgling period survival of our top model was 0.73 (95% CI = 0.49-0.87), indicating that increasing amounts of juniper in the habitat positively influence survival. Fledglings moved greater distances and foraged more as they aged, transitioning to using oak trees, likely to improve foraging ability. Overall, this study showed that survival of Golden-cheeked Warbler fledglings is relatively high compared to other species, and it has identified certain habitat features that managers could use to potentially create high-quality habitat for golden-cheeked warbler fledglings.

**15 Chris Tyson**, Natasha Gillies, Joshua Hull, & Tim Guilford. Chris Tyson - University of California, Davis Natasha Gillies - University of Oxford Joshua Hull - University of California, Davis Tim Guilford - University of Oxford. **Provisioning coordination increases with mate familiarity in a long-lived pelagic seabird, the Manx shearwater.** Seabirds as a group are notable for displaying high mate fidelity and maintaining long-term pair bonds. While this behavior is generally believed to be adaptive due to a commensurate increase in reproductive success with pair experience, the behavioral benefits of mate familiarity are largely unknown. To evaluate the impact of mate familiarity on breeding competence and potential fitness implications, we studied Manx shearwaters (*Puffinus puffinus*) on Skomer Island, Wales. From 2009 to 2018, we observed over

1,500 breeding attempts from 332 distinct pairs with 40% of pairs remaining together for more than one year. During our study, the probability of inexperienced pairs fledging a chick was ~65%, which increased by ~5% for each additional year of mate familiarity. To evaluate behavioral mechanisms underlying this relationship, we used radio-frequency identification (RFID) readers to monitor nest-attendance patterns of 65 pairs during chick rearing in 2018. During chick rearing, Manx shearwater pairs undergo two types of foraging trips; short duration trips for chick provisioning and long trips for self-care. We found that more experienced pairs coordinated to a greater degree by alternating between foraging trip types, resulting in more consistent chick provisioning as well as more balanced self-care foraging time within pairs. These results provide compelling evidence for a positive mate familiarity effect in this species and provide some of the first documentation for a specific breeding behavior improving as the pair bond matures.

**L2** **Todd J. Underwood** (1) and Spencer G. Sealy (2) 1. Department of Biology, Kutztown University, Kutztown, PA 19530, USA 2. Department of Biological Sciences, University of Manitoba, Winnipeg, MB R3T 2N2, Canada. **Cowbird egg burial by hosts other than the Yellow Warbler: anti-parasite adaptation or mistimed laying?** Yellow Warblers (*Setophaga petechia*) are well known for burying Brown-headed Cowbird (*Molothrus ater*, hereafter cowbird) eggs under nest material and completing their clutch in this “new” nest. Because Yellow Warblers frequently bury their own eggs along with cowbird eggs, this response is considered an adaptation to counter brood parasitism. In contrast to the detailed research on burial in Yellow Warblers, little is known about burial of cowbird eggs by other species. In this study, we reviewed the literature and major nest records schemes to locate records of cowbird egg burial by host species other than the Yellow Warbler. Our objectives were to tabulate cowbird egg burial records by taxa and to determine whether egg burial is an anti-parasite strategy. We found records of cowbird egg burial for 50 species in 12 families. Burial was most frequently reported in Red-winged Blackbirds (*Agelaius phoeniceus*) and the Tyrannidae. Across all host species, only 8.6 % of burials included both cowbird and host eggs (n = 198 records). Burials of both cowbird and host eggs ranged from 0.0 % (Vireonidae, Fringillidae, Passerellidae) to 14.6 % (Tyrannidae). This lack of host eggs buried with cowbird eggs suggests that burial is a continuation of the nest-building process that resulted from mistimed laying by the cowbirds. We found no evidence in any group of hosts that burial represents an anti-parasite adaptation. Nevertheless, 49.3 % of nests where cowbird eggs were buried were not parasitized again.

**C3** **Dominique Varra**, Kerilynne Spiess, Lucas J. Redmond. Penn State Schuylkill. **The effect of predator threat to adults on variation in Gray Catbird nest defense.** Reproductive success in birds is dependent on factors such as food availability, weather, and nest predation. Nest predation typically accounts for the bulk of nest failure and a variety of strategies have evolved that reduce the likelihood that nests are depredated. Nest defense is one strategy that could reduce the risk of nest predation. While this may lead to fitness gains by increasing reproductive success, there is a trade-off because adults risk injury or even death by defending their nests. Parental investment theory predicts that adults would defend nests with either more and/or older offspring the most aggressively. Fewer studies, however, have explored how nest defense varies with the amount of risk specific predators pose to adults. We evaluated the relationship between predator threat level to adults and variation in nest defense in Gray Catbirds throughout the breeding seasons of 2018 and 2019. We presented catbirds with models of two different predators: a black rat snake, which represented a high risk to adults, and an eastern chipmunk, which represented relatively little risk to adults. If predators were recognized as different threats by adults, then we predicted catbirds would respond more aggressively to the chipmunk because it should have been identified as less of a threat. However, our results indicated that there was no differential response by catbirds to the two different predators. This would imply that catbirds either perceived the predators as equal threats or that nest defense intensity is independent of the risk faced by adults.

**E5** **David Walker**. Montclair State University. **Analysis of avian parasite diversity and infection rates as reported by New Jersey State Wildlife Rehabilitator.** The Raptor Trust of New Jersey accepts two to six thousand birds for rehabilitation purposes annually (TheRaptorTrust.org, 2018). In order to give each animal the best chance at recovering, trained medical staff identify and treat diseases and disorders including but not limited to parasitic infections. Parasites are ubiquitous parts of the lives of wild animals but, when the host has been otherwise compromised, such infections can prove fatal. In an effort to streamline the process of assisting the birds in their care, this project was undertaken to digitize the archived parasite logs and create new protocols for the most common infective parasitic agents. The resulting 2511 entries, as recorded from September 2011 to February 2018, spanned 125 species known to inhabit New Jersey. Overall infection rate was nearly half (48.77%), but due to the manner of identification (fecal analysis) there is a low degree of specific host-parasite relationship data. My analysis is thereby limited to broad trends in the seven most commonly recorded species (*Buteo jamaicensis*, *Branta canadensis*, *Columba livia*, *Accipiter cooperii*, *Corvus brachyrhynchos*, *Megascops asio*, and *Turdus migratorius*). A focus on quantifying and classifying parasite biodiversity within avian models is recommended for future areas of research.

**N1** Therese A. Catanach(1)(2), Jeff A. Johnson(3), Russell Thorstrom(4), Matthew R. Halley(5), Samantha Palhano(2)(6), and **Jason D. Weckstein**(2)(5)\*. 1. Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, 2258 TAMU College Station, TX 77843-2258 2. Academy of Natural Sciences of Drexel University, 1900 Benjamin Franklin Parkway, Philadelphia, PA 19096 3. Department of Biological Sciences, University of North Texas, 1155 Union Circle, #310559, Denton, TX 76203-5017 4. The Peregrine Fund, 5668 West Flying Hawk Lane, Boise, ID 83709 5. Department of Biodiversity, Earth, and Environmental Science, Drexel University, Philadelphia, PA 19104 6. Museu Nacional, Universidade Federal do Rio de Janeiro, Quinta da Boa Vista s/n, Rio de Janeiro, RJ, Brazil, 20940-040. **Phylogenetic relationships and species limits of the Sharp-shinned Hawk complex with a focus on Caribbean populations.** The Sharp-shinned Hawk (*Accipiter striatus*) is widely

distributed across the New World, breeding from western Alaska to Argentina. Currently, 10 subspecies are recognized, although based on size and plumage variation some authorities have suggested that the South and Central American taxa are distinct species. Using DNA sequences of the flanking regions of ultraconserved elements and full mitochondrial genomes we inferred a phylogeny for the *Accipiter striatus* complex. We then coupled our phylogeny with a suite of morphological characters to identify species limits within this clade. Based on these results, we determined that multiple lineages within the complex warrant species status. Three *Accipiter striatus* subspecies occur on Caribbean Islands and a fourth occurs on Haida Gwaii, British Columbia. The Caribbean subspecies have undergone drastic population declines, and one of these, the Puerto Rican Sharp-shinned Hawk (*A. s. venator*), is federally listed as endangered. Within each Caribbean island a number of disjunct montane forest populations exist and, based on band recoveries, individuals do not appear to travel between these populations. However, we do not know if this isolation recent, due to habitat fragmentation, or whether these populations are truly isolated montane specialists without historical gene flow between them. Therefore, we sequenced multiple individuals from across the Caribbean, including virtually all distinct collecting localities to identify population connectivity both between islands and among forest patches on individual islands.

**O2** **Jacob L. Wessels** (1)(S) and Than J. Boves (1). 1. Department of Biological Sciences, Arkansas State University, Jonesboro, AR 72401. **Cerulean Warbler habitat selection, breeding biology, survival, and movements in the Ozark region.** Cerulean Warblers (*Setophaga cerulea*; 'ceruleans') are a declining species of Nearctic-Neotropical migratory songbird that breeds in deciduous forests of eastern North America. Because habitat loss and degradation are thought to be major causes of this decline, active habitat management has become an important part of the conservation strategy for ceruleans. However, ceruleans exhibit regional variation in habitat selection and reproductive success, which may complicate efforts to manage for them. Information on the ecology of local populations is therefore necessary to effectively manage for and conserve this species. Although population trend and migratory route data suggest that the relatively large population of ceruleans in the Ozark region of Arkansas and Missouri may be a natural population, ceruleans have been understudied in that region. To address this important knowledge gap, we studied their habitat selection, breeding biology, survival, and movements along the Buffalo National River in Arkansas and compared the results with studies from other parts of their range. During our first field season (2018), we captured and banded 28 males and estimated within-season apparent weekly survival at 0.96 ( $\pm 0.02$ , SE). We located 15 nests and estimated entire period nest success at 29% (via logistic-exposure model). We estimated mean territory size at 2.15 ha ( $\pm 0.28$ , SE). Ceruleans mostly selected riparian habitat and did not show preference for any tree species. Further analyses including data from our 2019 field season are in progress. This study will inform appropriate regional conservation for ceruleans and provide parameter estimates for use in integrative full-annual-cycle population models.

**N2** **Wiegardt, A.** (1\*) Wood, Z (2), K. Barton (2), J. Clark (1), J. Homola (3), B. Olsen (2), M. Kinnison (2), A. Kovach (1). 1. Department of Natural Resources and the Environment, University of New Hampshire, Durham NH 2. School of Biology and Ecology, University of Maine, Orono ME 3. Department of Agriculture and Natural Resources, Michigan State University, East Lansing MI. **The relationship between phenotypic and genomic divergence under selection.** Phenotypic divergence with a genetic basis is a central aspect of evolutionary biology, yet uncertainty remains around how well genetic divergence mirrors phenotypic divergence. In particular, patterns of divergence at loci coding for phenotypes under divergent selection are poorly understood. To explore these patterns, we conducted a meta-analysis of over 40 papers with 900 pairwise comparisons of phenotypic (Pst) and genetic (Fst) divergence, in which both were putatively due to selection. We found that Pst and Fst for diverging traits and loci are significantly related, but the strength and slope of this relationship is heavily contingent on molecular and statistical methods—particularly the DNA fragments used and the methods for detecting loci under selection. We also show how methods for outlier detection, significance thresholds, and transformation of Fst influence the perceived amount of genetic divergence. Acknowledging how different methods of determining divergent loci impact the interpretation of results is an important step in linking genotype to phenotype. Understanding the relationship between phenotypic and genomic divergence remains critical to understanding the mechanisms by which populations diverge.

**P4** **Lisa M. Williams\*** (1), Justin D. Brown (2), Nicole M. Nemeth (3), Nicholas Bolgiano (4) 1. Bureau of Wildlife Management, Pennsylvania Game Commission, Harrisburg PA, 17110 2. Department of Veterinary and Biomedical Science, Pennsylvania State University, University Park PA 16802 3. Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens GA, 30602 4. State College Bird Club, State College PA, 16805. **Managing Ruffed Grouse in the age of West Nile Virus – Implications for vulnerable woodland birds.** West Nile virus (WNV) has increasingly been identified as negatively impacting a diversity of wild avian taxa. Historically, little was known about WNV ecology in woodland habitats as nearly all public health WNV surveillance occurs in urban and suburban environments to monitor risks to human health. Since 2001, dramatic Ruffed grouse (*Bonasa umbellus*) declines in Pennsylvania have been temporally-associated with WNV, and statewide grouse populations have not recovered. Pennsylvania Game Commission (PGC) research has demonstrated that grouse declines are associated with WNV detections in mosquito pools and human cases in the Commonwealth. In addition, PGC research has characterized the susceptibility of Ruffed grouse to WNV, identified potential woodland vectors of WNV, and evaluated whether existing public health surveillance adequately represents WNV activity in woodlands. Related data analysis has identified several other woodland bird species in Pennsylvania showing moderate to strong associations between annual WNV prevalence and population-level declines. Research is now focused on determining if there are landscape barriers to disease prevalence and implications for other vulnerable woodland birds. Up-to-date research findings and a newly-developed habitat

siting tool will be presented, along with a discussion of steps that public and private land managers can take to minimize WNV risks to woodland wildlife.

**Q2** **Andy Wilson\***(1), McKenzie Somers (1)(S), Marisa Immordino(1)(S), and Lauren Sherman(1)(S). 1. Department of Environmental Studies, Gettysburg College, Gettysburg, PA 17325. **Airborne bioacoustics — a new way to survey birds.** Using drones to conduct airborne bioacoustic surveys is a potentially useful new way to estimate abundance of vocal bird species. Airborne bioacoustics could have several advantages over ground-based surveys, including increased precision, increased repeatability, and easier access in difficult terrain. Here we review recent experiments conducted in Pennsylvania which shows that drone surveys have minimal effects on bird song output, can be much more efficient than traditional ground-based surveys, and can be used in conjunction with a novel distance sampling technique to estimate population densities. We show that our techniques work best for species that vocalize from low perches in open country, and hence could be especially useful for survey birds in wetlands, shrub-scrub, and wetlands habitats. In our experiments one-minute airborne surveys yielded similar results (number of detections) to paired five-minute point counts. We show that under ideal conditions, it would be feasible to survey more than 30 point locations with a drone in just one hour.

**P2** **Rebecca L. Windsor** (1)\*, Erin L. Hewett Ragheb (2), Karl Miller (2), and Reed Bowman (1). 1. Archbold Biological Station, Venus, FL 33960 2. Florida Fish and Wildlife Conservation Commission, Gainesville, FL 32601. **Presence of breeding Florida Grasshopper Sparrows on a private cattle ranch drives a shift in habitat occupancy paradigm.** Florida Grasshopper Sparrows (*Ammodramus savannarum floridanus*, hereafter FGSP) are a critically Endangered subspecies of Grasshopper Sparrows, with fewer than 75 individuals breeding and overwintering in native dry prairie habitats in south-central Florida. Previous research on sparrow occupancy and habitat quality has guided land management efforts for the past 10 years to improve and increase available habitat for FGSP. However, with the recent discovery of a population residing on a private cattle ranch, this paradigm of sparrow habitat occupancy is now being revisited. We surveyed and monitored the FGSP population on the ranch in 2015-2019 and compared its demography with those of the three other known populations inhabiting native dry prairie habitat. All populations were uniquely color-banded and intensive efforts are put forth each year to locate and protect nests to maximize productivity and prevent population collapse. FGSP on the ranch established territories in both semi-native and improved pastures. Initially, nest survival at the ranch was lower than that of the native populations due to a greater abundance of red imported fire ants (*Solenopsis invicta*), which pass through nest fences and depredate nestlings. However, ant colony eradication began in 2017 and nest success increased subsequently. Annual adult survival was comparable across sites, though the ranch appeared to attract more unbanded and assumed immigrants. The success of FGSP at this ranch and the influx of unbanded birds each season suggest that there are additional sparrows inhabiting neighboring ranches. Future conservation efforts should consider both native habitats and non-native private lands.

**A3** **DW Winkler**, R Fogg, TA Miller, M Pancerasa, S Blackshire, D La Puma, A McGann, J Benedict, C Halverson, MJ LanzonE. Cornell University, Ithaca, NY Cellular Tracking Technologies, Rio Grande NJ Conservation Science Global, West Cape May, NJ Politecnico di Milano, Italy. **VultureNet and how large animal movements can inform those of much smaller species.** Large wildlife can be instrumented to monitor their environments. Since the deployment of tiny Life-Tags™ (solar-powered radio tags that are very light AND long-lived) we have been keen to enlist the help of larger bird species to track smaller animals bearing Life-Tags™ that occur in areas that are not covered by emerging radio receiver networks. We have developed methods to use eBird data to evaluate the potential of various large bird species to serve as a tracker for targeted small bird species. This can depend on the probabilities of checklist co-occurrence as well as seasonal patterns of movement and flight behavior. Vultures emerge as some of the best species to be considered as WAM (wildlife assisted monitoring) trackers in North America. We have begun working with two vulture species (Turkey and Black), and we present our initial data on the feasibility of their use in WAM. Working with vultures, we have been impressed by how much better we are understanding their patterns of movement, and the development of this system entails many interesting challenges in engineering, statistics and ornithology with potentially large benefits for our understanding of all animal movements.

