

AOS 2024 Scientific Program Abstract Booklet

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Poster Presentations

Tracking Eastern and Western Meadowlarks throughout the full annual cycle

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The Eastern and Western Meadowlark, iconic indicator species of grassland habitats, have declined by more than 70% and 40% respectively in the last 50 years. To adequately understand the drivers of decline and protect these iconic species we need to know where individuals spend the full annual cycle. In 2021, we initiated a tracking study of Eastern Meadowlarks in Virginia. In 2022, we expanded these efforts to a range-wide tracking study of Eastern and Western Meadowlarks to identify if and where breeding individuals migrate and spend the non-breeding season to elucidate the range-wide migratory connectivity of two species of native meadowlarks. From 2021 – 2023, we deployed 165 tags across 22 sites in the United States and Canada. We found a mix of migratory strategies within and among tagged birds at each site and identified where populations transitioned from resident to partially migratory to migratory. We also identified a potential migratory divide for Western Meadowlarks along meridian 110°W and important areas throughout the full annual cycle including the Great Plains/Central Grasslands region and areas in Virginia as well as a common nonbreeding area in the Sacramento Valley, California for birds from Oregon, Idaho, Montana, Alberta, and British Columbia. Understanding the migratory connectivity of these meadowlark species will help inform conservation measures at the appropriate time and place for supporting populations on both breeding and nonbreeding grounds.

****Nest defense behavior in American kestrels is positively associated with nest success**

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Nest defense is a common behavior among raptor species. While nest defense behavior is energetically costly and could result in mortality for the parent, it may be beneficial if it successfully deters nest predators and prevents depredation of young. Our study investigated whether nest defense behavior correlated with nest success for the American kestrel (*Falco sparverius*), a widespread but declining falcon species in the western United States. We analyzed nesting data collected from 1989 to 1994 from approximately 70 nest boxes monitored as part of nest box studies across several sites in Colorado, Wyoming, and Alaska. We used a constructed scale from 1 to 4 to score nest defense behavior for each nest visit, in which higher numbers represented increasingly aggressive behavior, and summed these scores across the breeding season to obtain a total nest defense score for each nest. We then fit a generalized linear mixed effects model to determine whether total nest defense behavior correlated with nest success. We found total nest defense over a nesting cycle was positively associated with nest success. This suggests that exhibiting nest defense behavior might be advantageous for kestrels, despite potential mortality risks. As nest boxes are a common monitoring and management tool for American kestrel populations, it is important for researchers to understand how nest box monitoring affects kestrel reproduction over the course of the nesting cycle. Understanding defensive behavior will help managers and researchers to minimize disturbance to nesting birds and could inform nest box placement.

Beating the heat: The potential role of microclimate refugia in buffering Amazonian birds from climate change

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Tropical forests are biodiversity hotspots and contain over half of the world's known species, yet they are also the current epicenter of deforestation, forest fragmentation, and biodiversity loss. Recent studies have demonstrated declines of biodiversity inside of intact lowland tropical forests. While the specific mechanism behind these declines remains unclear, some propose that they are linked to accelerated

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understory drying due to climate change, and that microclimate refugia within the forest understory could be buffering birds from intensifying macroclimatic changes. This study examines the microclimate hypothesis in the central Amazon rainforest, where through mist net sampling and microclimate data collection, we test whether or not understory birds are more likely to seek refugia in more favorable microhabitats in riparian areas, especially in less climatically buffered habitats, such as secondary forest compared to primary forest. Preliminary data has revealed that throughout the day, temperature increases and humidity decreases on plateaus, and while temperature also increases in riparian sites, they remain relatively cooler and the humidity remains constant, providing favorable microclimates for individuals looking to escape hotter and drier conditions within the forest understory. Ultimately, continuing to assess climate change impacts through macroclimate data may be inadequate for our understanding of tropical ecology and best conservation biology practices in an era of climate change, thus a better understanding of how species use microclimate refugia and how it impacts their individual condition will fill a critical information gap in ecology and for conservation.

****Assessing movement patterns of avian pollinators in a fragmented landscape**
J Santano, J Karubian

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Hummingbirds provide crucial pollination services necessary for maintaining biodiversity and facilitating ecological recovery in tropical forests. In the Chocó of Ecuador, high rates of deforestation and land use change may be disrupting pollination dynamics; however, the nature and magnitude of these potential impacts are not understood. This represents a major knowledge gap, because understanding how these disturbances disrupt avian pollination is a necessary step towards understanding successional patterns and refining viable conservation solutions and management plans. Given their role as pollinators in tropical ecosystems, hummingbirds' movement through their environment is likely to have important implications for pollination services. Hummingbirds are responsible for transferring pollen between individual plants, which in turn shapes genetic structure within plant populations, and functionally connects patches of forest. In my study, I focus on two key hummingbird species: the white-whiskered hermit (*Phaethornis yaruqui*) and the rufous-tailed hummingbird (*Amazilia tzacatl*) in NW Ecuador. Notably, both are the dominant species found across all habitat types at our site (i.e., primary forest, secondary forest, and recovering pasture). I captured and radio tracked individual hummingbirds across a gradient of habitat degradation. During these tracking sessions, I recorded their GPS locations and various behaviors. Additionally, I measured habitat characteristics, such as canopy cover, canopy height and tree species diversity, to classify the habitat type each bird used as a continuous variable. With these data, I can compare the movements of individuals within and between species. I can then extrapolate these findings to make predictions about differences in pollination services across habitats.

Habitat use and territory size of Black-capped Vireos (*Vireo atricapilla*) at Government Canyon State Natural Area

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The Black-capped Vireo (*Vireo atricapilla*, BCVI) is a small, migratory songbird recently removed from the federal endangered species list. BCVI prefers mid-successional habitat of 35-55% woody vegetation cover and dense vegetation between 2-3m interspersed with open corridors, and often nests in oaks (*Quercus* spp). Due to its highly specific preferences, BCVI's nesting habitat must be actively managed, making it a conservation reliant species. A new population was discovered in 2021 at Government Canyon State Natural Area (GCSNA) outside San Antonio, Texas. In order to investigate preferred vegetation types by BCVI at GCSNA, as well as the relationship between habitat preference and life history stage, we will capture and band male BCVI and map their territories. We will also conduct nest searches and will quantify preferred habitat through identification of substrate type at each nest site and measurement of nest height, substrate height, and mean vegetation height of nest patches. Pilot data suggests that BCVI at GCSNA are using Ashe juniper (*Juniperus ashei*) as a nest substrate, a novel behavior as Ashe juniper is considered marginal BCVI habitat. In addition, preliminary data shows a

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difference in mean territory size between birds with fledglings (mean = 13,393 m²) compared to those without (mean = 5,133 m²). We predict that nest survival will increase with habitat island size and canopy cover. We aim to use the results of this investigation to inform overall BCVI management and aid GCSNA staff in modifying their adaptive management plan to encourage population growth and sustainability.

Sensory pollution and conspecific aggression in chipping sparrows (*Spizella passerina*)

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As urbanization expands across the globe and the presence of pollutants such as noise and light penetrate natural areas, it has become increasingly important to understand how changes in sensory environment can impact avian behavior. Previous studies have found that urban areas select for bold, aggressive behavior; although, how much we can attribute these changes to noise and light pollution respectively is still unknown as the effects of these two pollutants combined has not been tested in detail. To do this, we will conduct conspecific payback experiments on chipping sparrows (*Spizella passerina*) across noise and light gradients during the breeding season to observe any differences in conspecific aggression behavior. We predict that birds nesting on Noise and Light+Noise treatments will produce stronger playback stimuli (higher aggression) than those nesting on Light or Control treatments, due to sensory pollutants selecting for behavioral phenotypes that are more aggressive in noise. Our results will help delineate whether 'urban aggression' is tied to changes in acoustic communication within sensory pollution, or a result of other urban factors.

****Competitive Traits of Territory Holders in a Saturated Population of Black-crowned Antshrikes (*Thamnophilus atrinucha*)**

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Over the past few decades, there has been an increasing focus on why individuals of the same species differ from each other, and how these differences impact individual fitness. Often traits of individuals have been used to try to understand these differences. For example, age and body condition are known to influence reproductive success, as experience can improve an individual's reproductive success before the onset of senescence, and individuals in better body condition are often better equipped for the physiological stress of breeding. In long-lived species with limited breeding opportunities, there is likely intense competition to acquire territories for breeding. Thus, individuals with more competitive traits may be more likely to 'win' better breeding positions. I will study the relationship between intrinsic traits of breeding individuals and their success in a long-lived tropical bird, *Thamnophilus atrinucha* (black-crowned antshrike) in Soberania National Park in Panama. I examined how age, morphometrics, 'backpatch' size (white patch used during aggressive encounters), and fighting ability are correlated with annual productivity, size of territory, and location of territory. Results will be analyzed using generalized additive mixed models. Examination of individual traits in a saturated and competitive landscape is essential for understanding what makes some individuals more successful than others.

Exploring Mimicry and Visual Communication in Woodpeckers: A Field Study Utilizing 3D-Printed Models

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The evolution of similar phenotypes poses an interesting challenge in evolutionary biology. While divergent ecologies may drive divergent morphology, physiology, or behavior, similar phenotypes are often due to similar ecology or selection for mimicry. One prominent case of mimetic phenotypes is found in hairy and downy woodpeckers. While several hypotheses might explain the hairy-downy mimicry complex, we aimed to test the idea that downy woodpeckers benefit from resembling hairy woodpeckers.

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To test this hypothesis, we used 3D-printed models of various woodpecker species in the field. These models were painted with colors that match the reflectance of their feathers, as measured by a spectrometer. We intended to test a couple of hypotheses of woodpecker behavior and visualization of different species using the 3D-printed models. The controls for this experiment were the 3D models of the hairy and downy woodpeckers. Meanwhile, the experimental models were a red-bellied woodpecker and a white-headed woodpecker, both the size of a downy. We conducted these experiments in several environments, including rural, urban, and suburban locations across multiple seasons. Our results emphasize the differences in interactions between plumage and woodpecker size in relation to other woodpeckers and third-party species. The results of this work underscore the complex interactions between mimicry and visual communication in woodpeckers and suggest future experiments to further demarcate the benefits of mimicry in woodpecker mimicry complexes.

Latitudinal Variation in Neophobic Behavior

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Overcoming neophobia, the fear of novelty, is an important strategy birds use to adapt to changing environments. During breeding season, being less neophobic can be valuable for offspring survival. However, many factors can modulate neophobia including life history strategies. Latitude may play a large role in an individual's neophobic response as birds can adopt different life history strategies at varying latitudes. Birds at northern latitudes tend to have shorter lifespans than birds at southern latitudes which may alter behavioral strategies. Since birds with shorter lifespans have less time to invest in reproduction, they may alter their behavior to increase their success in foraging and offspring survival. House Sparrows are a geographically widespread invasive species that are often associated with human habitats. Additionally, they are social birds and biparental. The objective of this study is to determine how latitude may influence neophobic behaviors in House Sparrows. To test neophobia, we utilized a latitudinal gradient (ND, OK, TX) and conducted novel object trials at feeders during the non-breeding season and nest boxes during the breeding season. We designed feeders to have zones to quantify the distance to a novel object. Latency to feed was measured when a novel object was present compared to absent. To test parental neophobia, we measured latency to enter the box in the presence of a novel object and compared it to its absence. If latitude influences neophobic behavior, we expect birds at northern latitudes to be less neophobic than birds at southern latitudes due to harsher and more limited conditions. Thus, birds in northern latitudes may be better at adapting to changing environments.

A sticky situation: Identifying drivers of woody avoidance in Grasshopper Sparrows (*Ammodramus savannarum*)

L Anderson, A Boyle

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Woody encroachment has been well-documented in grassland systems worldwide. In the Flint Hills of eastern Kansas, woody plant colonization of rangelands and prairies is a major factor in local grassland bird declines. Woody plant-associated grassland bird declines have been largely attributed to measurable increases in nest depredation rates, but it remains unclear why woody plant avoidance occurs in the first place and whether it is driven directly by shrub avoidance or indirectly via frequent contact with woody-associated predators. To distinguish between shrub and predator avoidance, we monitored the movement of a common grassland songbird, the Grasshopper Sparrow (*Ammodramus savannarum*), within their territories by triangulating their locations using small arrays of radio receivers surrounding territories of tagged sparrows. We experimentally increased woody plant cover and perceived predation risk using a model shrike (*Lanius* spp.) on the territories of tracked sparrows. Using the location data, I plotted sparrow movements before and after the introduction of model shrikes and junipers. This novel approach to tracking may prove an effective method for gaining fine-scale movement data across multiple separate home ranges. The results of this project may be crucial in understanding why woody aversion is occurring in areas with pioneering woody plants—further informing land managers how small increases in

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woody plants may affect grassland bird abundance regardless of patch size.

Parental compensation, signaling, and long-term mate retention in wild songbirds.*M Mash, K Miller, K O'Neil, S Green, R Pell, E Bowers***Presenting author: Madison Mash, mlmash@memphis.edu*

Because mate quality can impact fitness, individuals employ various strategies to discriminate potential 'quality' differences between available mates. While morphological traits are the focus of many studies on mate preference, within-pair communication and coordination of parental care also have strong effects on mate preference and retention. Previous studies have found female preferences for male singing and provisioning rates, which inform females of male presence/reliability and overall investment into the current breeding attempt. However, females have also been found to prefer males that exhibit an inverse relationship between singing and provisioning rates. Implying that the ratio to which males invest in singing versus parental care behaviors may directly impact his probability of being retained as a mate in subsequent nesting attempts. Prothonotary Warblers (*Protonotaria citrea*) are a multi-brooded, biparental species with facultative male polygyny, making them a model species to examine how aspects of male song and parental care impact mate choice and retention. By comparing males that employed different strategies, we examined how that choice is related to future mating and reproductive success. Doing so by quantifying male singing rate and song frequency to examine their relationship with measures of mating ability, parental care, and reproductive success. Additionally, we assessed whether males exhibit compensatory singing and/or provisioning behavior after temporary, experimental removal of their female mate during the nestling stage. This ongoing project will elucidate the relative importance of mate communication and coordination of parental behaviors in mate choice and retention.

Nest microclimate and breeding ecology of American Goshawks (*Accipiter atricapillus*) in the Intermountain West**J Wilson, J Carlisle, R Miller, A Simler-Williamson, J Cruz***Presenting author: Jessica Wilson, jessicawilson506@u.boisestate.edu*

Forest dynamics are shifting in the western United States due to a combination of climatic and human-use factors which has consequences for forest-dwelling avian populations. Over the past two decades, occupancy and productivity trends across American Goshawk (*Accipiter atricapillus*) territories in the Minidoka Ranger District of the Sawtooth National Forest have declined. We aim to assess the relationships between nest microclimate, broad climatic factors, forest management practices, and how these factors contribute to changes in local goshawk populations. Nest microclimate has been linked to productivity in other bird species, but this has not been directly tested for American Goshawks. We hypothesize that nest temperature is influenced by changes in canopy cover, and that nest temperature affects productivity. Reduced canopy cover likely leads to increased nest temperature, which in turn is more likely to contribute to increased rates of nest failure, abandonment, and turnover. We will sample 90 known goshawk nest structures across 43 territories, deploying dataloggers in each sampled nest to collect nest temperature data across twelve months. Additionally, we will record nest tree canopy cover, neighboring tree density, and nest fate data for occupied nests. We will use generalized linear mixed models to quantify the relationships between canopy cover, nest temperature, and productivity. Last, we will use these relationships to predict goshawk productivity responses as forest canopy changes. We expect the results of this project to provide critical information about the microclimate conditions goshawks experience at the nest, and how this process can guide better-informed management action for goshawk populations.

Nesting Success of Grenadas Native Landbirds: Examining Depredation Rates of Invasive vs. Native Predators.**Z Nanji, N Koper***Presenting author: Zahra Nanji, nanjiz@myumanitoba.ca*

Bird population trends provide insights into ecosystems' overall health and functioning, making them vital environmental indicators. Nest predation is one of the most critical factors affecting avian reproductive performance and population growth, particularly in island populations. Due to their low genetic diversity, island avifauna are more vulnerable to extinction. Despite this vulnerability, many Caribbean islands lack nest fate data crucial for understanding population trends. This research focuses on Grenada's avifauna, which initially evolved without native mammalian predators until early European colonizers introduced several ground predators. To better understand the impacts of these exotic predators, we examined the nesting success of terrestrial birds, monitoring nest depredation rates by invasive and native predators. During the peak breeding season, April to July 2023, we found 250 active nests of 12 terrestrial species with open and closed-cup nests using behavioural cues and systematic searching. Searches were conducted at 2 sites with differing habitats at Belmont Estate on the north part of the island. Nests were monitored and checked every 3-5 days until the end of the breeding attempt. Early findings suggest that nest height and conspicuousness do not greatly affect success rates. However, open-cup nests were more likely to have fledged offspring than closed-cup nests. Identifying these factors is essential for effective conservation planning, enabling the development of targeted strategies to safeguard Grenada's avifauna, and inform conservation efforts for other threatened bird populations. Effective management practices are essential for ensuring the long-term survival of these vulnerable bird populations.

Territory Level Effects of Extreme Weather on the Reproductive Output of an Island Endemic Bird (*Aphelocoma insularis*)

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Territory size and quality, coupled with environmental variation, can be a major predictor of variation in reproductive success within a population during years of extreme weather. The Island Scrub-Jay (*Aphelocoma insularis*), an endemic bird to Santa Cruz Island, California, provides a model system for studying the effects of territory and individual quality on reproductive output. Breeding pairs maintain a year-round territory where each territory differs in size and vegetation composition. Our 15 year dataset captures periods of both drought and heavy precipitation. We predicted variation in reproductive output across territories reflects variation in territory quality, and in drought years, breeders on lower quality territories experience reduced reproductive output compared to breeders on higher quality territories. Alternatively, wet years will have a positive impact on reproductive output for all individuals regardless of territory quality. Data collected from two study plots was used to assess the relationship between reproduction, territory, and weather. One of the study plots had higher overall mean annual reproductive output than the other. There was also evidence of extreme weather affecting reproductive output. During drought years, reproductive output decreased likely due to lack of available resources. Conversely, wet years have a positive impact on reproductive output. We also test for possible correlations between individual quality, reproduction, and weather. These results can help to inform conservation scientists about how populations may respond to an increase in the frequency, severity, and duration of extreme weather events, which is an important consideration for population viability and management.

Evaluating nest success and migratory patterns of intermountain grassland species

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Understanding reproductive dynamics of songbirds is crucial for effective conservation and management strategies for species that depend on an ever-declining intermountain grassland ecosystem. Our study investigates nest success and migration patterns of three key intermountain grassland species: the Western Meadowlark (*Sturnella neglecta*), Grasshopper Sparrow (*Ammodramus savannarum*), and Vesper Sparrow (*Pooecetes gramineus*). We evaluated the impact of various restoration strategies on nest success of these species through systematic nest monitoring. Migration patterns and behavior were studied by attaching Motus tags (i.e., CTT Lifetags and Hybrid tags) to these species via rump mounted

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harnesses while on their breeding grounds. By tracking individual birds throughout their annual migratory cycles, we aimed to elucidate the timing, routes, site fidelity, stopover sites, and wintering locations critical for the survival of these species. Preliminary findings indicate variations in nest success rates among species and restoration effort. Additionally, our migratory tracking efforts reveal diverse migration strategies employed by the Western Meadowlark, Grasshopper Sparrow, and Vesper Sparrow, highlighting the importance of incorporating habitat connectivity and conservation corridors into grassland management plans. By integrating nest success and migratory data, this study contributes to a comprehensive understanding of the ecological requirements and vulnerability of intermountain grassland bird species. Such insights are essential for informing targeted conservation actions aimed at safeguarding these avian communities in the face of ongoing environmental change.

City living in the North: Comparing environmental, phenotypic and life history traits in Snow Buntings nesting in a novel urban environment

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Urbanization is increasing worldwide, profoundly affecting the environment and biodiversity, leading to changes in urban animal behavior, physiology, and fitness. Most studies to date examining the impact of urbanization on wildlife have occurred at southern latitudes, resulting in a knowledge gap for northern communities. However, climate change and urbanization in the North may synergistically affect life history decisions. Although individuals may adjust reproductive investment to maximize success in response to environmental variation, our understanding of how and why cold-adapted species respond to the effects of climate change and urbanization, and the impact those responses have on breeding success and fitness, remains very limited. This study aims to investigate how Snow Buntings (*Plectrophenax nivalis*) respond to climate change within an urban environment. Our objective is to determine whether there are differences in environmental conditions, life history traits, and breeding decisions between two different populations of Snow Buntings nesting in an urbanized environment (Iqaluit, Nunavut, Canada), and a more traditional tundra environment (East Bay Island, Nunavut, Canada). We will use breeding, banding, and weather data from Iqaluit from 2022-2024 and East Bay Island from 2007-2023 to compare a variety of traits including temperature, laying phenology, chick growth, and nest success between the sites. Overall, the work will provide valuable insight into whether a declining Arctic songbird can flexibly adjust investment decisions to maximize performance and fitness in response to the cumulative effects of urbanization and climate change. By quantifying the mechanistic drivers of fitness outcomes, results can then be used to develop predictive models assessing the expected impacts of future changes coming to the north, providing much-needed policy guidance for conservation efforts and policy changes designed to support populations of Arctic breeding birds.

****Is Timing Everything? Examining the importance of the timing of parasitism to cowbird chick success**

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Brood parasitism is a reproductive strategy whereby parasitic offspring are raised by an unrelated host. Brown-headed Cowbirds are North America's most widespread avian brood parasite and successfully parasitize 140+ host species. Cowbird females typically parasitize during the narrow window of the host's laying period before the start of incubation, resulting in their chicks hatching before the host's. Despite extensive cowbird research, female cowbirds are cryptic and difficult to monitor during egg laying, and it's unknown if female cowbirds incur reproductive costs by laying eggs in host nests outside the host laying period. Single cowbird eggs were added experimentally to the nests of Prothonotary Warblers (*Protonotaria citrea*), a common cowbird host, at different stages of host nest progression to simulate

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different cowbird parasitism timing decisions. This manipulation resulted in cowbird eggs hatching early, synchronously, or late relative to warbler eggs. We compared hatching synchrony and success between cowbird and host eggs, as well as growth, health, and survival of the chicks across the 3 treatment groups. We predicted that cowbird eggs experimentally added 'late' to host nests would have lower hatching success, slower growth, and lower fledging success compared to cowbird eggs added to nests prior to onset of host incubation (the natural condition). Data from the first field season documented little difference in cowbird hatching success across treatments (overall hatching success = 93%, $n = 28$). Survival varied between treatments: of 26 cowbirds, only 7 (27%) fledged: 5 (50%) early hatch, 2 (29%) synchronous hatch, and 0 (0%) late hatch. Growth and health analyses are pending. Another field season will bolster sample sizes, allowing us to determine the strength of selection on female cowbirds to time parasitism correctly. Advantages from accurate timing, like early hatching, are likely an important factor shaping how brood parasites select hosts and d

Trends in demographic rates of the Brown-capped Rosy-finch (*Leucosticte australis*) and their relationship to annual variation in snow cover

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Brown-capped Rosy-finches (*Leucosticte australis*) are a range-restricted species that breed at high elevations in Colorado with small populations in Wyoming and New Mexico, USA. Their reliance on alpine environments throughout their annual cycle and their preference for foraging on snow and wet tundra has raised concerns about the impact of warming temperatures and declining snowpack on the species. To address these questions, we examined annual survival using a 13-year mark-recapture dataset from the Sandias Mountains and annual changes in juvenile-to-adult ratios of Brown-capped Rosy-finches using data from the Bird Banding Lab to look for trends in demographic rates. We also examined whether survival or juvenile-to-adult ratios were associated with annual variation in the date of disappearance of snow cover or peak snow water equivalent. We found strong support that annual survival was influenced by residency status, age at first capture, and that resident survival declined over time. We also found some support for a decline in the juvenile-to-adult ratio over time. Snow disappearance date and peak snow water equivalent declined over the period, we will examine the association between the snow measures and demographic parameters. The decline in survival and juvenile to adult ratios over the period of study suggests that Brown-capped Rosy-finch populations may be vulnerable to environmental changes associated with global warming.

***Determining the relative importance of climate change and land-use effects on avian communities**

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Presenting author: **Shannon Reault**, National Audubon Society, shannon.reault@audubon.org

Global changes are driving shifts in avian abundance and distribution across biomes. While it is known that both climate change and land-use/land-cover (LULC) changes are important drivers of avian dynamics, a detailed mechanistic understanding is lacking. In-depth knowledge of environmental factors required to successfully implement conservation and mitigation efforts. We assess the relative importance of each driver in explaining bird occurrence trends from 2000 – 2017 across the continental United States at a 1 km resolution. We represented climate change as the trend in annual climate departures from 1970-2017, and LULC change was calculated as change in proportional cover classifications over the same period. Using an integrated community occupancy model, we generated avian occurrence trends for hundreds of species across six U.S. biomes. We then correlated trends via a post-hoc analysis with our measures of climate and LULC changes to determine the relative importance of the two drivers for individual species and whole communities. Our work provides essential insight into retrospective drivers of changes in avifauna distributions, which is a critical step in refining forecasts of distributional dynamics under anticipated global changes.

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Multiple stable isotope analyses of ancient and modern Adélie penguin bone collagen from the Ross Sea, Antarctica**V Munoz, S Emslie***Presenting author: Valerie Munoz, University of North Carolina at Wilmington, vam1389@uncw.edu*

The Ross Sea region of Antarctica currently supports approximately 1/3 of the world's population of Adélie Penguins (*Pygoscelis adeliae*). This species is an important marine indicator due to its unique life history requirements. It also has the longest traceable past record, extending to over 27,000 years of any extant seabird and builds pebble nests each year that help form ornithogenic soils that preserve paleoecological specimens (bone, feathers, eggshell and hard parts of prey in guano). Here, we apply stable isotope analyses of $\delta^{13}\text{C}$, $\delta^{15}\text{N}$, and $\delta^{34}\text{S}$ of ancient and modern Adélie Penguin bone collagen to investigate changes in diet and foraging grounds at six colonies in the Ross Sea over the past 4000 to 5000 years. Bone samples from active and abandoned colonies spaced north to south in the Ross Sea were collected over the past 20 years. Collagen was extracted using a 0.5 M EDTA chelating solution and then analyzed through a continuous-flow stable isotope mass spectrometer. Results of these analyses indicate the persistent use and importance of polynyas in the Ross Sea for Adélie Penguin foraging. Changes in climate and sea ice conditions, past and present, allow prediction of future penguin nesting and foraging grounds that will aid in the conservation of this species. This study is the first to apply multiple stable isotope analyses to investigate a living species of seabird over millennia in a region where it still exists today.

****Bird community composition along an elevational gradient in Gaurishankar Conservation Area (GCA), Nepal****A Kattel, M Buchha Magar, P Ghimire***Presenting author: Angel Kattel, angelkattel21@gmail.com*

The distribution of species along latitudinal and elevational gradients has always been an interest in ornithology, especially to answer why some species prefer certain altitudes and elevations. Species range in mountains are known to be driven by thermal regime and species competition. Although there have been great studies from the Andes and European mountains, little is known about the Himalayas. What is known about species distribution in the Himalayas comes mostly from the eastern and western Himalayas with the central Himalayas being relatively unexplored. Therefore, we study avian species composition along an elevational gradient in the most unexplored part of Ramechhap, Nepal along the Jatapokhari-Panchpokhari trekking trail, located within the Gaurishankhar Conservation Area. The data was collected along an altitudinal transect ranging from 1800m asl to 4600 m asl with a total of 81 points (points taken every 200 m on the transect). Birds observed around a 100 m radius were recorded from each of these points during the post-monsoon season in the month of October. We recorded a total of 433 birds of 87 species belonging to 32 families and 7 orders. We found a decrease in species richness and abundance with the increase in elevation along rhododendron and Juniper-rich Forest Mountain landscapes. The highest species richness was found between 1800-2200 m asl and abundance was recorded at 1900 m asl. The most common species observed were the Gray-hooded Warbler, Green-backed Tit, Plumbeous Redstart, Rufous Sibia, Oriental Turtle Dove, and Black-faced Laughingthrush. The species that was recorded as having the largest elevation range was Large-billed Crow recorded at 1800 m and 3875 m asl. Roads and infrastructure development observed along the trail, fragments the habitats along an elevational gradient disrupting the movement of species along the gradient. So, efforts to conserve mosaic habitat elevational as corridors should be done to aid species survival.

Landscape-scale influences on the value of shade coffee to migratory birds in mixed-species flocks**L Crenshaw, A Rodewald***Presenting author: Leah Crenshaw, Cornell University, lccrenshaw17@gmail.com*

Declining populations of migratory birds have created an urgent need to identify conservation solutions

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that accommodate social and environmental needs. Shade-grown coffee is one such solution that can support human livelihood and bird populations. Most research on shade-grown coffee has focused on farm-level characteristics and their effect on avian abundance and diversity. We still poorly understand how environmental attributes at larger spatial scales influence migratory birds. Our research will fill this gap by investigating how local- and landscape-scale habitat characteristics influence mixed-species flocks in Panamanian Highland coffee farms. We hypothesize (1) shade-grown coffee offers greater vertical structure complexity, thereby supporting larger, richer flocks and (2) the positive effects of shade-coffee are greater in areas with high surrounding forest cover. From January to March, we conducted transect surveys at 48 sun-grown coffee, shade-grown coffee or forest sites. We followed mixed-species flocks to quantify diversity and relative species abundance. We used on the ground and remotely-sensed habitat surveys to determine local and landscape-scale habitat characteristics. Analysis is now underway. We will use two-factor ANOVAs to determine the effects of local- (sun, shade, forest) and landscape-scale (<40% or >40% forest cover at 2km) habitat on mixed-species flock size, richness, and encounter rates. We will also use a community assemblage model using guild proportionality to understand niche availability/utilization. This work will elucidate the multi-scale relationships between migratory birds and agroforestry practices and help to develop sustainable tropical agriculture.

Using remote sensing to unveil the associations between habitat and functional diversity in a community of tropical resident birds.

R Galvan, J Gomez, C Rutt, O Jamarillo, J Brawn, H Pollock, G Prata, E Broadbent, C Tarwater

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Climate change, land use change, and other anthropogenic disturbances are altering habitats worldwide, impacting the species that rely on these habitats. Nevertheless, in most environments we do not have a good understanding of how different metrics of habitat influence species, making it challenging to predict how communities will respond to future habitat change. Studies often focus solely on the roles of temperature and precipitation in influencing species. However, habitat productivity and heterogeneity often have stronger associations with functional diversity. Here we asked how habitat productivity and heterogeneity influence functional diversity for a community of birds in a tropical forest. Field work took place in Soberanía National Park in Central Panama. We conducted point counts of birds in the wet and dry seasons. We used LIDAR to evaluate a suite of metrics associated with habitat heterogeneity at multiple spatial scales and we used Landsat data to evaluate metrics associated with habitat productivity. To evaluate how habitat metrics influence functional diversity we used N-mixture models and generalized additive mixed models (GAMMs). Given the recent findings of widespread bird declines across the tropics, understanding the links between habitat metrics and functional diversity is particularly important in this region of the world.

Dietary composition and partitioning in Ecuadorian hummingbird communities

L Wilson

Presenting author: Liam Wilson, University of Guelph, lwilso26@uoguelph.ca

Hummingbirds (Trochilidae) are a highly diverse and primarily nectivorous group of birds. However, they also feed on small invertebrates to supplement their diet with protein and other nutrients. Despite this, invertebrate consumption and how invertebrates fit into the food network of hummingbirds is largely unknown. As such, our study aims to use DNA metabarcoding, a DNA-based identification method, to determine the diet of 29 hummingbird species from Ecuador. With this information, our goals are to 1) determine if beak morphology (length, width, shape) or habitat elevation impacts invertebrate composition in the diet, and 2) explore whether hummingbirds partition their invertebrate diet similar to their floral diet. To do this, hummingbird stomach contents of recently collected museum specimens will be metabarcoded using both invertebrate and plant primers. The identity of invertebrate species will then be compared to hummingbird beak shape and habitat elevation to determine if these factors influence invertebrate prey choice. Overlap in the floral and invertebrate diet of community members will also be examined to highlight dietary resource use. It is expected that the results from this study will emphasize tropical

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hummingbird dietary networks and the factors which influence resource use between species. With this information, we hope to aid in combatting the population decline of at-risk hummingbird species and the plants which rely on them for pollination. In addition, this study will allow for further examination of tropical hummingbird community dynamics and add to the current set of primary literature concerning their ecology and evolution.

***Waterbird Bioenergetics of Impounded and Sheetflow Great Salt Lake Wetlands**
L Head

Presenting author: **Lauren Head**, Utah State University, lauren2975@gmail.com

The Great Salt Lake ecosystem, located in northern Utah, is facing serious and unprecedented threats due to extreme droughts and water diversions that have significantly reduced water levels in both the pelagic region and in the wetlands that follow the lake's eastern shoreline. Millions of migratory waterfowl and shorebirds (waterbirds) rely on the diverse and abundant macroinvertebrate and vegetative foraging resources provided by the hypersaline pelagic region, as well as the extensive network of brackish and freshwater wetlands that feed into the lake. However, the energetic capacity of GSL wetlands has been historically understudied. Impounded wetlands were developed by state and federal biologists as a tool to manipulate water depths and manage habitat specifically for the millions of birds that utilize these areas during the nonbreeding season, whereas surrounding non-impounded sheetflow wetlands are subject to more variable flows and habitat changes. Due to the uncertainty of how drought and water diversion will continue to affect this ecosystem, there is a need for updated research on the bioenergetic value of impounded and non-impounded sheetflow wetlands around the Great Salt Lake to ensure that there are enough foraging resources to continue to support the large waterbird populations that rely on these wetlands for spring and fall migration. Six representative wetland areas, including four impounded waterfowl management areas and two unmanaged sheetflow wetlands have been selected to assess foraging resource availability and monitor waterbird populations during spring (April-August) and fall (August-November). This research presents methodology and preliminary results for quantifying macroinvertebrate, seed, and vegetation resource availability in relation to environmental variables such as depth, turbidity, and salinity, as well as preliminary assessment of waterbird densities and abundances at each area.

Identifying appropriate buffer zones to limit impacts of boating activity on snail kites (*Rostrhamus sociabilis plumbeus*)
L Elmquist, R Fletcher

Presenting author: **Lara Elmquist**, lelmquist@ufl.edu

Anthropogenic disturbance is an increasing threat to animals as the human population continues to grow and spread to natural environments. One source of human-driven disturbance is recreational boat traffic, which can negatively impact foraging and nesting success of bird species. Management strategy to reduce these impacts often includes restricting human activity near important locations for sensitive species, including the use of buffer zones. Many of these zones are calculated using flight initiation distance (FID). Flight initiation distance is a common metric that can capture the trade-off between fitness benefits and costs in a species in its response to disturbance. The Everglade snail kite (*Rostrhamus sociabilis plumbeus*) is an endangered wetland-dependent raptor species that benefits from the use of buffer zones around its nesting habitat. These zones were established using FID from perched snail kites without reference to nesting locations, yet they are currently applied to breeding birds. To test whether there are differences between FID of breeding and foraging birds, we measured FID of snail kites at nests and on individuals not displaying breeding behavior. In 2023-2024 breeding seasons, we did experimental trials to determine FIDs on over 200 individual snail kites. Results suggest that FIDs for nesting kites tend to be higher than foraging kites. We discuss these differences in the context of buffer zones currently implemented for snail kites and other sources of information (e.g., return times to nests) that might better supplement FIDs for reliable management decisions.

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The relationship between human interactions and Canada jay (*Perisoreus canadensis*) habitat use and distribution in the Northeast United States

M Postava-Davignon, C Carter, N D'Antonio, J Long

Presenting author: **Marielle Postava-Davignon**, Virginia Wesleyan University, mpostavadavignon@vwu.edu

Canada jays are charismatic and curious birds that have a long history of interacting with humans to varying degrees. Recently, it has become common practice in popular recreation areas to purposely seek jays to interact with them, and even hand feed them. Because of the increase in recreationists interacting with jays, there is increasing concern that jay populations in these areas will also increase, putting higher nest predation pressure on the songbird community. Preliminary data collected in our research group has demonstrated that jays inhabiting areas where they are frequently fed by humans exhibit higher levels of nest predation on decoy songbird nests. While the majority of Canada jays inhabit boreal forests in Canada at lower elevations, populations of jays in the Northeast United States have established in high elevation alpine forests. These forests can have very different forest structure, resource availability, and host a unique community of songbirds, many of which are in decline. In order to fully understand the relationship between human activity and jay presence, we aimed to quantify where jays are exposed to the highest levels of human interaction, and how jay appropriate habitat varies and is distributed in the Northeast US. We used ground surveys, crowd sourced data, citizen science surveys, and remote sensing data to map jay and human activity levels, and jay habitat distribution. We then used this map to calculate which factor(s) are the strongest predictors of jay habitat use.

Grassland bird abundance and reproductive success across a gradient of agricultural land use in Tompkins County, New York

M Gilbert, A Eppedio, A Dokter, D Bonter

Presenting author: **Matthew Gilbert**, matthewgfrommaine@gmail.com

Grassland birds are experiencing the most significant population declines of any group of terrestrial bird species in North America. The Bobolink (*Dolichonyx oryzivorus*), a common grassland bird of the Northeast and Great Plains, is currently declining at a rate of 3.2% annually in New York State, largely due to changing agricultural practices. In May-July of 2023 we conducted point counts, nest searching surveys, and nest monitoring at three grassland sites under different management regimes within Tompkins County, New York to understand what factors are associated with population density and breeding success of Bobolinks. Our results demonstrate that higher mowing frequency (for hay harvesting) is associated with lower abundance of Bobolinks, and that any mowing during May or June resulted in no observed reproductive success. Larger patch sizes and greater isolation from non-grassland habitats were important predictors to greater Bobolink abundance. Of our three intensively-monitored sites, only the site managed specifically for grassland birds by restricting mowing supported successful Bobolink reproduction. Phenologically, all successful nests fledged by June 20, suggesting that harvesting after that date would facilitate grassland bird reproduction in our study area. Notably, the site managed for grassland birds also hosted large flocks of Bobolinks during the post-breeding dispersal period. Based on our findings, we recommend delaying mowing at large patches of grassland habitat until at least late June in our study region.

No change in Golden-winged Warbler (*Vermivora chrysoptera*) abundance in Highland County, Virginia over the last decade

S Fishman, L Bulluck

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Monitoring avian abundance is critical for understanding and responding to local population trends, especially in declining, at risk species. Golden-winged Warblers (*Vermivora chrysoptera*; hereafter GWWA) are a rapidly declining migratory songbird currently being considered for listing under the US Endangered Species Act. During the breeding season, this Nearctic-Neotropical species occurs in two primary regions, the Great Lakes, and the Appalachian Mountains, and they are experiencing much

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steeper declines in the latter. We conducted surveys at 266 points in a regional hotspot for GWWAs in Virginia, 126 of those surveys were conducted in both 2014 and 2023. Between the two time periods, the overall mean change in GWWA relative abundance across sites was 0, while several sites increased or decreased by 1-2 birds. Across all survey locations in 2023, we observed 172 GWWA breeding pairs, and several more opportunistically between survey locations. Hybrids and Blue-winged Warblers increased from being at 4.1% of the survey locations in 2014 to 7.9% in 2023. This relatively stable population of GWWA over the last decade can be attributed to the region's high elevation (>2500 ft) and habitat on private working lands. Management of shrubs and forests on these private lands mimics natural disturbance that no longer occurs in this region, resulting in a mosaic of early successional habitat in a primarily forested landscape. Efforts are underway to expand suitable breeding habitat from current GWWA occupied sites in this region.

Seasonal and breeding phenologies of 38 grassland bird species in the midcontinent of North America

G MacDonald, M Anteau, K Ellis, L Igl, N Niemuth, J Vest

Presenting author: Garrett MacDonald, garrett.john.macdonald@gmail.com

Grasslands in the midcontinent of North America are highly imperiled, and grassland birds have suffered the largest bird declines of any terrestrial biome in North America in the last 50 years. Consequently, the conservation and management of grasslands, as well as their associated avian communities, are major priorities for the State, Provincial, and Federal agencies, non-governmental organizations, and private entities that influence the millions of hectares of grasslands in the midcontinent. Resource managers often deploy disturbances to grasslands (for example, grazing, haying, and burning) to maintain or enhance their quality or structure, but the timing of these disturbances has the potential to disrupt the nesting activities of grassland birds. We compiled two types of phenology information for 38 species of non-waterfowl, grassland-nesting birds across four author-defined regions including 18 States and 3 Provinces in the midcontinent of North America: (1) species- and region-specific arrival and departure dates from the eBird database, which indicate when a species may be assumed to be present in a region, and (2) reported dates of nesting activity for each species (start and end dates of nesting as well as total duration) from published bird distribution and occurrence books and breeding bird atlases, which indicate when a species may be assumed to be nesting. This previously available but widely dispersed information, compiled for the first time, will aid resource managers and inform their decisions about the timing of disturbances while minimizing grassland management effects on nesting birds.

Quantifying suitable habitat for an endangered falcon population under climate change

J McCabe, P Juergens, B Mutch, T Anderson

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Ensuring quality and quantity of habitat for reintroduced species is perhaps the most important factor in determining the potential success of reintroduction efforts, especially as climate change shifts distributions. Northern Aplomado Falcons (*Falco femoralis septentrionalis*) were extirpated from the US due to habitat destruction, pesticide, and woody encroachment (predatory owl habitat) into the coastal grasslands required by this falcon. Past release efforts re-established this endangered falcon in South Texas. However, there has been no recent work to identify suitable habitat on the landscape. Here we, 1) quantified and map suitable breeding habitat, using occupancy models, and 2) broadly explored the potential effects of climate induced sea level rise on suitable habitat under global climate predictions for 2100. Probability of occupancy was negatively related to the percent of grassland when the nest site contained < 47% grass, while occupancy was highest when the percent of grassland reached 67%. As woody vegetation increased, occupancy decreased significantly, suggesting that although falcons prefer to nest in areas of open areas, some woody vegetation is desirable to sustain adequate prey. Yet,

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increased woody vegetation near nests may provide perching locations for predatory owls. Approximately 31% of the study area was found to be suitable. Of the suitable habitat, 4-30% may be lost due to sea level rise by 2100. This work will assist in the revision of the N. Aplomado Recovery Plan and help managers locate areas for habitat restoration, land acquisition, and determine the potential for reinstating a release program.

Fire shapes songbird communities in sagebrush ecosystems**W Harrod, R Eggleston, R Carter, D Dahlgren***Presenting author: William Harrod, Utah State University, will.harrod@usu.edu*

Altered fire regimes have profoundly shaped sagebrush ecosystems in western North America. Invasive annual grasses have led to more frequent fires in some areas, while fire suppression has led to conifer encroachment in others. Historically, the effects of fire have been studied more extensively in the greater sage-grouse than in other avian taxa. The recent decline of pinyon jays has highlighted the need to manage for multiple avian species within the great basin rather than focusing on a single species. With that in mind, we are studying how fire shapes the distribution of four sagebrush-associated species (Brewer's sparrow, sage thrasher, sagebrush sparrow, and green-tailed towhee) and three grassland-associated species (vesper sparrow, western meadowlark, and horned lark) across heterogeneous sagebrush landscapes in northern Utah and southern Idaho. We are using a chronosequence approach, placing point count transects within fire perimeters that burned between 1996 and 2020 and pairing each of these with a reference transect outside of any known fire parameter. All avian species observed from each point along the transect are recorded and binned by minute of detection and radial distance from the point. This method allows for simultaneous estimation of abundance and detection probability when analyzed in a hierarchical framework. Our goals are: (1) to construct density maps for each of these species and observe how fire shapes their distribution, (2) forecast how future fires will affect these distributions throughout the northern great basin, and (3) compare how each species correlates to sage grouse and pinyon jay abundance. We will be finished with field work for this project by July of 2024 and plan to present final results by spring of 2025.

Tracking Our Tiniest Birds*D La Puma, M Tucker, S Bonfield***Presenting author: Susan Bonfield, Environment for the Americas, sbonfield@environmentamericas.org*

The Western Hummingbird Partnership, in collaboration with Cellular Technologies and UC Riverside, launched a study to examine the use of new tags on our smallest birds, hummingbirds. We developed a protocol in partnership with UC Riverside, where hummingbirds in enclosures are fitted with the tags and then observed to examine if their behavior and flight are changed as a result. This poster will share details about Cellular Technologies' hummingbird tags, the results of the study, and the implications for hummingbird research and conservation.

****Habitat Use of Henslow's Sparrows (*Centronyx henslowii*) in Southern Ohio****G Lindsey, K Williams, C Dykstra, A Wegman***Presenting author: Gabriella Lindsey, Ohio University, gl629919@ohio.edu*

Grassland birds have narrow habitat requirements which are influenced by food availability, habitat composition, and habitat structure. Because survival is dependent on habitat use, understanding these requirements is critical for conservation. We determined how Henslow's Sparrows (*Centronyx henslowii*) use grassland habitat in the breeding season. We deployed nanotags on 47 adult Henslow's Sparrows at two sites in Southern Ohio to determine home range size and habitat use in relation to distance to edge and shrub. We predicted that Henslow's Sparrows would use core grassland habitat and avoid edge and shrubs. We found no difference in home range size between female and male Henslow's Sparrows. Henslow's Sparrows used shrubs when available and edge habitat as refugia after disturbance. We also found that Henslow's Sparrows use fields beyond the dates recommended for disturbance which suggests the need to leave corridors and patches for refugia after management.

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Shorebirds and the shrimp factory. Shrimp farms serve as feeding areas for shorebirds in Marismas Nacionales, Mexico**C Salinas, E Bolado, H Salazar, M Moreno***Presenting author: Carlos Salinas, Universidad Autonoma de Nayarit/SuMar AC, carlos@sumar.org.mx*

Each year, around 120,000 shorebirds arrive in Marismas Nacionales, Mexico, to spend the winter, with December and January being the months in which the highest number of these organisms are found in the region. During these months, shrimp farms empty their ponds, leaving them without water and creating important feeding grounds for birds. In the region, there is a large number of shrimp farms, as it is one of the areas with highest production of farmed shrimp in Mexico. However, the extent of shrimp farms in Marismas Nacionales and how birds use them as habitat are not precisely known. Therefore, our research conducted shorebird surveys on five shrimp farms (150 acres) during the months of December and January from 2021 to 2023. The shorebird surveys were conducted over three days after the ponds were emptied, and the potential of the farms as feeding grounds was also assessed using satellite imagery. The results showed the presence of 28 shorebirds in the shrimp farms, with 14,400 birds sighted in the two seasons. The maximum number of organisms found on a single pond was 5,600 birds, 40% of which were Western Sandpipers and Least Sandpipers. Additionally, 17,000 hectares of shrimp farms were identified in the area that could serve as feeding grounds for shorebirds. It is important to raise awareness among shrimp farmers about the importance of not disturbing birds, as they play a crucial ecological role in eliminating fauna harmful to crops, in addition to their importance as organisms in Marismas Nacionales.

From the edge of Earth to the entire planet: World's southernmost Motus station, challenges, and opportunities in the Cape Horn Biosphere Reserve*M Troncoso-Villar, R Jara, E Travera, R Cañoles, C Valeris-Chacín, J Rivero de Aguilar, R Gates, T Poma, R Rozzi***Presenting author: Matías Troncoso-Villar, University of Magallanes, matias.troncoso@umag.cl*

At the southern tip of South America, where the Pacific and Atlantic flyways meet, lies the Cape Horn Biosphere Reserve (CHBR; 56°S), a critical area for global biodiversity conservation. This reserve serves as non-wintering ground for long-distance migrants such as Baird's Sandpiper, White-rumped Sandpiper, and Greater Yellowlegs, as well as a breeding ground for neotropical shorebirds like the Rufous-chested Dotterel, playing a vital role in supporting avian populations. However, despite its importance, the understanding of migratory shorebirds inhabiting the CHBR remains limited. To address this gap, we established the southernmost Motus station, in Puerto Williams, Chile (55°S) in January 2024, a collaboration between the Cape Horn International Center (CHIC) and Centro de Ornitología y Biodiversidad (CORBIDI). This initiative aims to unravel fundamental aspects of the ecology of migratory birds in the Americas. Interdisciplinary efforts have supported citizen engagement in understanding the Motus station and its significance through open-access workshops for the local community. Early data collected from the Motus station are already providing insights into bird migration patterns and routes. Discussions are underway regarding the potential expansion of this stations to cover additional pathways near Tierra del Fuego and the Diego Ramírez Marine Park, the southernmost place in the Americas.

****Effects of Heavy Metals on Migratory and Resident Passerine Birds at the Tar Creek Superfund Site****A Triemstra, E Bridge***Presenting author: Abigail Triemstra, triemstra@ou.edu*

The Tar Creek Superfund Site (TCSS) is a forty-square-mile former mining area in Northeast Oklahoma characterized by heavy metal contamination; primarily lead, cadmium, and zinc. Previous research in this area has determined that humans and wildlife in the vicinity suffer from elevated levels of these metals. Thus, I am investigating how exposure to these contaminants is affecting several species of migratory and nonmigratory birds and how the effects may differ between residents and migrants. The effects I am

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looking at include metal accumulation in feathers and blood, stress, blood cellular components, and susceptibility to avian malaria. To carry out this work, I have captured birds at several places within the TCSS, at two sites within a few miles downstream of the TCSS, and at a reference site over twenty miles away and completely outside of the watershed. The species targeted for this include residents such as Northern Cardinals, Tufted Titmice, Carolina Chickadees, and Blue Jays, as well as winter migrants such as White-Throated Sparrows and Dark-Eyed Juncos. As summer migrants such as Painted and Indigo Buntings arrive, I will capture and take samples from them as well. Blood, body measurements, and feather samples are being taken from all birds and will be used to analyze the health markers mentioned previously. I expect to obtain results from these analyses within the next several months, using them to determine whether birds within the TCSS differ from birds outside in terms of these health markers, as well as whether the heavy metal contamination has different effects on migratory birds than birds that spend the entire year in the TCSS.

Monitoring daily and seasonal rhythms of roosting blackbirds using acoustic recording systems and comparing signal intensity with in-field blackbird counts

M Stagl, P Klug, J Duttenhefner

Presenting author: **Michelle Stagl**, NDSU, mstagl26@gmail.com

Blackbirds (Icteridae) are a common pest of agricultural fields, specifically sunflower fields, in North Dakota. To effectively mitigate this damage, knowledge of blackbirds' movements across the landscape is needed. Autonomous recording systems (ARS) are monitoring devices that provide a noninvasive method for monitoring large aggregations of birds in difficult to reach habitat. We placed eight ARS in cattail-dominated wetlands (night roosts = 2, day roosts = 6) in North Dakota from September to November (2023) to monitor blackbird (Icteridae) aggregations (06:00AM to 09:00PM). We conducted in-field surveys to evaluate if the number of blackbirds present within 50 m of the ARS could be correlated to the sound intensity from avian calls. We established daily phenology at night roosts, including time of first call, roost departure (morning) and return (evening), and daytime loafing activity (i.e., dB patterns throughout the day). We also evaluated daily phenology of blackbirds occupying cattail roosts within sunflower fields (i.e., day roosts), including arrival (morning) and departure (evening), and timing and intensity of midday loafing periods. We evaluated seasonal fluctuations of avian densities in night roosts, given birds do not roost in the same position or even the same roost every night, and identified the progressive reduction in density as fall migration advanced. Understanding the density of blackbirds in roosting habitat will inform the timing and effectiveness of methods aimed at reducing local blackbird numbers and spreading blackbirds across the landscape to reduce blackbird damage to agricultural crops.

What Makes Wetland Easements Most Beneficial to Birds? A Critical Assessment of the Wetland Reserve Program Thirty Years In.

C Dobson, T Boves

Presenting author: **Colin Dobson**, Arkansas State University, cdobsonbirds@gmail.com

Over the past 100 years, wetland habitat has declined across the world. In the United States, in the 20th century, >50% of wetland habitat was drained and converted to other land uses, primarily agriculture, causing wetland dependent organisms to decline as well. To combat these losses, the United States federal government instituted the Wetland Reserve Program (WRP) in the 1990's, which pays farmers to convert farmland to wetland habitat. Since then, >1 million ha of wetlands have been restored. During this time, some wetland dependent species have increased (such as waterfowl), suggesting that this program has been beneficial. However, numerous other species, including many wetland-associated passerines, have continued to decline over this same time period. One potential way to reverse these declines is to continue to expand and refine the WRP. In this study, we are aiming to assess how characteristics of WRP easements are related to avian abundance and diversity and individual metrics (age, body condition, nest survival, and adult survival) of birds using these sites. To do so, we are conducting point counts, capturing, and resighting birds, and monitoring nests across an array of wetland easements in Arkansas to evaluate how size, age, landscape, and microhabitat of these parcels may be impacting birds

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at different scales. This study will ultimately show the importance of these easements for passerines but will also show the potential areas of improvement that could help curb the decline in wetland dependent passerine populations at least in the Mississippi Alluvial Valley.

***A bird's eye view on terminal lake decline: migratory species as a sentinel of change for terminal lakes along the Pacific Flyway?**

I Jorgensen*Presenting author: Isabel Jorgensen, University of Waterloo, ibjorgen@uwaterloo.ca*

Terminal lakes in the American West are critical stopover habitats for migratory birds on the Pacific Flyway. However, recent studies suggest that declines in the surface water extent of terminal lakes and their adjacent wetlands will diminish these habitats and cause shifts in migratory bird populations. Given the evidence that millions of migratory birds often rely on terminal lakes to feed and nest as they travel along the Flyway, such shifts would have large consequences for North American avifauna. This study aims to explore if long-term regional trends in bird populations on the Pacific Flyway are related to changes in the open surface water extent of terminal lakes, and identify which species are most sensitive. This is accomplished by combining 20 years of data on over 400 species from eBird and the Breeding Bird Survey and analyzing population trends against hydrologic data from the USGS Dynamic Surface Water Extent Landsat product. Expected outcomes are a greater understanding of the historic relationship between migratory bird populations and terminal lakes in the American West that refines a research agenda for fine-grained spatial studies and regional network analyses.

The science of haying regulations and the impact on grassland bird populations: Balancing conservation and agriculture

M Voss, R Welsh, T Langen, D Closson, C Olds, S Jackson*Presenting author: Margaret Voss, Syracuse University, mavoss@syr.edu*

Grassland bird species face declining populations due to habitat loss and degradation, a situation exacerbated by agricultural practices and climate change. The USDA Conservation Reserve Program (CRP) incentivizes farmers and ranchers to take agricultural land out of production for conservation purposes. However, under drought conditions, emergency haying and grazing are allowed on CRP land outside the critical period for grassland bird breeding, known as the Primary Nesting Season (PNS). Through structured interviews with USDA conservationists, state biologists, conservation organizations, other stakeholders, and informants, we investigate how PNS is determined in states with substantial CRP land and explore perceptions about the adequacy of emergency haying regulations to protect grassland birds. We summarize the existing research on phenological shifts in bird breeding and plant growth caused by changes in rainfall and temperature patterns and assess whether PNS dates and emergency regulations are adequately reviewed and revised in response. Aligning haying practices with shifts in rainfall, temperature, and less sensitive phases of bird breeding cycles can enhance conservation outcomes. Collaboration among ecologists, government agencies, and farmers and ranchers is essential for developing and implementing effective conservation-friendly agriculture policies. Our work underscores the need for ecologists to document climate-induced shifts in grassland phenology and disseminate findings to agencies mandated to conserve grassland birds and ecosystem health while supporting agricultural interests.

Best bird for buck? Evaluating the influence of a grassland restoration program on bird diversity in North Dakota.

A Herron, K Kading, B Link, S Johnson, S Ellis-Felge, A Boyce*Presenting author: Ashlyn Herron, University of North Dakota, Ashlyn.herron@und.edu*

Temperate grasslands are the most endangered and least protected ecosystem in the world, with agricultural conversion perpetuating continued loss. As a result, grassland avifauna have experienced the greatest population decline of all avian groups in the United States and Canada since 1970. Grassland

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restoration is a tool used to reverse habitat loss; however, success has traditionally been measured by the restoration effort, not by increased ecological function. The Meadowlark Initiative is 'a strategy initiated by the North Dakota Game and Fish Department, tapping into the collective insights, resources and efforts of conservation, agriculture and industry partners to enhance, restore and sustain native grasslands in North Dakota'. Additional partnership includes the U.S. Fish and Wildlife Service, U.S. Department of Agriculture- Natural Resource Conservation Service, and various federal, state, and non-government organizations. Grassland restoration efforts through The Meadowlark Initiative began in 2022, creating an opportunity to assess the outcomes of these efforts in ecologically meaningful terms. Our research aims to determine if occupancy of grassland obligate bird species increases on restored grasslands and on adjacent grasslands due to an increase in patch-size. To estimate avian occupancy on reseeded and native grassland, autonomous recording units were deployed on eleven properties across Western North Dakota from May to July 2023. Grassland bird species identification was extracted from sound files using BirdNET, a deep artificial Neural Network (DNN) classifier. We assessed habitat characteristics by determining dominant vegetation using a modified belt transect, structure using visual obstruction readings, and litter depth. Our results should provide an evaluation of the success of a grassland restoration program using avian responses as an ecological metric of return on investment. This research will evaluate grassland restoration as a habitat.