**J4** **Theresa Wisneskie** (1)(S), Chris S Elphick (1)(2), Eliza Grames (1). 1. Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT 06269 2. Center of Biological Risk, University of Connecticut, Storrs, CT 06269. **Intensification of agricultural wetlands and its effects on birds: a systematic map.** With rapid expansion of the human population, there is a growing need to balance biodiversity preservation with achieving food security. Agricultural intensification through increasing agricultural inputs has greatly increased food production on a smaller area of land, but often has negative effects on biodiversity and local ecosystems. As natural wetlands are being lost at an alarming rate worldwide, wetland birds are increasingly using agricultural land. We created a systematic map to collate peer-reviewed and gray literature on how agricultural intensification is affecting wetland birds. Our goals were to determine where research is taking place, what types of intensification and effects on birds have been studied, and what bird species and crops are represented in the literature. Through a systematic review process, we found 94 papers that met all inclusion criteria. Although Asia contains 86% of agriculturally important crops grown in intentionally flooded conditions, only 20% of studies returned during our search are from Asia. Conversely, Europe, which produces only 0.4% of the world's agriculturally important flooded crops, represented 49.5% of included studies. Post-harvest water use and grazing pressure were the most commonly studied types of intensification, followed by post-harvest management and mowing intensity. Most studies focused on abundance and diversity of birds. Notable evidence gaps include the lack of data from Asia, economically important flooded crops other than rice, and

effects on the vital rates of birds that use flooded farmland. Addressing these gaps is key to developing a comprehensive understanding on the effects of intensification in agricultural wetlands.

**J8 Petra B. Wood (1)\* and Gretchen E. Nareff (2).** 1. U.S. Geological Survey, West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, Morgantown, WV 2. West Virginia Cooperative Fish and Wildlife Research Unit, Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV. **Cerulean Warbler and associated species response to operational silviculture.** We examined response of Cerulean Warblers (*Setophaga cerulea*) and 5 additional songbird species to timber harvests prescribed through operational silviculture based on the Management Guidelines for Enhancing Cerulean Warbler Breeding Habitat in Appalachian Hardwood Forests. We quantified abundance on 9 study areas in 4 central Appalachian states and territory density in West Virginia during 2013-2017. Cerulean Warbler abundance increased with increasing percentage of basal area that comprised tree species preferred for foraging and nesting (i.e., white oak species [*Quercus* spp.], sugar maple [*Acer saccharum*], hickories [*Carya* spp.]) or of large diameter trees (those  $\geq 40.6$  cm diameter at breast height). Harvests on all available slope positions and aspects were effective in increasing Cerulean Warbler abundance. However, singing males selectively placed territories where mid-story basal area was high more so than where preferred tree species basal area was high. Cerulean Warbler mean territory size decreased up to 2-years-post-harvest. Eastern Towhee (*Pipilo erythrophthalmus*), Indigo Bunting (*Passerina cyanea*), and Hooded Warbler (*S. citrina*) territory densities and abundances increased significantly post-harvest and continued to increase with years-post-harvest. Scarlet Tanager (*Piranga olivacea*) and Wood Thrush (*Hylocichla mustelina*) declined within harvests but remained in proximity to harvests. Wood Thrush responded positively to higher amounts of residual basal area and had highest abundances at 26-37 m<sup>2</sup>/ha. Our findings suggest that implementing the Management Guidelines in operational silviculture contexts and across all slope positions and aspects can improve Cerulean Warbler breeding habitat and that the majority of the avian community responds positively.

**D1 Jay Wright (1)(S), Jim Johnson (2), Erin Bayne (3), Carol Foss (4), Luke Powell (5), Jeremiah Kennedy (3), Peter Marra (6)** 1. School of Environment and Natural Resources, The Ohio State University, Columbus, OH 43210 2. USFWS, Migratory Bird Management, Anchorage, AK 99503 3. Biological Sciences Department, University of Alberta, Edmonton, AB T6G2E9 4. New Hampshire Audubon, Concord, NH 03301 5. Department of Biosciences, Durham University, Durham, UK DH13LE 6. Georgetown Environment Initiative, Georgetown University, Washington, D.C. 20057. **Full annual cycle ecology of the Rusty Blackbird (*Euphagus carolinus*) revealed through archival GPS tracking.** In order to develop effective species recovery plans for declining migratory birds, it is necessary to take a full annual cycle approach. In particular, it is important to know 1) the migratory connectivity of different populations, 2) how much time individuals spend in each phase of the annual cycle, and 3) what habitats individuals are using throughout the year. We used archival GPS tags, recently miniaturized for use on passerines, to answer these questions for three populations of a rapidly declining songbird, the Rusty Blackbird. Between 2015 and 2018, we deployed 30 tags on individuals breeding in Alaska, Alberta, and New Hampshire. We recovered 7 of these tags, which collected between 17 and 194 GPS points over the course of the year. Several of these tags provided daily location data during migration, a level of detail rarely seen for migratory songbirds. Among the three study populations, migratory connectivity was moderate (MC = 0.489), with the Mississippi alluvial valley as an important wintering area for both Alaskan and Albertan birds. Partitioning of the annual cycle between stationary and migratory periods varied between populations, likely due to differences in distance traveled (1,200 km for New Hampshire vs. 5,200 km for Alaska birds), but most birds exhibited extended stopovers (>10 days) during both migrations, as well as multiple wintering sites. Habitat use was primarily tied to emergent and woody wetlands throughout the year, but the relative importance of these habitats varied between annual cycle stages and behavior (roosting vs. foraging).

**K1 Joseph Youtz (1) (S), Kelly D. Miller (2), E. Keith Bowers (2), Samantha Rogers (3), Lesley P. Bulluck (3), Matthew Johnson (4), Brian D. Peer (5), Katie L. Percy (6), Erik Johnson (6), Elizabeth Ames (7), Christopher M. Tonra (7), and Than J. Boves (1).** 1. Department of Biological Sciences, Arkansas State University, Jonesboro, AR 72467 2. Department of Biological Sciences, University of Memphis, Memphis, TN 38152 3. Department of Biology, Virginia Commonwealth University, Richmond, VA 23284-2012 4. Audubon South Carolina, 336 Sanctuary Rd., Harleyville, SC 29448 5. Department of Biological Sciences, Western Illinois University, Macomb, IL 61455 6. Audubon Louisiana, 5615 Corporate Blvd., Suite 600B, Baton Rouge, LA 70808 7. School of Environment and Natural Resources, Ohio State University, Columbus, OH 43202. **Bergmann's rule is followed at all stages of development in a migratory songbird, but climate change may soften this relationship.** For endothermic organisms, climate is a crucial factor as they are required to maintain their body temperature within a narrow thermal range to maintain homeostasis. One biogeographical pattern that stems from this physiological requirement is the positive relationship between body size and latitude, known as "Bergmann's rule". Bergmann's rule has been well studied in birds and evidence suggests it may be applicable to many species. This principle is not uniform across life history strategies however, and there remains uncertainty about the ontogeny of this relationship. Further, it remains unclear how this relationship may be influenced by climate shifts across latitudes. To address these questions, we used a model migratory species: the Prothonotary Warbler (*Protonotaria citrea*). We sampled eggs, nestlings, and adult birds from across the eastern U.S. and measured body size. We used museum collections to compare historical egg dimensions to contemporary samples to understand the impact of climate on size over time. We found that Bergmann's rule is exhibited in Prothonotary Warblers during multiple life stages; first manifesting during the nestling period and continuing through adulthood. However, dimensions of eggs exhibited a reverse Bergmann's rule pattern and eggs from museum collections were larger than contemporary eggs. We suggest this pattern may be due to differences in egg composition or the need for increased incubation efficiency among larger clutches at high latitudes.

Finally, the temporal declines in egg size that we documented, suggests that climate change may be altering the expression of one of the most well-documented principles in ecology.

**I1**        **Lucy R. Zipf** (1)(S), Elissa Landre (2), and Richard B. Primack (1). (1) Biology, Boston University, Boston, MA, (2) Broadmoor Wildlife Sanctuary, Mass Audubon, South Natick, MA. **Spring temperature and precipitation important determinants of reproductive phenology and success for a migratory aerial insectivore.** Migratory aerial insectivores have experienced significant population declines in North America over the last 30 years. Here, we test whether the reproductive success of *Tachycineta bicolor* (Tree Swallow) has been negatively impacted by global change. In northeast North America – the area in which aerial insectivores are declining most dramatically – there has been a 67% increase in very heavy precipitation events and a 10% increase in annual precipitation over the last 50 years concurrent with about 1.2 °C of air temperature warming. Using a dataset of reproductive success and phenology of *T. bicolor* that spans 32 years (1987-2019) from a Mass Audubon conservation area in South Natick, Massachusetts, we investigate reproductive timing and success of *T. bicolor* in response to the climate warming, precipitation change, and habitat management. Over the 32-year period clutch sizes have declined ( $p < 0.001$ ) by about 0.5 eggs per nest. Egg laying is advanced in warm springs ( $p = 0.002$ ), with eggs being laid 1.7 days earlier per °C of average April temperature. April precipitation can delay reproductive phenology, with *T. bicolor* laying eggs 0.4 days later per cm of rain ( $p = 0.012$ ). Fledging success is lowest in years with high June precipitation, meaning fewer offspring enter the potential breeding pool in wet years ( $p = 0.003$ ). Importantly, our findings also highlight site-specific differences in reproductive phenology and success that have widespread conservation implications for habitat management.

## Poster Presentations

**P40 Dylan Allenback.** CBASE CSU Pueblo Pueblo Colorado Department of Biology. **Cassin's Sparrow song behavioral analysis.** Cassin's Sparrows (*Peucaea cassinii*), although not the prettiest to look at, may be one of the most interesting of songbirds in prairies of North America. Cassin's Sparrows are very understudied and are declining by 3% per year in Colorado. They like many other birds have displays and songs that they use to attract a mate, but unlike many songbirds Cassin's Sparrows have two very distinct songs. Anecdotal evidence suggests that these songs may be sung in different social contexts and may have different functions. Cassin's Sparrows are highly territorial and defend their territories from neighboring males. We used playback experiments to try to determine the function of these two songs and in what context male Cassin's Sparrow are using them. Preliminary data suggest that one song may be used for initial attraction of a mate and the other may be used to defend that mate from neighboring males. Further analyses will include comparison of song use at different stages of nesting. This research will increase understanding of the basic breeding behavior of this bird and may assist in future conservation efforts for this species.

**P33 Matthew H. Anthony** (1) (SP), Lucy Greenman (2), Jared A. Grooms (2), Andrew J. Rapp (2), Frances Zidonis (1), and Daniel A. Cristol (2) 1. Department of American Studies, William & Mary, Williamsburg, VA 23185 2. Department of Biology, William & Mary, Williamsburg, VA 23185. **Justification for recreation: trends in marketing appeals to amateur ornithologists in the late-twentieth and early twenty-first centuries.** Do amateur ornithologists justify their birdwatching by labeling their activities as science? We addressed this question by asking how marketers have appealed to amateur ornithologists in advertisements for birding tours and through eBird. We used textual analysis to evaluate changes across decades in the relative prevalence of science-related words versus non-science words, such as those describing recreational benefits. We looked at all advertisements for bird-related tourism in "Birding" and "Audubon" magazines from 1975 (n=33), 1985 (n=71), and 1995 (n=125). In each magazine advertisement, we quantified references to the concepts of science, as well as nature, culture, and environmentalism. We also examined a digital archive of eBird web content from 2002-2018. We quantified science versus recreation terms on the home page and other prominent pages. We found that the frequency of references to science in magazine bird tour advertising diminished substantially over time, while there was no detectable difference in mentions of culture, nature or environmentalism as reasons to participate in a tour. In contrast, on eBird, science words have consistently outnumbered words related to recreation. On the few occasions when eBird content contained more recreation- than science-related words, there was a rapid reversal evident in the subsequent archived web pages. Appeals to the amateur ornithological public have placed a higher emphasis on science in recent years than in the past, suggesting that in the late twentieth century birders did not require the justification of science for their hobby, but they do now, in conjunction with the rise of citizen science.

**P77 Adele Balmer** (1)(S), Lesley Bulluck (2), Derek Johnson (3), Catherine Viverette (2). 1. Integrative Life Sciences Doctoral Program, Virginia Commonwealth University, Richmond, VA 23284 2. Center for Environmental Studies, Virginia Commonwealth University, Richmond, VA 23284 3. Department of Biology, Virginia Commonwealth University, Richmond, VA 23284. **Demographic trends in a breeding population of a migratory songbird.** Knowing the probability of survival is key to understanding the population dynamics of declining species. Prothonotary warblers (*Protonotaria citrea*) are Neotropical migratory songbirds currently in decline. They are known to have high site fidelity, making them an ideal species for population dynamic studies in migratory songbirds. A population of Prothonotary warblers has been surveyed at Henrico County, Virginia, since 1987. The goal of this study was to determine the probability of survival for adult breeding female Prothonotary warblers using a long-term dataset. To determine the probability of female survival, we used the CJS Model within a Bayesian framework to estimate the apparent survival using mark-recapture data collected from 1987 to 2018. We found an 81% probability of recapture the probability of survival ranged between 30.1% and 56%, with a mean of 51.4%. This suggests a high likelihood of recapture with approximately half of the females surviving to the following year. These results will allow us to take the next step and evaluate exogenous and endogenous factors that influence female survival each year.

**P02 David R. Barber** and Laurie J. Goodrich. Acopian Center for Conservation Learning Hawk Mountain Sanctuary. **Population trends of forest interior birds on Hawk Mountain Sanctuary, Pennsylvania, 1982–2018.** Many species of North American birds, particularly Neotropical migrant songbirds, have undergone severe declines in recent decades. Some of these species have declined throughout their range, whereas others have declined in some areas, but have remained stable or increased in other areas. We examined population trends of forest interior species in an unfragmented, mixed deciduous forest at Hawk Mountain Sanctuary in southeastern Pennsylvania. Total numbers of birds increased significantly from 1982 to 2018. Abundance of long-distance Neotropical migrants increased significantly, whereas the abundance of residents and short-distance migrants declined. Population trends of species found at Hawk Mountain will be compared with those state-wide.

**P16 Gage Barnes** (1)(S), John Hewlett (1), Kate Slankard (2), Loren Taylor (2), Andrea Darracq (1). 1. Murray State University 2. Kentucky Department of Fish and Wildlife Resources. **Assessing the influence of telecommunication towers on Osprey (*Pandion haliaetus*) nesting and behaviors in western Kentucky.** Osprey (*Pandion haliaetus*) nests located on telecommunication towers (TCTs) are approximately 3–8 times higher than natural or constructed nests. Consequently, nestlings reared on TCTs may be exposed to harsher weather conditions and ultimately have lower survival rates. Additionally, adults may use more energy during food provisioning because of TCT heights, which could influence foraging or nest guarding

behaviors. The objective of our study was to evaluate the influence of TCTs on Osprey nest productivity, adult foraging, and nest guarding behaviors. We observed 30 Osprey nests (TCTs; [n=11], navigation daymarkers [DMs; n=10], natural substrates [NATs; n=9]) from aircraft, vehicle, or on foot. To assess differences in adult behaviors and nest success and productivity, we monitored each nest for adult foraging and nest guarding behaviors and the number of successful fledglings produced throughout the 2019 breeding season. Nests on DMs received 2 to 2.6 times more fish than nests on NATs and TCTs, respectively. Though not significant, DM nest success was 22.2% and 14.2% greater than NATs and TCTs, respectively. We hypothesize that the potential costs associated with TCT height may be counteracted by reduced human disturbances. Though DMs had high rates of human disturbance, increased provisioning of fish to offspring may offset these costs and partially explain the greater nest success we observed at nests on DMs. Consequently, there may be a trade-off between intensity of human disturbance and fish provisioning.

**P12 Elizabeth Besozzi<sup>1</sup>, Michael Patten<sup>2</sup>.** <sup>1</sup>University of Oklahoma, Department of Biology, <sup>2</sup>Oklahoma Biological Survey, University of Oklahoma. **Patterns of Volcano Junco resource-use in the highlands of Costa Rica.** A chief conservation concern in a changing world is how fragile bird communities will respond to anthropogenic disturbance. Highland bird species are particularly at risk of dwindling habitat: as low elevation vegetation creeps higher, mountaintop habitats will shrink, and the species that depend on them may disappear. Given that the tipping point is unknown, understanding how the avifauna of montane habitats use and move through their environments takes on new importance. The Cordillera de Talamanca of Costa Rica hosts high numbers of endemic bird species, many of which occupy páramo habitat threatened by global temperature increase. Though relatively common above 2,700 m, little is known about the Volcano Junco (*Junco vulcani*), one such páramo endemic; records of its breeding behavior, resource use, and movement are, at best, anecdotal. Clearcutting within the Talamancan páramo has facilitated the downslope expansion of *J. vulcani*, suggesting that rather than selecting for páramo habitat, *J. vulcani* may be restricted to páramo by the structural complexity of the next highest vegetation strata, notoriously impenetrable oak grove. I spent three months delineating the breeding territories and cataloguing the resource use of *J. vulcani* at Cerro Buenavista, an anthropogenically disturbed site, to provide insights into human-mediated differences in range expansion and habitat selection. Though the prognosis for *J. vulcani* is hopeful, this research highlights the species-specific idiosyncrasies of páramo bird ecology, and emphasizes the need for conservation protocols that address a variety of unique requirements.

**P71 Kevin Black (S) and Lindsey Walters.** Department of Biological Sciences, Northern Kentucky University, Highland Heights, KY 41099. **The relationship between ambient temperature and the incubation behavior of female Eastern Bluebirds.** Temperature plays an integral role in the development of bird embryos and incubating females must carefully regulate the temperature of their eggs. Generally, females must balance this regulation against their own metabolic needs; more time must be devoted to temperature regulation of eggs in periods of extreme heat or cold, but under normal conditions females can focus more on their own provisioning. Our goal was to investigate how daily temperature changes are related to nest attentiveness specifically in Eastern Bluebirds (*Sialia sialis*). We predicted that females would take shorter, more frequent off-bouts in cold temperatures and fewer, longer off-bouts when it was warm. To test our hypothesis, we installed remote iButton temperature sensors in 11 Eastern Bluebird nest boxes at Middleton-Mills Park in Covington, KY from April to July of 2018 to record the ambient temperature outside of the nest and to measure changes in temperature inside the nest box indicating when an adult female was present or absent. In total, we identified 2,837 off-bouts from our 11 nests. We found that ambient temperature had a significant negative relationship with off-bout number and a significant positive relationship with off-bout duration. These findings support the hypothesis that ambient temperature is an important factor in the trade-off of Eastern Bluebird females between self-provisioning and incubating eggs. This is consistent with the findings of a previous study on the Carolina Chickadee (*Parus carolinensis*), showing that the relationship between temperature and off-bouts is not restricted to a single species.