Tick infestation and pathogen consequences for Ohio Appalachian breeding bird species

A Rose, S Matthews*Presenting author: Anna Rose, rose.1472@osu.edu*

Tick populations and species diversity are on the rise in Ohio Appalachia resulting in now five medically relevant tick species as well as an increase in human tick-borne disease cases. In addition to other wildlife, birds have been identified as weak reservoirs and important transport vehicles for tick-borne infectious bacteria. Bird species that forage and nest close to the ground (particularly in low shrubs, vegetation, and in leaf litter), such as Ovenbird (*Seiurus aurocapilla*), Kentucky Warbler (*Geothlypis formosa*), and Blue-winged Warbler (*Vermivora cyanoptera*), are especially vulnerable to tick infestation. To dive into the mechanisms driving this pattern, my central research question explores how tick load varies between a ground nesting species, Ovenbird, and a mid-story nesting species, Wood Thrush (*Hylocichla mustelina*), at several southern Ohio field sites. Tick loads will be determined through nest searching, nest monitoring, and tick surveillance to observe tick abundance, species diversity, and life stage that are present in breeding adults and nestlings in the summer of 2024. I will identify how tick loads vary by nesting bird species, nest height (ground vs. mid-story nesting species), age (nestling vs. adult), and temporally throughout the breeding season. Higher levels of tick infestation have been shown to reduce nesting success and offspring quality in other passerine families, but not yet in warbler species. My research will aid in filling a significant knowledge gap on how tick burdens impact nestlings and adults and the role that birds play in spreading pathogens that perpetuate zoonotic diseases.

The role of avian hosts in an emerging tick-borne zoonosis in Arizona

H Deese, D Jackson, A VandenBrooks, S McNew*Presenting author: Henrey Deese, University of Arizona, henreydeese@me.com*

Birds are often important hosts for ticks and may serve as reservoirs and dispersers of zoonotic diseases. In southeast Arizona, the Gulf Coast tick (*Amblyomma maculatum* species complex) vectors the emerging pathogen *Rickettsia parkeri*, putting people who work or recreate in areas where ticks are found at risk of infection. To better assess the risk of *R. parkeri*, we need more information about the preferred hosts of its vector and its methods of dispersal. Here, we assess the capacity of birds to serve as hosts for immature life stages of *A. maculatum* and reservoirs for *R. parkeri*. We mist-netted birds in Pima, Santa Cruz, and

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Cochise counties of Arizona during the winter and spring of 2024. Birds were visually inspected for ticks and a small blood sample was taken to test for Rickettsia infection. In appropriate habitat for *A. maculatum*, avian hosts had high prevalence (~35%) and a mean intensity of >2 tick nymphs per infected bird. Species with the greatest prevalence and intensity of ticks include resident species such as Abert's Towhee (*Pipilo aberti*), Curve-billed Thrasher (*Toxostoma curvirostre*), and Song Sparrow (*Melospiza melodia*) and the winter residents including the Lincoln's Sparrow (*Melospiza lincolni*). We also recorded two species collection records for *A. maculatum* in Arizona: Northern Cardinal (*Cardinalis cardinalis*) and Pyrrhuloxia (*Cardinalis sinuatus*). These preliminary data suggest that birds are more important hosts for *A. maculatum* in Arizona than previously thought and that migratory species may disperse *A. maculatum* and *R. parkeri* to new areas. We discuss implications for management of *R. parkeri* in Arizona and future directions of research in this system.

Metagenomic characterization of the gut microbiome in Blackpoll Warbler individuals in non-breeding areas in Colombia.

A Morales Rozo, K Ciuderis Aponte

Presenting author: **Andrea Morales Rozo**, Universidad Nacional de Colombia, Universidad de los Llanos, anmoralesr@unal.edu.co

The Blackpoll Warbler (*Setophaga striata*) is a Neotropical-Nearctic migratory bird (NNMB) which has been undergoing a significant population decline since 1970. From an ecological and evolutionary perspective, microbiome plays critical roles in the immune system training and development, including multifold interactions in homeostasis and disease. Migration phases significantly influence the association between gut microbiome and host body mass and subcutaneous fat deposits in birds. Therefore, host-associated microbiome can be considered as a key component of natural selection. Despite the important role of gut microbiome in modulating many aspects of bird physiology to facilitate long-distance movements, few studies have characterized it in Blackpoll Warbler and other NNMB birds in non-breeding grounds. Thus, the aim of this pilot study was to describe the gut microbiome profile in Blackpoll Warblers during the non-breeding season in agricultural systems in the department of Meta, Colombia. Through a metagenomic sequencing approach (16S rRNA), microbiome composition of cloacal samples from 36 individuals were analyzed. Our preliminary analysis revealed a high relative abundance of Proteobacteria, Firmicutes and Actinobacteriota, while lower proportions of Cyanobacteria, Bacteroidota and Campylobacterota were observed. These results suggest that the microbiome of Blackpoll Warbler in South American non-breeding grounds may undergo adaptive remodeling while playing a potential role in physiological modifications for survival.

Transboundary Avian Zoonotic Infectious Diseases and Migratory Birds: Strengthening and Connecting Research and Surveillance Networks

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Presenting author: **Jeanne Fair**, Los Alamos National Laboratory, jmfair@lanl.gov

Globally, migratory birds are important reservoirs of emerging zoonotic pathogens, most notably highly pathogenic avian influenza viruses that are leading to massive die-offs of birds and mammals. To better predict and mitigate the impact of these avian-borne pathogens it is essential to build both the capacity of scientists in different regions to conduct surveillance efforts and collaborative networks to promote communication. In 2020, we initiated a project, called the Avian Zoonotic Disease Network (AZDN) to strengthen global biosurveillance of migratory birds along the Mediterranean and Black Sea Flyway that connects Europe and Africa. The partner countries are scientists in Georgia, Ukraine, and Jordan. Initially, the team is focusing on prevalence of avian influenza viruses and Newcastle disease virus in migrating waterfowl, shorebirds, and gulls. In landbirds, the focus is on presence of ticks (and pathogens they harbor) as well as the host microbiome. The team seeks to understand the determinants of transboundary disease propagation and coinfection in the region. The field and lab efforts are strengthening capacities for disease diagnostics, field biosafety, proper wildlife capture and handling, and vector sampling. Here, we share what is required to create and coordinate an international migratory bird surveillance program.

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We report the initial results for prevalence of avian influenza viruses in waterfowl in Georgia and Jordan and the microbial community of three landbirds species captured during spring migration in Jordan. Global surveillance programs are critical for ensuring scientists maintain research integrity and have the needed skills to sample and test wild birds using safe and ethical practices.

Urbanization and vector-borne parasitism in overwintering sparrow assemblages**T Verrett, D Becker, S Austin, B Demory, K Dyer**Presenting author: **Taylor Verrett**, tbverrett@ou.edu

Using urban habitats can alter disease dynamics in wild birds by influencing contact with parasites and susceptibility to infection. Land-use changes associated with urbanization may structure parasite transmission by altering the distribution of arthropod vectors and/or by moderating host immunity. We investigated how urbanization may drive patterns of pathogen infection in migratory birds by collecting infection data from overwintering sparrow assemblages across rural, suburban, and urban habitats in central Oklahoma, with an emphasis on locally common Dark-eyed Juncos and Harris's Sparrows. Birds were sampled during both winter and pre-migration spring, when infection patterns are expected to be governed by distinct seasonal processes (pre-migration immunosuppression and active vector transmission). We use PCR of a novel subgenomic RNA marker to test birds for recent infection with West Nile virus (WNV), and both microscopy and PCR to test for haemosporidian infections (e.g. avian malaria). Using generalized linear mixed effect models, we test how urbanization affects vector-borne parasitism across seasons. We predict infection prevalence and intensity will be higher in urban sites because of habitat-related stressors, especially before spring migration. In 2022 and 2023, we found birds wintering in rural habitats had more intense haemosporidian infections, but wintering in suburban habitats amplified spring infection prevalence. Our ongoing 2024 research contributes an additional sampling year, WNV diagnostics, and spatiotemporal estimates of vector activity using carbon dioxide traps. Results will also be contextualized with ongoing mathematical model development of how urbanization affects infection processes during winter and prior to spring migration. This study provides insights on how vector-borne disease dynamics may respond to urbanization in tandem with seasonal stressors in songbirds, which is timely given the rapid expansion of urbanized landscapes.

Temporal and spatial analyses of genetic diversity and stable isotope ecology in the Common Nighthawk (Chordeiles Minor)*A Harvey, S Bolinger, E Johnson, M Polito, N Mason**Presenting author: **Amanda Harvey**, Louisiana State University, amandaharvey2001@gmail.com

In recent years, rising sea levels and saltwater intrusion have impacted coastal habitat composition in the Gulf of Mexico, potentially reducing the reproductive fitness of native species unadapted to briny environments. The Common Nighthawk (*Chordeiles minor*) is an aerial insectivore that nests on open grounds along the beaches of the Gulf Coast. Between 1966 and 2019, *C. minor* had a cumulative population decline of 48%, dropping 1% each year. My study aims to combine field samples with museum specimens to study temporal change in trophic ecology via stable isotope signatures over the last century. My study will include ~94 feather samples that span the dates of 1937–2022. I will collect data on $\delta^{15}\text{N}$, $\delta^{13}\text{C}$, and $\delta^{34}\text{S}$ isotopic ratios to provide an integrative perspective on the trophic ecology and habitat use of *C. minor* by tracing primary producers, trophic level, and salinity content of food webs respectively. This is an ongoing project, and as we begin analyzing our data, I hypothesize that historical specimens will carry a different isotopic signature from contemporary samples, indicating temporal change in the trophic ecology of *C. minor* and food webs of the Gulf Coast. I will build upon this study by testing for loss of genomic diversity through time in Gulf Coast populations of *C. minor* due to their steep decline using a combination of historical and contemporary blood and tissue samples. These data will inform future conservation initiatives by providing an understanding of how this coastal breeding population is adapting to this changing environment.

Examining the effects of songbird nest boxes and land use on avian community

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composition and functional diversity in Napa Valley vineyards**E MacDonald, A Turner, C Pham, D Karp, M Johnson***Presenting author: Eleanor MacDonald, Cal Poly Humboldt, em648@humboldt.edu*

Agricultural expansion threatens biodiversity, but promoting native species like insectivorous birds in agricultural landscapes could benefit both biodiversity and farm productivity alike. Recently, some California winegrape growers have used nest boxes to promote biodiversity and attract insectivorous birds in an effort to help control insects. While early findings suggested nest boxes have a positive impact on bird functional richness and abundance, later research found no significant effect on avian community composition or pest control. This project addresses research needs using a before-after-control-impact experiment involving winegrape vineyards in Napa Valley, California that lie along gradients of local habitat and landscape complexity. The objectives of this study are to (i) examine how habitat and landscape composition influence bird communities and (ii) how the addition of nest boxes affects insectivore abundance. Avian point counts will be conducted for two seasons on 20 vineyards, 10 with existing nest boxes and 10 with nest boxes added between field seasons. Preliminary analyses of data from point counts conducted during the first season from April to June 2023 show that sites with nest boxes present had significantly higher abundances of Western Bluebirds and Tree Swallows; future analyses will examine the interactions between nest box presence, year, and habitat effects. We hypothesize that the addition of songbird nest boxes to winegrape vineyards attracts insect-eating birds, and these effects are mediated by local and landscape level characteristics. We also hypothesize that the beneficial effects of within-farm habitat complexity on bird abundance and diversity are mediated by the composition of the surrounding landscape.

How does forest management affect Cerulean Warbler breeding ecology and demographic rates in mixed-oak forest of the Ozark ecoregion?**E Saffle, T Boves***Presenting author: Ethan Saffle, ethan.saffle@smail.astate.edu*

Neotropical-Nearctic migratory songbirds are declining throughout North America and the Cerulean Warbler (*Setophaga cerulea*) is one of the fastest declining species. Among the contributing causes of the severe decline of ceruleans likely includes habitat loss and degradation via reduction of natural disturbances and incompatible forest management practices. Much of our understanding about the impacts of these habitat degradation, and management guidelines designed to mitigate these effects, come from research conducted in the Appalachian Mountains, while the Ozark ecoregion (home to likely the second largest breeding population of ceruleans) has largely been ignored with respect to this species. To understand if management guidelines developed for ceruleans in the Appalachians are transferrable to the Ozarks, we are assessing habitat selection, apparent survival, and reproductive output of Cerulean Warblers in managed (and unmanaged) forest stands of the Ozark-St. Francis National Forest in north-central Arkansas, USA. This study will provide valuable knowledge to private and public landowners about sustainable forest management for Cerulean Warblers (and possibly other associated forest dwelling songbirds) in this important, but often overlooked, ecoregion.

Assessing the impacts of gold mining to avian communities in the Peruvian Amazon*C Sayers, J Pisconte, C Vega, N Huaraca-Charca, L Huamani Valdivia, D Evers, L Fernandez, M Tingley***Presenting author: Christopher Sayers, UCLA, csayers2@ucla.edu*

The tropics support the richest avian communities on Earth, but face increasing pressures from resource extraction that may compromise international conservation and sustainable development goals. Gold mining has rapidly expanded throughout the Amazon Basin, resulting in widespread deforestation, hydrological change, mercury pollution, malaria transmission, and overexploitation. While each of these

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disturbances are important independent causes of biodiversity loss, their relative impacts remain poorly understood because they potentially interact with and amplify one another within mining landscapes. We introduce a multi-year campaign to isolate and quantify the impacts of gold mining on avian diversity in Madre de Dios, Peru, in which we leverage bird banding, bioacoustics, and remote sensing techniques to monitor the responses of individuals, populations, and communities along disturbance gradients and across land-use classes. Among our preliminary findings, we detect mercury concentrations in many taxa that exceed known thresholds for biological risk, as well as strong edge effects on species composition among artisanal gold mines, large-scale gold mines, and conservation reserves. As we continue to collect more data, this research stands to clarify mechanisms of ongoing biodiversity loss in Amazonia and inform future opportunities for sustainable gold mining at local to global scales.

****Exploring Movement Ecology and Demographics of Female Cerulean Warblers (*Setophaga cerulea*) in the Ozarks**

J Miranda, A Matthews, T Boves

Presenting author: **Jacob Miranda**, Arkansas State University, jacob.miranda@smail.astate.edu

The decline of North American bird populations, especially Neotropical-Nearctic migrant species, has driven the need for research for many avian species to better conserve them. However, most research on species of conservation concern has focused on males, while potential differences with females have been largely ignored. As we learn more about the ecology of female birds, however, it is becoming clear that crucial gaps in our knowledge of potential sex-specific behavior and life history exist, potentially impacting our ability to effectively conserve many species. One species where sex-biased research is evident is the Cerulean Warbler (*Setophaga cerulea*), a declining species of great conservation concern. Very little research on female Cerulean Warblers exists, largely because of difficulty in capturing and tracking them. To understand if both sexes behave similarly and face similar selective pressures, we developed techniques to capture cerulean females and tracked them using radio telemetry on their breeding grounds. We compared space use, micro-habitat selection, and apparent survival between females and their social mates on the breeding grounds in the Ozark ecoregion (in Missouri, USA). From the first year of data (n=5), we found a difference between males and females in habitat selection, females preferring habitat with a greater basal area, but detected no difference in home range size or selection for other habitat features. This study provides valuable biological information on female breeding ecology that will aid in our ability to produce effective conservation plans for Cerulean Warblers.

Investigating the effects of habitat on the distribution and abundance of Chuck-will's-widows (*Antrostomus carolinensis*) in central Texas, their diet across space and time, and insect availability and preference

S Tomczyk, M Ward, J Hutchins Sperry

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Chuck-will's-widows are a declining crepuscular nightjar that breeds across eastern North America. They are among the largest nightjars, primarily sustaining themselves on insects. Despite their overall decline, their presence at Fort Cavazos during breeding seasons appears consistent and widespread. However, limited research has been conducted on this species at Fort Cavazos, prompting an investigation into their distribution and habitat preferences. To address this gap, fieldwork has been undertaken utilizing various methodologies. Point counts, microhabitat measurements, and GIS LiDAR technology have been used to find the reasons behind their presence at Fort Cavazos. Despite the base being subject to constant disturbance, fragmentation, and localized droughts, Chuck-will's-widows persist in the area, suggesting potential habitat suitability amidst challenging conditions. Data collected from two field seasons (Spring 2023 and 2024) along with four years of point count data (Spring 2021-2024) will be analyzed to discern patterns in their distribution and habitat preferences. Additionally, insect availability in the habitat of Chuck-will's-widow is being assessed through insect traps, aiming to correlate their presence with specific insect populations. By examining habitat characteristics, insect availability, and the species' distribution patterns, this research seeks to determine whether Chuck-will's-widows exhibit preferences for particular habitats or specific insect prey. An analysis of CWWI diet is also being

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conducted through metabarcoding fecal samples to be able to compare insect availability with chosen prey. Such insights are critical for understanding the factors influencing their presence at Fort Cavazos and for informing conservation strategies to mitigate the decline of this species in other areas.

The impact of environmental methylmercury exposure on the feeding rates of nonbreeding invertivorous passerines

X Gitre*Presenting author: Xavier Gitre, xaviergitre@gmail.com*

The impact of environmental exposure to methylmercury (henceforth MeHg), a potent neurotoxin, on the feeding rates of resident invertebrate-eating songbirds in winter was examined along a stretch of the South River, a waterway contaminated with mercury, north of Waynesboro, Virginia. Research into the neurobiological effects of MeHg exposure in birds has established a variety of potential impediments to avian foraging, such as behavioral alterations that result in the avoidance of high-energy behaviors and impeded coordination. It was hypothesized that invertivorous passerines with high environmental MeHg exposure would exhibit decreased feeding rates when compared to those with little or no exposure. This was tested by the measurement of feeding rates of resident species with the highest mean blood MeHg concentrations at contaminated sites. A small but statistically significant difference was observed between feeding rates of target species at contaminated and reference sites, a difference that was accentuated in Carolina Wrens, the species with the highest known blood MeHg concentrations at the study sites, and absent in Carolina Chickadees, a species with lower blood MeHg concentrations. However, it should be noted that the sample sizes were only large enough for preliminary findings. We plan to collect more data through a variety of methods before definitively establishing an inverse correlation between MeHg exposure and feeding efficiency. Regardless, the preliminary results of the study do support the hypothesis that invertivorous passerines with high environmental MeHg exposure exhibit decreased feeding rates when compared to those not exposed.

Anticoagulant Rodenticide in Adult and Nestling Raptors in Southern California

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Anticoagulant rodenticides (ARs) are a group of environmental pollutants commonly used for pest control. Animals targeted by AR use are also prey of apex predators. These predators, including many raptors, face a high risk of secondary AR exposure. This is due to the toxicant's bioaccumulative nature, and effects are further influenced by ingesting multiple ARs, frequency of exposure, stress, and other environmental variables. These toxicants have also been found in other species such as Mallards (*Anas platyrhynchos*) and Magpies (*Gymnorhina tibicen*). ARs reduce the body's ability to clot blood, and the effects of this in raptors include excessive bleeding, dull mentation, and anemia, which in turn may impair hunting ability, and increase susceptibility to disease and other toxicants. For this research we will collect blood, blood smears, and feathers from Red-shouldered Hawks (*Buteo lineatus*), Swainson's Hawks (*Buteo swainsoni*), Red-tailed Hawks (*Buteo jamaicensis*), and Great Horned Owls (*Bubo virginianus*). Capturing will take place throughout Southern California. To detect and quantify the amount of ARs in each blood sample, we will perform dispersive solid phase extraction followed by liquid chromatography and mass spectrometry (LC-MS). This study will quantify exposure to ARs and test for a positive correlation to indicators of stress, such as hematocrit and heterophil lymphocyte (H/L) ratio, in the previously mentioned raptor species. We will also test for a positive relationship of ARs exposure between parent and nestling Red-tailed Hawks. Further, ArcGIS Pro will be used to spatially analyze sample locations to test for increased ARs exposure levels in Red-tailed Hawks due to nesting proximity to urbanized areas.

****When females compete and males care: Phenotypic differences in the spotted sandpiper**

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Variation between populations promotes adaptability and survival amidst evolving environmental conditions. Spotted sandpipers (*Actitis macularia*) are migratory shorebirds with a sequentially polyandrous mating system. Females compete for multiple mates, and males care for offspring, including through incubation and chick care. A study of a Midwestern population found that females have larger body mass and feather spots, but we do not know whether this pattern extends to other populations of this species. We studied a California population of spotted sandpipers surrounding Mono Lake. We used PCR to identify genetic sex from blood samples, and we used R to compare morphological traits between females and males. We find female-biased sexual dimorphism in several morphological traits, including tarsus, wing, and bill length, as well as body mass, suggesting the Midwestern and California populations both have sexually dimorphic morphology, despite different environments.

Ecomorphology of the hindlimb in North American sparrows**Z Sicut, K Riggan, T Imfeld***Presenting author: Kurt L. Riggan, Regis University, kriggan@regis.edu*

Links between functional morphology and ecological niches are extensively documented in birds, although the majority of this research effort has been focused on bills and wings. Despite being the direct connection between birds and physical substrates and their role in thermoregulation, hindlimb morphology and its ecological role have been relatively overlooked. Here, we explore the relationships between hindlimb morphology and ecological niches in North American sparrows (Passerellidae). We measured 9 traits from the tarsometatarsus, middle toe, and hallux from specimens in natural history collections, and we documented habitat and degree of ground use in the foraging, vocalization, and nesting of these species from descriptions in the literature. Our phylogenetic comparative regressions of these data found no significant relationships between any morphological trait and any of the ecological variables. In contrast, all but one measured trait had strong, significant phylogenetic signal. Together, these results suggest that morphological variation in the hindlimbs of North American sparrows appears to track diversification among these species and to lack notable ecological signal. However, the lack of detailed ecological data for many, if not most, tropical species constrains our ability to explore these relationships at broader taxonomic and geographic scales.

Functional Genomics of Gut Microbiome Variation in Golden-winged Warbler x Blue-winged Warbler Hybrids**T Nguyen, S Hyder, D Toews, A Wood, M Baiz***Presenting author: Tina Nguyen, tnp2@buffalo.edu*

Birds, like other vertebrates, harbor essential gut microorganisms crucial for development and well-being. Previous 16S amplicon sequencing revealed that colorful warbler species exhibit variable gut microbial community compositions. Despite this, frequent natural hybridization among warblers, including Blue-winged and Golden-winged warblers, occurs. Hybridization may offer advantages, for example by potentially exposing individuals to more beneficial symbiotic partners. Notably, we found that certain bacteria abundances, such as *Sphingomonas* sp., correlate with host ancestry and feather coloration. We hypothesize that birds utilize carotenoid (yellow) pigments produced by gut bacteria, potentially mediated by the host gene, BCO2. Here, we use metagenomic sequencing to delineate gut microbiome taxa unique to each host species and to unravel the potential functions carried out by the gut microbiome. Additionally, we ask whether the distinct microbiomes of parental species exhibit similar or divergent functions. Lastly, we explore the role of host genetic factors in mediating host-microbiome interactions. Altogether, our data yield important insights on functional aspects influenced by hybridization in the context of host-microbiome interactions.

Assessing genomic divergence among four subspecies of Gray-crowned Rosy-Finch (*Leucosticte tephrocotis*) in Alaska

Updated September 26, 2024

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M Jang, K Winker, T Glenn*Presenting author: Min Jang*, University of Alaska Fairbanks, mjjang@alaska.edu

The Gray-crowned Rosy-Finch (*Leucosticte tephrocotis*) is an alpine and tundra specialist. Six subspecies are recognized, and four of these are distributed across mainland Alaska, the Aleutian Islands, and the Pribilof Islands. Varying life histories and population connectivity can lead to differences in selection pressures on island and mainland taxa. Previous work using whole-genome sequences suggests widespread introgression and that *L. tephrocotis* is a paraphyletic species, although the Alaskan island subspecies are monophyletic. We perform Diffusion Approximation for Demographic Inference (DADI) using ultraconserved elements (UCEs) to quantify the level of gene flow and characterize modes of divergence among these Alaska lineages.

The nonexistent forms of birds: Tracing the evolutionary pathways of bird morphology**S Chia, A Swain, W Fagan***Presenting author: Stephanie Chia*, sychamore@gmail.com

The shape and form of birds are closely related to their ecological niche. Understanding how bird morphology has evolved over time is critical for unraveling the biological and environmental factors shaping their evolution. By analyzing ten morphological traits of over 9,000 bird species using the AVONET dataset, we seek to uncover the evolutionary pathways that have shaped bird morphology through time. Specifically, we employ a topological analysis tool to identify unoccupied spaces, or 'holes', within the multidimensional space representing the morphological traits of 2,083 extant bird genera. We then reconstruct ancestral trait values at various time points, map them within the multidimensional space, and examine changes in the size and location of the identified holes across evolutionary time. Finally, we discuss the potential mechanisms that may have driven the evolutionary trajectories of bird morphology.

Avian Tongue Morphology is Understudied*C Kintz, M Rubega***Presenting author: Chelsea Kintz*, chelsea.kintz@uconn.edu

As birds lack teeth for mastication, they rely on their beak and tongue to manipulate, process, and ingest food. The lingual apparatus is pivotal in this process for most birds, and is comprised of cartilage, bone, muscles, and salivary glands. Previous research has shown that this structure varies widely across different groups of birds. However, investigation into the morphological and functional aspects of the lingual apparatus is unevenly distributed among bird taxa. Hence, our understanding of the evolution of the structure and function of the avian lingual apparatus is limited. Certain avian taxa, like parrots and hummingbirds, are well represented within avian tongue literature, while other groups are entirely absent. Using the R-package litsearchr, I conducted a comprehensive review of the literature to assess the extent to which the lingual apparatus has been investigated across the avian phylogeny. I documented which taxa have and have not been studied and what methods have been used to document their morphology and histology. I also cataloged if there were any functional analyses performed. This review will help guide future research on avian tongues, aiming to bridge knowledge gaps and deepen our understanding of this crucial anatomical feature.

Genomic underpinnings of behavioral courtship display elements in hybridizing Selasphorus hummingbirds*N Najar, A Brelsford, C Clark, B Myers***Presenting author: Nadje Najar*, University of California Riverside, nadjenajar@gmail.com

How do courtship behaviors evolve? Identifying the genetic underpinnings of sexual displays is often confounded by sexual selection, which tends to reduce genetic variation in the trait. This limitation can be overcome by comparing admixed with non-admixed individuals in hybridizing species. Rufous and Allen's hummingbirds have courtship behaviors consisting of stereotyped high-speed dive and shuttle displays,

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and regularly hybridize where their ranges meet in northern California and southern Oregon. We recorded 10 courtship displays from each of 377 adult male *Selasphorus* hummingbirds from two transects spanning the hybrid zone. Each male's courtship displays were decomposed into 14 elements. Hybrid displays are highly variable compared with parental displays. We categorized each display element based on whether the hybrid phenotypes fall within (non-transgressive) or exceed the parental phenotype range (transgressive). We used whole genomes and an admixture model that accounts for population structure to map each element of the display to the genome. Courtship display elements overwhelmingly map to a small 6 mbp region of the Z chromosome, despite relative homogenization of the autosome. Unlike the rest of the Z, recombination in this region is not homogeneous, with some combinations more favored than others. Overall, the stereotyped, species-typical display behavior of Rufous and Allen's hummingbirds are associated with relatively small genomic differences.

Falcon Immunogenomics - Understanding Adaptations in a Changing Arctic

S Dale, S Buerki, T Booms, S Galla

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The Arctic is experiencing the most severe climate change on earth. Historically, low pathogen abundance throughout the Arctic has been advantageous for nesting birds to avoid disease, but has also limited selective pressures for birds to develop advanced genomic mechanisms of immune defense. As a consequence of rapid environmental change, the poleward shift of pathogens and disease vectors-like biting insects-have increased opportunities for novel pathogen exposure for naïve species. There is a need to understand the mechanisms underpinning immune tolerance, especially for immunologically naïve wildlife who may lack previous experience with diseases and are being introduced to novel pathogens. Here, we aim to utilize comparative genomics to establish a fundamental understanding of interspecific immune gene diversity between a highly specialized Arctic raptor with suspected low immune competence-the Gyrfalcon (*Falco rusticolus*)-and its globally distributed congener-the Peregrine Falcon (*Falco peregrinus*). We predict Gyrfalcons will have lower diversity in immune genes, including the major histocompatibility complex (MHC) and toll-like receptors (TLRs), and fewer immune genes under positive selection compared to Peregrine Falcons. These results will reveal fundamental knowledge for understanding immune competence in a holarctic raptor, with the potential to identify candidate genes in vulnerable populations in the Arctic.

**Drivers of home range variation during nesting in the Red-tailed Hawk (*Buteo jamaicensis*)

E Wein, A Stillman, B Robinson

Presenting author: **Eliza Wein**, erw77@cornell.edu

Home range assessment can provide crucial information on space use during key periods of an animal's life cycle. The Red-tailed Hawk (*Buteo jamaicensis*) is a generalist predator that occupies a variety of habitat types across North and Central America. Despite being well studied and common throughout its distribution, home range during nesting for the Red-tailed Hawk has never been studied on a broad scale. To this end, we used data from 67 GPS/GSM-tagged Red-tailed Hawks from broadly distributed nesting sites to estimate breeding-season home range sizes for adult hawks. We further assessed interannual variation in nesting home range, and tested for effects of sex, age, ecoregion, and key parameters associated with human-altered landscapes. Our results provide the first large-scale perspective on home range size variation for Red-tailed Hawk across a substantial portion of its breeding distribution, providing a perspective for continued investigation into factors influencing space use during this important period of the annual cycle.

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Factors influencing the length of the post-fledging dependence period in golden eagles (*Aquila chrysaetos*)**K Myers, A Santiago, K Warner, M Stuber, J Cruz, J Heath***Presenting author: Kevin Myers*, Boise State University, kevinmyers14@u.boisestate.edu

For many birds, the post-fledging dependence period (PFDP) is a period of high mortality. In this phase of life, parents sustain fledglings while they learn to fly and forage. For golden eagles (*Aquila chrysaetos*) the length of PFDP is highly variable, ranging from 39 to 250 days. The underlying factors affecting the PFDP length remain unclear. We are studying factors affecting the PFDP of non-migratory golden eagles in southwestern Idaho. We are fitting nestling eagles with GPS or GSM transmitters from 2022 to 2025 to measure the duration of the PFDP and test whether phenology, nestling health, sex, or diet affect the PFDP. Preliminary results suggest that eagles tracked so far have left their natal territories in as early as 60 days after fledging, whereas others dispersed 197 days after fledging. Neither phenology nor sex was associated with the length of the PFDP. Understanding the factors that affect the length of the PFDP will provide insight into mechanisms that lead to dispersal and, ultimately, the end of this period of high mortality.

An open-source, 3D-printed RFID feeder for cost-effective monitoring of presence and body mass of individual birds**M Jacobs, A Pham, C Bauer, J Lee, S McNeill, D Conte, C Check, C Rushing***Presenting author: Madison Jacobs*, Embry-Riddle Aeronautical University, jacobm21@my.erau.edu

Monitoring individual birds using mark-recapture techniques has been an essential approach to ornithological research for decades, allowing researchers to quantify survival, recruitment, and movement of avian populations. Conducting mark-recapture studies, however, is often logistically challenging, expensive, and often produces sparse data sets that make estimation challenging. We developed an inexpensive, 3D-printable bird feeder designed for passively monitoring individual birds using radio frequency identification (RFID) technology. Here, we describe elements of the feeder design and demonstrate approaches to make the design open source. For example, we optimized the feeder design for diverse 3D printers, reducing material waste. By segmenting the feeder into multiple parts, we not only improved print reliability but also facilitated the production and implementation of replacement components. To address hurdles in display system compatibility, securing components, and weatherproofing, our design utilizes onboard LEDs, heat set inserts for mounting, and encloses sensitive electronics in impermeable structures. The feeder is also equipped with a weighing system and environmental sensors, which provide valuable auxiliary data for understanding demographic and behavioral processes. We demonstrate the utility of the data provided by the feeder by analyzing visitation data from several resident and migratory species, documenting seasonal and individual variation in feeder use. This collaborative project, bridging engineering and science disciplines across institutions, showcases innovative approaches to environmental research. Through existing technology, it offers insights into avian health and migration, emphasizing the potential for community-engaged ecological monitoring.

High Elevation Monitoring Program (HEMP): Monitoring and Science to Document Climate-Induced Effects on Mountain Birds**C Mahon, A Jacobsen, L McLeod***Presenting author: Anna Jacobsen*, University of Alberta, aljacobs@ualberta.ca

Terrestrial birds in high elevation ecosystems are not adequately monitored in northwest boreal ecoregions due to limitations in the North American Breeding Bird Survey (BBS) including gaps in coverage, spatial distribution, and representation of rare alpine and subalpine habitats. Monitoring and scientific studies of montane terrestrial birds are required to: (1) assess status, breeding distribution, and population size; (2) quantify short and long-term population trend to fill gaps in northwest boreal montane landscapes and identify shifts across elevational gradients; (3) identify methods to track shrub change

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and correlate with bird distribution shifts; and (4) identify montane bird species most at risk during a changing climate. Although long-term monitoring of breeding populations of terrestrial birds is a high priority, the design and implementation of avian monitoring programs is complicated by remote, rugged, and difficult to access landscapes. We used a modified version of the Boreal Optimal Sampling Strategy (BOSS) (Van Wilgenburg et al. 2020) to create the High Elevation Monitoring Program (HEMP) in southwest Yukon, Canada. We outline our HEMP sampling design and survey methods that include Autonomous Recording Units (ARUs). We designed HEMP as a flexible design that incorporates spatial balance, habitat representation, access constraints, and cost. The HEMP design is a statically defensible, efficient, and feasible (cost, operations, safety) design for long-term monitoring of montane terrestrial birds that can be combined with complementary short-term science projects that focus on mechanistic studies of habitat associations, climate adaptation, and habitat use patterns in post-breeding and migration periods.

***Examining the utility of trail cameras for estimating sex ratios in duck populations**

K Tucker, M Brasher

Presenting author: Katie Tucker, Ducks Unlimited, Inc., ktucker@ducks.org

A reliable understanding of the adult sex ratio in duck populations is important for accurate estimation of breeding population size and documenting long-term trends. Recent evidence from alternative population estimation methods suggests the sex ratio in duck populations has become more male-biased over the past 2 decades, increasing from 2:1 to possibly as high as 4:1 in some species. If true, failure to account for changing sex ratios may lead to overestimation of population size and inaccurate trend estimation using conventional survey techniques. Given the potentially significant implications of this finding, there is growing interest in validating estimates of adult sex ratios using independent data sets. To this end, Ducks Unlimited, Inc. is conducting a pilot project to evaluate the utility of trail cameras for collecting data on duck sex ratios across space and time. This pilot project is working with biologists and private landowners to deploy 25 trail cameras on a series of wetlands at different latitudes within the Mississippi Flyway during fall and winter of 2024–25. Images captured with these cameras will be processed using a combination of image recognition software and human observation to estimate the sex ratio within a random sample of photos. If this method proves useful, there is potential to expand its application across broader geographies, with an ultimate goal of developing an independent and reliable database to estimate duck sex ratios across space and time. We will describe the study design of this project and present initial findings from trail camera deployment.

Effectiveness of Autonomous Recording Units for monitoring birds on military installations

A Schroeder, J Cohen, M Schlesinger, J Larkin

Presenting author: Alison Schroeder, SUNY ESF, aschroeder@esf.edu

Autonomous Recording Unit (ARU) technology can be used to remotely detect the presence and estimate abundance of avian species in locations that are difficult for traditional point counts to regularly access. They can readily be deployed for long time periods across large areas. Military bases have the potential to harbor high avian species densities and rare ecosystems because of restricted land development, but monitoring on military installations is often difficult due to restricted access for point counts. ARUs may be particularly beneficial in such settings. Our study sought to 1) compare the results of ARU- and point count-based methods for modeling abundance of songbird species on Fort Drum Military Base in New York, and 2) to compare model results between ARUs at point count locations and sites inaccessible for regular point counts. Our study included 25 plots where both ARUs and point counts were used, and 25 plots in restricted areas where only ARUs were used. At all plots, woody stem density, canopy cover, and ground cover were measured. Using time-to-detection models, we will compare occupancy and abundance estimates and their precision between point counts and ARUs, and between accessible and remote locations, for 5 species: Cerulean Warbler (*Setophaga cerulea*), Yellow-throated Vireo (*Vireo flavifrons*), Wood Thrush (*Hylocichla mustelina*), Scarlet Tanager (*Piranga olivacea*), and Rose-breasted

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Grosbeak (*Phaeucticus ludovicianus*). These species represent the forested ecosystem that comprises much of Fort Drum, and the Cerulean Warbler is of particular concern due to increasing rarity in the region.

Open-source bird radio tag development

T von Eicken

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Bird tracking has a long and illustrious history with many creative technologies being used over the decades. Recently much of the tracking uses radio tags of various types and the majority of tag development has shifted to commercial companies with the result that technological developments are proprietary. One of the effects of this closing-off of development is that technical trade-offs happen behind closed doors and have to focus on revenue expectations, yet these tradeoffs can deeply affect the boundaries of scientific research. This poster describes an open source tag development project that aims to develop sub-1g tags that are compatible with the Motus network and can be deployed alongside commercial tags. The goal of these tags is to be able to experiment in order to provide new and better data for ornithological research, and also to be able to test new tag technologies or functional strategies, such as when to gather what data. For example, the monitoring of birds and bats around wind farms typically needs altitude information that current VHF tags do not capture. The poster will show what is possible with commodity resources from design to contract manufacture, what the limits are, what the trade-offs are. Initial prototype tags have been produced and are functional and we expect to have several versions at the poster for demonstration. An important note is that this open source development is intended to be complementary and not antagonistic to the offerings of commercial vendors who clearly provide significant value to the research ecosystem.

Satellite tracking of 30g Bobolinks (*Dolichonyx oryzivorus*) revealed variation in breeding, stopover, and wintering Space Use.

Z Wu, W Kochtitzky, N Perlut

Presenting author: Zishi Wu, University of New England, zishiwu33@gmail.com

Despite extensive research on their dramatic migration between North and South America, little is known about Bobolinks (*Dolichonyx oryzivorus*) small-scale movement dynamics or habitat selection during migration or stationary periods. Using miniaturized satellite tracking technology (2 g) and Continuous-Time Movement Models (CTMM), we investigated seasonal and population-level differences in male Bobolinks' home ranges across breeding New York (NY) and Vermont (VT), stopover, and wintering periods. Additionally, we used remote sensing techniques to analyze landcover composition within home ranges to compare habitat selection across the life cycle. We predicted larger home ranges for male Bobolinks breeding in NY compared to VT, because NY is a new, geographically isolated population and VT is an established, open population. We predicted temporary home ranges during stopover and wintering periods to be smaller than breeding home ranges, given abundant food resources on agricultural farms and reduced mating-related movements. While the NY population had limited grassland around their breeding fields, we predicted similar home range compositions between populations as well as during stopover and wintering. This research will contribute to a better understanding of Bobolinks' habitat requirements throughout their annual cycle, informing conservation strategies aimed at preserving this migratory songbird species in agricultural landscapes. Furthermore, this study is the first to use highly precise satellite tags on songbirds that weigh <70g.

**The differential effects of environmental and genetic cues on long-distance songbird migration

K McGee, S Travis, N Perlut

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Plasticity within migration behavior is determined by a species' reliance on environmental and genetic cues during different portions of their annual cycle. As climate change alters global weather patterns,

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understanding how different bird migration behaviors are responding, or not responding, to new and variable weather patterns is vital. While many studies have observed changes in migration patterns that correlate to weather, it is difficult to tell if these migratory responses are rooted in heritable genetics or simply a product of the conditions a bird is exposed to enroute. This study delineates environmental and genetic influences on migratory behavior in a long-distance migratory songbird, the Bobolink (*Dolichonyx oryzivorus*). We predicted that major arrival/departure dates in migration will be more similar in genetically related birds, while behaviors such as number and length of time at stopovers will be more influenced by weather conditions. Utilizing geolocators, we mapped full migration paths for Bobolinks from 2009-2023 (n=33). We collected climate reanalysis data from the (ECMWF)'s ERA5 Daily Averages (accessed C3S catalog), providing daily weather data for the entirety of each bird's annual cycle. We measured genetic relatedness with microsatellite primers newly developed for Bobolinks. We compared genetic relatedness in conjunction with weather conditions such as precipitation, temperature, and mean sea level pressure for each of the migration behaviors.

To migrate or not to migrate? Testing proximate drivers for the partial fall migration of Lewis's woodpeckers (*Melanerpes lewis*)

C Piper, F Fogarty, H Wan*Presenting author: Cameron Piper*, Cal Poly Humboldt, cap222@humboldt.edu

The proximate drivers for birds' seasonal migration are poorly understood, particularly when there is intrapopulation variation. Partial migration is when a portion of a population is migratory and the other is sedentary, often remaining in their breeding range year-round. The decision of whether or not to migrate is not random nor genetically fixed and is likely influenced by environmental and population factors. We are testing if proximate drivers including size, sex, breeding outcome, and home range quality influence the fall migration of Lewis's woodpeckers (*Melanerpes lewis*) in eastern Oregon using the Motus Wildlife Tracking system. Additionally, we are investigating the space use patterns of resident woodpeckers in the breeding and nonbreeding seasons to understand their home ranges and space use, filling in critical information gaps. The population we are studying is the last remaining year-round population in Oregon, and studying their migration and movement will inform management to protect both resident and migrant woodpeckers by giving a clearer understanding of the costs and benefits of individual migratory decisions.

****Assessing juvenile dispersal patterns in the Great Green Macaw (*Ara ambiguus*)**

A Allison, M Jimenez, T Wright*Presenting author: Alexander Allison*, New Mexico State University, xangrey@nmsu.edu

The critically endangered Great Green Macaw (*Ara ambiguus*) is declining throughout its range in Central and South America due to habitat loss and capture for the pet trade. Research has been conducted by the Tropical Science Center and the Macaw Recovery Network to elucidate family group movement patterns, though little is known about the dispersal patterns of recently fledged, vulnerable juveniles as land use patterns continue to change. Seeking to build on previously collected data, we fixed 24 radio collars to juvenile macaws from 16 nests to track post-fledging movement via radio telemetry during the 2023 breeding season in Costa Rica. We conducted telemetry throughout the 7 months post-fledging, initially sampling near nesting areas and later from viewpoints overlooking the known range between the Rio San Carlos and the Rio Sarapiquí. Twelve chicks from 9 nests were located at least once through triangulation or visual detection and 3 collars produced mortality signals but could not be recovered. Chicks may have moved north across the Nicaraguan border, out of tracking range. Tracked chicks showed an initial preference to remain in family groups near their nesting areas during the first month post-dispersal, even in forests that are heavily fragmented by cattle pasture. We observed a 70 km roundtrip movement for one family group two months post-fledging, located one chick near their nesting area six months post-fledging, and another in their original nest tree the following breeding season. Our results support previous findings of high site fidelity of family groups throughout the year, suggesting that conservation of habitat immediately adjacent to nests is crucial to the success of juveniles in their first year.

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Bear Divide: a newly discovered dawn migration corridor for western passerines during spring*K Reckling, R Terrill, M Mutchler, D Kammerichs-Berke, M Brady, R Campbell, J McCormack, M Tingley***Presenting author: Kelsey Reckling, kelseywreck@gmail.com*

Bear Divide is a recently discovered dawn migration hotspot located in the Angeles National Forest just 35 miles north of Downtown Los Angeles. Very few dawn migration sites have been identified in the U.S., especially on the West Coast. Bear Divide is nested in the San Gabriel Mountains at just over 500m above sea level with neighboring mountains at 800 meters creating a low, narrow funnel through the mountains. We believe this funnel is creating a unique passageway allowing high concentrations of birds to pass through, often at eye-level. In 2020, we started an unofficial survey of birds moving through Bear Divide and launched an official, standardized migration count project in 2021. Combining data across our first four years of surveys, we quantify the phenology of migratory passage for several western species across the avian phylogeny. Additionally, we explore inter-annual variability in abundance and phenology which can then be linked to weather and other environmental conditions. With few standardized migration observatories along the western flyway, Bear Divide is a critical site for collecting ornithological data while simultaneously existing as a remarkable spectacle for thousands of birdwatchers.

Simultaneous near-range detection of migrating birds with NEXRAD radar and moonwatching.**E Bridge, V Melnikov***Presenting author: Eli Bridge, ebridge@ou.edu*

Weather radars, including North America NEXRAD network, are widely used to study migrating birds. Ornithologists most frequently use 'level II' reflectivity data that exclude a radius of a few km around each radar. We used a WSR-88D radar (KOUN in Norman, OK) in conjunction with an automated moonwatching device to simultaneously collect visual footage and reflectivity data from migrating birds. The observation angles of the two devices were matched so that they monitored the same portion of the night sky, and we recorded 'level I' data from the radar that included range gates from 250m to 5000m. Birds detected visually were clearly manifested in the radar reflectivity products, which included velocity and ranging information. This work points to the potential of creating a new type of bird observatory at each of the 150+ NEXRAD stations by simply analyzing each stream of 'level I' data to extract likely bird detections.

Do birds in poor condition remain longer at stopover sites when there is no barrier to migration?**K Doolittle, A Hite, C Ramos***Presenting author: Kieran Doolittle, winterMusic45@gmail.com*

Migration season is a very stressful time for many migratory species of birds, taking a toll on their physiological health, resulting in individuals making choices about how and when to migrate based on their physical condition. Stopover sites serve as a resting and refueling point that birds take advantage of to return themselves to a condition where they can continue their migratory journey. Most previous studies of birds at stopover sites have been conducted on either islands or peninsulas where birds are faced with a large physical barrier, such as an ocean, that encourages them to stay at these stopover sites for longer durations of time. We questioned whether birds would stay at a particular landlocked stopover site that does not precede a large physical barrier for shorter amounts of time and how their condition influences their timing in departure. The information we had gathered prior to our experiment led us to predict that birds with higher overall body condition would depart from stopover sites in less time than those who had lower overall body condition. During the spring migratory season of 2024, we tracked Swainson's Thrushes, Western Tanagers, and Green Tailed Towhees using radiotelemetry to determine the duration of their stay at a stopover site in central Colorado in relation to their overall condition. The birds were

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captured between sunrise and 10am with mist nets at Clear Springs Ranch. CCT hybrid tags were deployed on individuals, and we used a handheld CCT Sidekick receiver to determine when the birds had departed from the capture site as well as detections from the MOTUS network to investigate their migration progress for the remainder of the migratory period after departure from the site. Results will be discussed.

***Characterizing Waterfowl Movement Patterns in a High Altitude System**

H Johnston*Presenting author: Haley Johnston, haleyc4@gmail.com*

The study of animal movement is applicable to nearly any aspect of ecology, impacting gene flow, nutrient transport, habitat use, and landscape level interactions. At elevations above 3,000 m, intense physiological pressures likely influence landscape level movement patterns and life history of avian species. However, these metrics have not been quantified in relation to waterfowl movements and habitat use. I will use GPS Satellite transmitters and remote sensing to determine the major drivers of yellow-billed pintail (*Anas georgica*) movement around Titicaca National Reserve, Lake Titicaca, Peru (3,812 m). Because metabolic capacity for flight is likely altered in yellow-billed pintail at high altitudes, I hypothesize that speed and distance of movement will be diminished compared to low altitude populations. This may impact home range, habitat choice, and migratory behavior. I will capture, band, and fit $n=18$ individuals with 10 g Ornitela GSM transmitters. To compare the Titicaca population movement patterns and migratory behavior to those at sea level, I will use pre-existing data from 18 individuals of the same species at sea level in Carampangue, Chile; and Northern Pintails (*Anas acuta*) from North America. The study includes analysis of daily distance traveled, flight speed, habitat use, and migratory events. Through remote sensing and Geographic Information Systems, I will map landscape level variation alongside bird movement. I will test the association between pintail movement and landscape metrics using linear mixed effect models. My findings will provide insight into how waterfowl movement patterns are characterized above 3,000 m, with broad implications in both physiology and ecology.

Using White Blood Cell Ratios to Assess Physiological Stress on Wilson's Warblers (*Cardellina pusilla*) Across Migration Seasons

M Kolln, C Ramos, A Fuller*Presenting author: Mikayla Kolln, mikaylakolln15@gmail.com*

Birds travel thousands of miles during migration. During this time, they experience higher levels of physiological stress. White blood cell counts can supply insight into the extent of physiological stress a bird is experiencing. More specifically, the ratio of heterophils to lymphocytes (H:L) has been demonstrated to be correlated with individual stress. The species of interest is the Wilson's Warbler (*Cardellina pusilla*) because they travel thousands of miles during their migration, and they are a commonly caught bird during migration in Southern Colorado. We compared the H:L ratios of Wilson's Warblers between fall and spring migration. Because spring migration is more rapid, it is hypothesized to be more physiologically stressful. Therefore, we predicted that Wilson's Warblers would have a higher H:L ratio during spring migration due to the urgency to find a suitable breeding area. We caught Wilson's Warblers using mistnets and collected a small blood sample with a 30-gauge needle and capillary tubes. A drop of the whole blood was then placed on a glass slide and a cover slip was used to create a blood smear. The blood cells were then dyed using Wright-Giemsa dye to classify and count different white blood cells using a compound microscope. The heterophil to lymphocyte ratio was calculated based on these counts. These data may play a role in bird conservation as migration is a critical period in the life cycle that is less well understood, and these data may help to elucidate the stressors birds face during this period.

Warbler flight-calling behavior is affected by hearing conspecific calls**M Dobrasz, A Gioia, F Piwko, S Morris**Presenting author: **Michael Dobrasz**, Canisius University, dobraszm@canisius.edu

There are relatively few studies of individual migrant flight calling behavior, which may be important in interpreting automated recordings of flight calls during migration. In this study, we attempt to increase understanding of how birds' behavior is affected by hearing conspecific flight calls. In conjunction with the Braddock Bay Bird Observatory (Greece, NY) and the Appledore Island Migration Station (Maine), we studied flight-calling behavior in migrant warblers during short term captivity. We placed warblers in an acoustically isolated chamber, played conspecific flight calls (stimulus) to them, and recorded their responses using RavenPro software. We compared the flight calling of birds calling during pre-stimulus, stimulus, and post-stimulus periods. We present results from tests of over 3400 warblers of 9 species. Warblers were most likely to call while they were hearing our flight call cues ($p < 0.001$). Overall, 3% of migrant warblers gave spontaneous flight calls (pre-stimulus period), 29% gave flight calls while we were playing our flight calls (stimulus period), and 9% of warblers gave flight calls after we stopped playing flight calls (post-stimulus period). There were significant differences in likelihood of calling in each period among species. These results suggest that flight calling by warblers is affected by the sounds that birds are hearing. Further, because of both individual and species-level differences in responses, flight call data used to estimate birds aloft should be interpreted with caution.

The structure, reflectance, and bioclimatic associations of iridescent plumage in Sturnidae**S Rutledge, N Mason**Presenting author: **Samantha Rutledge**, Louisiana State University, slrutledge27@gmail.com

Iridescence is a form of color in birds produced by arrangements that generate different colors depending on the angle of incident and reflected light. This form of coloration may have previously undetected reflectance peaks in other parts of the solar electromagnetic spectrum, especially in near-infrared (NIR) wavelengths. Total reflectance across the entire solar spectrum (UV-Vis-NIR) may play vital roles in biology, such as photoprotection or thermoregulation, impacting a species' ability to occupy different environments. Using Sturnidae as a model system, I employed spectrophotometry to test the hypothesis that iridescent structures contribute to the solar reflectance (UV-VIS-NIR) of sturnid plumage. Preliminary spectrophotometry data shows that iridescent plumages have higher absorption across the solar spectrum, including in the NIR portion, than non-iridescent patches. Further data collection will be conducted to increase species sampling within Sturnidae, as well as bioclimatic analyses, to elucidate the potential role of iridescent plumages in avian thermoregulation.

Transcriptomic insights into sexually dimorphic plumage development**M Secor, R Widelitz, P Wu, C Chuong, M Dean, A Shultz**Presenting author: **Maeve Secor**, University of Southern California, msecor@oxy.edu

Sexual dimorphism in plumage is a common phenotypic difference between males and females of the same species observed across diverse avian lineages. Ornamental tail feathers, known as sickle feathers in chickens, exhibit apparent sexual dimorphism in their shape and size between males and females. How do males and females develop different feathers when they largely share the same genome? Studies in chickens have shown that perturbation of sex hormone levels can change the form, texture or colors of feathers, implying that sex hormone signaling can modulate core feather morphogenesis molecular circuits. Other studies have supported the concept of cell-autonomous sex identity (CASI) in birds, implicating genes on sex chromosomes in driving plumage sex dimorphism. Therefore, the precise role of sex hormones and sex-biased genes in guiding feather morphogenesis at the genetic level is not well understood. As a first step in investigating this, we performed bulk-RNA seq on growth phase feather follicles of male and female white leghorn chicken sickle feathers. We show that genes on the W and Z chromosomes are significantly differentially expressed, and that female-specific genes have known

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functions as transcriptional regulators. We then verify the spatial localization of candidate gene mRNA in the developing feather follicle using section in situ hybridization. Given that chickens are a basal lineage of Neoaves, this study provides insights into sexually dimorphic feather development that serves as a reference point for all other avian lineages.

Gaps in the color wheel: Examining research bias in the study of color in birds

E Morrison, U Nwigwe, R Demopoulos, J Fraser Cooper

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Feather color plays an important role in the lives of birds, including mate choice, speciation, social structure, and camouflage. There are several established mechanisms that birds use to color their feathers, including carotenoid pigments, melanin pigments, and structural color. Most of the research on mechanisms of bird coloration, however, has been done on a species-by-species basis by individual research groups. As a result, it is possible that conclusions have been made about the diversification and evolution of color across the avian lineage that may not be inclusive of all mechanisms of the production of color in birds. A comprehensive examination of the existing information about avian coloration is needed to understand where there are gaps in our knowledge of the mechanisms of coloration in birds. In this study, we reviewed over 500 scientific publications that identified mechanisms of color in birds published since 1990. The data we collected will provide information on what avian families and orders are most and least represented in these studies, the frequency that color is studied in different sexes across species, and the most common methods of color identification. Assessing what aspects of color research are underrepresented in the literature provides a framework for the future research directions needed for a more comprehensive understanding of avian coloration.

***Tail of turmoil: Freezing rain's impact on avian rectrices across the Pacific Northwest**

O Noonan, D Warrick, T Hahn, J Cornelius

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Freezing rain presents serious challenges to organisms, including thermal stress, physical encumbrance, and restricted access to resources. Despite birds' presumed resilience to climate fluctuations due to their thermoregulatory abilities, their response to extreme freezing rain events remains poorly understood, especially concerning their physical condition. Following a severe freezing rain event in Oregon in January 2024, observations revealed instances of birds missing part or all of their rectrices. We hypothesized that birds were losing rectrices or experiencing severe damage due to ice accumulation on the tail. Here we employed a citizen science approach to gather observational data on the prevalence of tail damage or loss in the Pacific Northwest before and after the storm. Additionally, we experimentally tested flight dynamics of both tailed and tailless birds of the same species. Analysis of survey data and eBird observations revealed a higher prevalence of tailless birds post-storm, suggesting a link between freezing rain and tail loss. Notably, Golden-crowned Sparrows and Dark-eyed Juncos exhibited a higher incidence of taillessness compared to other species, though there were observations of tail loss or damage in at least 24 different species shortly after the event. Preliminary results from an escape tunnel test suggest that taillessness may degrade low speed flight performance. These findings shed light on the profound impacts of extreme freezing rain storms on avian plumage and emphasize the necessity for further research to comprehend and mitigate these effects on avian populations.

Morphometric study and some predictions in the environmental space of Turquoise-browed Motmot (*Eumomota superciliosa*, Aves: Momotidae)

B Hernandez-Banos, L Zamudio-Beltrán, S Ramírez-Barrera, R Patiño-Ramírez, M Vázquez-López, A Bueno-Hernández, M Arizmendi-Arriaga, K Ruegg

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The Turquoise-browed Motmot (*Eumomota superciliosa*) is one of the species belonging to the family of Momotidae. *Eumomota* represents a monotypic genus distinguished by its spectacular plumage, differing from the rest of the motmots. *E. superciliosa* is distributed along two disjunct big ranges: one that includes the Yucatán Peninsula (Mexico), and the second on the Pacific slope from southern Mexico south to Central America (Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica). Despite that seven subspecies have been described and are currently recognized, a formal study about the boundaries within this complex is still lacking. Here, we present exploratory analyses of phenotypic variation that might reveal differences among allopatric populations. We also present some predictions about differences in the environmental space for these populations and historical data about past scenarios for the species. As a first integrative study for *E. superciliosa*, we will add information from different sources, such as genomic data, geographical variation in bird song, and plumage coloration patterns.

Species limits, phylogeography, and systematics of the Japanese Paradise Flycatcher (*Terpsiphone atrocaudata*) complex.

M Boyd, H Mays, B McKay, I Nishiumi, C Yao, B Carstens, L Kubatko, J Satler

Presenting author: **Madeline Boyd**, Marshall University, boydm@marshall.edu

Paradise flycatchers (*Terpsiphone* spp.) are widespread throughout Africa, South and Southeast Asia, and the Philippines. Many species are island endemics found on oceanic and continental islands. The Black or Japanese Paradise Flycatcher (*Terpsiphone atrocaudata*) exhibits a breeding distribution that includes the Batan Islands in the Northern Philippines, Lanyu Island off the East coast of Taiwan, the Ryukyu Islands, the Korean peninsula, and the Southern parts of the main islands of Japan. Three subspecies have been recognized across this range including the nominate subspecies (*T. atrocaudata atrocaudata*) breeding on the Korean peninsula and the main islands of Japan, the Ryukyu Paradise flycatcher (*T. atrocaudata illex*) breeding throughout the Ryukyu islands, and the Lanyu Paradise Flycatcher (*T. atrocaudata periophthalmica*) breeding on Lanyu Island and the Batan Islands. *T. atrocaudata atrocaudata* and *T. atrocaudata illex* have a dark purple mantle that distinguishes them from *T. atrocaudata periophthalmica* which exhibits a black mantle. We investigated the systematics of this group based on a geographically widespread sampling of as many as 69 individual samples from all three taxa and a dataset employing Sanger sequencing of 15 loci (2 mtDNA loci, 6 nuclear introns, and 7 nuclear protein-coding loci) and a multilocus SNP dataset generated from a GBS library. We found little evidence for population structure between the more northerly distributed nominate subspecies and populations in the Ryukyu islands. However, we uncovered significant evidence of genetic differentiation between a northern clade in Korea, the main Japanese islands, and the Ryukyu islands and those southern populations found on Lanyu and the Batan islands, a finding mirroring the differences in plumage among these groups. Some population structure is also evident between populations on Lanyu Island and the Batan Islands suggesting the Bashi Channel may be an important biogeographic break.