**P43 Tricia E. Blankenship (1)(S), Norbert J. Cordeiro (2), and Jay P. McEntee (1)** <sup>1</sup> Department of Biology, Missouri State University, Springfield, MO 65897 <sup>2</sup> College of Arts and Sciences, Roosevelt University, Chicago, IL 60605. **The structure of male-female duets in *Artisornis* tailorbirds of eastern Africa.** Male-female duets in birds vary in structure, with some correspondence between structure and functionality across species. Here we examine the structure of avian duets in the *Artisornis* tailorbirds of Tanzania and Mozambique, African tailorbird *A. metopias* and Long-billed tailorbird *A. moreaui*. We focus on asking how male and female parts differ, whether male songs are different in solo contexts versus duetting contexts, and whether duet structure is similar between species. We made field recordings of the songs of each species between 2007 and 2016. We quantify the temporal precision of duet initiation and temporal overlap of male and female parts, in addition to characterizing spectro-temporal characteristics of each. We find that, although spectrotemporal aspects of male and female vocalizations are different in the two species, many aspects of duet structure are similar. In both species, duet parts vary by sex (under the assumption that males are responsible for the loud territorial advertisement songs of both species). Duets in both species are typically initiated with male advertisement song, with females responding, creating duets on some occasions. In both species, males sing similar songs in solo and duetting contexts. Female duet notes have higher entropy than male duet notes, and correspondingly transmit less well across distance, suggesting that the potential audience for male and female duet parts is different. Moreover, as *Artisornis* females rarely sing their duet parts outside of duets, but males frequently do, the selection pressures shaping the duet parts of each are likely to be distinct.



**P11 David E. Blockstein.** Center for Environmental Policy, Bard College, Annandale-on-Hudson, New York 12504-5000. **Solve Climate by 2030: Solar Dominance.** It is now well recognized that climate change poses a major and perhaps existential threat to bird populations and species. The changing economics of solar energy plus battery storage now make a transition to electricity largely powered by the sun possible in a decade. In 2019-20, The Center for Environmental Policy at Bard College is catalyzing a nationwide series of campus and community Power Dialogs. The project will engage more than 100,000 students in critical conversations about Power as clean energy, but also about Power as engaged action. Dialogs will spotlight how transforming global energy and transportation in the 2020's will get us on the path to climate stabilization by 2030. What would a clean energy revolution deliver on green jobs, access to reliable power, improved environmental quality and health and more accessible transportation? Can a just and fair transition be achieved? How can students and others help drive this change? On April 7, 2020, Solve Climate will host a nationally coordinated on-line event with local events at hundreds of participating schools in every state. The Power Dialog will feature hour-long, simultaneous, university-hosted webinars on state-specific solutions, followed by community dialogs that will focus on how students and others can take action. This will be preceded by One-Night Teach-Ins & Speakers Network Presentations, Fall-Winter 2019-2020. Speakers will be available to help spark dialog across the country for lectures and brown bag events at colleges, universities, high schools, and in faith-based and community groups. [www.solveclimateby2030.org](http://www.solveclimateby2030.org)

**P20 Evangelyn Buckland (1)(S),** Dr. Raymond Danner (1), Marae Lindquist (1), John Carpenter (2) 1. Department of Biology and Marine Biology, University of North Carolina at Wilmington, Wilmington, NC 28403 2. North Carolina Wildlife Resources Commission, Raleigh, NC 27699. **Overwinter survival and population size estimates of Seaside and Saltmarsh Sparrows in Southeastern North Carolina.** Little is known about the overwintering populations of Seaside Sparrows (*Ammospiza maritima*) and Saltmarsh Sparrows (*Ammospiza caudacuta*) along the southern Atlantic Coast, yet populations of both species are experiencing declines across their ranges. Winter seasonal survival probabilities and population estimates remain two important unknowns for these species in North Carolina. My objectives are to estimate overwinter survival and population size for both species using a novel approach, combining mark-recapture and radio-telemetry during their winter stationary period. We have conducted one season of field research on Masonboro Island, North Carolina in 2019 and will complete the second season in 2020. To estimate survival, I am analyzing mark-recapture data with CJS and Robust models and radio-telemetry data with known-fate models using the R package RMark. To estimate population size, I am using closed population capture-recapture models. Early analyses indicate apparent survival (̂) of Seaside Sparrows was 0.93 over a 2-week period and apparent Survival of Saltmarsh Sparrows was 0.87. Initial Population size estimates indicate that our study site contained approximately 103 (69-144, 95% CI) Seaside Sparrows and roughly 5 (3-8, 95% CI) Saltmarsh Sparrows. This investigation into the winter population biology of Seaside Sparrows and Saltmarsh Sparrows contributes to a deeper understanding of these species throughout their ranges and across the seasons of their life cycles which will provide vital assistance toward their conservation.

**P65 Jameson F. Chace (1,2)** and Erin O'Neill (2). 1. Department of Biology and Biomedical Science, Salve Regina University, Newport, RI 02840. 2. Department of Cultural, Environmental and Global Studies, Salve Regina University, Newport, RI 02840. **Factors affecting the abundance and distribution of wintering waterfowl in Narragansett Bay, Rhode Island.** Narragansett Bay, Rhode Island has a diverse assemblage of nonbreeding waterfowl during the winter months, yet little is known of the key factors that shape species-specific abundance and distribution. Patch occupancy was predicted by optimal foraging theory balanced against the physiological constraints of exposure to the foraging sites. We measured the abundance and distribution of a diverse assemblage of wintering waterfowl across a wide gradient of exposure and geomorphology of Narragansett Bay to near shore of Rhode Island Sound. Actively foraging waterfowl were surveyed at 30 locations along the edge of the open ocean along Newport Neck and 33 sites along a 24 km transect of the west passage of the bay at low tide between January and March of 2015-2018 (n=481). Prey base was sampled by minnow traps and shoreline sampling at each foraging observation station during the summers of 2012-2017. Each location was identified and coded based on its topography of open to the ocean, open bay, semi-open cove, or fully sheltered cove. Overall, twenty species were detected when actively foraging during winter at low tide. Of those, four species were only found in the more sheltered bays and coves of the west passage, while five species were only detected foraging in the more exposed areas of Newport Neck, and three species were equally distributed across the study area. Structural components of coastal topography were a stronger predictor of Common Loon (*Gavia immer*) and Brant (*Branta bernicla*) occupancy, while prey base sampling was a stronger predictor of American Black Duck (*Anas rubripes*), Common Goldeneye (*Bucephala clangula*), and Red-breasted Merganser (*Mergus serrator*).

**P60 Elsa Chen(1)(S),** Lesley Bulluck(2). 1. Department of Biology, Virginia Commonwealth University, Richmond, VA 23284 2. Center for Environmental Studies, Virginia Commonwealth University, Richmond, VA 23284. **Examining the tradeoffs of female aggression in high- and low-density breeding sites for a migratory songbird.** Tradeoffs associated with aggressive conspecific interactions are a driving force of evolution, but the tradeoffs of female competition for limited reproductive resources are often overlooked. For avian males, it is well documented that more aggressive individuals tend to provide less parental care. In females, more study is needed to fully understand these tradeoffs, but they seem to be more context-dependent, varying due to factors such as predation pressure and habitat quality. This study assessed the tradeoffs of female aggression related to parental care and reproductive success within the context of breeding density in the Prothonotary Warbler (*Protonotaria citrea*), a secondary cavity-nesting warbler that readily uses nest boxes. During incubation, we conducted 5-minute staged territorial intruder trials with a female decoy 'perched' on the box, paired with playback of female chips. We

audio recorded the response of the focal female and documented her chips with a Tascam mounted on the box. Trials were coded with Behavioral Observation Research Interactive Software (BORIS). Preliminary results indicate that female aggression does not differ between high- and low-density sites when using female chips as a vocal measure of aggression (N=59). Future analyses will compare other physical metrics of female aggression (i.e., attacks and time spent within close proximity of the decoy) with the degree of parental care (incubation and nestling provisioning) and reproductive success (# young fledged). Through explicit consideration of the potential tradeoffs of female aggression, this project will further our understanding of how and why female competitive traits are favored in some systems.

**P27 Samantha A. Collins (1)\* and Lisa M. Ferguson (1)** 1. The Wetlands Institute, 1075 Stone Harbor Blvd, Stone Harbor, NJ 08247. **Habitat use and reproductive success of wading birds nesting on marsh islands in Cape May County, New Jersey.** Colonial nesting long-legged wading birds (Ciconiiformes) in the coastal region of New Jersey are limited by suitable nesting habitat and many of these areas are changing at an accelerated rate, primarily due to sea-level rise and marsh subsidence. Research to investigate habitat suitability and nesting habitat needs for these sensitive species is considered a priority for this region to provide recommendations on marsh management and restoration plans that may enhance declining populations. We investigated species abundance, nest site selection and nest success of four wading bird species at colonies on Gull Island and Sturgeon Island in Cape May County. Areas with dense stands of *Phragmites australis* and *Iva frutescens* were selected by colonial nesting wading birds on both islands but nesting areas were smaller on Sturgeon Island and surrounded by marsh flats with nesting gulls. Breeding pair estimates for wading bird species was similar between sites but nest success was higher on Gull Island (87.3%) compared to Sturgeon Island (60%), with higher rates of avian predation documented on Sturgeon Island. With few alternate sites, habitat enhancement and management on Sturgeon Island may be necessary to provide more suitable habitat for wading birds to improve reproductive outcomes. Continued surveys of wading bird colonies and monitoring nest success can help agencies understand changes in spatial distribution or productivity of these species and highlight where to focus efforts to help species adapt to current and future changes in habitat.

**P55 Kristen M. Covino\* (1), Francesca Foltz (1), Alessandra Waller (1), Brielle Michener (2), Sarah J Courchesne (3,4), Mary E. Everett (4)** 1. Biology Department, Loyola Marymount University, Los Angeles, CA 90045. 2. Department of Biological Sciences, University of Rhode Island, Kingston, RI 02881 3. Department of Natural Sciences, Northern Essex Community College, Haverhill, MA 01830 4. Gulls of Appledore Research Group, Amesbury, MA 01913. **Using excreta samples to study the link between testosterone and aggression in breeding Great Black-backed Gulls.** Hormones mediate a wide range of avian physiological and behavioral traits, but blood sampling for hormones is not possible in every study system. The link between testosterone and aggression is yet unstudied in breeding Great Black-backed Gulls (*Larus marinus*), a species that requires a non-invasive approach to sampling because repeated captures of individuals is extremely difficult. Quantification of hormone levels in excreta, produced by the common voiding of urine and feces, removes the aforementioned sampling issues since samples can be obtained with minimal disturbance, repeatedly over a period of time. We collected excreta samples from gulls throughout their breeding season on Appledore Island, Maine and scored aggression using a categorical response scale. Currently, our research is focused on developing, testing, and validating the laboratory protocols necessary for accurate hormone determination from excreta. We are working towards determining the most efficient and accurate laboratory protocols for each of the four basic steps required for excreta hormone (and hormone metabolite) quantification: 1) Freeze-drying, 2) Sample grinding, 3) Alcohol extraction, and 4) Enzyme Immunoassay (EIA). Using a set of test samples, we are assessing several different methods for each step of the hormone quantification process. For example, we are testing how dried sample mass, sample-to-alcohol ratio, and type of alcohol solvent affects hormone quantification. To confirm that our quantification of excreta hormones is biologically meaningful, we will next compare hormone levels from excreta samples of our focal birds to plasma hormone levels from samples taken at the same time point.

**P38 Lily A. Day (S), Robert L. Curry** 1. Department of Biology, Villanova University, Villanova, PA 19085. **Song discrimination and male aggressive behavior within a songbird hybrid zone.** Hybridization has important implications in evolutionary biology. The ability of individuals to respond to conspecific and heterospecific songs and their propensity to “honestly” signal about their own genetic identity through song may affect hybridization dynamics in songbirds. Two closely-related songbirds, Black-capped (BCCH) and Carolina chickadees (CACH), hybridize along a northward-shifting zone that crosses Pennsylvania. We observed behavioral responses of male chickadees to BCCH and CACH songs through song playback experiments (SPEs), incorporating model chickadees to elicit a focused response from subject males. In 2019, we conducted 39 experiments at Hawk Mountain across 14 active nests. Preliminary analysis of behavioral responses to SPEs show that males varied in both quantity and type of vocal response; spatial responses also varied greatly between males. However, song type response varied little with respect to stimulus type. In certain individuals, consistency in response between multiple experiments is evident. The Curry lab is assessing genotypes to categorize males as BCCH, CACH, or hybrid. We are continuing to score recordings and video from the experiments. Of scored experiments for birds with known genotypes, there is no clear relationship between genotype and type of song response; for example, one male with a mostly CACH-like genotype (94%) sang only BCCH song (211 total) during each of three SPEs. Further analysis of behavioral responses with respect to genotype information will examine the extent to which, at least in terms of male-male interactions, birds in the hybrid-zone signal their identity in ways that might affect the dynamics of hybridization.

**P44 Yuting Deng\*** (1), Russ Charif (2), David N. Bonter (1) 1. Cornell Lab of Ornithology, Cornell University, Ithaca, NY 14850. 2. Bioacoustics Research Program, Cornell Lab of Ornithology, Cornell University, Ithaca, NY 14850. **Comparisons between birds detected by autonomous recordings units (ARU) and mist net captures at a migration banding station.** Autonomous recording units (ARU) are increasingly used to estimate wildlife abundance based on acoustic monitoring. There has been an explosion of studies in recent years comparing ARU studies to conventional point counts. However, there is little research known to compare it to mist-net capture data. In this study, we correlate the vocal activity rate index (VAR; the number of songs per mist-net hour for a species) recorded from ARUs with capture rates (birds per mist net hour) to test the potential of ARUs for monitoring songbirds at a migration stopover site. During spring migration in 2017, we deployed 5 ARUs at Braddock Bay Bird Observatory near Rochester, New York, USA to monitor the acoustic activity of birds. We deployed ARUs to overlap with a grid of 36 mist nets operated daily as part of a long-term migration monitoring operation. From the banding data, we estimated bird abundance as the number of birds captured during the first six hours of operation after sunrise each day (including recaptures of previously banded birds). Using the template detector built into Raven Pro 2.0, one observer calculated the number of distinct vocalization events (clusters of songs and calls by the focal species) per mist net hour. We found the acoustic activity of the focal species correlating significantly and positively with the banding data, shown by the linear model ( $F = 36.37$ ,  $P < 0.001$ ,  $R^2 = 0.5859$ ). We also detected seasonal changes in ratios of song and call detections, suggesting sex-based differences in the timing of migration. Our work demonstrates that ARUs can potentially be used to monitor migratory songbirds at stopover sites with less effort and expense than is required for operating a constant-effort banding station.

**P76 Daniela M. Depalma** (1,2) (S), Myriam E. Mermoz (1). 1. National Scientific and Technical Research Council (CONICET), Institute of Ecology, Genetics and Evolution of Buenos Aires, Intendente Güiraldes 2160, C1428EHA, Argentina 2. Department of Ecology, Genetics and Evolution, University of Buenos Aires, Intendente Güiraldes 2160, C1428EHA, Argentina. **Birds breeding on roadside borders of the Argentine Pampas: assessing predation risk through the monitoring of artificial and real nests.** Pampas grasslands have been continuously modified by grazing and agriculture, leading to habitat loss for birds. Although roadside borders provide nesting sites, it is essential to assess the predation risk that they involve in order to evaluate their suitability. Our objectives were to identify nest predators and environmental factors affecting nest success. Regarding the latter objective, we hypothesized that nest detectability and the amount of habitat available for predators in the landscape reduce nest success. To identify predators, we monitored 60 artificial nests containing two quail eggs (one natural egg and the other filled with paraffin). To study real nest survival we searched and monitored 114 nests belonging to 18 species, until predation occurred or one fledging was produced. Real nests were found on substrates such as clumps of grass, thistles, wetlands and trees. We evaluated the effects of environmental variables on nest success with a logistic exposure model. Paraffin eggs of artificial nests exhibited marks from small mammals and, to a lesser extent, from medium mammals, birds and ophidians. Daily survival rate of real nests was 0.937, and 86.6% of failures were due to predation. According to the logistic exposure model, nest height was the most important variable increasing nest success. The positive effect of nest height suggests that mammals may be an important source of predation. Enhancing vegetation height and the presence of tall native grasses (*Pampas grass Cortaderia selloana*) might help to preserve the bird community nesting on these roadside borders.

**P61 Michael Fleming** (S)(1), Eric Nathan Thompson (1), and Lucas J. Redmond (1). 1. Department of Biology, Penn State Schuylkill, 200 University Dr, Schuylkill Haven, PA 17972. **Offspring sex ratio bias in a Pennsylvania population of Gray Catbirds.** Alternative mating strategies such as extra-pair mating systems can allow male birds to achieve higher reproductive success than females. Therefore, females could increase reproductive success by biasing offspring sex ratios towards males. In birds this is possible because the maternal gamete determines offspring sex due to the fact that females are the heterogametic sex, and, at least in some species, females have been shown to be able to manipulate the sex of offspring. In instances where sex ratio manipulation has been observed there is evidence that identifies a number of factors which are associated biases in offspring sex ratios, such as individual quality and timing within the breeding season. In our study we documented offspring sex ratio in broods of Gray Catbird nestlings at our study site in eastern Pennsylvania. Gray Catbirds are multibrooded songbirds which nest in relatively high density on our study site. We used an information theoretic approach to evaluate the influence of clutch initiation date and parent morphology on offspring sex ratio. Our analyses indicated that the only variable that influenced brood sex ratio was female tail length. Females with shorter tails raised male-biased broods. Tail length in catbirds increases with age, therefore, our results suggest that females bias the sex ratio of their broods towards males early in life. Future directions of this study will address a potential physiological mechanism driving brood sex ratio bias caused by variation in circulating levels of sex hormones.