***Annual Cycle Phenology of Roosting Aerial Insectivore Species Quantified by Doppler Radar and Citizen Science Data**

Y Deng, M Belotti, W Zhao, G Perez, E Tielens, J Kelly, D Sheldon, S Maji, K Horton

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Climate change permeates throughout the full annual cycle of migratory birds. As the timing of life stages may be changing differentially, birds are facing increasing challenges to adapt and avoid mismatches with food sources, which can shape critical population dynamics. Multiple annual cycle stages are rarely studied together, since standardized long-term data on paired events are sparse, especially for data covering a continuous time scale. Citizen science data (i.e., eBird) and weather surveillance radar data (NEXRAD) offer a unique opportunity to quantify the relationships between multiple phenological indices across two migratory life periods in roosting aerial insectivore species. To achieve this, we quantified spring arrival using eBird and peak roosting formation using radars along the eastern half of the United States (> -104 W), in total we examined roosts at 145 radars from 1995-2023. We explored the linkage between spring phenology and roosting phenology within and between years, as well as compared their long-term trends. Variations in seasonal annual phenology associated with latitudes were also studied,

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along with important environmental drivers. Our study demonstrates the importance of examining migratory birds' annual cycle stages altogether to understand the impact of climate change.

ddRAD-based Phylogeography and Subspecies Delineation in Eastern Screech Owls (*Megascops asio*)

M Rao, B Robinson, I Lovette, J WalshPresenting author: **Mei Rao**, Cornell University, mtr74@cornell.edu

The Eastern Screech Owl (*Megascops asio*) is a small owl with a broad distribution throughout eastern North America. There are currently 5 recognized subspecies for the Eastern Screech Owl, however previous work on subspecies delineation has relied on morphological metrics and vocalizations, as well as single mitochondrial markers. To this end, the objectives of this project are to (1) analyze population structure across the continental distribution of the species and to (2) provide evidence to either confirm or alter existing taxonomic delineation. Using ddRADSeq, *Megascops asio* samples from across the continental United States have been leveraged to create the first high throughput genomic sequences for the taxa. Standard population genetic analyses have been employed to assess current subspecies designations. Through this approach, we provide new empirical data on population structure to inform both taxonomic revisions and effective management decisions for *Megascops asio*.

Characterizing variation in gut microbiome composition and diet from breeding through molt in the migratory black-throated blue warbler

A Bechler, B Trevelline, G Clucas, S KaiserPresenting author: **Amaya Bechler**, amb658@cornell.edu

The microbial communities of the intestinal tract, known as the gut microbiome, can influence important host processes such as nutrient uptake, immune function, and behavior. Compared to other vertebrate taxa, the gut microbiome of birds shows greater inter-individual variation, suggesting that dietary and environmental factors may strongly shape the avian microbiome. In migratory birds, the gut microbiomes exhibit variation between individuals, between breeding and wintering habitats, and over phases of migration. Although this variation has been studied in wild birds during migration and reproduction, our understanding of the microbiome during molt, a key life history event, is limited. Here, we used 16S rRNA sequencing to characterize differences in the composition and function of the gut microbiome and diet over the breeding season and molt in a migratory passerine, the Black-throated Blue Warbler (*Setophaga caerulescens*) at the Hubbard Brook Experimental Forest, NH. Specifically, we hypothesized that the gut microbiome and diet are affected by the nutrient requirements of and stress hormone downregulation during molt. We analyzed 260 fecal samples from adults of both sexes, at all breeding stages and over molt. We will use DNA metabarcoding to identify microbial taxa and prey taxa present in fecal samples. We examine differences across breeding stages and molt in (1) relative abundance and diversity of microbiota and (2) frequency of occurrence and diversity of prey taxa in diets. These comparisons will help us understand how environmental factors and major life-history events shape the avian microbiome, which could contribute to the fields of the physiology, ecology and conservation of migratory birds.

Characterization of gut microbiome composition of common (*Sterna hirundo*) and roseate (*Sterna dougallii*) terns on White Island, NH, USA.

R Gritton, G Clucas, E CraigPresenting author: **Robert Gritton**, Cornell University - Ithaca, NY NY, rpg79@cornell.edu

The gut microbiome, despite its increasing importance in the fields of veterinary medicine and animal health, remains understudied in wild birds. Recent studies, however, have illustrated the role of the avian gut microbiome in nutrient uptake, immune regulation, and stress resilience, suggesting a critical role for the microbiome in avian health. This relationship between the gut microbiome and host health has particular conservation implications for colonially nesting seabirds, whose food sources are being altered at a community level by climate change and competition with fisheries. This study investigates the gut microbiome of co-nesting Common and Roseate terns (*Sterna hirundo* and *S. dougallii*, respectively) to

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characterize and examine drivers of microbiome variance in a tern colony in the northeastern US. We predicted that gut microbiome variance will be associated with diet, species, age, sex, and seasonal conditions. To test these predictions, we analyzed 16s DNA metabarcoding data from fecal samples collected from Common and Roseate tern nestlings. Data were analyzed using QIIME2 and phyloseq to generate measures of microbial diversity, similarity, and variance, which we then compared with our predicted drivers. The dominant microbial phyla represented in the samples were proteobacteria and firmicutes, though significant variation in microbiome composition was observed across individual samples as well as different shared variables. Our findings offer new insight into the role of inter-specific variation in shaping microbiomes in seabirds.

Age differences in hematocrit levels in migrating warblers

X Becerril-Hernández, C Ramos

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Hematocrit is the ratio between the volume of red blood cells to the volume of plasma in a blood sample. This measurement can provide information about the health of an individual animal. High hematocrit levels indicate possible dehydration, exposure to high altitudes, or various stress-related conditions. Low hematocrit levels indicate possible anemia, malnutrition, or some other blood disorders. In migratory birds, hematocrit has been shown to increase during migration. It has also been shown to be higher in young birds than in older birds in the non-migratory Seychelles Warbler. The study was conducted to discover if migratory birds, Wilson's Warblers, Orange-crowned Warblers, and Yellow Warblers, display similar age-related hematocrit patterns as non-migratory birds. It was predicted that hatch-year birds would have a higher hematocrit than after hatch-year birds during fall migration. Birds were caught utilizing mist nets and blood samples were collected in capillary tubes, which were stored at 4°C. They were then centrifuged in order to separate the red blood cells from the plasma. The volume of cells and plasma was measured with calipers. Better understanding of patterns in hematocrit can be used to assess avian health during migration.

Variation in genetic structure and parasite prevalence in Northern cardinals (*Cardinalis cardinalis*) and their ectoparasites across ecoregions in Arkansas

N Hines

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Variations in climate, landscape fragmentation, and urbanization can influence the dispersal and population structure of organisms, but it is not clear how these factors can impact the dynamics of host-parasite interactions. Here, we seek to better understand how the presence of different ecoregions in Arkansas, and their geographic boundaries, affect stable populations of birds and their ectoparasites. Cardinals are an excellent focus species to address this aim as they are a relatively common bird throughout each ecoregion, carry multiple ectoparasitic species, and individual birds maintain stable territories. We hypothesize that the distinct ecoregions in Arkansas serve as barriers to gene flow among cardinals and their ectoparasites, and distinct populations exist for both organisms along ecoregion boundaries. We collected blood and any lice from 31 cardinals across 4 different sites in Arkansas, representing 3 different ecoregions and urban, natural, and agricultural habitat. With these data, we calculated prevalence and abundance of the lice. We then obtained genome-wide single nucleotide polymorphisms (SNPs) from cardinals and their lice to assess fine-scale patterns of dispersal among different ecoregions. Our results show differences in the abundance, diversity, and genetic structure of lice between ecoregions, which could indicate a barrier to dispersal among and between host species. Bettering our understanding of the mechanisms behind parasite dispersal and host switching can aid in conservation and human health initiatives as these ecosystems change.

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Protecting birds in protected areas: a multi-scale analysis of landscape context effects on abundance trends**B Amaral, J Doser, A Weed, E Zipkin***Presenting author:* **Bruna Amaral**, Michigan State University, amaral.bruuna@gmail.com

Protected areas are crucial for conserving biodiversity, providing resources for wildlife species, and supporting ecosystem services. However, their efficacy in protecting avian populations might be limited by the surrounding landscape quality and configuration. Due to their high mobility, birds can be affected directly (through their use of multiple land types outside of protected areas) and indirectly (through the spillage of stressors into protected areas) by local- to regional-scale land-use conversion. Despite having undisturbed forested areas, some National Parks in the Northeastern US have experienced declines in avian communities. Here, we investigate scale-dependent community responses to landscape structure, considering land-use inside and outside of parks. Using bird point counts and forest cover satellite data from the Marsh-Billings-Rockefeller Historical Park, we will develop a multi-species, multi-scale removal-sampling model to estimate how forest area and landscape configuration affect forest bird community trends at varying spatial scales. We found high variability in species responses to the landscape variables and in the spatial extent with the strongest effects. The American Goldfinch, for example, was strongly affected by tree basal area at the county scale, and was not influenced by this same variable at the site and park scale. Both landscape metrics and scale of responses are likely associated with guild- or species-specific habitat requirements. Our study can help determine at which spatial scale birds are most vulnerable to land-use changes, providing insights into when managing habitats beyond protected areas may be advantageous. Identifying effective scales for implementing management practices is critical and requires a thorough understanding of the role played by landscape context.

Protect insects, protect birds: a global awareness raising campaign to conserve**M Matta Pereira, S Bonfield, L Andino, D Souza, L Baboolal***Presenting author:* **Miguel Matta Pereira**, Environment for the Americas, mmatta@environmentamericas.org

The loss and disturbance of insect populations along avian migration routes threaten bird survival and well-being. The timing of bird migration often coincides with peak insect abundance at stopover locations, supplying nourishment for birds to replenish their energy reserves before continuing their journeys. A scarcity of energy- and protein-rich insects can hinder bird migration and breeding, leading to weakened immune systems, reduced reproductive success, and increased mortality rates for both adult birds and their offspring. Insects and their importance to migratory birds is the focus of this year's World Migratory Bird Day, a global campaign that aims to raise awareness of migratory birds and the need for international cooperation to conserve them. A variety of factors may impact insect populations, including climate change and chemical use. We explore the relationship between declines in bird populations that may be the result of declines in insect populations, the potential causes, and actions that should be taken to protect both insects and birds; from passerine to shorebird and how insects are important to them, from breeding ground in North America to wintering and stopover sites in the Neotropics.

Communicating Conservation – Living In A Wildlife Corridor*A Privett-Mendoza, B Goto, A Zellmer***Presenting author:* **Auxenia Privett-Mendoza**, Arroyos & Foothills Conservancy, auxeniagrace@gmail.com

In recent years, the intersection of art and environmentalism has emerged as a vital platform for raising awareness about the fragile ecosystems and diverse species that inhabit our planet. Utilizing this platform, Arroyos & Foothills Conservancy hosted an interactive exhibit, Living In A Wildlife Corridor (LIAWC), at Descanso Gardens in Los Angeles in the summer of 2023. Blending art, science, and the best of community conservation efforts, the exhibit focused on the importance of wildlife corridors in

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sustaining biodiversity. The exhibit focused on all types of wildlife that might be found in urban spaces, such as the wide diversity of birds. The 'Sky Corridors' room shared information on the impacts of climate change on bird populations, utilizing visualizations from the Audubon Bird Migration explorer. It also spotlighted ways that individuals can protect birds in their own backyard. Throughout the exhibit, AFC hosted engagement events, artist talks, and expert panels to provide additional opportunities for the public to learn about conservation efforts. The goal: to empower individuals to take specific, direct action in their cities, neighborhoods, and backyards. LIAWC hosted over 40,000 visitors by the end of its showing at Descanso, and is now a mobile exhibit, able to travel to schools and community events across Los Angeles.

***An ethno-ornithological estimation of perceptive, cultural, and ecological salience at Lake Titicaca.**

L Nino Barreat, H Johnston

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As one of the most conspicuous elements in terrestrial environments, Birds play a major role in ecological, economic, and cultural significance. Associated with this diversity is an even greater variety of local names and stories that bind people to their community's heritage. The significant positive correlation between British current avian abundance, historic distribution estimates, and English late Twentieth Century folk-names of birds published by Andrew G. Gosler (2017) opens up an exciting line of investigation in ethno-ornithological inquiries: the estimation of current/historical avian abundance and distribution inferred by linguistic diversity. Now, it is necessary to determine whether this pattern holds across cultures, and which causal factors are behind it. In this sense, Traditional Ecological Knowledge is thought to be affected by taxon perceptual, cultural, and ecological salience. Lake Titicaca represents an ideal system to study due to the confluence of two native language families (Quechua and Aymara) and the invasive Indo-European family. In collaboration with local communities, we will perform semi-structured interviews to estimate the used avifauna names, their structure, and proportion of people using them. We will also classify names according to the qualitative perception and cultural relevance of associated species. We will approximate the avifauna's current and past relative abundance/distribution with the combination of drone aerial surveys, citizen science abundance estimates, and niche models. Correlations between name classifications and abundance estimates will be calculated using linear regression analysis. These findings will provide insight to the cultural significance of avifauna in the Andean highlands.

Microgeographic variation and diel patterns in Hawai'i 'amakihi dialects within a fragmented landscape

H Araujo, L Fink, P Hart, B Gottesman

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Although Hawai'i 'amakihi (*Chlorodrepanis virens*; hereafter 'amakihi) dialects are well-documented across the island of Hawai'i, the biogeographical factors that contribute to variation in dialects, or memes, across microgeographic scales remains less explored. Investigating Kāpuka-forest fragments formed by lava flows of different ages, sizes, and proximity to neighboring areas, we hypothesized that older, larger, and less isolated fragments would exhibit more diverse memescapes. Beyond spatial variation, we also investigated whether 'amakihi memescapes change over diel cycles. Since 'amakihi regularly move between these forest fragments, how temporally stable is the memescape of each kipuka? To address these questions, we deployed passive acoustic monitoring recorders at 12 sites within a Kāpuka complex on Mauna Loa, Hawai'i. We used BirdNet Analyzer GUI to detect the 'amakihi songs from the recordings, measured the spectral and temporal characteristics of each detected song, and computed a PCA using these measurements to determine if there were distinct dialects and how their prevalence varied across Kāpuka. To determine if the types of memes were stable throughout the day, we tested for differences in relative meme abundance across dawn, midday, and dusk. This study is among the first to leverage passive acoustic monitoring to explore temporal patterns in bird dialects. Our findings will shed light on the factors that shape dialect differences across microgeographic scales.

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Seets and dees: Exploring the food-related vocalizations of the Tufted Titmouse (*Baeolophus bicolor*) and the Carolina chickadee (*Poecile carolinensis*)*P Chen, K Sieving**Presenting author: **Po-An Chen**, University of Florida, poanchen@ufl.edu

In North America, species of the Paridae family play a pivotal role in mixed-species groups and exhibit significant vocal complexity, especially in foraging contexts, which still needs to be explored. This study focuses on the foraging-related vocalizations of the tufted titmouse (*Baeolophus bicolor*) and the Carolina chickadee (*Poecile carolinensis*), which are both key figures in the social structure of bird communities in the Eastern U.S. Examining how their vocalizations convey information about their mixed-species foraging environment, I conducted two experimental manipulations assessing the impact of food quality and competitor presence on these birds' vocal signals. Preliminary analysis of data from nine feeders on the University of Florida campus reveals that both species frequently use 'contact seet' calls in two variations (hard and soft seets) and 'chick-a-dee' calls during foraging. Notably, encounters with high-quality food increased soft seets in both species, indicating their perception of environmental certainty or uncertainty. The titmice showed a reduction in 'D-notes' within chick-a-dee calls when high-quality food was offered; in contrast, the chickadees showed the opposite response, suggesting a nuanced response to food quality and potentially different foraging strategies between the two species. This research aims to elucidate the adaptive significance of foraging-related vocalizations, contributing to our understanding of communication within complex social structures. Further experiments of both manipulations are underway in the UF campus and natural forests near Gainesville, FL, to bolster these preliminary findings, with a comprehensive analysis to be presented at the 2024 AOS Annual Meeting.

Hummingbird Harmonies: High-frequency vocalizations from the white-necked jacobin (*Florisuga mellivora*)**M Negrette, S James, A Fernandez, J Falk**Presenting author: **Michelle Negrette**, mnegrette@unal.edu.co

Hummingbirds are known for their fascinating colors and incredibly high metabolic rate, but other aspects of their ecology such as their vocal communication have received relatively limited attention. Recent studies have shown that some species of hummingbirds can produce high-frequency vocalizations with fundamental frequencies above 8 kHz, the upper hearing range limit known for birds (2-8 kHz). In this study, we investigated if the white-necked jacobin *Florisuga mellivora* produces high-frequency vocalizations. We recorded wild *F. mellivora* at feeders across various locations in Gamboa, Panamá using an Avisoft ultrasound microphone, and extracted acoustic parameters from the vocal repertoire of this species. We show that the white-necked jacobin produces high-frequency vocalizations with fundamental frequencies above 8kHz. In some call types, acoustic energy is evenly distributed over several harmonics into the ultrasonic range. Moreover, our data shows that this species may produce different types of high-frequency calls in a variety of contexts, including territorial and feeding calls and courtship. The results of this study will help expand current knowledge about vocalizations, hearing, and complex vocal communication in avian taxa.

Using Machine Learning Algorithms to Identify Individual Vocal Signatures**B Tweedie, L Symes, M Webster**Presenting author: **Bridget Tweedie**, Cornell University, brt43@cornell.edu

Recent advances in passive acoustic monitoring (PAM) and sound analysis methodologies have strengthened our ability to study cryptic vocalizing species and to investigate variations in acoustic behavior. However, most PAM research remains focused at the population-level, so discriminating between individuals continues to be an obstacle. Identifying individuals by vocalizations has important implications for population estimates and the ability to gather non-invasive behavioral data. As PAM analysis techniques continue to improve as a method for monitoring animal populations, there is a need to develop models that can distinguish between individual vocal signatures. Here, we introduce a novel

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machine learning classifier that can identify individual singers in our study population of Black-throated Blue Warblers (*Setophaga caerulescens*) in the Hubbard Brook Experimental Forest. To train the model, we used a combination of passive acoustic and focal individual recording data for target-individual recognition, along with a subset of background noise and non-target species vocalizations for the model to process and learn to avoid. We then tested and validated the model with passive acoustic samples from singers of known identity and used logistic regression to understand the probability of each clip being a true or false positive. This new method has the potential to greatly enhance our ability to monitor and interpret complex vocal behaviors by gathering large amounts of non-invasive behavioral data, including rare events. Additionally, identifying the number of individual vocalizers in a population has important conservation implications for species whose capture is high-risk, costly, or difficult to achieve.

Is the community soundscape shaped by environments across ecoregions of North America?

M Costas-Sabatier, T Fristoe*Presenting author: Miguel Costas-Sabatier, miguel.costas@upr.edu*

Birds are known worldwide for their acoustic vocalizations, with songs and calls playing a crucial role in intra- and interspecific communication. To be heard, they need to make sure that the signal they produce is sufficiently distinct from the noise in the background. However, communities across diverse ecosystems are made up of multiple animals producing vocalizations, which leads to the question, how are they all heard? The acoustic adaptation hypothesis states that signals produced by animals in a given environment will be similar to each other, converging to the ideal traits that prevent degradation by the habitat. In contrast, the ecological displacement hypothesis states that acoustic signals will sound different from others in the area to stand out. Here, we investigate the macroecological drivers of birdsong diversity, integrating data from the North American Breeding Bird Survey and songs from citizen science repositories to construct community soundscapes and compare their characteristics across environments. Quantifying functional similarity based on the composition of song frequencies; our initial results identify differences in community level soundscapes across the ecoregions of North America. Furthermore, we will be looking into how taxonomic and phylogenetic diversity contribute to soundscape diversity within and across communities.

Geographic song variation and subspecies recognition in the Yellow-rumped Warbler (*Setophaga coronata*) complex

H Pryor, I Lovette, S Kaiser*Presenting author: Hannah Pryor, hgp26@cornell.edu*

Because song plays an important role in avian species recognition and mate choice, it can function as either a driver of speciation or to break down reproductive isolation via hybridization. The Yellow-rumped Warbler (*Setophaga coronata*) complex includes two North American subspecies - *S.c. coronata* and *S.c. auduboni* - that are phenotypically and acoustically distinguishable. Though the two forms appear to mate randomly across a narrow hybrid zone in western Canada, no study has yet attempted a geographically broader analysis of song recognition between these populations. We conducted a reciprocal playback experiment to test for possible divergence in song recognition across the ranges of both subspecies. We hypothesized that individuals farther from the hybrid zone would respond less strongly to playback from the other subspecies. This study, ultimately conducted at four locations in two breeding seasons, controls for isolation-by-distance effects through paired sampling points within the range of each of these warbler subspecies.

Modeling the distribution of common ravens (*Corvus corax*) using coastal characteristics and step-selection functions

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Western snowy plovers (*Anarhynchus nivosus nivosus*) are a federally threatened shorebird with a declining population in coastal California. Their primary nest predator, common ravens (*Corvus corax*, hereafter ravens), are increasing in this area and present a significant barrier to the stabilization of snowy plover populations. Managers have used habitat restoration to conserve snowy plovers, but little is known about how this restoration might influence ravens or how habitat characteristics could affect raven distribution in this area. I will study how anthropogenic and environmental characteristics along the coast of Humboldt County in northern California influences the distribution of ravens by conducting a habitat suitability analysis. I will create species distribution models (SDMs) that incorporate geospatial paths of 22 GPS-tagged ravens using a step-selection function. I will incorporate environmental variables like habitat complexity, substrate type (bare sand, vegetation, or large woody debris), and distance to anthropogenic resources as well. Managers can use this knowledge to update habitat restoration techniques and identify suitable habitat for ravens.

****Evaluating the efficacy of treated windows to reduce bird-window collisions in Ottawa, Canada**

S Lysyk, B Frei, R Buxton

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Collisions with windows is one of the leading causes of avian mortality in North America, resulting in an estimated 1 billion mortalities each year. Effective window treatments reduce the occurrences of window collisions but treating windows is not common practice and often do not follow guidelines (e.g., markers are spaced far apart or on interior surfaces of windows). Current knowledge of window treatment efficacy is from lab and field-based assessments that explore the outcomes of visual markers that meet guidelines. Here we aim to evaluate the efficacy of window treatments to reduce bird-window collisions in downtown Ottawa, Canada by conducting daily collision surveys at treated and untreated windows during spring migration. Using carcass persistence and searcher efficiency trials to account for error due to missed detections, we generated corrected estimates of collision mortality at each window. We then created a predictive model of mortality rates based on untreated windows using measures of environmental factors including glass area, area of surrounding vegetation, building height, and proximity to water. Preliminary results suggest that model predictions at windows treated according to City of Ottawa guidelines deviate the most from rates of mortality predicted from untreated windows. In contrast, windows treated against guidelines most closely resemble mortality estimates predicted at untreated windows. This study contributes to understandings of window treatment efficacy to reduce bird-window collisions by describing effectiveness across a range of conditions.

Bird-window collisions on the Washington State University Tri-Cities campus: Patterns of mortality and scavenging

L Nelson, J Buster, D Cancino, E Diaz

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We studied bird mortality from window collisions at campus buildings on the WSU Tri-Cities campus, located in the Columbia Basin of eastern Washington. From March 2020 - May 2023, student teams surveyed all campus buildings for at least one week each month. In September 2023, we switched to longer survey periods during fall migration and spring migration only. Surveyors walked slowly around the perimeter of each building in both directions (clock-wise, counter clock-wise) searching for birds that had collided with windows. We identified birds to species and mapped their locations using GPS coordinates. The average risk of mortality across all buildings was 31.2 birds/building/year; a value consistent with results of other results from low-rise buildings. Mortality at buildings varied from 1.3 to 40.4 birds/building/year and was correlated with building size and percent of façade composed of glass.

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Bird-window collisions occurred mostly during fall migration without an increase during spring migration. We also studied scavenging of carcasses at campus buildings over four time periods (Spring and Fall 2021, Fall 2022, Spring 2023). We placed carcasses at campus buildings and recorded persistence and scavenger identity using motion-activated cameras. Carcass removal was high (mean = 81%) and mean persistence time varied from 3.5 (SE = 3.3) days to 9.6 (SE = 5.0) days. Nine species scavenged carcasses; Striped skunks (*Mephitis mephitis*) comprised 51% of identified scavengers. Scavenging occurred mostly at night. This study expands the geographic range for studies of bird-window collisions and scavenging behavior of carcasses, adding data from arid inland locations that are underrepresented in current datasets.

Temporal trends in the avian community of a university campus

S Glassman, M Yen, L Wang

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Human activity and disturbance are interconnected with the distribution and ecology of animals, and thus the collection of ecological datasets within urban environments is important to understand the changing biosphere. These human-induced changes may occur on both a short and long-term time scale, causing, for example, a weekend effect or community turnover. Bird surveys have previously been conducted on the University of California, Berkeley campus from 1913–18, 1938–39, and 2006–07. We have been conducting surveys since fall 2023 using the same locations and point count methodology as these previous surveys. With these data, we will be able to assess short and long term temporal trends in the avian community of this University of California campus.

***The effects of artificial light and urban heat islands on spring departure dates for migratory birds.**

C Adams, M Tomaszewska, G Henebry, K Horton

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Urban environments present many challenges to maintaining effective circadian and circannual clocks. The discovery that Purple Martins (*Progne subis*) exposed to artificial light departed earlier from their non-breeding areas in South America ignited many questions about how urban environments affect migration phenology. Are other species in other regions also departing earlier from urban areas? If so, could this effect be explained by increased artificial light, higher temperatures, and/or advanced vegetation phenology? We investigated these questions for ten songbird species who depart from non-breeding areas near the US Gulf Coast. By modeling how each species' probability of observation in eBird checklists declines (i.e., migration initiation) as winter transitions to spring, we are studying how urban features affect species' median departure dates. We found that Winter Wrens (*Troglodytes hiemalis*) and Golden-crowned Kinglets (*Regulus satrapa*) depart earlier in areas with more impervious surface, while the departure dates of White-throated Sparrows (*Zonotrichia albicollis*) are unaffected. We are continuing this investigation for other species and determining whether departure dates are most affected by artificial light (using NASA Black Marble data), temperature, green-up of the land surface, or other factors. While departing earlier may help urban individuals keep up with rising temperatures and the advancement of spring, it may expose them to adverse weather during migration. Arriving earlier at the breeding grounds may give urban males a competitive advantage over fitter individuals that winter in more natural areas, with negative consequences for non-urban populations.

Arrival Time and Habitat Preference of Migratory Birds in a Peri-Urban Area in Northern Ghana

S Boakye Yiadom, N Annorbah, T Aikins

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Globally, long-distance migratory birds are facing severe decline and it's partly attributed to anthropogenic factors such as habitat destruction and climate change leading to phenological mismatch increasing competition between Resident and Migratory birds. This study identified bird species, their habitat

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preference and the arrival times of migrants on a University Campus in Northern Ghana. A four 1 km-long line transects were used from August 2018 to March 2019 in six different habitat types in data collection. A total of 92 species of birds were identified and documented and 26 were migrants with the remaining 65 being Resident species. The results obtained showed that Afro-Palearctic Migrants preferred Arable lands whereas the Residents and their Intra-African migratory counterparts also preferred the vegetation dominated mostly by Neem on the study site.

Movement Ecology and Habitat Use of Wilson's Snipe (*Gallinago delicata*)

K Perozeni, A Long

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Wilson's Snipe (*Gallinago delicata*; hereafter snipe) are one of the most widespread, legally hunted shorebirds in North America, but remain understudied everywhere they occur. We are using data from GPS transmitters affixed to overwintering snipe in Louisiana to quantify movement patterns (timing, duration, location) throughout the snipe's diel and annual cycles to examine snipe site fidelity, and to estimate their seasonal home ranges. We are also using remotely sensed data to evaluate the biotic and abiotic conditions used by snipe across each season. Our study will provide detailed information about the movement patterns and habitat use across their full annual cycle, which is necessary to effectively manage the species, predict how snipe may respond to future changes in land use or environmental conditions, and ensure future hunting opportunities for this unique migratory game bird.

Territory characteristics of white- and tan-striped White-throated Sparrows vary between riparian and upland habitats

K Kardynal, K Hobson

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Variation in resource quality among habitats has the potential to affect both avian behavior and demography. Riparian areas and adjacent shoreline forests may provide higher quality habitat for some species due to more and better-quality food and/or more complex habitat structure that potentially influence individual space use and density. White-throated sparrows occur as white- and tan-striped morphs that have different territorial defense behaviors with white morph males being dominant over tan morphs. Whether individual morphs respond similarly to habitat quality and conspecific density cues remains unknown. Using a 2¹—2² factorial design, we fit miniaturized archival global positioning system (GPS) tags to tan and white morph White-throated Sparrows (*Zonotrichia albicollis*) in shoreline (0 to 300 m from a wetland) and upland (600 to 900 m from a wetland) boreal forest in Saskatchewan. We assessed their territory characteristics (e.g. size, configuration) to determine if territory size varies between habitat types and morphs. Overall territory sizes of White-throated Sparrows were larger in upland forests, but white morphs had smaller territories in shoreline forest but no differences between morphs occurred in upland forests. Additional birds will be sampled in 2024 and we will examine whether insect biomass, long-chain polyunsaturated fatty acids and mercury, habitat structure, and conspecific density, as proxies of habitat quality, drive relationships in territory characteristics. Results will be framed within the context of the ideal despotic and ideal free distribution models, which make predictions about competitive ability of individuals in relation to habitat quality and competitor density.