**P21 Kimberly I Fonseca** (1) (S), Dejeanne Doublet (1), Martha J Desmond (1), David H Johnson (2), Fitsum Abadi (1). 1. Department of Fish, Wildlife, and Conservation Ecology, New Mexico State University, Las Cruces, NM 88003 2. Global Owl Project, Alexandria, VA 22310. **Factors affecting Western Burrowing Owl nest site selection of artificial burrow systems in Arizona.** The Western Burrowing Owl (*Athene cunicularia hypugaea*) is considered a Bird of Conservation Concern in the United States. Their decline is attributed to the eradication of fossorial mammals and habitat loss due to increased urbanization. Conservation efforts such as their translocation to artificial burrows systems (ABS) aim to provide new habitat for this species. Few studies directly assess important burrow features that play a role in nest site selection of ABS. Thus we aim to understand the local-scale factors affecting nest site selection of Burrowing Owls at ABS. We conducted research at 4 sites across Maricopa and Pinal counties in Arizona. The factors assessed included nest chamber temperature, angle of the tunnel entrance, number

of nearby perches, height of the tunnel entrance, and the configuration of the ABS (single or double entrance to the nest chamber). We used logistic regression models and AICc model ranking to determine the most relevant factors that contributed to owls choosing nest sites. Our preliminary results indicated that Burrowing Owls were more likely to nest in (1) single-entrance ABS over double-entrance ABS, (2) ABS with a shorter tunnel length, and (3) burrows that maintained cooler temperatures. Owls may use single entrance burrows and shorter tunnel lengths to obtain favorable microclimates. Double-entrance burrows are constructed by wildlife managers to potentially provide additional escape cover for nestlings; however, based on our results, we recommend constructing ABS with single entrance burrows that have tunnels shorter in length to increase nest site selection at ABS.

**P53** **Valerie Galati**(1), Gunnar Kramer(2), Henry Streby(2), Lesley Bulluck (3). 1. Department of Biology, University of Richmond 2. Department of Environmental Sciences, University of Toledo 3. Center for Environmental Studies, Virginia Commonwealth University. **Variation in crown feather reflectance in two species of hybridizing warblers.** Golden-winged warblers (GWWA) and Blue-winged warblers (BWWA) are two North American songbird species that readily hybridize in regions where their ranges overlap. Hybrids show intermediate plumage patterns and are able to successfully back-cross with the parent species. GWWA populations in the Appalachian region have declined significantly in recent decades, while BWWA populations are stable or expanding in this region. Hypothesized causes of GWWA declines include habitat loss throughout the annual cycle and competition/hybridization with BWWA. Little is known about the role of ornamentation in avian hybridization dynamics, yet ornaments vary significantly among individuals and can be used to attract mates or compete for resources. The objective of this study was to assess how crown plumage ornamentation varies among males and females of the two species, and whether differences are stronger when the two species are sympatric (in the same geographic area) or allopatric (in distinct geographic areas). We obtained crown feathers from 465 individual birds at 25 field sites throughout the two species' breeding ranges and measured their reflectance. We found that GWWA are generally less ornamented than BWWA, and that these differences are most pronounced in females. Specifically, GWWA crown feathers have lower carotenoid content and lower yellow intensity than BWWA. When comparing males only, we found differences between the species in allopatric sites, but not in sympatric sites. A higher degree of ornamentation in BWWA may facilitate hybridization in regions of overlap through either social or sexual selection. More study is needed to explicitly test these potential mechanisms.

**P54** **Caraline Gammons** (1) (S). Robert Curry (1). 1. Department of Biology, Villanova University, Villanova, PA 19085. **Achromatic plumage brightness in Carolina, black-capped, and hybrid chickadees: implications for social dominance and mate choice.** Achromatic brightness can be an important signal that affects inter and intra-species relationships in social animals. Black-capped (BCCH), Carolina (CACH), and Hybrid (HYCH) chickadees are social songbirds whose achromatic patches of feathers can be measured by the UV light they absorb and reflect. Birds often use these visual factors to determine their relationships with one another. New interspecies relationships are emerging as the Carolina Chickadee advances northward, converging with Black-capped Chickadee territory and creating an area of hybridization between the two species. We measured the visual (400-700nm) and UV (300-400nm) reflectance of 6 body regions on 69 adult chickadees from sites that are either predominately Black-capped, hybrid, or Carolina territory to determine whether there is significant interspecies variation between the two species, and if their hybrids exhibit intermediate plumage brightness. Preliminary results suggest that there are significant differences in UV chroma among birds at the different sites, with birds from BCCH sites having more intense UV chroma than birds from CACH sites. HYCH sites were intermediate and varied, suggesting that hybrid index (how much Carolina and how much Black-capped a hybrid is) correlates to plumage brightness. All groups exhibited sexual dimorphism in plumage brightness, with males being brighter than females. These results suggest that UV reflectance is important in determining sex, species, and hybrid index of chickadees. Further analysis of genetic data will determine how genotype correlates to plumage brightness. We will also use nesting and behavioral data to see whether plumage variation correlates with reproductive success, mate choice, and social dominance.

**P78** **Jorge L. Garzon** (1)(S), Daniel Buitrago-Rosas (2), Matthew J. Miller (3). 1. Integrative Life Sciences Doctoral Program, Virginia Commonwealth University, Richmond, VA 23284, USA 2. Biology Department, University of Massachusetts Boston, 100 Morrissey Blvd. Boston, MA 02125, USA 3. Oklahoma Museum of Natural History and Department of Biology, University of Oklahoma, Norman, OK 73072-7029, USA. **Morphometric criteria as an indicator of population differences in *Mionectes oleagineus* (Lichtenstein, 1823) (Passeriformes: Tyrannidae).** *Mionectes oleagineus* (Ochre-belly flycatcher) is a subsocial flycatcher of Neotropical lowland forests. Previous studies demonstrated three divergent and non-monophyletic mtDNA lineages in partial sympatry across the Isthmus of Panama. It has been suggested that this divergence is the result of periodic episodes of range expansion out of Amazonia and across the Andes during the Pliocene-Pleistocene. The mitochondrial phylogeographic pattern in *M. oleagineus* is inconsistent with prior taxonomic treatment of the group. The lack of mtDNA mixture within populations suggests that there are several genetically distinct populations of *M. oleagineus* in Panama. Using morphological characters, we broadly surveyed museum study skins to assess potential differences from a quantitative phenotypic perspective. The morphometric characters measured included beak length, width, and height, wing length, tail length, tarsus length, hallux length, and body mass. We classified specimens by their geographic distribution in Panama: Northwest, Southwest, Central and East regions. Principal Components Analysis of morphometrics grouped three populations, Northwest, Southwest and Central/East. A linear discrimination function analysis showed that Northwest and Southwest, and Central and Eastern populations could not be morphologically distinguished, but that these two broad groups were distinct.

These results demonstrate the presence of several morphologically distinct populations in Panama, which is in line with previous mtDNA studies.

**P30** Eres A. Gomez (1)(S) and Jennifer A. Smith (1). Department of Environmental Science and Ecology, The University of Texas at San Antonio, San Antonio, TX 78249, USA. **Evaluation of the potential effects of anticoagulant rodenticide exposure to raptors in San Antonio, Texas.** Anticoagulant rodenticides are a commonly used form of rodent pest control that consist of toxic compounds designed to kill rodents by blocking the vitamin-K cycle which prevents blood clotting and leads to internal bleeding. Secondary exposure to non-target wildlife has been documented in species that prey on rodents including many apex predators like raptors. As urbanization increases, conflicts between rodents and humans are likely to increase, yet the potential for rodenticide to affect raptors in urban areas is largely unknown. By considering patterns of rodenticide provisioning by humans in unison with biological data associated with raptors, we can begin to gain a better understanding of the indirect effects of rodenticide on raptors in urban areas. The objective of this study is to assess the potential effects of anticoagulant rodenticide exposure to raptors in urban areas in San Antonio, Texas through three objectives: (1) store surveys will be conducted to determine provisioning of rodenticide by humans (e.g., type of poison, when and where it is provided); (2) raptor distributions will be evaluated using point counts and publicly available data (e.g., eBird, iNaturalist); (3) tissue samples from raptors with known origins (i.e. geographic locations) will be collected from a raptor rehabilitation center and analyzed for rodenticide compounds. Relationships between data collected during the three project components will be assessed using statistical models and spatial analyses in GIS. Results will help determine if raptors admitted to a rehabilitation facility in Texas are being exposed to rodenticide via secondary exposure.

**P72** Samantha Hagler (1)(S), Vanya Rohwer (1), Shawn M. Billerman (2). 1. Cornell Lab of Ornithology and Cornell University Museum of Vertebrates, Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY, 14851 2. Fuller Evolutionary Biology Program, Cornell Lab of Ornithology, Cornell University, Ithaca, NY, 14850. **Differential survival estimated using age ratios of museum specimens across two Great Plains hybrid zones.** Hybrids are typically expected to have lower fitness relative to parental species; however, it can be difficult to measure these fitness costs or assess the mechanisms reinforcing species boundaries without extensive field study. In this study, we compared the ratios of young and adult birds to estimate survival probability for hybridizing towhee and grosbeak populations across an east-west transect through the Great Plains. If hybrids suffer survival costs compared to parental species, we predicted that hybrids would have age ratios skewed towards young birds (young: second-year), as survival to adulthood (adult: after second-year) should be lower. We used plumage characteristics to assign age classes to towhee (n=383; Eastern [*Pipilo erythrophthalmus*] and Spotted Towhee [*Pi. maculatus*]) and grosbeak (n=265; Rose-breasted [*Pheucticus ludovicianus*] and Black-headed Grosbeak [*Ph. melanocephalus*]) specimens and to distinguish hybrids from phenotypically pure parentals, using specimens collected in the 1950's. Age classes for hybrids were more strongly biased towards young birds in the grosbeaks, but not towhees, suggesting that hybrid grosbeaks experience reduced adult survival compared to phenotypically pure grosbeaks in the hybrid zone. Hybrid grosbeaks also had lower adult survival compared to pure Black-headed Grosbeaks (n=193) collected outside the hybrid zone. These results are consistent with genetic and phenotypic data showing a steeper cline for grosbeaks than towhees. This study suggests that costs of hybridization are expressed, in part, through reduced survival in grosbeaks but not towhees and that contrasting ecologies of hybridizing species likely result in stronger costs of hybridization.

**P10** Robert J. Smith (1) Margret I. Hatch\* (2) Michael Carey(1). 1. Department of Biology, The University of Scranton, Scranton, PA 18510 2. Biology, Penn State Scranton, Dunmore, PA 18512. **Possible carryover effects of temperature and precipitation in Field Sparrows (*Spizella pusilla*) breeding in northeastern Pennsylvania, USA.** Increasing evidence suggests that environmental factors such as temperature and precipitation experienced by landbirds during one part of the annual cycle carry over, influencing individuals and population processes in subsequent phases. However, most studies have focused on long-distance, primarily insectivorous landbirds. Here we take advantage of a long-term (23 breeding seasons) data set on the arrival and breeding ecology of female Field Sparrows (*Spizella pusilla*), a granivorous, short-distance migrant to look for evidence of carry-over effects. We tested for relationships between average daily precipitation and temperature experienced during the previous annual cycle on arrival timing, clutch initiation, clutch size and egg volume. Arrival day was related to temperature at the breeding site and areas south of the breeding site during the preceding fall and early winter. Arrival day was also related to precipitation occurring at the breeding site in late winter/early spring of the previous year. Clutch initiation day was associated with temperature in the preceding fall and winter south of the breeding site and with temperature at the breeding site in spring. Clutch initiation day was also related to precipitation in the late fall/early winter at the breeding site. Our findings add to the growing body of evidence that events experienced prior to the breeding season may carry over, influencing individuals and population processes in subsequent seasons. Further, our results suggest that climate change will have differential fitness effects dependent upon where, and in what stage of the annual cycle, a migratory bird experiences that change.

**P63** Meredith Heather (1)(S), Chelsey Hunts (2), Eliseo Parra (3), Ari E. Martínez (4) .1. Department of Marine and Ecological Sciences, Florida Gulf Coast University, 10501 FGCU Blvd, Fort Myers, Florida 33965, U.S.A. 2. Gili EcoTrust, Jalan Ikan Hiu, Gili Trawangan, Lombok, NTB, Indonesia 80111 3. Department of Biology, San Francisco State University, San Francisco, California, 94132, U.S.A. 4. Department of Biological Sciences, California State University Long Beach, Long Beach, California, 94268, U.S.A. **Alarm eavesdropping by two *Thamnomanes* antshrikes within Amazonian mixed-species flocks.** In the mixed-

flock systems of Amazonia, species of antshrike (*Thamnomanes* sp.) have been shown to provide other flock members valuable information regarding threats from predation through their frequent alarm calls. Several species of flock attendees respond to the alarms of antshrikes with predator-avoidance behaviors, but no study has yet shown a reciprocal relationship between flock members and flock-leading antshrikes. Using alarm signals recorded during in situ exposures of mixed-flock species to trained raptors, we conducted a playback experiment to 16 different mixed flocks in the Peruvian Amazon to see to what degree antshrikes may be eavesdropping on the alarms of *Myrmotherula* antwrens. 8 Dusky-throated Antshrike *Thamnomanes ardesiacus* and 8 Cinereous Antshrike *T. schistogynus* were presented with i) conspecific alarms ii) White-flanked Antwren *Myrmotherula axillaris* alarms iii) Grey Antwren *M. menetriesii* alarms and iv) a control. The results of our experiment support that the alarms of the two species of antwren illicit a significant response from both species of antshrike. Our model also shows the responses of antshrikes to antwren alarms are indistinguishable from their response to conspecific alarms, yet different from a control (Marginal  $R^2=0.36$ , Conditional  $R^2=0.37$ ). This suggests that highly social flock-leading species such as *Thamnomanes* antshrikes may benefit from the information provided by flock mates regarding predators.

**P34 Noah M. Henkenius** (1)(S), Daniel P. Shustack (1) 1. Department of Environmental Studies, Massachusetts College of Liberal Arts, North Adams, MA 01247. **Presence and abundance of avian ticks on breeding forest birds in the northern Berkshires, MA.** While extensive research has evaluated the risks ticks present to humans less research has been devoted to understanding how tick parasitism affects birds. In June 2018, we sampled breeding songbirds and their habitat for ticks from a mixed hardwood and pine forest in Northern Berkshire County, Massachusetts. Our goals were to 1) estimate prevalence and abundance of ticks on breeding forest birds, 2) determine if the ticks parasitizing birds were native or exotic species being transported to the study area by migratory birds, and 3) assess potential impacts of ticks on birds' body condition. Using passive and active strategies we mist netted and inspected birds for ticks. While we found at least one tick attached to 41 of the 122 birds we captured we failed to detect a relationship between bird body condition and presence of ticks. The ticks attached to birds were exclusively larvae and nymph stages of mostly *Ixodes scapularis*. We used 1 m<sup>2</sup> white flannel tick "flags" to sample the forest vegetation. We found that most ticks from the forest vegetation were adult stages of *Ixodes scapularis*. All tick species we collected from the forest vegetation and on birds were already known to occur in western Massachusetts. Our findings provide little evidence that birds body condition is significantly impacted by ticks or that birds are dispersing exotic species to the area during migration.

**P66 Alexandra Immerso\*** (1), Sriya Revankar (1), and Luke K. Butler (1). 1. Department of Biology, The College of New Jersey, Ewing, NJ 08628. **Relationship between body condition and distance-to-road in an area-sensitive migrant, the Ovenbird, on its breeding grounds.** Forest fragmentation threatens many bird populations due to habitat loss and a potentially complex suite of edge effects. A substantial body of literature has shown health and demographic effects of fragmentation on Ovenbirds (*Seiurus aurocapilla*) during their breeding season in the forests of northern North America. In order to explore potential effects of fragmentation associated with minimal habitat loss, we compared several body condition indices between male Ovenbirds with breeding territories that either abutted or were ~100 meters away from a 15-meter-wide, unpaved road that bisected a large area of mostly contiguous, suitable forest habitat and functioned as a barrier to territorial intrusions from neighbors. In contrast to similar work showing physiological costs in male Ovenbirds breeding in small forest fragments, breeding adjacent to a lightly-used road did not reduce the physiological condition of male Ovenbirds in our study. These results suggest that a single road bisecting contiguous forest may be a physiologically cost-free form of habitat alteration for breeding male Ovenbirds. Alternatively, any direct physiological cost of breeding near a road may be offset by the benefit of holding a territory that is partly "defended" along one border by the habitat break created by the road itself.

**P06 Andrew W. Jones**<sup>1</sup>, Tim Jasinski<sup>2</sup>, Courtney L. Brennan<sup>1</sup>, Sylvie F. Crowell<sup>1</sup>, Gary Fowler<sup>2</sup>, Laura Gooch<sup>1</sup>, Moira Meehan<sup>3</sup>, Stephanie Secic<sup>4</sup>, Harvey Webster<sup>1</sup>, Matt Shumar<sup>5</sup>. <sup>1</sup> Cleveland Museum of Natural History, Cleveland, OH <sup>2</sup> Lake Erie Nature & Science Center, Bay Village, OH <sup>3</sup> Ohio Wesleyan University, Delaware, OH <sup>4</sup> The Ohio State University, Columbus, OH <sup>5</sup> Ohio Bird Conservation Initiative, Columbus, OH. **Lights Out Cleveland: collision patterns revealed through a collaborative, citizen science effort.** In 2017, we initiated a collaboration among six organizations to monitor bird-building collisions in downtown Cleveland, Ohio, USA. Field monitoring is carried out entirely by volunteers, daily through spring and fall migration. Social media has been a key tool to recruit new volunteers as well as to coordinate daily monitoring schedules. During daily surveys, injured birds are placed in paper bags and then transported to Lake Erie Nature & Science Center for rehabilitation. Most injuries are related to cranial swelling. Birds are then banded before release. Birds that are found dead, or die during rehabilitation, are frozen and later prepared as museum research specimens at the Cleveland Museum of Natural History. In Fall 2017 alone, over 1,800 collisions were detected in downtown Cleveland, with 1,200 of these collisions being fatal. We analyzed the collision data, finding that adult birds were more likely to survive collisions than hatch year individuals. By comparing collision sites to the adjacent landscape, we show that collision numbers are tied to their proximity to green space. The local abundances of species were compared to their collision totals, showing several highly overrepresented and underrepresented species.

**P24 Courtney Kern** (SP), Dr. Kara Lefevre (Advisor). Florida Gulf Coast University, Audubon Society of Southwest Florida. **Exploring black skimmer (*Rynchops niger*) population dynamics as an indicator for overall ecosystem integrity.** The Black Skimmer, *Rynchops niger*, is a seabird species that nests on Florida's coastal beaches during the northern summer. Due to their diet consisting of fish, and their tendency to breed on Southwest Florida beaches that are popular with people, black skimmers

(hereafter, “skimmers”) are particularly sensitive to environmental changes. For this reason, they might function as “whistleblowers” for ecosystem integrity, i.e. the unimpaired condition of a natural system at stake. Skimmers are colonial nesters that tend to nest on the same beaches every year, unless deterred by some environmental disturbance. They are known to frequently nest in colonies along with tern species; in Florida, they commonly share nesting sites with least terns, *Sternula antillarum*. Previous research has explored skimmer population dynamics in various regions throughout the country and state, but to our knowledge there are no published studies about Florida’s skimmer populations. The objective of this study is to determine whether skimmer populations in Southwest Florida, at important colonies on the beaches of Marco Island and Fort Myers, have been increasing, decreasing, or remaining constant over a timespan of ten years. Further, this project seeks to better understand skimmer population changes in order to support management of the species along Florida’s coast, including whether colony locations and sizes change between years. By simultaneously looking at population counts of least terns in these regions, we aim to evaluate the relationship between these two species of seabirds. This study is observational, and thus is not invasive to the birds or their colonies; it is based on historical counts from the Florida Shorebird Database coupled with our own observations at select sites. Determining population dynamics of these seabirds will enhance the understanding of how to better manage nesting populations of skimmers in Florida, in regard to overall ecosystem integrity.

**P79** **Jeremy J. Kirchman\*** (1), Nancy Rotzel McInerney (2), Tom C. Giarla (3), Storrs L. Olson (4), and Robert C. Fleischer (2)1. New York State Museum, Albany, NY 2. Smithsonian Conservation Biology Institute, National Zoological Park, Washington DC 3. Department of Biology, Siena College, Loudonville, NY 4. Nation Museum of Natural History, Smithsonian Institution, Washington DC. **Phylogeny of rails (Ralloidea: Rallidae) based on DNA sequences from thousands of ultra-conserved elements.** The avian family Rallidae is a global radiation of approximately 150 historically known species, >30 of which are or were flightless species endemic to single islands. The geographic distribution and high incidence of flightlessness in rails makes them an attractive subject of studies of biogeography and trait evolution, but the rarity or recent extinction of so many rail species has made them difficult to study with modern molecular phylogenetic methods. Previous analyses of mitochondrial DNA and nuclear introns have clarified species relationships in some groups of rails, confirmed the non-monophyly of many genera, and identified some major clades, but sparse taxon sampling and poor resolution of basal nodes have hampered our understanding of rail evolution. We used target-enrichment and Illumina sequencing of >5000 homologous ultra-conserved elements (UCEs) to generate a large DNA sequence dataset comprising 3.2 million nucleotides from 67 gruiform species that we sampled from frozen tissues () and study skins () from 13 museum collections. Taxon sampling focused on the type species in all named genera, and additional species that would resolve persistent classification problems. We present the results of maximum likelihood (RAxML) and Bayesian (MrBayes, BEAST2) analyses of concatenated UCE alignments, and of multi-species coalescent (ASTRAL) analysis of individual locus alignments. Our UCE data and fossil calibrations reveal the temporal and biogeographic context of rail diversification and provide a well-resolved phylogeny of rails and their ralloid allies the finfoots and flufftails that will enable comparative studies and provide the basis for a revised classification.

**P42** **Jessica Knight** (1)(S), Andria Kroner (1), Dr. Anne B Clark (1). 1. Department of Biology, Binghamton University, Binghamton, NY 13902. **Changes in captive Mariana Crow (*Corvus kubaryi*) chick vocalizations throughout development.** The purpose of this study was to quantify and track changes in the vocalizations of captive-reared juvenile Mariana Crows, a highly endangered species found only on the island of Rota, Northern Mariana Islands. A detailed understanding of chick vocalizations as they mature can provide information on the social development of captive-raised birds in conservation programs, their vocal abilities in comparison to parent-reared chicks and prospects for social integration after release. Chick vocalizations were recorded at a conservation facility on Rota where they were being reared for release. This study follows four nestling crows, two males and two females, during feedings from ages 1-20 days. Recordings were processed using Raven™ and measurements were analyzed with Microsoft Excel. With a small dataset, this study was primarily descriptive, aiming to identify trends that may provide insight into the variables influencing chick vocal development. The most notable trend observed was an overall decrease of peak frequency and bandwidth in all individuals as they aged. However, we found measurable differences in the rate of change between sexes, despite a lack of differences in weight gain. This raises questions concerning the developmental differences between male and female crows, and further research is necessary explore these trends.

**P49** **Sam Koch** (S) and Lindsey Walters. Department of Biological Sciences, Northern Kentucky University, Highland Heights, KY 41099. **Eastern Bluebird nest sanitation: Do different sexes display equal effort?** Nest sanitation is a vital part of maintaining avian brood healthiness. Fecal sac removal is a common form of nest sanitation exhibited by passerines and is rarely studied. The purpose of our research was to determine whether Eastern Bluebird (*Sialia sialis*) males and females differed in their rates of fecal sac removal. We collected our data at Middleton-Mills Park in Covington, Kentucky. We conducted 70 one-hour observations of 14 different Eastern Bluebird nests over the course of two years. For each observation, we used a viewing scope to watch the entrance of the nest box. We noted returns and departures from the nest box by both sexes and whether they carried a fecal sac upon departure. We found that male bluebirds provisioned at a significantly higher rate, but both sexes performed nest sanitation at similar rates. Our results are consistent with a previous study of a Georgia population of Eastern Bluebirds that found equivalent sanitation rates between the sexes. However, the same study also found equal provisioning rates between the sexes, whereas we found that males provisioned more. Future studies should focus both on examining the reasons for differences in parental care behavior between bluebird populations as well as on examining fecal sac removal in other species to see if these findings hold true for non-cavity nesters. Studies like this are crucial if we are to

understand the full extent of avian breeding biology, as nest sanitation is an important part of parental investment behavior that is often ignored.

**P07**      **Kayleigh Kueffner**, Sean Lyon, Ben D. Marks. Bird Collection, Science and Education, Field Museum of Natural History, 1400 S Lake Shore Drive, Chicago, IL 60605. **PLUME: Phenotype linkage utilizing multimedia in EMU.** Field Museum personnel have been salvaging specimens of spring and fall migrants that collide with glass buildings in Chicago for the last 40 years. The majority of these specimens have been preserved as skeletons for on-going projects and the feathers have been discarded, thus losing potentially useful information (the phenotype) without documentation. As of 2019, we have initiated a project to photograph most of these birds prior to preparation as skeletons. We take a dorsal and ventral photo of each bird with wings and tail spread. To date, we have photos of over 1000 individuals representing 65 genera and 95 species of birds that migrate through Chicago, providing a record of plumage variation. These photos are then attached to the Field Museum EMU catalogue records of the birds and available on-line for anyone to use.

**P35**      Adrienne Kovach (1), Brian Olsen (2), Kristina Cammen (2), Serita Frey (1), Benjamin King (2), Michael Kinnison (2), Michelle Smith (3), Kelley Thomas (1), Anthony Westbrook (1), Lindsey Fenderson (1), Zachery Wood (2), Kayla Barton (2), Jonathan Clark (1), Alice Hotopp (2), **Emily Patterson** (1). 1. University of New Hampshire, Durham, NH 03824 2. University of Maine, Orono, ME 04473 3. Cornell University, Ithaca, NY 14850. **Genomic ecology of coastal organisms (GECO): Using tidal marsh birds to study genome-phenome relationships in the wild.** Tidal marshes are highly dynamic environments that pose harsh abiotic challenges for animal colonization and survival. Accordingly, they are natural laboratories for studying organismal adaptation and the linkages between genotypes, phenotypes, and organismal fitness in natural environments. Genomic Ecology of Coastal Organisms (GECO) is a multidisciplinary collaboration between the Universities of New Hampshire and Maine that seeks to investigate genome-phenome-environment relationships in a suite of ecologically relevant traits for tidal marsh birds. We use as a case study six species of passerellid sparrow that have differing evolutionary histories and levels of specialization in tidal marshes of the Atlantic coast. We seek to determine what genomic variation is associated with tidal marsh adaptations and how it is expressed phenotypically. We investigate relationships among candidate genes, gene expression and key phenotypes related to tidal marsh specialization – bill morphology, plumage color and wear, kidney function, and nest timing. Through the collection of extensive ecological and molecular data we will associate the genetic, transcriptomic and phenotypic data with male and female fitness. We also explore ecological feedbacks of adapted phenotypes through examining relationships between 1) feather microbiomes and plumage degradation and 2) sparrow dietary niche and invertebrate community structure. Through these collaborative objectives we will provide new insight into genetic and plastic influences on adaptations of tidal marsh birds threatened by sea-level rise and, more broadly, the adaptive capacity of natural populations.

**P32**      **Amanda M. Lamberson** (1)(S) and Jennifer A. Smith (1). 1. Department of Environmental Science and Ecology, The University of Texas at San Antonio, San Antonio, TX 78249, USA. **A multi-step approach to understanding the effects of backyard bird feeding on the abundance and diversity of birds in San Antonio, Texas.** The provision of store-bought wild bird food has created a lucrative industry in developed nations; in the United States alone sales of wild bird food generated US \$4 billion in profits in 2016. Pervasive feeding of wild birds raises questions regarding the potential for anthropogenic subsidies to affect wild birds. Previous studies addressing these questions have mainly focused on birds in temperate areas, in non-urban settings, and have occurred during the breeding season. This study utilizes a multistep approach to evaluate the effects of wild bird food on the abundance and diversity of birds in San Antonio, an urban setting in a subtropical region, during the non-breeding season. We will 1) use sales data from different stores offering wild bird food to investigate what, when, and where wild bird food is provided in San Antonio, 2) survey residents of neighborhoods about wild bird feeding habits to acquire site specific information, and 3) use data from Objective 1 and 2 to inform a field-based study incorporating citizen science to evaluate the effects of wild bird feeding on the abundance and diversity of birds. Preliminary results from Objective 1 suggest that varieties of mixed seed and nyjer seed are most commonly bought in San Antonio and that bird food is provisioned year-round. Results from this research will expand on existing knowledge and aid in understanding of how urbanization affects birds.

**P25**      **Elissa M. Landre** (1) and Lucy R. Zipf (2)(S) 1. Broadmoor Wildlife Sanctuary, Mass Audubon, Natick, MA 01760 2. Department of Biology, Boston University, Boston, MA. **Updating a unique historic insect abundance dataset to determine the direction and magnitude of change in prey availability to diurnal aerial insectivores.** Migratory aerial insectivores, birds that feed primarily on flying insects, have experienced significant population declines in North America. Because the decline in aerial insectivore populations is guild-wide, researchers suspect the cause may be linked to their communal prey base. Despite the documented aerial insectivore decline and widespread ecological consequences of insect decline, data documenting insect abundance over time is scarce. During the 1989-1991 breeding season for Tree Swallows (*Tachycineta bicolor*), a well-studied the aerial insectivore, aerial insects were collected daily using “windsock” style nets on fixed poles in the middle of two nest site locations at Broadmoor. The net was designed by the late Dr. David Hussell, Wildlife Resources Division, Ministry of Natural Resources, Ontario, Canada. In the 2019 breeding season we replicated this sampling; insects were collected daily during daylight hours from each of two sites from April 23 - July 11, 2019. By replicating the 30-year old collection method, we aimed to determine if insect abundance and/or community composition has changed through the breeding season. We will then relate these insect findings to population trends in Tree Swallows, which are monitored in the same area. Preliminary analysis and comparison with historical data show similarities in taxa: largely Diptera and Coleoptera, but insect identification of the more than 120 samples has just begun. We plan to complete insect ID for presentation in October. Our results will then allow



investigation of insect life histories and point to conservation management that can support prey abundance for aerial insectivores.

**P45 Connor O'H. Loomis(1)(S), Anne B. Clark(1), John Confer(2), Kevin J. McGowan(3).** Binghamton University Ithaca College Cornell Lab of Ornithology. **Behavioral interactions between nest-parasitic Merlins (*Falco columbarius*) and nest-building Fish Crows (*Corvus ossifragus*) in a new zone of overlap.** Nesting Merlins (*Falco columbarius*) typically adopt the deserted nests of other raptors and American Crows, according to published accounts. The Merlin's breeding range has expanded south into urban areas of upstate New York in the last 2 decades. In Tompkins and Broome counties, NY, they now overlap with northern-edge breeding populations of Fish Crows (*Corvus ossifragus*), a typically SE USA species whose range has expanded north. Based on studies of both species in Ithaca, NY, we report the behavioral details of direct contests between Merlins and Fish Crows over newly-built Fish Crow nests. Most resulted in successful displacement of Fish Crows and nest use by Merlins. Merlins also targeted nests of American Crows (*C. brachyrhynchos*), with less success, but at least two take-overs. Merlins' aggressive harassment of a crow 2/3 the weight of American Crows they encounter in Canada may represent a novel opportunistic shift in Merlin behavior and also significantly affect reproductive success in this small northern population of Fish Crows.

**P39 Justin T. Mann (1) (SP) and Anne B. Clark (1).** 1) Department of Biological Sciences, Binghamton University, Binghamton, NY 13902. **Quantitative classification of the Black-and-white Warbler's (*Mniotilta varia*) song types and analysis of their habitat and social context dependent use.** Although many N. American wood warblers (Parulidae) produce two categories of songs used in distinct social contexts, multiple song types have not been quantitatively described in Black-and-white Warblers (*Mniotilta varia*). In this study, songs were recorded as part of a long-term playback experiment testing the effects of conspecific attraction and habitat quality on Black-and-white Warbler habitat use. We collected 14 acoustic measurements from 310 song samples produced by seven free-living Black-and-white Warblers. Using an unsupervised clustering algorithm and logistic regression models, we found that Black-and-white Warblers have two primary song types (A, B); these are similar to those of other parulids with "form-encoded" song systems. We also quantified understory vegetation cover at census stops, some of which received morning playbacks of song and others none. At both types of stops, we simultaneously recorded local warblers' songs across four days. GLMM analysis showed that both playback treatments and habitat quality affected the song types used by Black-and-White Warblers. At stops where type A songs were played, males responded in kind, producing more type A songs than individuals at control stops—but only in high quality habitats. Males at both experimental and control stops produced more type B songs in high quality habitats.

**P29 James S. Marshall\***, Bethany Hanson, Alissa Johnson, Jennifer Driscoll, Tham Mana, Shane Andrews, Cassidy Hanson, Damon Roznowski, and Sean Beckmann. Dept. of Chemical & Biological Sciences, Rockford University, Rockford, Illinois, 61108. **Effects of *Borrelia burgdorferi* infection on the body condition of fall migratory and resident birds in northern Illinois.** The increasing prevalence in the upper Midwest of Lyme borreliosis caused by *Borrelia burgdorferi* infections and transmitted by Ixodid ticks is bringing increased focus to the organisms involved in the bacterial transmission cycle. While a lot is known about the role of mammals and ticks, the role of birds in *Borrelia* transmission remains less clear. It is also uncertain what effect, if any, *Borrelia* infection has on infected birds. One way to detect potential negative impacts of infection on birds is to look at various indices of body condition, under the assumption that an infection might interfere with feeding or other basic maintenance activities. In previous work, we compared the body mass of healthy and infected birds, but found no significant difference between the two groups. Body condition indices, however, provide a more reliable picture of bird health than body mass alone. In this study we used a simple body condition index to compare healthy and infected birds. We predicted that birds infected with *Borrelia* would have a lower body condition index than healthy birds. We also predicted that the stresses of migration would result in migrant species being more likely than resident birds to show negative condition effects of an infection. We caught birds during fall migration from 2015-2018, and collected blood samples, tarsus measurements, and body mass. We used primers for the *Borrelia* flagellin B gene to detect the presence of an infection in blood samples. For body condition index, we used the residuals from a simple linear regression of body mass on tarsus for each species. According to the data, birds with and without *Borrelia* infections did not differ significantly in body condition, nor were infected birds consistently in poorer average condition. That was true for both residents and migrants. Although that does not mean birds are unaffected by *Borrelia* infection, we did not see evidence that birds with infection experienced any decline in condition.

**P64 Alix E. Matthews (1) (S) and Than J. Boves (1).** 1. Department of Biological Sciences, Arkansas State University, Jonesboro, AR 72401. **Integrating next-generation sequencing and ecology to understand host specialization and coevolution of symbiotic feather mites.** Symbiotic relationships are among the most common ecological interactions and nearly all organisms engage in one or more symbioses. They are fundamental to the maintenance and interconnectedness of dynamic biological communities, and can have strong effects on biodiversity. Despite their importance, we still know very little about the details of how symbionts have evolved with their hosts and, in many cases, even what associations exist. Feather mites living on avian hosts are unique candidates to investigate host specialization and coevolution as they are ubiquitous, highly evolved to live on feathers, and have high genetic diversity. On a broad scale, major feather mite diversifications have been synchronous with major bird diversifications, indicating cospeciation. However, family-level cophylogenetic analyses suggest that feather mites are more prone to host shifts, indicating a lack of cospeciation. There are several alternate factors related to host ecology (e.g., similar nesting strata, sharing brood parasites, congruent migration) that could increase the opportunity for a mite to shift

to, survive, and reproduce on new hosts. In this work, the first goal is to use next-generation sequencing techniques to build multilocus phylogenies in order to assess phylogenetic congruence between feather mites and hosts (all species of family Parulidae) at a much finer scale. The second goal is to determine how various factors best explain patterns of host shifts by modeling them as a function of host ecological factors. Results will help to identify not only how ecology influences evolution in symbioses, but also unknown biodiversity of an understudied taxa.