The influence of weather conditions on incubation in prothonotary warblers (*protonotaria citrea*)

P Peterson, D Albrecht-Mallinger, L Bulluck

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Avian embryonic development is dependent on a narrow temperature window provided by the parent during incubation. This period has high energetic costs that can be affected by weather as parents must trade-off between incubating eggs and foraging for self-maintenance. The objectives of this study were to analyze i) the relationship between incubation duration (days) and average daily temperatures for a

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22-year dataset, ii) the relationship between incubation behaviors and ambient temperatures in 2023, and iii) the amount of variation in daily temperature differences between the nest cup and ambient environment that could be explained by incubation behaviors and daily temperatures. This study assessed these objectives in Prothonotary Warblers using a long-term dataset of 1084 clutches from nest-boxes along the lower James River, Virginia. Incubation behavior in 2023 was determined from changes in nest cup temperature collected using high-resolution thermochron iButtons placed in 41 nests for a total of 127 days. This data was used to estimate daily percent time spent incubating and the number and mean duration of on- and off-bouts. Across our long-term dataset, we found that higher daily temperatures, lower cumulative rainfall, larger clutch sizes, and older females reduced incubation duration. In 2023, the percentage of time spent on the nest was highest at intermediate temperatures, days later in the incubation period, and for younger females. Younger females were found to have on-bout durations that lengthened with higher daily temperatures while older females' behavior remained more constant. The mean duration of off-bouts increased with daily temperature and in light rain. The duration of off-bouts was the best predictor of average nest-cup temperatures; this behavior may therefore be the most critical for proper embryonic development. Warmer temperatures may allow females to spend less time and fewer days incubating, allowing them more time for self-maintenance.

The use of social information for prospecting and nest site selection by Western Bluebirds (*Sialia mexicana*)

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Habitat selection in birds holds important implications for fitness and conservation practices. Choosing favorable breeding grounds requires that individual birds assess nest site quality, but when sampling opportunities are limited or too costly and habitat quality is predictable over time, social information of nesting success may provide the most efficient way for an individual to assess future nest sites. I aim to investigate the hypothesis that prospecting Western Bluebirds use post-breeding social information to select nest sites the following year. I will utilize 10 cooperating winegrape vineyards to examine the effects of broadcasting simulated social information in newly deployed nest boxes on both bluebird prospecting behavior and nest site selection. In late summer of 2023, 10 vineyards without a history of nest boxes each received 20 new boxes ($n=200$). On five of the vineyards, 12 of the boxes received experimental treatment simulating a successful nest ($n=60$), using a previously used nest and a speaker playing Western Bluebird nestling and adult vocalizations over three days (~18 hrs). Video cameras were deployed on the treatment boxes as well as boxes nearby within range of the vocalizations (near-treatment, $n = 30$) and on boxes located on the 5 vineyards with no playback treatment at all (control, $n=30$). Throughout April-July of 2024, I will monitor all boxes to track occupancy timing and species. I will determine whether the use of nestling begging and adult playback increases prospecting visitation rates, nest box occupancy, and abundance of Western Bluebirds on experimental vineyards as opposed to silent controls.

Does recreation at Garden of the Gods impact the nesting activities of local White-Throated Swifts?

L Sprouse, C Ramos

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Garden of the Gods is one of Colorado's most iconic parks with its stunning outcroppings of brilliant red sandstone formations juxtaposed against Pike National Forest and America's Mountain. The unique habitats found in Garden of the Gods host many different species of wildlife, including White-throated Swifts (*Aeronautes saxatalis*) which nest in the crevices of the sandstone formations. Colorado Springs is located at the very eastern edge of the breeding range and this population is unique on the Front Range for its size. Some species of swifts live in close proximity to humans and have been thoroughly studied, but there is considerably less information known about White-throated Swifts. This city park boasts an estimated 6 million visitors annually and the current impact that recreationalists may be having on these nesting birds is unclear. This study seeks to determine if there is a correlation between nesting activities

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of White-throated Swifts and recreational activities such as rock climbing and drone photography. We hypothesize that swifts will avoid the areas of highest human disturbance.

Effects of vegetation on the behavior of hunting barn owls (*Tyto furcata*) and their prey

J Rodriguez, M JohnsonPresenting author: **Jadzia Rodriguez**, rodriguez.mira@hotmail.com

Changes in habitat and vegetation in space and time can strongly affect the behavior of both prey and their predators, and thus shape the outcomes of predator-prey interactions. In managed agroecosystems, these changes could mediate the capacity for natural enemies to reduce economically damaging pests. Farmers in Napa Valley, CA install nest boxes to attract American barn owls (*Tyto furcata*) to their winegrape vineyards to help control rodent pests. However, vineyards exhibit marked spatial and temporal variation in habitat structure due to different viticultural practices regarding cover crops, trellis systems, and pruning. How the owls respond to this habitat heterogeneity remains unresolved. During the spring and summer of 2024, GPS tags fitted with accelerometers will be deployed on adult breeding barn owls in Napa Valley to track their hunting behavior, and videography at nest boxes will identify when and what types of prey they provision to their young. These data will be used to determine the precise locations of where owls kill their prey, and resource selection function analyses will reveal how changes in vegetation structure affect the distribution of hunting strike locations. By leveraging improved GPS tracking technology, a heterogeneous landscape, and predictable and abrupt changes in vegetation caused by viticultural practices (i.e., mowing cover crops), this research will investigate questions fundamental to understanding predator-prey interactions while also shedding light on how owls may contribute to rodent pest management in this agricultural ecosystem.

**Feeding innovation in the Bare-throated Tiger-Heron (*Tigrisoma mexicanum*)

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Little is known about the population dynamics and feeding behavior of the Bare-throated Tiger-Heron (BTTH; *Tigrisoma mexicanum*) because it is mostly solitary and often found in remote habitats in Central America. Here we report the first documented observation of a BTTH using bait to obtain fish in the Tortuguero region of Costa Rica. Using bait to fish, where a bird places an object in water to attract fish to facilitate capture, is a complex behavior that has only been observed in 12 species of birds, 7 of which belong to the heron family, Ardeidae. We documented the behavior using video capture and camera footage. Four direct observations were made of an individual BTTH using bait to fish, three of which were successful. We also noted that several Black River Turtles (*Rhinoclemmys funerea*) appeared to benefit from the heron's feeding behavior. We conducted interviews with local people to develop a history of the behavior and learned that this individual has been using this method to obtain food for 19 years. While this is the first account of bait-fishing in BTTH, this behavior might exist in other members of this species. Just one account of feeding innovation behavior in birds has been correlated to lower extinction risk. Although this species is not currently on The IUCN Red List of Threatened as an at-risk species, they are decreasing in the southern part of their range due to habitat augmentation from wetland drainage. Thus, this observation of bait-fishing in a BTTH may demonstrate that other types of feeding innovation exist in this species and could provide a buffer against extinction.

Variation in color perception across hummingbirds

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Spectral tuning occurs when an individual's eyes become tuned to particular wavelengths of light. Hummingbirds in the clade, Mellisugini, are sexually dimorphic. Males display their colorful throat feathers, the gorget, to females during courtship displays which is an important sexual signal. If

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hummingbirds have undergone spectral tuning to match the peak sensitivity of their eyes to the respective gorget color of the males, this can translate to better perceptual ability in that range of colors. For instance, does a Costa's hummingbird with a purple gorget perceive purple shades better than an Anna's with a magenta gorget or Allen's with an orange gorget? I am studying differences in perceptual ability across three species, Anna's, Costa's and Allen's hummingbirds through operant conditioning, color discrimination experiments. Birds are trained to associate a particular shade of color to a food reward and then their ability to discriminate this shade against slightly different shades of the same color is studied. Preliminary data from this study suggests that a bird is better at discriminating conspecific colors. This study will help to determine if spectral tuning under sexual selection leads to a differentiation in color perception. Differentiation in visual signal perception is a driver for rapid speciation. Hence, differences in signal perception between species might have contributed to the rapid speciation seen in this clade.

The Need for Seed: Patterns of Birdfeeder Use in Slate-colored Junco (*Junco hyemalis*)

O Stringer, E Boczulak, J Morgan, G Lindsey, K Williams

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Birdfeeders are a source of joy for backyard bird enthusiasts, especially during the winter months. However, birdfeeders may act as ecological traps for birds and impose trade-offs between the 'need for seed' and an increased risk of mortality. We monitored birdfeeders at a residence near Athens, Ohio to investigate how Slate-Colored Juncos (*Junco hyemalis*) use birdfeeders during overwintering periods and how feeder use impacts overwinter survival. From 2021-2023, we captured and color-banded 45 Slate-colored Juncos in mist nets and baited traps. From January 23 to April 14, 2023, we observed birdfeeders at 30-minute intervals, documenting all color-banded birds that visited. We also recorded daily minimum and maximum temperatures, as well as maximum wind speeds on observation days. Overall, females exhibited greater visitation rates compared to males. Additionally, birds showed increased feeder usage when minimum temperatures ranged between -2 to 0 $^{\circ}\text{C}$, with visitation decreasing at both warmer and colder temperatures. We also found a negative relationship between visitation and maximum temperature. With overwinter survival estimates of 100% for male Slate-colored Juncos and 98% for female Slate-colored Juncos, the birdfeeders at our banding location may not have acted as ecological traps. Instead, supplemental feeding may have contributed positively to survival rates. By understanding how birds interact with feeders and the impacts that birdfeeders have on survival, we can inform conservation organizations on how to sustain avian populations in winter habitats.

Intra- and interspecific territorial behavior of two sympatric Hispaniolan Cuckoos

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The Hispaniolan Lizard-Cuckoo (*Coccyzus longirostris*) and the Mangrove Cuckoo (*Coccyzus minor*) coexist in various habitats on Hispaniola. Little is known about how, or even whether, the two species interact there. This study used playback experiments and observations to investigate the ecological distribution and territorial behavior of these two cuckoo species in Punta Cana, Dominican Republic to test the hypotheses (1) that both species are territorial and hence respond to conspecific playback, (2) that the species compete and therefore respond to heterospecific playback, and (3) that the response to playback is correlated to genetic relatedness by comparing the response of the Hispaniolan Lizard-Cuckoo and the Mangrove Cuckoo to the playback of allopatric lizard-cuckoos from the other Greater Antillean islands. Both species responded to conspecific playback and are thus territorial, with the Hispaniolan Lizard-Cuckoo showing a consistently stronger response than the Mangrove Cuckoo. Both

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species responded similarly to playback of the other sympatric species and both thus show some interspecific aggression. We also found support for hypothesis 3 in that the Mangrove Cuckoo barely responded to playback of the allopatric lizard-cuckoos while the Hispaniolan Lizard-Cuckoo responded quite strongly to playback of the lizard-cuckoos from other islands supporting the hypothesis that, in this species group also, response to playback is correlated to genetic distance.

***Florida Scrub Jay: Characterizing nest microhabitat**

S Mendez, S Beres, T Bakley, S Barve

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Florida Scrub Jays (*Aphelocoma coerulescens*) are cooperatively breeding birds that live in oak scrub habitats characterized by low shrub cover. FLSJ nests are hence typically 1 m off the ground and ~50% nests fail due to predation. Corvidae often select nest sites to reduce predation and in FLSJ nest predation is more prevalent later in the breeding season. While nest height has been found to increase through the FLSJ breeding season, especially after the failure of a previous nesting attempt, little is known about the other characteristics of nesting sites and how they covary with nest height. In this study, we will quantify several nest microhabitat parameters for over ~150 nests during the 2024 FLSJ breeding season at Archbold Biological Station. These will include canopy cover over the nest, shrub height, shrub species, shrub density, vertical and horizontal distance from the outside of the shrub etc. within a 5 m radius around the nest. We will then compare the characteristics of successful versus failed nests to understand the variables that may drive nest fates in FLSJ. Results from this study will help understand how nest microhabitat selection drives nest success and survival during early life stages in this threatened species.

Extreme heat events may reduce hatching success of Wood Ducks (*Aix sponsa*) in California's Sacramento Valley

T Russell, J Sweeney, B Lyon, C Thow, M Hinton, T Stair, M Jones, C Wells, K Cook, D Scheck, J Eadie

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Negative effects of extreme heat on avian reproductive success have been shown in several species of birds. Climate change is causing extreme heat events become more frequent during California summers. We have monitored Wood Duck (*Aix sponsa*) nest boxes in California's Sacramento Valley since 1998 and hatch success has declined significantly. Birds that depend on nest boxes may be more vulnerable to extreme heat since the microclimate of nest boxes has been shown to be more unstable than natural cavities. In addition, Wood Ducks are a precocial species, incubating their eggs for about a month, and nests may experience a wide-range of ambient temperatures prior to hatch. Based on observations of egg mortality after heat waves, we hypothesize that climatic changes may be negatively influencing hatch success. However, clutch size, which is related to rates of conspecific brood parasitism in Wood Ducks, and hen identity may also have important influences on hatch success. We use data from the 2014 – 2024 breeding seasons at two sites in the Sacramento Valley with a total of 113 nest boxes to investigate the relative effects of temperature, conspecific brood parasitism and hen identity on hatch success. Our results will inform management recommendations to improve hatch success in California Wood Duck nest box programs and identify potential effects of climate change on the reproductive success of cavity-nesting waterfowl.

Investigating arthropod community diversity using environmental DNA (eDNA) and a potential role of bryophytes in the nests of the Prothonotary Warbler (*Protonotaria citrea*)

S Kylander, M Brewer

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Birds construct nests to protect their young, but those nests have other inhabitants. The microhabitats

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that develop in nests are desirable to arthropods like avian ectoparasites, arthropods that may benefit the birds by depredating ectoparasites, and those simply looking for a place to live. Most studies of nest arthropods have focused on ectoparasites, but few have attempted to characterize the entire community (perhaps due to challenges associated with conventional techniques). Environmental DNA (eDNA) methods may allow for more streamlined and complete community characterizations. To moderate arthropod communities, especially ectoparasites, in their nests, birds may use certain fresh plants as nest material because those plants produce compounds that deter arthropods. Studies of birds that incorporate fresh vascular plants inconsistently support this idea, but little is known about birds that use bryophytes like mosses and liverworts. With this project, I am using eDNA to characterize arthropod communities in the nests of the Prothonotary Warbler (*Protonotaria citrea*), a watchlist species that uses bryophytes in its nests and the only cavity-nesting warbler in eastern North America, in five Coastal Plain forested wetland habitats. I am also identifying bryophytes used in these nests and completing chemical analyses of volatile compounds produced by these plants. This work will catalog arthropods and bryophytes associated with this warbler in varied habitats, identify those that may support healthy nesting conditions for birds, and generate information that will foster future research and strengthen management strategies in these habitats that are threatened by the consequences of global climate change.

****Changes in cattle stocking impact the breeding success of Mountain and Western Bluebirds in opposite directions**

E Patton, T Imfeld, M Giebel

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Decades of research have documented the range expansion of Western Bluebirds (*Sialia mexicana*) and the resulting competition with Mountain Bluebirds (*Sialia currucoides*) for nesting sites. The extent to which changes in land use and agricultural practices have impacted this phenomenon are not well documented, especially for cattle grazing. Here, we leveraged cattle stocking data from rangeland managers and nest box data from bluebird monitoring volunteers in Douglas County, Colorado to quantify how cattle stocking rates impact the breeding success of Western and Mountain Bluebirds. We hypothesized that, because Mountain Bluebirds prefer shorter grass and barren ground for foraging, this species' breeding success, quantified as nesting attempts, total fledged offspring, and proportion of offspring successfully fledged, is positively correlated with cattle stocking rates. We hypothesized the opposite relationship for Western Bluebirds, which prefer to forage in taller grass with less barren ground. Between 2009 and 2022, cattle stocking rates gradually decreased from 400 cow-calf pairs to 80, and the number of Mountain Bluebird nesting attempts and fledged offspring similarly declined. Western Bluebirds were first documented nesting in the study area in 2012, and the number of nesting attempts and fledged offspring of this species has increased in response to decreasing stocking rates. However, the proportion of successfully fledged offspring was not impacted for either species. Our study suggests that changes in stocking rates and rangeland management may facilitate the expansion of Western Bluebirds and their subsequent outcompeting of Mountain Bluebirds by altering the foraging opportunities for these species.

****How does a global climate cycle affect the reproductive output of a neotropical migratory bird?**

A Bressette, E Cummings, D Albrecht-Mallinger, L Bulluck

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El-Niño Southern Oscillation (ENSO) causes regional changes in climate and has been found to have varying effects on the survival, fecundity, and recruitment of migratory songbirds. This study seeks to better understand the effect of ENSO on the fecundity of Virginia-breeding Prothonotary warbler (*Protonotaria citrea*; PROW), a neotropical migratory songbird. PROW breed in the Eastern United States and spend the non-breeding season primarily in Panama and Colombia. Ongoing research in Virginia has found a positive relationship between spring precipitation and predicted number of PROW fledgelings during La Niña, but the opposite during El Niño. To better understand this relationship, we wanted to know if the effect of ENSO was a result of conditions on the breeding grounds or carry over effects from the nonbreeding grounds. To do this, we used linear models to assess how ENSO affects vegetation health

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and climate conditions in Virginia as well as how it affected vegetation health in Panama and Colombia. We found that ENSO had little impact on temperature and precipitation anomalies as well as vegetation health in Virginia, regardless of season. However, in both Panama and Colombia, vegetation health was significantly lower in El Niño during the dry season when PROW were overwintering there. This indicates that differences in fecundity during the breeding season may be the result of carryover effects from dry El Niño conditions in overwintering habitats. These results are especially concerning due to predictions for increased intensity of El Niño events caused by climate change.

Assessing microplastics as an environmental justice issues through avian ecology and community engaged research

M Ortega, C García-Louis, A King-Kostelac, K Walker, L Saldaña, J Smith

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The Urban Bird Project (UBP) is a transdisciplinary community science project that integrates avian ecology, Mexican American Studies and Indigenous studies through research about local, migratory and culturally significant birds and their environments in south Texas. In so doing, UBP aims to (re)claim marginalized knowledges, develop a holistic understanding of environmental histories, and elevate issues of environmental justice. As part of this approach, we are assessing microplastic pollution as an environmental justice issue through avian ecology and community-engaged research in San Antonio, Texas. Microplastics, defined as plastics 1mm-5mm in size, are prevalent in the environment. However, marginalized communities likely experience a disproportionate burden of microplastic pollution because procedural injustice often results in reduced or denied services that address issues of pollution, the accumulation of road-side waste and illegal dumps, or waste management facilities being located near marginalized communities. In this project, community scientists across the city host nest boxes in their homes and monitor the breeding attempts of House Sparrows (*Passer domesticus*) following a modified NestWatch protocol. Members of the research team collect nestling fecal sacs and analyze them for microplastic content. We anticipate that birds nesting in areas with a higher socioeconomic status will be less exposed to microplastics and have higher breeding success than birds nesting in areas with a lower socioeconomic status. This research empowers community members to address issues of environmental justice in their neighborhoods while also increasing knowledge about an environmental contaminant of pressing concern.

***Temperature effects on nestling growth in the Florida Scrub Jay (*Aphelocoma coerulescens*)**

K Wojcik, S Beres, T Bakley, S Barve

Presenting author: **Kass Wojcik**, Archbold Biological Station, kasswojck5@gmail.com

Climate change is forecasted to have a range of effects on avian morphology, ecology, and life-history. Recent research on birds has shown that warmer temperatures can lead to lower nestling body mass, as they may experience decreased parental provisioning while at the same time having to allocate more energy resources to thermoregulation. Nestling body mass in the Florida Scrub Jay (*Aphelocoma coerulescens*, FLSJ) is correlated with post-fledging survival, yet it is not known how temperatures experienced by nestlings affect their growth. As FLSJs are a threatened species, understanding how climate affects their developmental biology is particularly important for ensuring the maintenance of large populations. Using a 40-year long-term dataset on the body mass of >3000 FLSJ nestlings and locally recorded temperature collected at Archbold Biological Station, we will investigate how nestling body mass (d11) is affected by experienced climatic variables. After controlling for confounding factors such as group size, territory size, and number of nestlings, we predict that nestlings that grow during longer durations of warmer temperatures will weigh less than nestlings that develop during cooler conditions. As greater nestling body mass has been positively associated with higher post-fledging survival rates, this result could have implications for the short- and long-term fitness of FLSJs.

***The role of phenotypic plasticity in the adaptive capacity of avian species to**

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climate change in the Midwestern United States**S Ramirez, B Zuckerberg, J Vander Zanden, D Vimont**Presenting author: **Sarah Ramirez**, sramirez26@wisc.edu

Many avian species are adapted to specific cues predicting favorable conditions, however environmental variability due to climate change may result in unreliable cues. Responding to unreliable cues could result in mismatches with future conditions, such as birds using day length to initiate reproduction but missing peak abundant resources more strongly associated with temperature. However, phenotypic plasticity allows individuals to adjust their phenotypes (i.e., feather color or timing of phenological events) by responding to environmental cues that may more accurately predict favorable conditions. For example, black-capped chickadees (*Parus atricapillus*) use temperature to cue reproduction and reduce the risk of mismatches between nesting and resource abundance. We will synthesize previous literature to identify avian species documented to exhibit phenotypic plasticity in response to changing environmental conditions. We will explore potential phenotypic and phenologic mismatches during years of extremely variable weather patterns, followed by investigating the role of phenotypic plasticity in minimizing the risks of these mismatches, and then determining the mechanisms behind why those mismatches are detrimental to persistence of populations. As climate change progresses, knowledge about the ability of populations to respond and adjust to predicted extreme variability is important for anticipating management actions needed to maintain those populations.

Surviving the climate challenge: Eco-evolutionary modeling predicts future of Tibetan partridge (*Perdix hodgsoniae*) in sino-himalayan landscape*P Ghimire, N Wang, P Chhetri, N Dahal, S Lamichhane**Presenting author: **Prashant Ghimire**, pghimir1@kent.edu

Climate change influences species and ecosystems by directly altering habitat conditions through variations in temperature and/or precipitation patterns. In response, species adapt either by adjusting their current niche to track favorable conditions, through short-term responses (phenotypic plasticity) or long-term genetic adaptation. Species inhabiting high altitudes face extreme challenges due to the limited availability of suitable high-elevation habitats, restricting their ability to track and shift niches compared to their low-altitude counterparts. Therefore, it is important to understand how high-altitude species are thriving in current climatic conditions and predict their survival under future climatic conditions. In this study, we use a high-altitude resident bird, the Tibetan partridge (*Perdix hodgsoniae*) that inhabits montane environments (2800 – 4600m) of Sino Himalayan landscape. The Tibetan partridge thrives in varying environments that include a dry western habitat and a wet south-eastern habitat with varying temperature and precipitation conditions. We generated five million single nucleotide polymorphisms (SNPs) within 28 partridge populations (96 individuals) using whole genome sequencing and downstream bioinformatics analysis. We identified 3364 candidate SNPs associated with local adaptations in current climatic conditions using univariate and multivariate genotypes by environment association analyses. Using gradient forest and generalized dissimilarity modelling, we predicted that the western population of the Tibetan partridge has a higher genomic vulnerability, inferring that this population is vulnerable under future climatic scenarios. We will further use ecological data to predict future niche suitability changes and analyze niche-genome interruption. A landscape genomic approach will be used to delineate evolutionary rescue routes, aiming to aid evidence-based species management.

Climate Watch: A community science program where we strive for birding to be for everybody and every body**A Long, G LeBaron, N Michel, S Saunders, B Bateman**Presenting author: **Amanda Long**, National Audubon Society, amanda.long@audubon.org

The National Audubon Society's Climate Watch is a novel, large-scale community science program

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designed to assess how North American birds are responding to climate change. Since 2016, Climate Watch has recruited thousands of volunteers across the United States to conduct surveys for select target bird species that are projected to have considerable range shift under climate change. The program was co-developed with volunteers, and to address volunteer feedback of limited spatial coverage of the initial target species, we added additional target species to the program to better represent a larger geographic area and urban areas. To ensure continued improvement of the program for volunteers and in gaining better data coverage, we sought to assess both the current geographic coverage of survey sites and the accessibility of our Climate Watch program. We analyzed the spatial coverage of our volunteer survey locations over the course of eight years to identify areas where there are data gaps in terms of geographic coverage and demographic representation. In addition, we assessed the current resources and materials that we provide our volunteers from an accessibility and inclusion perspective. The results of our assessment will allow us to plan for and implement changes to our Climate Watch program to strategically address current program barriers and data gaps. As such, our work advances the inclusivity and accessibility of community science and the birding community.

Dietary Niche Breadth of Mixed Species Flocks Using Stable Isotopes: Exploring Fine Partitioning and Elevation Effects

L Hurtado, F Montano Centellas, H Vander Zanden

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The question of whether co-occurring species within communities 'finely partition' their dietary niche remains a central question in community ecology, shedding light on the dynamics of positive (facilitation, mutualism) and negative (competition) species interactions in community assembly. Our study focuses on ecologically similar species that overlap in mixed-species flocks at different elevations, namely understory insectivores, midstory omnivores, and edge sally-gleaners. Field data were collected between May and July 2014, and May and October 2015 and 2016, spanning an extensive gradient (1350-3650 masl) in the Andes of western Bolivia. We analyzed samples for carbon and nitrogen content to assess the dietary niche breadth of 195 feather samples and 63 blood samples from 10 species. Preliminary results indicate that species such as *Mionectes striaticollis* (Streak-necked flycatcher) have the widest niche in terms of carbon and nitrogen isotopes, while species like the *Myiothlypis signata* (Pale-legged Warbler) have a narrower niche. In addition, we will investigate whether this dietary niche overlap changes with elevation, traversing a gradient of stress and resource availability. Our results will contribute to the understanding of the mechanisms driving community assembly within mixed-species flocks and the ecological dynamics underlying species interactions along elevational gradients.

***Forest restoration and bird community recovery in the Amazon**

A Medeiros, P Bobrowiec, M Campos-Cerqueira, E Roberts, D Luther

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Amazonian bird communities may directly benefit from habitat restoration, as some species are restricted to specific forested types, avoid edges and open habitats. However, community recovery in previously fragmented forests might depend on general aspects of each area (e.g. age of the secondary forest, proximity to primary forest, size of forest fragments) as well as on traits of bird species (e.g. diet and forest strata used). Here, we investigate (a) When is habitat recovery enough for reestablishing amazonian bird communities? (b) Is patch size an important factor when considering a permeable matrix? (c) Are there feeding guild and functional diversity occupancy differences along a disturbance gradient? To address these questions, we sampled 26 sites using camera traps (CT) and audio recorders (AR) in the largest and longest running fragmentation project in the Amazon, the Biological Dynamic of Forest Fragments Project - BDFFP. We sampled forest fragments of 1, 10 and 100ha, nearby continuous (CF) and secondary forest (SF). We identified 201 bird species, 191 from AR and 28 from CT methods. Mean species richness was higher in CF (mean = 70.6 ± 8.26) and 100ha fragments (mean = 69.8 ± 15.4), compared to SF (61.4 ± 11) and 1ha fragments (40 ± 12.9). Carnivore and herbivore species are predominant in all areas, except to 1ha, where there were more omnivore species than herbivore (19% and 16%, respectively). Functional diversity was also greater in CF and 100ha fragments. These

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preliminary results suggest that mature SF in the BDFFP (~40yrs old) is sustaining or at least serving as corridors to more species than small fragments (i.e. 1 and 10ha), showing the importance of habitat restoration for bird community recovery.

Composition and dynamics of scavenger communities at slaughterhouses: implications for ecosystem services in The Gambia

M Agunbiade, D Ogada, K Birkhofer

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Slaughterhouses serve as critical hubs where scavenger communities perform essential ecological functions, yet little is known about their composition and dynamics in the Gambian context. This study investigates scavenger communities at slaughterhouses in The Gambia and explores their implications for ecosystem services. Through field surveys and data analysis, we assess the diversity, abundance and temporal dynamics of scavenger species and examine their role in waste disposal. This research will help fill the knowledge gap on scavenger ecology in The Gambia and inform conservation and management efforts aimed at maximising the ecosystem services provided by scavenger communities in abattoir environments. We investigated the ecology of vertebrate scavengers at 5 abattoirs in The Gambia using in-person surveys between 2022 and 2023. Specifically, we examined daily, and inter-weekly patterns of abattoir use by vertebrate scavengers and estimated carrion consumption rates. We demonstrated the importance of slaughterhouses in supporting a large number and diversity of scavenger species, including the critically endangered Hooded Vulture (*Necrosyrtes monachus*). Although our analysis is at an advanced stage, our preliminary results show that Hooded Vultures contribute 69% of the carrion removal provided by vertebrate scavengers. The detection of dogs at all 5 slaughterhouses is worrying, as any increase in their numbers, including other opportunistic scavengers, could significantly reduce Hooded Vulture carrion removal. We recommend that improved fencing around abattoir facilities could help to limit access by feral dogs, increase foraging by vultures and therefore increase overall carrion removal rates.