**P31 Sara Meissner (1)(S), Dr. James Rotenberg (1), and Dr. Joanne Halls (2).** 1. Environmental Sciences Department, University of North Carolina Wilmington, NC 28403 2. Earth and Ocean Sciences Department, University of North Carolina Wilmington, NC 28403. **Focused citizen science helps determine dates of annual cycle for Atlantic Painted Buntings (*Passerina ciris*) and create new range maps through spatial modelling.** In the United States, Painted Buntings (*Passerina ciris*) are divided into two distinct geographic populations: Central and Atlantic. The smaller Atlantic subpopulation was the focus of a citizen project called the Painted Bunting Observer Team (PBOT) that operated from 2008 to 2015. Participants were required to provide details of the buntings they saw, including plumage type. We used these data to answer a two-part question: How does citizen science compare to established programs, and can the sourced data be used to create more informed management tools by updating accepted habitat and range maps? Compared to a broad citizen science project like eBird, PBOT collected over twice the number of bunting observations (111,000 vs. 54,000) and with consistent addition of detailed information (plumage, behavior, etc.) over the eight years of the study. All these data allow for a more accurate dating of the bunting's full annual cycle in this Atlantic subpopulation instead of a broadly averaged timeline. Utilizing the plumage data allows for further parsing of population cycles, showing males often leading migration across the latitudes. The PBOT location data, combined with spatial analysis, can produce more nuanced range maps than possible with a broad survey, and can illuminate regional and seasonal habitat preferences. These results together can guide management efforts for Painted Buntings in the Atlantic subpopulation and in time lead to a unified, regional conservation plan with a strong base in citizen science.

**P70 Sheila R. Moore (1)(S) and Anne B. Clark (2).** 1. Department of Ecology, Evolution and Behavior, Binghamton University, Binghamton, NY 13902. 2. Department of Ecology, Evolution and Behavior, Binghamton University, Binghamton, NY 13902. **Behavioral lateralization in American Crows (*Corvus brachyrhynchos*): Individual differences in eye and foot use bias may develop over time.** Behavioral lateralization is a preference to use one side of the body over the other. Newly hatched domestic chickens (*Gallus gallus domesticus*) show visual laterality, a bias in eye use, which develops due to late embryonic light exposure of the right eye through the eggshell and gives rise to population-level laterality. This process may apply primarily to precocial birds because, as demonstrated in pigeons (*Columbia livia*), altricial species including all passerines hatch before the sensitive period. Recent reports of biased eye use in passerines must mean that post-hatching mechanisms can produce lateralized behaviors. We tested whether a passerine, the American Crow (*Corvus brachyrhynchos*), exhibits bias in either eye use or foot use at the population or individual level. Corvids are known for manipulative problem solving including tool use in some species; they use bills and feet to hold and manipulate. Lateralization may increase neural efficiency in complex actions. We suggest that such efficiency may develop through practice, explaining individual biases. We scored eye and foot use of individuals in a wild crow population during foraging. We found individual differences in direction and degree of eye and foot use laterality. We did not find evidence of population level biases of eye or foot use. The strengths of individual biases also differ across age classes, suggesting a "practice effect." This study emphasizes the importance of investigating the underlying mechanisms of laterality including practice effects but also effects of observational learning, specific task and individual morphology.

**P03 Patrick B. Newcombe (1)(S) and Kyle G. Horton (2,3).** 1. Sidwell Friends School, Washington, DC 20016 2. Cornell Lab of Ornithology, Cornell University, Ithaca, NY 14853 3. Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO 80523. **Migratory flight on the Pacific Flyway: strategies and tendencies of wind drift compensation.** Applications of remote sensing data to monitor bird migration usher a new understanding of magnitude and extent of movements across entire flyways. Millions of birds move through the western US, yet this region is understudied as a migratory corridor. Characterizing movements in the Pacific Flyway offers a unique opportunity to study complementary patterns to those recently highlighted in the Atlantic and Central Flyways. We use weather surveillance radar data from spring and fall (1995-2018) to examine migrants' behaviors in relation to winds in the Pacific Flyway. Overall, ---spring migrants tended to drift on winds, but less so at northern latitudes and farther inland from the Pacific coastline. Relationships between winds and fall flight behaviors were less striking, with no latitudinal or coastal dependencies. Differences in the preferred direction of movement (PDM) and wind direction predicted drift patterns during spring and fall, with increased drift when wind direction and PDM differences were high. We also observed greater total flight activity through the Pacific Flyway during the spring as compared to the fall. Such complex relationships among birds' flight strategies, winds, and seasonality highlight the variation within a migration system. Characterizations at these scales complement our understanding of strategies to clarify aerial animal movements.

**P57 Ashley C. Nunez (1)(S), Henry Streby (2), and Jeanine Refsnider (3).** 1. Department of Biology and Environmental Studies, Ursinus College, Collegeville, PA 19426. 2. Department of Environmental Science, University of Toledo, Toledo, OH 43606. 3. Department of Environmental Science, University of Toledo, Toledo, OH 43606. **Microcystin algal blooms cause chronic stress in wetland associated songbirds.** Large, harmful algal blooms containing Microcystin (CyanoHABs) are becoming more prevalent and severe as nutrient loading and climate change stimulate growth and expansion. Blooms have detrimental

impacts on ecosystem quality and associated animal and human health. Microcystins, hepatotoxin cyanobacteria, are dangerous to animals, but effects on birds are largely unknown. We investigated the impacts of Microcystin on physiological stress in Barn Swallows (*Hirundo rustica*) and Red-winged Blackbirds (*Agelaius phoeniceus*) that consumed insects emerging from water containing CyanoHABs. We hypothesized foraging on emergent insects causes indirect Microcystin exposure and direct exposure through consumption of water. We captured birds from wetlands in Ottawa National Wildlife Refuge on Lake Erie and Grand Lake in St. Marys, Ohio when Lake Erie did not contain algal blooms and Grand Lake contained severe algal blooms. We collected blood samples from each bird and created smears. We stained and analyzed smears using oil immersion microscopy to count and identify 100 leukocytes on each smear. The heterophil to lymphocyte ratio (H:L ratio) was calculated for each bird, creating a baseline indication of stress. Chronic stress can build to allostatic overload, possibly resulting in depressed immune function and other physiological issues. Birds from Grand Lake had a significantly higher H:L ratio than from Lake Erie, indicating chronic CyanoHAB exposure does have an effect on Barn Swallows and Red-Winged Blackbirds. This stress might have long-term implications for exposed populations through reduced survival and reproduction. We provide a starting point from which investigations of entire lake-associated avian communities should be considered.

**P59 Facundo X. Palacio** (1)(S), Francisco Cataudela (2), Diego Montalti (1), and Mariano Ordano (3). 1. División Zoología Vertebrados, Museo de La Plata, Universidad Nacional de La Plata, B1900FWA La Plata, Buenos Aires, Argentina. 2. Facultad de Bioquímica y Ciencias Biológicas, Universidad Nacional del Litoral, S3000 Santa Fe, Santa Fe, Argentina. 3. Instituto de Ecología Regional, Universidad Nacional de Tucumán, Consejo Nacional de Investigaciones Científicas y Técnicas (IER-UNT-CONICET), 4107 Yerba Buena, Tucumán, Argentina. **Eating the fruit of passion: bird functional traits and geography explains fruit removal by frugivorous birds in Blue Passionflower (*Passiflora caerulea*)**. Geographic variation in bird-fruit interactions represents a complex ecological scenario which determines a mosaic of selection pressures between interactors. This mosaic may partly be the result from geographic variation in bird assemblages, in which birds are expected to fulfil different ecological functions with strong consequences for seed dispersal patterns. However, the drivers of fruit removal by birds at a geographical scale are not fully understood. We described geographic variation in fruit removal and functional diversity (FD) of frugivorous bird assemblages among Blue Passionflower (*Passiflora caerulea*) populations, a bird-dispersed vine. We observed bird fruit consumption and frugivorous bird abundance in nine plant populations from northern and central Argentina (spanning 10° of latitude, 0-1250 masl, three biogeographical provinces). We quantified FD of frugivorous bird assemblages on the basis of body mass, fruit-handling behavior (gulper, pulp consumer or seed predator), and degree of frugivory. We recorded 14 bird species consuming passionflower fruits and detected a non-linear trend of higher frugivorous bird FD towards lower latitudes. Also, the number of birds consuming fruits (visits) per plant was negatively related to latitude, the proportion of gulper species, the degree of frugivory, and mean body mass. The Blue Passionflower shows functionally diverse frugivorous bird assemblages throughout its distribution range, which seems mainly driven by biogeographical factors at the geographical scale. At the population level, seed dispersal is presumably enhanced by small-sized generalist pulp consumers, whereas large birds may compensate lower visitation rates by increased fruit consumption.

**P26 Andrea Patterson\*** (1,4), Lesley Howes (2,4), Anthony Hill (3,4). 1. Braddock Bay Bird Observatory 2. Environment and Climate Change Canada 3. Appledore Island Migration Station 4. North American Banding Council. **Developing best practices for photography and videography in the age of social media**. Through the use of blogs, photo galleries, social networking sites, and scientific presentations, ornithologists daily promote bird monitoring and research to a wide audience. In so doing, ornithologists should meet, display, and model high ethical and scientific standards. Responding to requests from the ornithological community, in 2013 the North American Banding Council (NABC) developed a set of Photographic Guidelines that articulate best practices for taking and using photos and videos. Aimed at helping ornithologists develop their own policies, the guidelines are focused around two principles – that images must meet high standards of bird safety and scientific rigor, and that there is a difference between what one can safely do and what one can safely show. The recommendations embodied in the Guidelines are applicable not only to ornithologists but to wildlife researchers in general, and the NABC encourages especially all those who work with birds to use the Guidelines as a template for their own set of photographic standards.

**P67 Sarah Polekoff** (1)(S), Opaline Picard (2), and Pierre Deviche (1). 1. School of Life Sciences, Arizona State University, Tempe, AZ 85281. 2. Department of Human Sciences and Arts, University of Poitiers, France. **Adjusting to city life: oxidative stress in adult and juvenile urban House Finches, *Haemorhous mexicanus***. Urbanization is associated with a suite of stressors which may impose selection pressure on wildlife. Urban birds may experience increased oxidative stress relative to non-urban birds due to increased exposure to oxidizing agents and reduced availability of antioxidants, ultimately leading to cellular damage. How birds respond to urban stressors depends on their physiological state, which can vary as a function of age, reproductive status, and body condition. We measured oxidative stress in avian pox-infected and apparently healthy juvenile and adult urban House Finches, *Haemorhous mexicanus*. We sampled 47 birds (25 adults and 22 recently fledged juveniles) between March and June 2019 on the Arizona State University Tempe campus. We assayed blood samples for uric acid (the main byproduct of protein metabolism and the most abundant circulating antioxidant) and blood reactive oxygen metabolites (ROMs), which are reactive byproducts of oxidative damage. Plasma uric acid and ROM levels were positively correlated ( $\rho = 0.60$ ) and higher in juveniles than adults ( $p < 0.006$ ). Uric acid and ROM levels did not correlate with breathing rate, visible fat stores, or health status. Juveniles may experience higher oxidative stress due to differences in metabolism or foraging ability. Our next steps are to begin sampling non-urban finches for comparison and to recapture the individuals in this study to determine whether oxidative differences disappear during the nonbreeding season, when juveniles have become fully

independent. Research on this subject may help identify when birds are most vulnerable to stress and how multiple stressors affect their physiology.

**P68 Charlotte Probst (1)(SP) and Joel Ralston (2).** 1. Department of Biological Science, University of Notre Dame, Notre Dame, IN 46556 2. Department of Biology, Saint Mary's College, Notre Dame, IN, 46556. **The effect of climate on bill morphology divergence in *Toxostoma* thrashers.** Foraging has long been recognized as a selective pressure on bill morphology in birds. As a result, divergent bill morphology among closely related species is usually assumed to reflect differences in diet or foraging. However, in recent years the importance of bird bills in thermoregulation has come to light. Bills are extensively vascularized, which aids in cooling through environmental heat exchange. Because heat is released without water loss, this cooling method is especially advantageous in arid habitats. In this study, we examine the influence of climate on bill morphology in *Toxostoma* thrashers, a group of 10 species ranging across North America that vary in bill morphology and occupied climate niche, with several species inhabiting arid or semiarid climates. We photographed and measured museum specimens at the Field Museum of Natural History for 6 of the 10 species of *Toxostoma* thrashers. Bill measurements were calculated from digital photographs using a computer program created in MATLAB specifically for this purpose. To calculate the occupied climate of each species we obtained climate data from WorldClim describing temperature and precipitation means and extremes. We then used multiple linear regression to determine how temperature and precipitation variables influence bill morphology. We predict that the species occupying hotter, more arid climates will have larger bill surface areas to facilitate better thermoregulation.

**P28 Kayla Pruitt (S), Jennifer Driscoll, Tham Mana, Shane Andrews, Cassidy Hanson, Damon Roznowski, Sean Beckmann, and James S. Marshall.** Dept. of Chemical & Biological Sciences, Rockford University, Rockford, Illinois, 61108. **Patterns of *Borrelia burgdorferi* infection in urban versus rural birds of northern Illinois.** Lyme disease is a zoonotic disease caused by the bacterium *Borrelia burgdorferi* that is passed between different organisms and species via ticks. Since Lyme disease is zoonotic, it is important to know the number of animals besides humans that are infected with the bacterium. This is especially important with birds, since birds can carry the disease with their migration patterns and introduce it to areas that have previously had no cases of Lyme disease. They can also increase the amount of infected individuals in an area that previously had few individuals infected. This particular study focuses on whether or not *Borrelia burgdorferi* is more abundant in rural or urban populations of birds, and of those birds whether or not the infected birds are a migrant species or a residential species between the years of 2015 and 2019. Blood samples were obtained at two different sites, an urban and a rural location, between the first week of September and the second week of November in 2015 to 2018. Our rural location was the Severson Dells Nature Center located southwest of Rockford while the urban location was the wooded areas around Rockford University in Rockford, IL. The initial prediction was that Lyme disease would be more prevalent in rural areas, due to rural areas having a more suitable environment for ticks. We also expected that resident birds would fit this pattern, but that migrants would have equal infection rates in urban and rural areas. However the results show that there is no difference between the prevalence of Lyme disease between the rural and urban area overall or in resident species. Sample sizes are still small, however, so it may be too early for dismissing rural areas as harboring larger reservoirs of *Borrelia burgdorferi*.

**P68 Sarah Rackowski(SP)(1).** 1. Princeton High School, Princeton, NJ 08540. **Investigation into phenotypic variance and microevolution in introduced populations of feral North American rock pigeons (*Columba livia*).** In captivity as well as in the wild, the rock pigeon (*Columba livia*) exhibits substantial variation in behavioral and anatomical traits. In their native range, wild rock pigeons have diversified into 12 distinct subspecies; in captivity, hundreds of breeds have been generated by artificial selection. Rock Pigeons have been established populations throughout much of the world. In North America, these feral pigeons have been shown to be physically and genetically distinct from their European counterparts, but little is known about variation in rock pigeons traits among different North American populations compare with each other. To characterize regional trait variation, I took anatomical measurements on live and specimen feral rock pigeons from seven regions spanning from Maine to southern Florida. I analyzed photographs of other pigeons to score plumage color, eye color and plumage pattern. Among my findings, I found the "tumbler flight" trait in region 1, increased tarsus length in region 2, absence of "pearl eye" in region 3, increased culmen length in birds from region 4, increased tail length in region 6 and "split eye", "green eye", "crest", "spiny grouse" and non-functioning uropygial gland as well as decreased weight in region 7. The causes of these differences in trait frequency among regions is currently unknown, with possibilities including population specific mutation, mutation or genetic drift, or local adaptation.

**P04 Sriya Revankar, Luke K. Butler, Alexandra Immerso.** **Physiological changes associated with the transition to molt in a rapid-molting songbird.** In most temperate-breeding songbirds the transition from breeding to molt is accompanied by major changes in behavior and habitat use. Recent work suggests that pre-molt movements far from the breeding territory may be much more common than previously recognized, especially in passerines of eastern North America. We investigated changes in physiological state associated with the transition from breeding to molt in adult male Ovenbirds (*Seiurus aurocapilla*), which undergo a rapid and intense post-breeding molt that starts on the breeding territory but likely finishes elsewhere. Cloacal protuberance volume was similar during the early and late breeding stages, but dropped significantly during molt, suggesting a drop in androgen levels as mating opportunities declined. Hematocrit (packed red blood cell volume) declined significantly between the early breeding and late breeding stages, but was similar between late breeding and molt, suggesting that demands on the oxygen-carrying capacity of the blood are similar between late breeding and molt, but higher early in the breeding

season, during territory establishment. Body mass and fat stores were similar between breeding and molt. Overall, the transition from breeding to molt and a move away from the breeding grounds was accompanied by little change in basic measures of body condition, suggesting that the physiological demands of molt, the strategies for maintaining energy balance during molt, and preparation to depart the breeding site, are similar to those of the late breeding stage.

**P17** **Jadzia M. Rodriguez** (1)(S), Dejeanne Doublet (1), Martha J. Desmond (1), David H. Johnson (2), and Fitsum Abadi (1). 1. Department of Fish, Wildlife and Conservation Ecology, New Mexico State University, Las Cruces, NM, 88003 2. Global Owl Project, Alexandria, VA, USA. **Factors affecting the presence of Burrowing Owls at artificial habitat sites in Arizona.** The Western Burrowing Owl (*Athene cunicularia hypugaea*) is declining throughout its range due to loss of arid grassland habitat and declining small mammal populations. The relocation of owls to artificial habitat is a common conservation and mitigation strategy. Few studies have examined the influence of factors on artificial burrow presence. Our goal was to assess how habitat and site-specific factors influence owl presence of artificial habitat in the Phoenix, AZ area. Observations were conducted at 20 Wild At Heart artificial habitat sites for Burrowing Owl presence surveys. Each installed burrow was camera probed to discern which sites had available burrows to support owls. Burrow GPS points were used to digitize a 600-m radius around each site in ArcMap 10.6, which determined land-use types by separating different landscapes with the cut polygon tool using NAIP 2010 digital ortho quad tiles. Logistic regression models displayed how presence was negatively correlated with site age and positively correlated with burrow availability, albeit with large confidence intervals. Presence was also positively correlated with percent of agricultural land-use type, but this logistic regression model had the lowest fit among the models strongly supported by Akaike's Information Criterion (AICc). These findings will allow us to provide site selection and maintenance recommendations to improve methods for creating viable habitats for the owls.

**P22** **Mackenzie R. Roeder\*** (1)(SP), Adrienne Kovach (2), and Brian Olsen (1). 1. School of Biology and Ecology, University of Maine, Orono, ME 04469 2. College of Life Sciences and Agriculture, University of New Hampshire, Durham, NH 03824. **Thermoregulation strategies differ across closely related taxa in a highly saline environment.** Studies have shown some birds can dissipate heat via vasodilation of the vessels of the bill. Further, research indicates bill surface area increases with temperature in fresh-water limited environments suggesting the bill may serve as a thermoregulatory window in taxa needing to dissipate heat while conserving water. Three species of passerellid sparrows found in salt marshes, Seaside (*Ammospiza maritima*), Saltmarsh (*A. caudacuta*), and Nelson's Sparrows (*A. nelsoni*), all show increased bill size when compared to their closest fresh-water relatives suggesting convergence on a thermoregulatory phenotype: increased bill surface area. However, no studies have tested how these taxa dissipate heat and if they use their bills as thermal windows. We developed a method to test heat dissipation across the entire body over a range of ~25 °C, using a FLIR T540 thermal camera, which allows us to observe patterns of vasoconstriction and vasodilation of the heat dissipating body parts and thereby determine thermoregulatory phenotypic variation within and between species. During 2019 sparrows were captured, placed into portable environmental chambers, and recorded with the FLIR for a 30-minute period of decreasing and increasing temperatures. Preliminary data suggest Seaside Sparrows use their bills and legs as thermal windows and vasomanipulate them independently of each other. Saltmarsh and Nelson's Sparrows do not vasomanipulate their bills, instead they use solely their legs and toes. These findings indicate different adaptations to the same environmental pressure and may reflect differences in their evolutionary histories—Seaside Sparrows have inhabited salt marshes longer than Saltmarsh and Nelson's Sparrows.

**P08** Bryan Lenz, Christine Sheppard, and **Jordan Rutter**. American Bird Conservancy, Washington, DC 20008. **The truly sustainable campus: Reducing bird mortality from collisions with glass.** Collisions with glass walls and windows kill hundreds of millions of birds each year in the U.S. alone. There is a significant literature on this conservation challenge in the U.S. and Canada, and growing interest in Latin America and parts of Asia. As traditional campus architecture gives way to buildings with extensive glass, an increasing number of academic institutions are attempting to address the problem, providing excellent examples for states, municipalities, and other jurisdictions and creating new tools to render glass safer for birds. However, these efforts are not coordinated and may lapse with the departure of a single individual, so there is considerable repetition of effort. The earliest – and continuing - research on collisions was by Dr. Daniel Klem at Muhlenberg College. Other efforts include individual student projects and research by professors and graduate students, exploring correlates of collisions with structural detail, landscape features and species traits. In addition, schools have undertaken both large- and small-scale glass remediation projects, as well as building new structures intended to reduce danger to birds. American Bird Conservancy plans to debut a program that will provide model sustainability policies, a bibliography and web page specifically related to campus projects and accomplishments, and the opportunity for recognition of these efforts at the level of the institution.

**P09** Christine Sheppard and **Jordan Rutter**. American Bird Conservancy, Washington, DC 20008. **The 'Tunnel Test': evaluating the effectiveness of bird-friendly glass and other materials.** In 2013, separate U.S. and Canadian studies estimated mortality of hundreds of millions of birds each year in North America from collisions with glass. Increased adoption of strategies already in use in building design to control heat and light and enhance security can greatly reduce this mortality without sacrificing function or esthetics or increasing costs. To promote this change, it is essential to provide objective assessment of collision threat of materials, to building professionals such as architects, engineers, and planners, similar to ratings for insulation value or breaking strength. Dr. Daniel Klem was the first to develop protocols for testing bird collision deterrents. In 2004, the Hohenau-Ringelsdorf Biological Station (Hohenau) in Austria designed a new protocol to compare the effectiveness of

different markings on glass for preventing bird collisions. Building on Klem's work, the Hohenau 'tunnel' was constructed, binomial choice protocol where birds, protected by a net, fly either towards a test sample or unmarked control glass. Approximately 80 flights per sample are evaluated, with scores defined as percent flights to control. We wanted to determine whether we could use this test with local bird taxa, at the Powdermill Avian Research Center in Pennsylvania, to provide objective collision threat ratings. Preliminary work in 2010-11 scored two patterns tested at Hohenau in 2004-6, producing essentially identical scores. Since that time, we have used the Powdermill tunnel to: a) determine how size, orientation and spacing of pattern elements impact effectiveness b) rate commercially available glass and c) evaluate new bird-friendly technologies.

**P52 Amanda G. Savagian** (1)(SP) and Christina Riehl (1). 1. Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ 08544. **The functions of group chorusing in the joint-nesting Greater Ani (*Crotophaga major*)**. Group living requires maintaining dynamic relationships with fellow group members, while simultaneously interacting and competing with other groups. In several species of cooperatively breeding birds, group members produce collective choruses or "rallies", complex and conspicuous vocalizations that may offer an important window into how group-living birds navigate these relationships and interactions. However, little is known about the adaptive significance of group choruses, what information they convey, or whether they are primarily used for intra- or intergroup communication. We investigated the function of group chorusing in the greater ani (*Crotophaga major*), a Neotropical joint-nesting cuckoo that lives in groups of 2-3 unrelated pairs, all of whom chorus together. We recorded 500 choruses from over 100 greater ani groups across Barro Colorado Island in Panama to 1) quantitatively describe these vocalizations; 2) identify the behavioral contexts in which they occur; and 3) determine whether choruses contain a group-specific signature. In an initial subset of 205 choruses, we identified 5 distinct call types following a stereotyped temporal pattern. Choruses were primarily associated with social interactions within the group (62%), as well as interactions with extragroup individuals (25%), indicating that chorus participation may reaffirm group membership and reinforce group bonds. Only 5% were associated with intergroup interactions, although we found preliminary evidence for group-specific signatures, suggesting that anis may still use choruses to monitor their broader social network, even if they primarily function for within-group communication. Chorusing may therefore play a crucial role in mitigating competition and mediating cooperation within greater ani breeding groups.

**P37 Christopher J. Sayers II** (1)(S), Mackenzie R. Roeder (2), Lindsay Forrette (3), Daniel Roche (4), Gaetan L. B. Dupont (5), Samantha Apgar (6), Alison R. Kocek (7), Alexandra M. Cook (7), Greg Shriver (8), Chris S. Elphick (6), David N. Bonter (9). 1. Department of Natural Resources, Cornell University, Ithaca, NY 14850 2. School of Biology and Ecology, University of Maine, Orono, ME 04469 3. Saltmarsh Habitat and Avian Research Program 4. Division of Forestry and Natural Resources, Wildlife and Fisheries Resources Program, West Virginia University, Morgantown, WV 26501 5. Department of Organismic and Evolutionary Biology, University of Massachusetts, Amherst, MA 01003 6. Department of Ecology & Environmental Biology, University of Connecticut, Storrs, CT 06269 7. Department of Environmental and Forest Biology, State University of New York College of Environmental Science and Forestry, Syracuse, NY 13210 8. Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE 19716 9. Cornell Lab of Ornithology, Cornell University, Ithaca, NY 14850. **Geographic variation of mercury in breeding tidal marsh sparrows of the northeastern United States**. Anthropogenic stressors including environmental mercury contamination potentially threaten the reproduction and survival of both Saltmarsh Sparrows (*Ammospiza caudacuta*) and Seaside Sparrows (*A. maritima*), collectively referred to as tidal marsh sparrows, which have become species of conservation concern. To assess methylmercury exposure, we sampled blood from adult male tidal marsh sparrows from Maine to Virginia, USA. This is the first study of its kind to provide a comprehensive evaluation of mercury contamination in saltmarshes throughout the majority of the *A. m. maritima* and *A. c. caudacuta* breeding ranges. The mean Hg concentration ( $\pm 1$  SD) throughout the entire sampling range was 0.45 ppm  $\pm$  0.24 ppm wet weight where individual levels ranged from 1.53 ppm, remaining above the sublethal effect threshold, to 0.002 ppm. There was no significant difference between blood Hg values in Seaside and Saltmarsh Sparrows across the sampling range ( $p = 0.2$ ). We created a linear model to analyze the spatial relationships between National Land Cover Database (NLCD) land cover types and tidal marsh sparrow mercury levels within a 25km buffer of each marsh site. Our model revealed that percent forest cover and longitude were significantly associated with blood Hg levels ( $r^2 = 0.2889$ ,  $p < 0.05$ ). The positive association between blood Hg levels and percentage of forest in the landscape surrounding a marsh supports previous research demonstrating that forests enhance Hg methylation and dry deposition. Longitude exhibited a slight positive relationship which shows that tidal marsh sparrows are at a heightened risk of mercury in the northeastern part of their range.

**P51 Maria G. Smith** (1)(SP) and Christina P. Riehl (1) 1. Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ 08544. **Task specialization and division of workload in the communally nesting Greater Ani (*Crotophaga major*)**. Division of labor, in which different individuals specialize on different tasks, is widespread and well studied in eusocial insects but has received little attention in vertebrates. Such task specialization can increase efficiency and reproductive output and may be expected to evolve in stable groups of long-lived species. Cooperatively breeding birds, especially those with large breeding groups, therefore are good candidates for division of labor, but few studies have explored this possibility. Additionally, within a breeding group, individuals may vary not only in the tasks they tend to perform but in their overall share of communal workload. We discuss methods for quantifying division of labor in cooperatively breeding vertebrates and present preliminary results from an ongoing study of task specialization and workload distribution in the Greater Ani (*Crotophaga major*), in which two or three unrelated breeding pairs, sometimes with non-breeding helpers,

cooperate to raise a single clutch. Observations have revealed that all individuals contribute to all parental care tasks but that some individuals specialize on certain tasks. Additionally, we provide evidence that workload is more evenly distributed in small groups than in large groups. This result raises the question of whether some individuals in large groups may be cheating and whether members of groups with more unevenly distributed workload have lower fitness. Our results contribute to the study of division of labor and cooperative parental care in vertebrates and provide a starting point for tests of the fitness consequences of task specialization and unequal distribution of workload.

**P73** McKenzie Somers (1)(S)\*, Marisa Immordino(1)(S)\*, Precious Ozoh(1)(S), Lauren Sherman(1)(S)\*, and **Andy Wilson** (1)1. Department of Environmental Studies, Gettysburg College, Gettysburg, PA 17325. **Estimating songbird abundance using drones.** Using drones to conduct airborne bioacoustic surveys is a potentially useful new way to estimate abundance of vocal bird species. Here we show that using two inexpensive recording devices suspended from a consumer-end quadcopter drone it is possible to estimate distances to vocalizing birds. We broadcast an American Robin (*Turdus migratorius*) song from a speaker placed at ground-level and flew the drone along a 100 m transect starting directly above the sound source, at an altitude of 55 m. We measured the time-difference-of-arrival (TDoA) of bird vocalizations at the two drone-mounted recorders and applied the Pythagorean Theorem to estimate distances. We estimated distances within 100 m of the sound source with mean precision of 3 m, and mean bias of less than 2 m. This accuracy is substantially higher than that previously measured for technicians conducting traditional ground-based point counts. Our technique works best for species that sing close to the ground and have higher frequency range songs (>3,000 Hz). Low frequency songs and calls are subject to masking by the quadcopter noise. Field-testing in summer 2019 showed that short duration (1 minute) drone-based point counts can yield large amounts of acoustic detections, which can then be analyzed using distance sampling and time-of-detection models to estimate abundance.

**P48** **Jacalyn Speicher\*** (1)(SP) and Letitia M. Reichart (1). 1. Department of Biology, University of Nebraska at Kearney, Kearney, NE 68849. **Nesting in an invasive shrub, breeding Gray Catbirds (*Dumetella carolinensis*) in northeastern Pennsylvania.** Gray Catbirds, *Dumetella carolinensis*, are neotropical migrants that commonly breed along edges of seasonally moist, upland mixed deciduous/coniferous forests. New nests are built each year and are located in leafy shrubs or low trees, approximately 2.5m above the forest floor. We studied Gray Catbirds (GRCA) breeding in northeastern Pennsylvania at the Kettle Creek Wildlife Sanctuary. Historically, GRCA nested in native Northern Spicebush, *Lindera benzoin*, in the sanctuary; however recently nests have been found in the exotic invasive shrub, Japanese Barberry, *Berberis thunbergii*. The objectives of the study were to 1) document presence of nests in each shrub species (i.e., Northern Spicebush and Japanese Barberry), 2) document nest site characteristics of the nest microclimate (i.e., temperature at the nest, relative humidity), and 3) compare nest site characteristics for nests found in Northern Spicebush versus Japanese Barberry. We found 6 GRCA nests, where 5 were located in Japanese Barberry. There were no significant differences in nest microclimate characteristics for nest sites found in Northern Spicebush versus those found in Japanese Barberry. The presence of GRCA nests found in the invasive shrub was greater than nests found in the native Northern Spicebush. Future research is needed to determine if GRCA are choosing to nest in the invasive shrub species over the native shrub species or if changes in shrub species abundance within Kettle Creek Sanctuary can explain greater use of Japanese Barberry as a nesting site.

**P15** **Jeffrey A. Spendelov.** Independent Research Wildlife Biologist (Retired [Emeritus] U.S. Geological Survey). **Evaluating current limiting factors and future threats to recovery of endangered Roseate Terns.** The endangered NW Atlantic breeding population of Roseate Terns (*Sterna dougallii*) dropped by >25% from a high of about 4,300 “peak period” breeding pairs in 2000 to about 3,000 “peak period” pairs in 2008. The most important factors that caused the decline have not been determined, but the relatively slow rate of population growth from 2008-2013 compared to the greater rate of growth from 1992-2000 indicated that there had been a major change in one or more aspects of the population dynamics of this species. The (formerly USGS-PWRC) Cooperative Roseate Tern Metapopulation Project is integrating results of several research studies to evaluate the relative importance of current factors operating in the MA-NY area and future threats that may limit population recovery.

**P47** **Kerilynn Spiess** (1)(S), Dominique Varra (1), Lucas J. Redmond (1) 1. Department of Biology, Penn State Schuylkill, Schuylkill Haven, PA 17972. **Is nest defense in Gray Catbirds (*Dumetella carolinensis*) a repeatable behavior?** Because of their diurnal nature, most species of birds are well suited for behavioral studies. The various behaviors performed by birds, such as singing and other forms of mate attraction, parental care, and aggression towards both conspecifics and heterospecifics are important adaptive mechanisms that increase either survival or reproductive success. Further, a growing body of evidence indicates that individual birds exhibit distinct personalities. If, indeed, the various behaviors exhibited by these organisms represent an adaptive suite of traits that is consistent within an individual, then quantitative measures of these traits should be repeatable. We quantified nest defense behavior of Gray Catbirds (*Dumetella carolinensis*) from 2017 to 2019 and evaluated whether nest defense was repeatable among individual catbirds. Our analyses showed that nest defense of catbirds was, indeed, repeatable among individuals. However, when repeatability was calculated separately for the sexes, we found that nest defense for females, but not males, was repeatable. Our results provide some evidence that, at least for female catbirds, certain behaviors are consistent among individuals which may indicate that catbirds exhibit distinct personalities. The difference we found between males and females could be explained by the fact that female catbirds have more investment and involvement in nest protection/success than their male counterparts.

**P62 Meghan J. Strong\*** (1), Benjamin L. Sherman (2), Christina Riehl (1) 1. Princeton University, Department of Ecology and Evolutionary Biology, Princeton, NJ, U.S.A. 2. 24202 Cornerstone Dr., Yardley, PA, U.S.A. **Home field advantage, not group size, predicts outcomes of intergroup conflicts in a social bird.** Work on cooperatively breeding birds historically focused on causes and consequences of conflict within the social group. Here we shift focus from inter- to intra-group competition in an effort to understand the impact on an individual's fitness and how these behaviors have influenced the evolution of sociality. A long term study of the communally breeding greater ani (*Crotophaga major*) was conducted in order to better understand the adaptive pressures imposed by intergroup competition. We observed 18 instances in which a group's entire clutch was destroyed by ejection, often resulting in the affected group abandoning the territory. These events often coincided with behavioral observations of conflict between the neighboring groups. Spatial analyses using ArcMap revealed that groups were clustered in loose aggregations and displayed moderate reproductive synchrony. A typical clutch destruction scenario involved groups that nested in close proximity to one another on high-quality nest sites. Indeed, distance to nearest neighbor and site quality were the strongest predictors of clutch destruction. We did not find that group size garnered any competitive advantage for the greater ani. Instead, group tenure or what we call 'home field advantage' had a more significant effect, meaning that groups with a longer history of nesting on a particular site were more likely to destroy the clutch of a more recently established group. These results highlight the importance that territory quality and group stability have on the evolution of communal breeding.