***War on birds (and birding): Exploring patterns in bird community dynamics and community science engagement within pre- and post-war environments.**

Z Ladin

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Human military conflicts can have negative effects on ecosystems and wildlife populations, yet remain difficult to study. However, data from community science platforms such as eBird can be used to estimate bird community dynamics where activities associated with war such as large explosions, contamination of the environment, and loss and degradation of habitat occur. I predicted that bird community dynamics and community science engagement behavior would differ between pre- and post-war periods. To test predictions, I used eBird checklist data including species records (N = 25,313), to compare bird community dynamics and community science engagement using a difference-in-difference modeling technique that included data from a control group (i.e., a country where war was not occurring) and accounted for potentially confounding factors such as year, location, countries in conflict, and observer. I used eBird data from two recent conflict scenarios that occurred between Ukraine and Russia (began on 02-24-2022) and between Palestine and Israel (began on 10-07-2023), and included data from Turkey as a control group for both conflicts since it is spatially similar (same longitude) and is a similar distance between either of the conflicts assessed. Using a compositionally-aware index of species richness (i.e., Aitchison distances), I found that species richness and community science engagement differed between pre- and post-war periods, among country types (aggressor, defender, and neutral), and between treatment and control groups. This study provides preliminary evidence suggesting community science data can be used to evaluate potentially harmful effects of war on species assemblages and community science engagement.

***Balancing waterfowl and wild rice: quantifying the impacts of herbivory on a vulnerable plant species**

Updated September 26, 2024

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A Shipley, P Murphy, D MacFarland*Presenting author:* **Amy Shipley**, Wisconsin Department of Natural Resources, amy.shipley@wisconsin.gov

Northern wild rice (*Zizania palustris*; manoomin) is a culturally, economically, and ecologically important native plant species in the Great Lakes Region. The Ojibwe word for wild rice is manoomin, and it is considered an important gift. Over the past century, wild rice has declined in distribution and abundance due to wetland loss, water quality degradation, climate change, shoreline development, and other factors. Wild rice and waterfowl have long co-existed, and rice seeds are an important food source for migrating waterfowl and other species. However, efforts to restore Trumpeter Swan (*Cygnus buccinator*) populations have been very successful, and resident Canada Goose (*Branta canadensis*) populations have increased. There is increasing concern that grazing or herbivory by geese and swans is negatively impacting wild rice and restoration efforts. While mitigation projects are already underway, the impacts of goose and swan grazing on wild rice have not been directly measured. We are initiating a new field study across northern Wisconsin to address the following questions: 1) Do different levels of herbivory impact growth, density, and seed production of wild rice, and is waterfowl abundance related to herbivory intensity? 2) How does herbivory across the growing season impact seed production? 3) What conditions promote wild rice resilience to herbivory? 4) Do geese and swans have different impacts, and do they prefer wild rice over other aquatic plants? Results will directly inform management and wild rice restoration efforts, and will include recommendations on when mitigation to protect wild rice from waterfowl herbivory is necessary.

Laysan Duck (*Anas laysanensis*) Use of Artificial Freshwater Sources on Midway Atoll*P Ulsamer, A Roth, E Blomberg***Presenting author:* **Percival Ulsamer**, percyulsamer@gmail.com

The Laysan Duck (*Anas laysanensis*) is a critically endangered species endemic to the Hawaiian archipelago. To facilitate reintroduction on Midway Atoll National Wildlife Refuge, two types of freshwater sources were constructed; groundwater seeps and plastic tubs called guzzlers. To better guide future management decisions, we evaluated the role of these freshwater sources in terms of duck density, vegetation, and behavior. Game cameras were used to evaluate density and behavior at $n = 4$ seeps and $n = 6$ guzzlers. Duck density is higher at guzzlers ($\hat{\rho}^2 = -0.51 \pm 0.09$), increases with higher air temperature ($r^2 = 0.42$), and increases throughout the summer ($r^2 = 0.51$). Density is the highest in the morning ($\hat{\rho}^2 = 0.02 \pm 0.01$) and the lowest at night ($\hat{\rho}^2 = -0.08 \pm 0.01$). Based on quadrat surveys, plant richness ($p < 0.05$) and diversity ($p = 0.01$) are higher at seeps, but their effects on density is inconclusive. Activity doesn't vary throughout the day, but active ducks are more frequent at guzzlers during the day and night. Higher density at guzzlers may be of concern for management due to the higher risk of conspecific competition, disease, and botulism. Maintaining seeps can provide a low-density refuge and a high-quality vegetative habitat. Further research into density and survival of the species is needed. The lack of behavioral change at water sources throughout the day and changes in density based on time of day, date, and air temperature reveal new insights on the behavior of the Midway population.

****King Rail habitat use in restored and managed coastal wetlands****M Linke, S McRae***Presenting author:* **Megan Linke**, linkem22@students.ecu.edu

The King Rail (*Rallus elegans*) is an obligate freshwater marsh specialist, whose populations are declining throughout its Eastern United States range, leading to its federal designation as a species of priority conservation concern. Habitat loss due to inland marsh drainage and land conversion, has concentrated King Rail populations toward the coastal margins of their range. However, coastal marshes are increasingly exposed to climate change related assaults including hurricanes and associated storm surge, tidal inundation, and saltwater intrusion. To support habitat restoration and management efforts for

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King Rail populations, we are investigating habitat use across a series of natural and impounded wetlands interspersed with riparian forest along a tidally-influenced river in coastal South Carolina. The variable hydrology and land cover of this region differs from other sites where King Rails have been studied previously. Using VHF radio-telemetry, we mapped King Rail home ranges throughout this varied habitat during the breeding and non-breeding season. Time of day and environmental variables such as tide level and temperature were used to analyze movement patterns throughout individuals' home ranges. We determined spatiotemporal patterns in King Rail movement within and between seasons. Habitat variables collected at points of detection and at nest sites enabled the identification of habitat characteristics selected by King Rails during the breeding season. Our findings will help inform future habitat management strategies to better support King Rail conservation.

***Effects of Habitat Creation Events on Nesting Piping Plovers (*Charadrius melodus*) at Fire Island, NY**

H VanDerwater, C Wails, S Dorsey, H Bellman, K Oliver, S Ritter, S Robinson, D Catlin, S Karpanty, J Fraser

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Shorebird populations are declining globally, largely due to habitat loss caused by erosion, vegetation succession, and human activities. When populations are habitat limited, creation of new nesting habitat may allow population growth. We examined responses of the federally threatened Piping Plover (*Charadrius melodus*), a habitat limited shorebird, to new habitat created by both natural and anthropogenic processes, on Fire Island, NY. Habitat creation projects were led by the US Army Corps of Engineers and the US Fish and Wildlife Service. Old Inlet, a breach from Hurricane Sandy, gradually filled in, fully closing in late 2022. Between 2022 and 2023, nesting habitat at the breach increased from 51 ha to 61 ha (+20%) and we observed 8 new nesting pairs (+22%), more than twice the mean annual increase observed 2013–2022 (3.3 pairs/yr). At Democrat Point, dunes were flattened and vegetation was removed during the 2021–2022 winter, increasing plover nesting habitat from 21 ha to 32 ha (+52%). Since 2022, nesting pairs have increased above the pre-restoration trend (mean 2015–2021 = +2 pairs/yr, 2022–2023 = +9.5 pairs/yr). At Pattersquash Overwash, nesting habitat created by Hurricane Sandy was reduced by vegetative growth, which was removed during the 2022–2023 winter. This restoration was followed by a four-fold increase in pairs and an increase in reproductive output. We did not observe an immediate increase in reproductive output at the former inlet or Democrat Point, which may be related to changing predation pressures or the time needed for beneficial habitat features to form. We underscore the value of monitoring populations after natural and artificial habitat creation events to inform ongoing shorebird management.

***Marshes for Tomorrow: A Novel Spatial Prioritization for Saltmarsh Sparrow Resilience and Restoration**

Z Posnik, J Grand, D Curson, N Ganju, J Carr, H Bellman

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The Saltmarsh Sparrow (*Ammodramus caudacutus*) is a rapidly declining sparrow nesting in Western Atlantic salt marshes from New England to Florida. Salt marshes of the Chesapeake Bay and Coastal Bays are critical for this species' annual life cycle in both breeding and wintering seasons. Sea level rise represents an existential threat to the sparrow and its habitat, as irregularly flooded high marsh dominated by *Spartina patens* is converted to regularly flooded low marsh or open water. Somewhat counterintuitively, in the Chesapeake Bay, the interior marsh is experiencing the greatest marsh elevation loss, due to internal ponding. This research uses a Multi-Criteria Evaluation (MCE) approach to integrate two models, the Sea Level Rise Affecting Marshes Model (SLAMM) and the Unvegetated to Vegetated Ratio (UVVR) at the Marsh Unit (MU) scale providing both an assessment of marsh condition and options for potential restoration. Additionally, using manual aerial photo interpretation, we mapped vegetation across the study area to identify patches of remaining *Spartina patens* as well as vegetation that can be managed to facilitate the expansion of Saltmarsh Sparrow habitat. This model and accompanying data provide a method for estimating the long-term impacts of internal ponding on Saltmarsh Sparrow habitat

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through the end of the century. The project is being co-developed by NGO, government agency, and local community stakeholders and will ultimately help prioritize 25,000 acres of salt marsh for restoration and long-term conservation that will benefit both the Saltmarsh Sparrow and local communities.

***Use of E-scape models to examine waterbird behavior and effects of coastal restoration in the northern Gulf of Mexico**

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As coastal restoration work continues to increase in scale and frequency around the world, it is critical to consider how land and habitat creation affects species of concern and broader ecosystem function on modified landscapes. The dozens of restoration projects in coastal Louisiana include efforts to maintain barrier islands, which often serve as critical breeding habitat for waterbird populations. To remain productive, colonies must also be linked to high-quality foraging areas. To demonstrate how this linkage can be evaluated in dynamic environments at a regional scale, we coupled remote sensing and stable isotope data to generate maps of energetic importance for Gulf menhaden (*Brevoortia patronus*), one of the most ecologically and economically important fish species in the northern Gulf of Mexico. We then overlaid these maps with foraging data from brown pelicans (*Pelecanus occidentalis*) nesting in three of the largest colonies in the state to assess their movements relative to this novel representation of their principal prey distribution. We found significant variation in the quality of foraging habitat (i.e. menhaden habitat quality) used by pelicans over space and time, as well as strong spatial segregation between colonies, highlighting the importance of island placement when considering restoration priorities and wildlife response. Pelicans also used higher-quality habitat patches compared to simulations of birds moving realistically but randomly across the landscape, providing evidence that E-scapes hold considerable potential for assessment of coastal ecosystem function from a spatially-explicit, multi-trophic perspective, and could serve as a valuable tool for future restoration planning.

***Effects of solar energy development on grassland birds in New York**

T Boycott, T Simamora, S Grodsky

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In New York, an accelerated transition to renewable energy is underway with goals for 70% renewable energy production by 2030. Solar energy development is anticipated to interact with agricultural practices and conservation functionality of working lands, which provide habitat for avian species of conservation concern, including grassland birds. Yet, bird use of solar-modified landscapes and broader implications of solar energy development on bird populations in New York remain unclear. Our work aims to measure bird population response to solar energy development over multiple spatial and temporal scales, as well as underlying mechanisms including changes to local habitats and landscape composition. We achieve these measures through point count and passive acoustic monitoring methods. Baseline measures ahead of utility-scale solar development offer insight into grassland bird ecology across working and protected grasslands in New York, while measures from existing solar-modified landscapes indicate trends in habitat use preference and evaluate population displacement. Our findings illustrate the importance of unprotected working grasslands (i.e., suitable sites for solar energy development) for greater grassland bird species diversity in New York. However, we find temporally longer and probabilistically higher grassland bird occurrence on protected grasslands. We note fewer habitat-use behaviors and overall lower species diversity on solar-modified landscapes in breeding and winter-season birds compared to a range of non-solar grassland-type habitats. We relate our findings to potential interactions between grassland bird conservation and increased solar energy development in New York.

***Quantifying the Effects of Hydrologic Restoration on Avian Habitat in the Camas National Wildlife Refuge and Mud Lake Wildlife Management Area**

Updated September 26, 2024

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R D'Andrea, C Bromka, M Stewart, K Jo*Presenting author: Rosemary D'Andrea*, Analytical Mechanics Associates, rosemarydandrea0@gmail.com

Wetlands in the Intermountain Region are a rare landscape feature crucial for migratory birds along the Pacific Flyway, yet they face increasing threats from human activity and environmental change. This study quantified changes in surface water over time and projected future impacts on avian habitats within the Camas National Wildlife Refuge and Mud Lake Wildlife Management Area, using NASA Earth observation imagery. We processed Landsat imagery from 2016 to 2020 with ArcGIS Pro to classify land cover and forecast wetland extent to 2060 using IDRISI TerrSet Land Change Modeler. We also compared lidar data from 2011 and 2019 to detect related changes in vegetation and topography. (RESULTS PLACEHOLDER) We partnered with the U.S. Fish and Wildlife Service and the Idaho Department of Fish and Game, integrating their knowledge of the area with our remote sensing analyses to enhance wetland restoration efforts. This study demonstrates the value of NASA Earth observations in monitoring wetlands, informing restoration projects, and supporting avian conservation.

Activity patterns of Eastern Whip-poor-will (*Antrostomus vociferus*) across different Midwestern forest management regimes**H Coates, M Ward, T Benson***Presenting author: Holly Coates*, University of Illinois Urbana-Champaign, hcoates2@illinois.edu

Eastern Whip-poor-will (*Antrostomus vociferus*) are a species in steep decline, reliant upon early-to-intermediate-aged forests with moderate canopy cover across their life-history. With large-scale changes to Eastern US forest cover, structure, and composition across the past few centuries, silviculture and forest management regimes that produce intermediate canopy cover and basal area have been shown to be promising methods of increasing Eastern Whip-poor-will habitat, and promote their populations. We investigated the activity and percentage of time Eastern Whip-poor-will spend in differently-managed forests in the Midwest by using the natural ecological experiments created by management regime boundary lines, and an automated VHF-telemetry system. We were then able to generate more precise estimates on whip-poor-will habitat preferences, by correlating these values with prey abundance and a large suite of biotic and abiotic factors intrinsic to each forest management type.

Investigating the disappearance of the Eastern Whip-poor-will (*Antrostomus vociferus*) in the Midwest**D Edlund, M Ward, T Benson, C Tonra, S Matthews, G Witynski, M Avara, H Coates, I Souza-Cole***Presenting author: David Edlund*, University of Illinois Urbana Champaign, dedlund2@illinois.edu

Calls of the eastern whip-poor-will (*Antrostomus vociferus*) were once an iconic feature of Midwest forests. However, they have become increasingly silent across the landscape. Whip-poor-wills are a nocturnal, aerial insectivore, commonly found in forests throughout eastern North America. Due to their nocturnal nature, whip-poor-wills are not as closely monitored as other species. However, data suggests a 70% decline over the last 50 years and has since been listed as a species of conservation concern by the U.S. Fish and Wildlife Service. In response to this drastic decline and lack of monitoring, we instituted a monitoring project focused on revisiting and surveying Breeding Bird Atlas blocks in Illinois, Ohio, Missouri, Michigan, and Wisconsin, to elucidate what factors are contributing to their decline. From May-July in 2022 and 2023, we conducted fieldwork at 24 study sites with the following goals: conduct whip-poor-will point count surveys, trap insects, and collect fecal samples from whip-poor-wills. Using environmental data collected on-site and GIS layers from a multitude of sources, we are quantifying habitat, landcover, and other environmental covariates to identify predictors of whip-poor-will occupancy. These data include canopy cover, canopy height, landcover class, light pollution, and soil composition. Insect sampling was conducted using light traps deployed at 5 random point-count locations and were active for 3 hours. These samples were then collected and returned to be sorted by order and family and weighed to determine relative abundance and diversity. Upon capture, fecal samples were collected from

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whip-poor-wills. Using DNA metabarcoding, we can identify insect prey down to order and family, providing a means to compare prey availability from insect traps and examine spatial variation in the whip-poor-will's diet. Understanding the factors contributing to whip-poor-will decline will better inform future research and conservation practices.

Characterizing genetic diversity and connectivity in genetically distinct Bi-State Greater Sage-Grouse (*Centrocercus urophasianus*)

C Norville, P Coates, S Oyler-McCance, S Galla

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Greater Sage-grouse (*Centrocercus urophasianus*) found along the border of California and Nevada-known as Bi-state sage-grouse-are genetically distinct and listed with a proposed 'threatened status' under the ESA. Parker Meadows (hereafter PM), a Bi-state subpopulation, experienced drastic declines, a suspected genetic bottleneck, and subsequent population collapse. Translocation efforts were carried out and ongoing studies indicate that these translocation efforts were successful at increasing the PM subpopulation size. It is unclear if the population increase of the PM subpopulation is due to an increase in genetic variation, an increased number of birds on the landscape, or a combination of both. Further, conservation researchers and practitioners are interested in understanding diversity and barriers to connectivity across the Bi-state over space and time. Here, we propose a study to address both of these knowledge gaps regarding genetic variation and connectivity using feather samples and a genetic-based approach. We will amplify 15 microsatellite markers and characterize genetic variation across seven Bi-state populations, including pre- and post-translocations for PM. We will use diversity metrics-including observed (HO) and expected heterozygosity (HE)-to characterize changes in genetic diversity over space and time. We will also use STRUCTURE analyses to characterize isolation between subpopulations. This work will add to the understanding of the long-term genetic effects of translocations and will alert Bi-state researchers and practitioners of other sub-populations that are at-risk of collapse. We anticipate this work will have applications to diverse avian species that undergo conservation translocations worldwide. These findings are preliminary, subject to change, and provided for best timely science.

Spatial genomic structure in Tundra Swans: a circumpolar perspective for population delineation

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For migratory species, management practices are often defined and implemented across large spatial scales. Regional management areas may, therefore, contain genetically divergent populations necessitating the need for assessments of population delineation using multiple methods. While population delineation has often relied on movement data and geography, genomic data is increasingly being used to assess population structure and connectivity. In North America, Tundra Swans (*Cygnus columbianus*) are comprised of two well-recognized populations that display a high degree of flyway fidelity, the Arctic-nesting Eastern Population that winters along the east coast and the Western Population that nests exclusively in Alaska and winters in the west. Integrating both movement and genomic data can improve our ability to link both contemporary and historical effective dispersal and structure to population dynamics. To-date, there is very little known concerning the genetic composition of Tundra Swan populations. To fill this information gap, we use double-digest restriction site-associated DNA (ddRAD) sequence data to assess the distribution of nuclear genomic diversity of Tundra Swans between the North American Eastern and Western Populations and neighboring populations in Eurasia (i.e. northwest Europe and west Pacific). Although not heavily hunted, this wetland-obligate species is considered highly vulnerable to environmental change, habitat loss, and lead poisoning, especially due to certain life history traits such as delayed reproduction. Given these conservation concerns, knowledge of the population delineation and dispersal between populations can be key to identifying and understanding

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the resilience of individual populations to further natural and human-induced stressors.

Assessing coastal wetland distribution and *Himantopus mexicanus* habitat use in Puerto Rico

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Coastal wetlands and shorebird species are facing worldwide decline primarily due to the combined interactions between climate change scenarios and anthropogenic disturbances. In Puerto Rico, these pressures are exacerbated by land cover/use changes in the coastal areas and climate change in the Caribbean Region. In this study, we will quantify land cover/use changes in three watersheds in Puerto Rico that include the following coastal wetlands: Piñones Mangrove Forest, Jobos Bay National Estuarine Research Reserve, and La Parguera Nature Reserve. Land cover/use analysis will be explored for the following years: 1977, 1991, 2000, 2010, 2018, and 2023 using land cover maps and satellite imagery. We will identify the habitat use of the Black-necked Stilt (*Himantopus mexicanus*) during their breeding and nonbreeding periods by applying presence-only distribution models using eBird observations for Puerto Rico. Preliminary results of the land cover/use analysis for the years 1977, 1991, 2000, and 2010 followed the island's known shift from agriculture to industrial economy. Coastal wetland coverage fluctuated between the studied years and watersheds. In terms of the Black-necked Stilt, based on the literature review, we expect differences in coastal wetland habitat use during their breeding and nonbreeding periods driven by the specific habitat and nutritional requirements needed during both periods. In conclusion, our study highlights the importance of monitoring projects that encompass both habitat and species to pinpoint potential threats to shorebirds in Puerto Rico and contribute to the development of conservation and management strategies in coastal ecosystems.

Black-capped Vireo occupancy relative to vegetation management and wildfire disturbance

C Stephens, J Grzybowski, J Ross

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Best management practices when working with private landowners often included targeted actions with lasting effects. For succession-dependent species such as the Black-capped Vireo (*Vireo atricapilla*), maintaining a mixture of grassland and scattered young trees demands periodic disturbances. Here we examine both long-term and short-term responses of the vireo to Eastern Red Cedar (*Juniperus virginiana*) removal and a severe wildfire, respectively, at an outpost population in the Salt Creek Canyons of northwestern Oklahoma. Targeted cedar removal from the canyon slopes occurred during 2000-05 and a severe wildfire burned approximately 60% of the study site in the summer of 2022. We intensively surveyed for Black-capped Vireo in 2017-19 and 2023 to evaluate whether its territories were (a) non-randomly distributed relative to the cedar removal parcels before the wildfire and (b) differentially distributed after the wildfire within the unburned areas of the Salt Creek Canyons. We found that pre-fire territory centroids were in or within 20m of cedar management parcels (9 of 28 in 2017; 9 of 23 in 2018; 12 of 36 in 2019) significantly more often than expected based on a Poisson distribution fitted across 500 pseudo-random redistributions of each year's territories [mean(s.d.) = 3.6]. After the wildfire, territories were limited to unburned areas of the canyons with newly established areas having much higher tree cover and more Northerly-facing slopes than either the remaining pre-wildfire territories or those that had been in the burned area. Our findings highlight the impacts on Black-capped Vireo occupancy of both targeted management and uncontrolled disturbance at various timescales. Continued monitoring of this population is further providing the unique opportunity to assess the pattern and speed of post-wildfire recolonization by this species.

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Five-year impact report of the Coastal Solutions Fellows Program: advancing shorebird conservation through capacity building and collaborative initiatives**O Hinojosa-Huerta, V Ruiz-Gutierrez, D Ochoa***Presenting author: Osvel Hinojosa-Huerta, Cornell Lab of Ornithology, osvelhh@gmail.com*

The Coastal Solutions Fellows Program at the Cornell Lab of Ornithology was developed in 2017, with the goal of improving resiliency along the Pacific Flyway of Latin America to help recover shorebird populations and support a regenerative development in the region. The program is based on capacity building to cultivate a collaborative network of emerging conservation leaders, and the implementation of effective conservation projects with measurable impacts. In 2023 we launched our fifth cohort, with which there are now 30 fellows working in 37 sites in nine countries. The fellows have created a network of over 120 mentors and collaborators and 200 partner organizations that are participating in shorebird conservation through science, engineering, public policies, landscape design, engagement of the private sector, and community participation. Some of the common elements for success in these initiatives include the cultivation of leadership, planning, governance, conflict resolution, and strategic communication, as well as the implementation of science-based innovative projects with cross-sectoral collaborations, ranging from the real estate sector and shrimp producers to indigenous communities and social justice groups. The program has catalyzed outcomes that include the creation of new natural protected areas and the establishment of conservation easements, as well as the development of federal regulations for the protection of urban wetlands and the creation of local ordinances to reduce human disturbance, with an estimated conservation impact on 115,000 hectares and benefits to at least 28 shorebird species, including priority species such as Snowy Plovers, American Oystercatchers, Red Knots, and Hudsonian Godwits.

The Role of Waterbird Populations in Maintaining Culture and Food Security for Indigenous Communities in the Andean Highlands*H Johnston, L Nino Barreat***Presenting author: Haley Johnston, haleyc4@gmail.com*

Waterbirds are culturally significant to many peoples in the Andean Highlands. For the Uros - an indigenous Aymara people tracing back nearly 4,000 years - hunting and harvesting from waterbird populations is a common practice. However, measurements for how much food is available to families from harvest, and the role of waterbird consumption in food security has not been measured. In June 2024, we will conduct multiple structured and semi-structured interviews regarding harvest practices to understand the role of subsistence in both human and wildlife dimensions. These questions thoroughly address typical collection and processing methods across species, and provide daily and seasonal estimates for numbers of birds and eggs collected. In conjecture with insights gathered from the survey, we will weigh and measure specimens from targeted species to calculate net caloric and protein estimates available to community members. These data will allow us to quantify how much food is available to families through subsistence harvest, and the impact of harvest on waterfowl species abundance. Here, we will present estimated abundances and population numbers of waterfowl that are necessary for Uros communities to maintain cultural practices and food security. These data can serve as a valuable tool for community members and leaders, many of whom are fighting an uphill battle in preserving culture in the face of environmental degradation and social justice issues.

Historical prevalence of haemosporidian parasites and telomere dynamics in a partial migrant population of American Kestrels (*Falco sparverius*)

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Active and chronic infections have detrimental effects on host fitness. The physiological cost of infection may be reflected in telomere lengths, which are positively associated with maximum lifespans in birds. A causal relationship between Plasmodium infection and telomere shortening has been demonstrated in experimentally infected captive birds, making it a promising metric for the negative impacts of infection on individual health and lifetime survival. We used legacy samples collected from 215 individuals in a partial migrant population of American Kestrels (*Falco sparverius*) in Southwestern Idaho to investigate rates of haemosporidian infection and telomere lengths across multiple years (2009-2012). We determined blood parasite diversity, parasite load, and telomere length using quantitative polymerase chain reaction (qPCR). Preliminary results in this study system show the presence of multiple haemosporidian genera and a high amount of unexplained variance in telomere lengths in adult kestrels. Our next steps involve determining infection rates, telomere length, and circulating carotenoid concentrations from individuals sampled in recent years (2021-2024) to investigate migratory strategy as a mechanism for differential rates of infection and associated effects. Results will contribute to a better understanding of the prevalence and temporal trends of haemosporidian parasites (*Plasmodium*, *Leucocytozoon* and *Haemoproteus*) and have the potential to elucidate effects of chronic infection in natural populations.

Immunological condition and avian malaria infections of spring migrating Sharp-shinned Hawks (*Accipiter striatus*)

S Pagano, G Orfanides, A Bros, A Patterson, D Mathiason

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Sharp-shinned Hawks (*Accipiter striatus*) are an important migratory raptor species in North America, yet little is known about the immunological condition of these birds during migration nor potential pressures that these birds may encounter from parasites and disease. Understanding physiological and/or behavioral patterns, as well as challenges faced by these birds during migration, is important for developing conservation and management recommendations for this species. We sampled Sharp-shinned Hawks during spring migration at Braddock Bay Bird Observatory on the south shore of Lake Ontario and prepared a blood smear from each bird to derive leukocyte counts as an index of immune status. We also screened birds for avian haemosporidian parasites and performed genetic sequencing to identify parasite lineages. Results show that total leukocyte counts were positively related to arrival date, suggesting a potential physiological trade-off of immune condition and migration timing. Furthermore, avian malaria, specifically of the *Plasmodium* lineage BT7, was common in sampled birds. Our data provide insight into the immunological condition of migrating Sharp-Shinned Hawks and we further show that avian malaria is a routine challenge faced by these birds during migration. Considering that birds of this species are also confronted with additional infection pressures (e.g. oral capillariosis from *Eucoleus dispar*), our findings have important implications in terms of factors that may influence migration success and survival of Sharp-Shinned Hawks.

Movement and home range of Mexican ducks and Mallards in Southeast Arizona

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Waterfowl movement is primarily driven by their search for food resources in their environment. This is especially true in arid habitats, where water is one of the most limited resources. The Mexican Duck (*Anas diazi*) is a non-migratory endemic species of the southwest United States and central Mexico and is among the least studied waterfowl species in North America. In our study area, Cochise County, Arizona, Mexican ducks overlap with their close relative, Mallards (*A. platyrhynchos*), a migratory species with whom they may compete for resources. This study aims to investigate and compare sources of seasonal variation in home range between species. Between July 2023 and February 2024, we marked 19 individuals with GPS transmitters recording location data every hour. Twelve of these individuals have produced data for over a week. A 90% home range area was assessed for each individual using a kernel density estimation (KDE). Movement distance was measured by calculating the total displacement

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between location points. Based on the location data thus far, Mexican ducks exhibited a mean 90% KDE home range area of 3,215 m² ($\hat{A} \pm 2,475$ SE) and a mean movement distance of 313 m ($\hat{A} \pm 85$ SE; n = 7), whereas Mallards generated a mean 90% KDE home range of 2,545 m² ($\hat{A} \pm 1000$ SE) and a mean movement distance of 526 m ($\hat{A} \pm 130$ SE; n=5). Understanding Mexican duck and Mallard spatial behavior and the influence of seasonal conditions will help inform effective habitat management strategies for resident and migratory waterfowl in arid environments.