**P18 Henry L. Symanski**, Jeff P. Hoover. Department of Natural Resources and Environmental Sciences, University of Illinois at Champaign-Urbana, Prairie Research Institute. **Effects of forest management on breeding bird abundances in southern/central Illinois.** The reduction of hardwood tree species such as oak in deciduous forests in the Midwest is known as "mesophication", whereby shade-tolerant trees (such as sugar maple and beech) overtake oaks and hickories in hardwood forests. A variety of forest management techniques have been used in an attempt to reduce or reverse this mesophication including various types of thinning/harvest and prescribed fire. While these techniques alter the forest structure to suit the needs of target tree species, their effects on the abundance and diversity of breeding songbirds is not well known. In this study, we examined the effects of forest management on breeding birds in central and southern Illinois. We conducted point counts at 536 points to assess breeding bird abundances from 5 managed forests in central and southern Illinois during 2014-2018. Survey points were distributed across each study site to have several points in each type of management (e.g. prescribed fire, thinning) and in areas of the forest not being managed. Comparisons of breeding bird abundances among forest management categories will be presented for a select subset of species abundant enough to analyze, representing various nesting and foraging guilds, and the implications of these results will be discussed.

**P36 Cynthia A. Ursino** (1)(2)\*, M. Cecilia De Mársico (2), and Juan Carlos Rebores (2). (1) Department of Ecology and Evolutionary Biology, Princeton University, NJ 08544 (2) Departamento de Ecología, Genética y Evolución - IEGEBA, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina. **Removal behavior of botfly larvae live subcutaneously from their own and brood-parasitic nestlings.** Brood parasitic birds lay their eggs into the nests of other birds, abandoning parental care of their nestlings to the unsuspecting hosts. Parasite and host nestlings may themselves be parasitized by botfly larvae (*Philornis*: Muscidae). Infection by botfly larvae causes nestling mortality in many Neotropical birds. Despite the lethal effects, most *Philornis* hosts studied so far lack specific defenses against these larvae. Here, we provide the first direct evidence that adult baywings (*Agelaioides badius*), the primary host of the specialist brood-parasitic screaming cowbird (*Molothrus rufoaxillaris*), regularly remove botfly larvae from their own and parasitic nestlings by pulling them out of the nestlings' skin. All nestlings in the brood were preened exhaustively throughout the day and the larvae were removed at a very early developmental stage. By combining nestling cross-fostering with video recording of baywing nests, we show that due to prompt removal, infection with botfly larvae had negligible effects on nestling growth and survival despite high prevalence. This is the only bird species known to remove botfly larvae which burrow under the nestlings' skin. Our results provide the first direct observations for larvae removal behavior in botfly hosts. Screaming cowbirds may benefit from using baywings as its main host, as larvae removal by adult baywings reduces the costs of botfly parasitism.

**P74 Kai Victor**, Vanya Rohwer. Cornell University Museum of Vertebrates and Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, NY. **Are birds becoming vain? Exploring the occurrence and function of eyelashes in birds.** Eyelashes have captured the imagination of the human race. A few significant bristles have spawned a market that is projected to reach \$1.5 billion in the next five years based on the idea that long eyelashes make you more beautiful. Humans are not the only creatures to have eyelashes, though. Past studies focusing on terrestrial mammals have revealed the ubiquity and importance of eyelashes in diverting airflow and protecting the eye from dust. However, given that the ecologies of mammals with eyelashes are different than those of birds, we might expect the selective factors favoring eyelash development to differ between mammals and birds. To better understand avian eyelash evolution, we examined 204 bird families for the presence or absence of eyelashes, and for species with eyelashes, we measured the length of the longest 3 lashes. We defined eyelashes as a form of bristle feather, with a single, undivided rachis. Preliminary results show eyelashes were present among species in 27 of the 204 (13.2%) families examined. Several patterns have emerged from this preliminary data: families with species that live an aquatic or semiaquatic lifestyle rarely, if ever, have developed eyelashes; families with species with bare, brightly colored facial skin surrounding the eye often have eyelashes; finally, eyelashes appear most developed for sedentary species inhabiting



hot regions. These associations suggest that eyelashes protect the eye while foraging, moving, or nesting, a role similar to that observed in mammals, but that the ecologies of birds can influence the presence/absence or morphology of eyelashes.

**P50 Garrett Visser**, Claire V.W. Ramos. Colorado State University – Pueblo. **Extra-pair copulation and male parental investment in Cassin's Sparrow (*Peucaea cassinii*)**. The Cassin's Sparrow (*Peucaea cassinii*) is a species of songbird that breeds in the southern grasslands of North America. Populations of this bird in Colorado are decreasing at a rate of 3.4% annually. Cassin's Sparrows are monomorphic, which suggests that they may be monogamous and experience little sexual selection. Extra-pair copulations have been observed in our research, and males have unusually large cloacal protuberances, suggesting the possible sperm competition. If extra-pair paternity is high in this species, then we would predict that male investment in parental care would be reduced. To test this, we selected a study site east of Pueblo, Colorado on the U.S Army Pueblo Chemical Depot, where Cassin's Sparrows have been observed spending summer breeding months. Here, we mist netted for Cassin's Sparrows, and birds were given numbered aluminum bands and color bands for identification. To observe parental care in this species, video cameras were placed near nests and information regarding feeding rate and color-banded adult feeding was recorded. We found that while females are responsible for incubation, nestling feeding rates are roughly equal between males and females. This suggests either there is less extra-pair mating than predicted based on other observations, or that there is little to no cost of extra-pair mating for the female. We plan to genetically test parentage of chicks to determine actual frequency of extra-pair paternity and correlate this with male feeding rates to determine if extra-pair paternity influences male parental investment.

**P69 Andrew Vitz\*** (1), John Scanlon (1), and David King (2). 1. Massachusetts Division of Fisheries and Wildlife, Westborough, MA 01581 2. USDA Forest Service Northern Research Station, Amherst, MA 01003. **Avian response to young forest habitat created from a large-scale tornado in Massachusetts**. Early successional forests have become increasingly scarce in Massachusetts (<4% of forest habitat), and many bird species that benefit from this type of habitat are declining and are species of conservation concern (e.g., Prairie Warbler (*Setophaga discolor*), Eastern Whip-poor-will (*Antrostomus vociferus*)). In 2011, a large tornado (up to a half-mile wide) touched down and tore through a 40 mile stretch of south-central Massachusetts. This tornado converted over 7,000 acres of mature forest into young-forest habitat. To better understand the avian response to a large-scale natural disturbance, we used automated audio-recorders from late May through June (2012-2014, 2017) to document bird occupancy in and around the tornado area. In total, seventy-four locations were randomly selected and divided into the three treatment groups (tornado-impacted areas, tornado-impacted areas that were salvage-logged, adjacent mature forest not directly impacted by the tornado). Points were sampled on two days each year in June with each day consisting of 10-minute periods being recorded during five intervals around sunrise and sunset. Results revealed higher avian diversity at tornado impacted points compared to non-impacted points, and this was the result of impacted areas being used by both mature-forest and young-forest species. On the other hand, young-forest birds were not detected at points in mature forests not impacted by the tornado. Although salvage logged areas initially had low avian diversity, for many young-forest birds these areas provided habitat for a longer period following the tornado.

**P01 Hannah Wait** and Daniel Shustack. Environmental Studies Department, Massachusetts College of Liberal Arts. **Morphology of *Junco hyemalis* (Dark-eyed juncos) in Western Massachusetts**. *Junco hyemalis* (Dark-eyed Junco) is a widespread North American songbird. There are at least 15 subspecies in five distinct subgroups, which differ in various ways including morphology and migratory behavior. In eastern North America there are two subspecies within the "slate-colored" junco group. The *carolinensis* subspecies is generally non-migratory, and occurs from the southern Appalachians to at least western Pennsylvania. The exact northern distribution of *carolinensis* is unknown, but they are thought to intergrade with the *hyemalis* subspecies to the north. The *hyemalis* subspecies, likely the most abundant and widespread of all junco subspecies, is highly migratory and differs from the *carolinensis* subspecies in bill color and wing size. We are attempting to determine if juncos in western Massachusetts are year-round residents, if they display altitudinal migration similar to *carolinensis*, or if overwintering juncos come from a more northerly breeding location. The first stage of our project is to compare individuals based on morphology. We captured juncos in western Massachusetts during all seasons in order to detect evidence of *carolinensis* traits in breeding, migrating and overwintering juncos. During capture, we recorded bill color, mass, wing length, tarsus, tail length, age, sex, and tail white. We also collected secondary feathers for future isotopic analysis. We compared birds across these morphometric variables and season in order to quantify differences that might be related to migratory behavior. To date, we have only found *hyemalis* subspecies in our study area, and that measurements from morphological variables overlap across seasons.

**P46 L. Abigail Walter** (1)(SP), Catherine Viverette (1), Lesley Bulluck (1) 1. Department of Environmental Studies, Virginia Commonwealth University, Richmond, VA 23284. **Factors influencing parental care in a monomorphic species, the Red-headed Woodpecker (*Melanerpes erythrocephalus*)**. Red-headed Woodpeckers (*Melanerpes erythrocephalus*, RHWO) are a monomorphic species that cannot be sexed in the field. This has prevented a full understanding of parental care behaviors in populations that have been declining in parts of their range. Since parental care is intrinsically linked to fitness and fecundity, we assessed whether Red-headed Woodpecker incubation time, brooding time, nestling provisioning rates, and cleaning rates vary as a function of parent sex, habitat, brood size, nestling age, temperature and/or date. We recorded and analyzed 128 hours of high-quality video from 21 broods in two breeding habitats (savanna and closed canopy forest) at Fort A.P. Hill, Virginia. We captured and color-banded RHWO, taking feather samples for genetic sexing, and determined brood size and chick

age with an extendable camera. Using generalized linear mixed models, we found the best predictors of provisioning were an interaction between chick age and date; older chicks are fed more frequently in early summer (before 7 July) compared to late summer. We found chick age, parent sex, and temperature to be the best predictors in brooding models, with females brooding more before nestlings' feathers have grown. Additionally, males almost exclusively remove fecal sacs from nests ( $p < 0.001$ ), highlighting a potential method to determine sex in the field. Since this species is known to opportunistically forage, we expect the reduction in provisioning throughout the season to be related to resource availability. Whether or not reduced provisioning in later nests leads to reduced nestling survival warrants further study.

**P56** **Chris Watson**, Julie Jedlicka. Department of Biology, Missouri Western State University. **Avian biodiversity of Missouri Ozark glades increases with prescribed burn frequencies.** Glades are open, rocky habitats surrounded by forest in the Ozark highlands of Missouri and Arkansas. Characterized by having shallow soils and facing south or southwest, glades serve as habitat islands of drier prairie in an area dominated by oak-hickory forest. Missouri Ozark glades are threatened ecosystems with high levels of biodiversity and our study objective was to assess how avian biodiversity is affected by prescribed burn frequency. We surveyed 30 glade sites over the late spring and early summer during two consecutive years for numerous ecological factors and assessed biodiversity levels through the sampling of birds, reptiles, amphibians, arthropods, vascular plants, and nematodes in order to score glades for the Missouri Department of Conservation using a Community Health Index (CHI). For bird surveys, 6-minute point counts, passive mist netting, and targeted call-back surveys were conducted for glade indicative species including the Greater Roadrunner (*Geococcyx californianus*), Yellow-breasted Chat (*Icteria virens*), and Prairie Warbler (*Setophaga discolor*). Our results indicate that the CHI scores for each glade site are directly related to the occurrence of regular fires ( $p < 0.001$ ). We also found that, unlike other taxonomic groups surveyed, avian species richness was not strongly associated with burn frequency. Most of the 30 glade units surveyed had similar species richness of bird species recorded, 7-10 species being typical. Management practices including regularly prescribed fires that influence vegetative species and continued monitoring of the biodiversity levels will contribute to the persistence of glade ecosystems and their associated bird communities in the future.

**P41** **Douglas W. White** (1)\* and E. Dale Kennedy (1)\* 1. Biology Department, Albion College, Albion, MI 49224. **Retiring wrens: evening behaviors in nesting male and female House Wrens (*Troglodytes aedon*).** Morning behaviors of breeding House Wrens are coordinated: males start singing at territory boundaries in early civil twilight while incubating females do not depart until males sing at the box at dawn. In 2019, we investigated if behaviors of wrens retiring for the evening are arranged similarly. Female return for nocturnal incubation was based on iButton temperature logs from the nest cup. Last male song at the box and last male song of the day was determined from autonomous audio recordings from 1 h before sunset to 0.5 h after sunset. Each pair was monitored for three evenings; rainy and song-free evenings were omitted. Females began continuous nocturnal incubation  $17.7 \pm 22.0$  min before sunset ( $n=150$ ). Last male song at the box was  $22.3 \pm 18.1$  min before sunset (or  $4.3 \pm 27.5$  min before female retiring,  $n=116$ ) and last male song of the day was  $13.7 \pm 16.3$  min before sunset (or  $4.0 \pm 27.3$  min after female retiring,  $n=150$ ). In 41% of instances with song at the box, it was the male's last song. Although female retiring time and last male song at the box were close in aggregate, individual intervals in pair behavior varied (mean absolute interval =  $19.3 \pm 19.6$  min). Thus, in House Wrens daily activity ends at higher light levels than it begins: females begin their day at sunrise but retire a quarter hour before sunset, males begin territorial song in early twilight but stop singing before sunset. Both male and female wrens retire at similar light levels; however, behaviors within a pair are often not closely coordinated.

**P13** **Ramon J.T. Williams** (1)(S), Miya Warrington (1), and Nicola Koper (1). 1. Natural Resources Institute, University of Manitoba, Winnipeg, MB, Canada R3T 2M6. **Distribution, diversity, and abundance of Grenadian terrestrial birds, including endemic and restricted-range species.** Conservation status of Grenadian terrestrial birds is not fully understood because there has been no comprehensive study surveying all upland birds across Grenada. Currently, Grenada is experiencing rapid development and habitat alteration that may be affecting the conservation status for endemic, restricted-range, and native birds. To examine impacts of habitat alteration on terrestrial birds and identify birds and bird's habitat of conservation concern in Grenada, we collected baseline data by applying both single and dependent double-observer point count surveys across 54 field sites. At each field site, we conducted eight five-minute point-count surveys within a 25-meter radius with each point count plot separated by 100-meters. Percentage habitat type and land used were also recorded within each 25-meters point count plot. We used program DOBSERV to calculate each species perceptibility, Shannon diversity index to evaluate species diversity, and GLM in program R to analyze the distribution and abundance of Grenada's resident land birds. We analyzed data for 21 species and found uneven abundances across habitats. Most species selected cultivated and secondary grasslands, while most species avoided cloud and secondary forests and secondary scrub. Nonetheless, the otherwise avoided cloud and secondary forests were also selected for by the regional endemic Lesser Antillean Tanager and near-endemic Grenada Flycatcher. Thus, emphasizing the importance of a mosaic of natural and anthropogenic habitat types within Grenada. This information can inform habitat management decisions and conservation strategies, which will aid in the persistence of Grenada's passerines, and can be extrapolated to conserve birds on other Caribbean islands.

**P23 Grace Wilson (SP) 1, Dr. Jeff Hoover, 2** 1. Department of Natural Resource and Environmental Science, University of Illinois, Champaign IL 61820 2. Prairie Research Institute, University of Illinois, Champaign, IL 61820. **Woodpecker use of managed forests in central Illinois.** Forest management techniques have been used to control invasive plant species, improve timber stand composition, and improve habitat suitability for various species of interest for decades. In central Illinois, the main management prescriptions currently include prescribed fire, thinning, and spraying of aerial defoliant. We began studying how these management actions affect woodpecker abundance and diversity in April 2019 on forested lands owned by Illinois DNR and US Army Corps of Engineers. All species of woodpecker that are native to the state were included in the study (Downy woodpecker, Hairy woodpecker, Red-bellied woodpecker, Yellow-bellied sapsucker, Red-headed woodpecker, Pileated woodpecker, and Northern flicker). Five minute, unlimited radius point counts, followed by five minutes of broadcasted woodpecker calls were conducted at 134 points within forests, representing various management histories (including non-managed), across central Illinois between May and July of 2019; the quantity and size of snags, oaks, and down wood was also recorded. Comparisons of the average number of detections per species among management categories will be presented, as well as a comparison between passive and playback surveys.

**Juan D. Zuluaga (1)(S), Raymond M. Danner (1)** 1. Department of Biology and Marine Biology, University of North Carolina Wilmington. **Determining the Migratory Behavior of Seaside Sparrows (*Ammospiza maritima*) via Motus Radio Telemetry.** All seven extant subspecies of Seaside Sparrow (*Ammospiza maritima*) are closely tied to their habitat, spending every phase of their annual lifecycle within the tidal marshes of the East Coast and Gulf of Mexico. Seaside Sparrows are therefore considered indicator species of marsh health, making them an important species to assess. Seaside Sparrows face population declines in places across their range and have been extirpated from several locations, making it imperative that we take steps to minimize this trend by implementing conservation plans based on their full annual life cycle and migratory behavior. Northern populations of Seaside Sparrows are known to be migratory, however the migratory behaviors of southern populations are poorly known. I will determine the migratory status of Seaside Sparrows by employing Motus radio towers to track tagged individuals with the goal of determining three key pieces of information: 1) The proportion of migrant individuals to year-round residents, 2) The timing of migration, and 3) The migratory path and distance. I hypothesize that part of the population participates in short distance, facultative migration while the rest remains on the breeding grounds year-round. Radio tags were deployed in June 2019, and we will continue tracking the tagged individuals through January 2020 to obtain a clear representation of their behavior over the course of a full fall migration.