Songbirds as Pollinators? New Insights Into Flower Visitation by Passerines in the Western United States and Canada.

C Coyle, C Wells, T Schweizer, L Pejchar

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In Canada and the United States, certain species of migratory passerines that are not typically considered nectarivorous are often observed foraging in flowers. However, there has been no prior systematic research exploring the extent of songbird flower-foraging behavior for this region. We aim to expand the fundamental understanding of North American pollination systems by asking: 1) what individual bird characteristics (e.g., sex, age) or environmental factors (e.g., date of first flowering, average rainfall) are associated with the presence of pollen on songbirds?; 2) are particular plant morphological characteristics (e.g., flower color, shape) associated with a higher probability of flower-foraging and pollen-carrying by songbirds?; and 3) how does the structure and complexity of songbird and hummingbird pollination networks differ? In spring of 2022, we gently swabbed the heads and bills of 51 songbirds in Corvallis, OR as part of a pilot effort to evaluate whether pollen can be detected and identified from passerines. Using DNA metabarcoding techniques, we found that most of the analyzed samples contained animal-mediated pollen from genera such as currant (*Ribes* sp.), rose (*Rosa* sp.), and honeysuckle (*Lonicera* sp.). We expanded pollen collection efforts in 2023, collaborating with 10 bird banding groups ranging from Patagonia, AZ to Nanaimo, BC. These partners collected over 900 songbird samples and over 200 hummingbird samples, which are currently being processed for pollen. This work has the potential to stimulate new lines of research in songbird foraging and migration ecology, plant adaptation to climate change via directional long-distance pollen dispersal, and plant-pollinator population dynamics.

***Structural heterogeneity of North American forests promotes multiple measures of bird diversity**

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Heterogeneity of forest structure has long been known to promote species richness by expanding niche space and provision of refuge, but the shape and generalizability of this relationship remain debated. Further, the heterogeneity-richness relationship is altered by the three-dimensional structure of forest, in which many taxa take advantage of both vertical and horizontal niche space. We aim to clarify the structural heterogeneity-richness relationship by considering multiple axes of forest structure and measures of bird richness. Specifically, we extract observational data from eBird to model with light detection and ranging (LiDAR) data from a variety of sources (e.g., NEON, USGS, GEDI). We found that increased structural heterogeneity promoted bird richness, but that this relationship was weak and inconsistent among structural variables. The inclusion of functional trait richness information clarified heterogeneity-richness relationships by classifying birds based on their trait-based interaction with forest structure rather than their species. Finally, avian traits associated with local-scale habitat use (e.g., foraging guild, nest site preference) better correlated with the vertical axis of structural heterogeneity while dispersal traits strongly related to the horizontal axis. The vertical structure of forests and bird functional traits are critical drivers of the heterogeneity-richness relationship and warrant further study.

Planting a native pollinator garden and its effect on Apidae and Trochilidae abundance

J Powers, S Kovtynovich, C Ramos

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Eighty percent of all flowering plants require external pollination, and bees provide a vast majority of this, adding \$15 billion dollars in crop value each year. Alongside this, Hummingbirds are a critical keystone species responsible for the pollination of plants containing elongated tubular corollas. Within the last 30 years, native bee populations have dwindled dramatically due to disease, pests, climate change, habitat loss, pesticides, and other chemical applications. Hummingbirds are also experiencing population declines due to habitat loss and human disturbance. Humans may be able to slow or reverse their decline through habitat remediation efforts and the creation of refuges through pollinator gardens, both of which supply foraging resources and habitat. Our own pollinator garden was conceived through this mindset: we removed all non-native species of plant and replaced them with angiosperms native to Colorado with specific flower morphologies to attract both native bees and hummingbirds. The goal of our research is to compare the abundance of native Apidae species and Hummingbirds that visit our pollinator garden with areas that have traditional landscaping and areas of native habitat. By displaying the benefits of removing European and Asian ornamental plants and grasses in favor of natives, we hope to lend valuable insight into how these plants can be utilized for conservation, landscape remediation, and agricultural benefits.

***Drivers of Overwinter Survival in Florida Scrub-Jays**

G Beauchamp, T Bakley, S Barve

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Individual survival is affected by many ecological factors including weather, food availability, population density, and predation pressure. But documenting survival rates requires long-term observations of a large, marked population. Here we use 33 years of monthly survival data on Florida Scrub-Jays (*Aphelocoma coerulescens*), their population density, local weather, and acorn production to assess the determinants of jay survival during the non-breeding season (September to February) at Archbold Biological Station, Florida. We used the known-fate model from the program MARK to analyze the probability of survival for breeders and juveniles. For breeders, the odds of survival increased with higher acorn production, larger territory size, and the presence of two breeders at the territory. Breeder survival decreased with higher total rainfall and increased population density. Survival did not vary with the number of helpers nor the mean daily minimum temperature. For juveniles, the odds of survival increased with higher acorn production, higher daily minimum temperature, and the presence of two breeders at a territory. Juvenile survival decreased with higher total rainfall. Their survival did not vary with the number of helpers, territory size, or population density. We conclude that the two groups are impacted differently by their environmental stressors, potentially due to variations in experience levels and body conditions during the non-breeding season. Given the imperiled status of the Florida Scrub-Jay and the rapid ecological shifts of the Anthropocene, more research elucidating how specific factors affect jays is invaluable in furthering our understanding of the species and anticipating responses to climate change.

Responses of understory and terrestrial birds to seasonal flooding in the Peruvian Amazon

N Gardner

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Within Amazonian seasonally flooded forests, raised 'restinga' forest patches could become island refugia for understory and terrestrial birds as floodwaters rise. However, the effects of these refugia on seasonal habitat occupancy in birds is yet to be investigated. In this study, I am testing the prediction that terrestrial birds increasingly occupy unflooded refugia as flooding occurs, while the occupancy of understory antbirds varies less in response to floods, as they can forage over water. In the wet seasons of 2023 and 2024, autonomous acoustic recorders were deployed at 27 forest sites along the Rio Tahuayo in Peru. Sites range from restinga to riparian areas that receive up to 7m of flooding. Vocalizations of three terrestrial and three understory species were detected in the acoustic data using a retrained BirdNET classifier. Detection frequency was calculated to model dynamic occupancy across sites. Preliminary results suggest that Undulated Tinamou (*Crypturellus undulatus*) shifts from low-lying to restinga areas as flooding occurs, matching my prediction. Other tinamous show lower occupancy overall, especially in

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low-lying areas, irrespective of flood levels, suggesting a habitat preference for restinga patches. As predicted, antbirds show little change in their habitat occupancy between seasons, but there is variation among species. Plumbeous Antbird (*Myrmelastes hyperythrus*) seems the most flood-adapted, and White-shouldered Antbird (*Akletos melanocephus*) shows the greatest seasonal variation. As flood patterns are altered by hydroelectric dams and climate change, identifying these occupancy patterns in will help to predict which bird species are most threatened, and how understory community structures could change.

***Macroevolution of body extremities reveals an integrated phenotypic response of coloration and morphology to temperature in a large clade of Neotropical passerines (Furnariida)**

G Macedo, R Marcondes, B Bravo, C Biondo, E Derryberry

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Endotherms show smaller body extremities and larger body sizes in colder climates, thereby reducing heat loss. Coloration can also be important in thermoregulation, as darker coloration absorbs more radiant energy than lighter coloration (thermal melanism hypothesis). Extremities lacking or bearing thinner covers of feathers or fur - such as ears, legs and bills - can be important thermal windows to exchange heat. Yet, no study to date has simultaneously investigated coloration and morphology of body extremities in relation to temperature. In 566 species of Furnariida (Neotropical ovenbirds and allies), we tested with phylogenetic comparative methods whether body extremity coloration, morphology and plumage coloration jointly respond to temperature. We predicted that, in colder climates, bills and tarsi would be darker and smaller as well as associated with darker plumages and larger body sizes. Consistent with this prediction, we found that, in colder climates, bills are darker, smaller and are associated with darker plumages and larger body sizes. Tarsi are darker and associated with darker plumages and larger body sizes in colder climates, but tarsus coloration is not associated with tarsus length. With phylogenetic path analyses, we found that climate affects body extremity coloration both directly and indirectly through its effects on habitat type, plumage coloration and morphology. Our findings suggest that temperature promotes an integrated phenotypic response of coloration and morphology across body extremities, plumage and body size.

***Genomic evolution in Darwin's finches in response to a novel parasite**

D Jackson, L Campagna, S McNew

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Introduced parasites and pathogens threaten wild populations globally and are a particular danger to island birds. The arrival of a virulent parasite imposes a novel selective pressure on the hosts, which may lead to positive selection on alleles conferring resistance or tolerance and/or other genomic changes as a result of this altered evolutionary landscape. A parasitic nest fly, *Philornis downsi*, was introduced to the Galápagos in the 20th century and causes high nesting mortality in many endemic songbird species. We tested for patterns of independent and parallel selection in response to a novel parasite in three species of Darwin's finches, the small tree finch (*Camarhynchus parvulus*), the medium ground finch (*Geospiza fortis*), and the vegetarian finch (*Platyspiza crassirostris*). We used whole genome sequences from birds sampled before and after the introduction of this fly to test whether there are signs of genomic evolution in response to *P. downsi*. Our analysis employed genome-wide summary statistics and deep learning models to identify putative genes subjected to selection pressure from this novel parasite. We report putative gene lists from each species and discuss implications for the future of these important island birds.

Investigating cryptic speciation in White-crowned Sparrows

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The White crowned Sparrow (*Zonotrichia leucophrys*) is a migratory songbird found extensively throughout North America. There are two populations in British Columbia which are phenotypically similar

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but have been recently shown to have significant genetic differences. This suggests that these sparrows may be two separate, cryptic species. These two populations have recently come back into contact in Central British Columbia, where they likely hybridize. The presence of this hybrid zone provides an opportunity to assess genetic mixing and hybrid fitness. Hybridization in contact zones is expected, even from clearly distinct species. However, low hybrid fitness can act as a reproductive barrier to species from fully merging into a hybrid swarm. My study aims to determine whether there are two cryptic species of White-crowned Sparrows. To assess this, I will collect DNA samples from birds across the hybrid zone and use a bioinformatic approach to quantify hybridization in each individual. If the two sparrow populations are hybridizing freely with no decreased hybrid fitness, I expect to find many F1s (direct descendants of two pure parents) and backcrosses (later generation hybrids that are successfully reproducing). If hybrids have low fitness however, I expect to find F1s, but few to no backcrossed individuals. This will inform us as to where White-crowned Sparrows lie on the speciation continuum, thereby contributing to our understanding of cryptic speciation and biodiversity in Western Canada.

The genetic basis of rapid changes in migratory behavior

S Sudoku, E Scordato*Presenting author: Samantha Sudoku, sam9132@gmail.com*

Human activity has led to rapid landscape changes that can alter the behavior of wild populations. One critical behavior that is impacted by human activity is migration. Migration allows organisms to leave unfavorable environments for more suitable areas, and it has been particularly sensitive to anthropogenic changes like warming climates and alterations in resource availability. However, the genetic mechanisms underlying changes migratory behavior in response to anthropogenic activity remain poorly understood. In this study, we are assessing the genetic basis of variation in migratory behavior in welcome swallows (*Hirundo neoxena*). Welcome swallows are native to Australia and include a sedentary western population and a partially migratory eastern population. Welcome swallows nest almost exclusively on manmade structures, which has enabled recent population size expansions within Australia. In the last 60 years, welcome swallows also colonized New Zealand, most likely facilitated by the availability of human-made nesting sites. New Zealand populations subsequently lost their migratory behavior, making this system well-suited to assessing the genetic basis of rapid changes in migratory behavior. We used genome scans to identify genomic regions that are differentiated between sedentary-migratory population pairs that are not differentiated between migratory-migratory and sedentary-sedentary pairs. These regions represent candidate loci associated with gains and losses of migration despite shallow genome-wide differentiation. By untangling the underlying genetic mechanisms of rapid behavioral changes, this study provides insight into how human activities shape the evolution of behavior in wild populations.

Comparison of Vocal and Genomic Differentiation in Obligate Ant-Followers

[Thamnophilidae: Rhegmatorhina]**R Zucker, B Whitney, R Brumfield, C Ribas, G Del-Rio***Presenting author: Ryan Zucker, Cornell Lab of Ornithology, Cornell University, rjz45@cornell.edu*

Amazonia represents a natural laboratory for the study of avian speciation, with rivers carving barriers to gene exchange and creating centers of endemism full of recently-diverged allopatric taxa. The obligate ant-following genus *Rhegmatorhina* represents a classic case in Amazonian biogeography, in which rivers and tributaries serve as barriers for individual movement and gene flow. However, the current inferences and understanding of *Rhegmatorhina* evolutionary history are solely based on phylogenetic trees obtained from few mitochondrial and nuclear markers, leaving some relationships unresolved and key questions about divergence mechanisms unanswered. Here we present the phylogenetic relationships within the genus at the subspecific level based on ultraconserved elements (UCEs) for 123 vouchered museum specimens. We also quantify the vocal differentiation across *Rhegmatorhina* using over 100 recordings from seven taxa as well as *R. berlepschi* x *hoffmannsi* hybrids. Our results suggest significant divergence in vocalizations between all species-level taxa in the genus, with some overlap in the *R. berlepschi*-*hoffmannsi* complex. The vocal differentiation aligns with the genus-wide nuclear phylogeny, suggesting that prezygotic barriers such as innate vocalizations in Suboscines could be crucial for

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maintaining reproductive isolation in young radiations such as *Rhegmatorhina*. Further study is needed to determine if vocal variation in the genus follows geographic clines or whether the subspecies in the *R. melanosticta* complex should be considered full species.

***Genomic Consequences of Strong Bottlenecks in a Previously Endangered Bird**

A Calderon, A Wood, Z Szpiech, D Toews

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Runs of homozygosity (ROH) are homozygous chromosomal segments that arise from population bottlenecks, isolation, and inbreeding, when two related individuals mate and pass on identical by descent (IBD) haplotypes to an offspring. In addition to providing insights into levels of inbreeding and genetic diseases, quantifying the distribution and prevalence of ROH can also illuminate population history such as bottlenecks and population expansions. In the early 1970's Kirtland's warblers (*Setophaga kirtlandii*) experienced population declines as a result of jack pine habitat degradation and nest parasitism by the brown-headed cowbird. The population crash caused it to be listed under the 1973 Endangered Species Act. Even though the population is above the recovery goal, the existence of this species relies heavily on conservation management. Using whole genome sequencing of contemporary and historical samples of this previously endangered bird, we compare the distribution of runs of homozygosity as well as allele frequencies pre-bottleneck and post-bottleneck recovery to understand the long-term genomic consequences of reduced population size.

***What can a reference genome tell us about conservation need? A case example in declining Columbian Sharp-tailed Grouse**

M Calahan, N Forsdick, J Forbey, J Lautenbach, J Johnson, S Galla

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Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*; hereafter CSTG) were once widespread in shrub-steppe ecosystems in western North America, but experienced significant decline due to anthropogenic change. CSTG are estimated to occupy less than 5% of their former range, have been extirpated from four US states, are considered endangered in Washington state, and have been petitioned twice for the Endangered Species Act. To facilitate the characterization of remaining diversity, estimate population structure, connectivity, and demographic histories of CSTG, we have produced the first high quality reference genome assembly for this imperiled subspecies. Genome assembly produced a reference genome that is 1.07 Gb and is highly contiguous and complete (scaffold N50 = 70.8 Mb, avian ortholog completeness (BUSCO) = 99%). This assembled genome provides a glimpse of demographic history indicating historic bottlenecks of the subspecies during the Pleistocene. Further, the heterozygosity of this assembly is low, indicating recent decline. As we resequence individuals across the CSTG range, this reference genome will support accurate estimates of inbreeding through runs of homozygosity to prioritize populations in need of intervention. The characterization of adaptive loci will allow us to understand local adaptation of populations across the western US and how these loci affect translocation success. Finally, this reference genome will be the first for Sharp-tailed Grouse (*T. p. spp.*), providing an important genomic resource for a genus where most extant taxa are in decline (Lesser Prairie-chicken, *T. pallidicinctus*), endangered (Attwater's Prairie-chicken, *T. cupido attwateri*), or extinct (Heath Hen, *T. c. cupido*).

Past and present consequences of hybridization in crowned sparrows

C Pageau, F Fogarty, D Irwin

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Hybridization followed by repeated backcrossing can lead to genetic material being exchanged between species, and event termed introgressions. If an introgressed locus is highly beneficial and favored by selection, it can rapidly spread to the whole population and become fixed, permanently impacting the receiving population. A great natural system to study introgression events are the crowned sparrows, particularly the Golden-crowned Sparrow and two subspecies of White-crowned Sparrow (*pugetensis* and

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gambelii) for two main reasons. First, Golden-crowned Sparrow shares similar mitochondrial DNA with one of the subspecies of White-crowned Sparrow: pugetensis. This leads us to think that there was an introgression of mitochondrial DNA from pugetensis to Golden-crowned Sparrow and that it swept through the whole population. Second, there is a potential new active hybrid zone in British Columbia between both White-crowned Sparrow subspecies. My research question aims to investigate if there was an introgression of the mitochondrial DNA in addition of two maternally inherited components of the genome in Passerines: the W chromosome and the germline-restricted chromosome. I am also interested in studying in real time the active hybrid zone between both subspecies of White-crowned Sparrows and what are the consequences at the genomic level. Answering these research questions will help us understand how past and present hybridization shape the speciation process and contribute to crowned sparrows' current local adaptations to their environment.

Evidence for independent origins of avian iridescence*Y Erritouni, A Rico-Guevara***Presenting author: Yasmeen Erritouni, University of Washington, yasmeenerritouni@gmail.com*

Iridescent plumage is an ecologically important trait present in nearly all major radiations of birds, but it remains unknown if this trait and its genetic underpinnings are the result of shared ancestry or of independent evolution. Disparate avian clades produce iridescence using the same basic components – melanin and keratin – but use unique morphologies to do so. This study uses a transcriptomic approach to determine whether patterns of gene expression are shared across groups of birds that have converged on iridescence. Similar transcriptomes may suggest either strict genetic requirements for iridescence or conserved ancestral genetic characters. We first used transmission electron microscopy to characterize the feather nanostructures responsible for iridescent and non-iridescent plumage coloration in Anna's (Calypte anna) and Rufous (Selasphorus rufus) hummingbirds. We then identified the genes responsible for the iridescent nanostructures through a differential expression analysis of developing iridescent and non-iridescent feathers in wild Anna's and Rufous hummingbirds. To elucidate whether distantly-related groups of birds produce iridescent feathers using similar genetic mechanisms, we compared these hummingbird transcriptomes to those of superb starlings (Lamprolornis superbus) from a previous study. Differentially expressed genes related to melanin synthesis were dissimilar in hummingbirds and starlings, suggesting different genetic mechanisms for iridescence. These results lend support for independent origins of iridescence in the Trochilidae and the Sturnidae despite similar nanostructural morphology and function. Continued collection of feather transcriptomes from distantly-related species will cultivate an understanding of the genetics and evolution of iridescence in birds.

****The effects of structural size on Swainson's hawk natal dispersal distance and recruitment dynamics****E Meisman, C Vennum, C Briggs, B Woodbridge, P Bloom, M Collopy, M Johnson***Presenting author: Elizabeth Meisman, Cal Poly Humboldt, edm170@humboldt.edu*

Increased structural size is typically viewed as a positive individual trait assumed to enhance survival probabilities and overall fitness. For territorial species, larger structural size relative to conspecifics could aid with obtaining a territory, attracting a mate, and territorial defense. We explore this dynamic in a hemispheric migrant, Swainson's hawk (*Buteo swainsoni*), which exhibits strong natal philopatry. Previous research from this breeding population in northern California has shown that average natal dispersal was 9 km in the mid-1990s, and has remained constant, despite the population doubling. From 2009 to 2018, over 800 individual Swainson's hawk nestlings were marked; of those, 111 (55 females, 56 males) were later observed breeding within the boundaries of our long-term study area (i.e., recruited). Previous work has also shown that nestlings recruited into the local population are structurally larger than those never resighted. We also know that females will disperse farther than males. Given these population observations, we hypothesize that nestling structural size influences natal dispersal distance, age of recruitment, and quality of territory obtained. We predict that relatively smaller recruits will have larger natal dispersal distances, recruit at older ages, and be relegated to less productive territories.

Dusky Grouse Ecology in Northern Utah

L Clark, D Dahlgren

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Formally a subspecies of blue grouse, dusky grouse (*Dendragapus obscurus*) population monitoring and life history has gone largely unexplored before and after its taxonomic split. Past blue grouse research has been predominantly studies on sooty grouse (*Dendragapus fuliginosus*) in the Pacific Northwest during the mid to late 20th century. The limited space-use research on dusky grouse reveals significant variability in breeding habitat selection, strong seasonal site fidelity, and breeding-to-wintering site distances exceeding 15km. For the purpose of designing an optimized monitoring program for the Utah Division of Wildlife Resources, we are conducting breeding surveys in the Bear River Range using both autonomous recording units (ARUs) and human observer point counts. We plan to assess the results for consideration of a state-wide monitoring approach using ARUs. We found that the single-note 'whooot' vocalization made by displaying males is effectively detected by sound recognition software. We also found that ARUs demonstrate detection distances comparable to the human ear for this species. We are using pointing dogs, noose poles, and walk-in traps to capture dusky grouse. To discern seasonal habitat selection and site fidelity patterns, we are fixing store-on-board GPS units to females. These units provide locations every 20 minutes during the day. We are using this detailed telemetry data to locate nests, track broods, trace migration routes, and assess winter space utilization at a fine scale. We tagged 8 females with GPS units in late summer 2023, and successfully tracked them until they commenced their migrations in mid-fall. During the subsequent winter, we partially downloaded GPS data from aircraft. Our plan for 2024 involves tracking surviving females and their broods while aiming to deploy an additional 15 GPS units.

Tag effects on nesting Roseate Terns (*Sterna dougallii*)

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Animal tracking can yield important insights into animal movement ecology and habitat use, potentially highlighting key areas for foraging. However, attaching tracking devices can have negative effects on the health and behavior of individuals, and different avian species have been shown to have varying levels of sensitivity to device attachment. We are studying the potential effects of attaching GPS tracking devices to nesting Roseate Terns (*Sterna dougallii*) using leg-loop harness attachments. The study was conducted on a population breeding on Seavey Island in the Gulf of Maine, United States. We gathered nestling survival and parental attendance and provisioning data using visual observations (both in person and from remote cameras) and compared the data between nests belonging to parents with ($n = 10$) and without ($n = 10$) GPS transmitters. Understanding the movement and foraging hotspots of endangered seabirds like the Roseate Tern can be critical to informing fisheries management, offshore development, and conservation. Studying tag effects on these birds is a critical step in this process, and will inform future research on the movement ecology of the species.

***Power analysis of long-term monitoring for temporal trends in Clark's nutcracker abundance in Yellowstone National Park**

T McLaren, N Grevstad, D Tomback

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Long-term ecological studies are implemented to estimate annual population rates of change in response to changing environmental conditions. To ensure project goals are met, planning should evaluate monitoring protocols, and their statistical power to detect changes. We initiated a long-term study in Yellowstone National Park in 2019 to monitor Clark's Nutcracker (*Nucifraga columbiana*) population dynamics. Nutcrackers disperse whitebark pine (*Pinus albicaulis*) seeds. Of concern is the decline in whitebark pine due primarily to the pathogen *Cronartium ribicola*, which causes the disease white pine blister rust and, in turn, a potential decline in nutcrackers. The study sampling design consists of 11 forest community sites, with 5 point counts along a 1-km transect per site. The distance to each bird is recorded.

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All 11 sites are surveyed during 4 annual surveys, resulting in 44 surveys per year. We assessed the power of the design and a Hierarchical Distance Sampling (HDS) model to detect nutcracker decline by simulating nutcracker abundance under two population-decline scenarios (2.5% and 5% annually), three annual survey sample sizes (30, 40, or 60 surveys per year), and time intervals of 5 to 20 years. The statistical power was the proportion of simulated datasets for which the HDS model detected the decline. Power to detect a 5% annual decline reached 0.8 after 17 years using 30 annual surveys, after 15 years using 40 surveys, and after 11 years using 60 surveys. Power to detect a 2.5% annual decline did not reach 0.8 within 20 years for 30, 40, or 60 annual surveys. This analysis highlights an important aspect of designing a conservation-oriented monitoring program that may be overlooked during the planning phase.

***A Novel Approach to Investigating Developmental Changes in Eggshell Thickness and Fracture Resistance**

A Berger

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Despite extensive research effort into other aspects of bird evolution, the diversification of avian eggs is a recently growing field of study. While all bird eggs serve the same functions, they are highly morphologically diverse, including interspecific variations in shell thickness. Shell thickness is often used as a proxy for resistance to breakage of the eggshell overall, with thicker shells offering greater protection from impact and predation attempts. This attribute is under great selective pressure to protect the embryo within until hatching, balancing impermeability, effective gas exchange, and hatchability. My research investigates the tradeoffs between eggshell protectiveness and hatching difficulty in avian eggs. I seek to apply CT scanning and imaging technology to developing eggs from a diversity of avian taxa to evaluate shell curvature, thickness variation, and fracture resistance across embryonic developmental stages. Non-destructively characterizing 4 dimensional shell morphology and creating effective scanning methodology that can be ethically applied to a diversity of eggs could improve conservation efforts and contribute unique resources to 3D image repositories. With the addition of my future research on the posture and strength of embryos at the time of hatching, the results may lead to new insights regarding the significance of hatching effort relative to the overall morphology of the egg. Understanding the selective pressures that influence this relationship will lead to more accurate characterization of the reproductive ecology of both extant and extinct egg-laying species, adding a novel perspective to the evolutionary drivers of egg morphology, hatching posture, and hatchling physiology.

Effects of en route severe tropical weather on the morphometrics of a Nearctic-Neotropical migratory songbird (*Catharus fuscescens*)

C Heckscher, T Mohyuddin

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The southward migration of Nearctic-Neotropical migratory songbirds coincides with the peak of Atlantic hurricane season. Tropical storms pose serious threats to transient birds that cross portions of the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. Multiple studies now suggest that songbirds experience high mortality during en route storm events. Birds can be blown off-course, succumb to high winds and torrential downpours, be forced to expend valuable energy stores to circumnavigate storms, or be forced to land in inhospitable environments. Given that recent research has documented morphological changes in various migratory bird species, we tested whether severe tropical weather (i.e., hurricanes, tropical storms) over a 23-year period affected the morphometrics of a breeding migratory songbird population. Using two meteorological indices as predictors, accumulated cyclone energy (ACE) and the preceding year's Southern Oscillation Index (SOI), our analyses revealed both age and sex effects of each. ACE and SOI were both predictors of mean wing chord and mass of returning individuals. Notably, elevated September and October ACE values were predictors of decreased body condition of returning SY birds. No variables influenced the physical condition of returning ASY birds. These results reveal selection pressure from inclement tropical weather on a transient songbird, adding to the growing body of evidence that storms are a source of high annual songbird mortality. Tropical weather events are projected to become more frequent and severe as climate change progresses and therefore should be recognized as

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a significant emerging threat to Nearctic-Neotropical migratory songbird populations.

Potential effects of interannual climate extremes on migratory landbird movement in southern California

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Extreme interannual climate variability of extremely dry years (drought) and extremely wet years driven by temperature and precipitation may impact migratory landbirds movement patterns due to their influence on resource availability. An important migratory region for landbirds in the Western Hemisphere is coastal southern California, which includes the Pacific Ocean coastline and inland mountains. The effects of extreme annual climate events, such as drought and wet years, on migratory landbirds moving through the region are unclear. In this study, I conducted a comparative analysis of migratory landbird captures between a coastal bird banding station, Zuma Canyon, and a mountain banding station, Bear Divide, to understand the influence of interannual dry and wet years on landbird movement in southern California. I analyzed three years of spring migration data from 2021 to 2023 composed of extreme dry and wet years to analyze the influence of climate on species diversity and abundances between the stations and years. Opposite effects on migratory landbird abundances were observed in each station. Bear Divide captured more migratory landbirds in dry years than wet years. Zuma Canyon captured more migratory landbirds in wet years than in dry years. Vegetation greenness was higher in wet years than dry years. Interannual climate extremes can likely influence landbird migratory movement in southern California between coastal and inland zones that may potentially be explained by resource availability.

Prepping for disaster ecology: the Avian Migration Program at New Mexico State University

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The Avian Migration Program at New Mexico State University (NMSU) aims to prepare a diverse cadre of future leaders in the field of disaster ecology via training in the biology of migratory birds. Disaster ecology is an emerging field that seeks to understand, predict, and mitigate the effects of natural disasters, which are occurring with increasing frequency and severity, on non-human organisms. Our program is motivated by a mass mortality of migratory birds in the fall of 2020 within the Southwest US. The causes of this event remain uncertain, but are thought to include drought, wildfires, extreme weather events, pesticide exposure and opportunistic infections. All of these are a direct result of, or act in synergy with, human-induced climate change and habitat degradation. With funding support from the USDA NIFA Hispanic Serving Institutions program and NMSU, we have recruited an initial cohort of 6 graduate and 10 undergraduate students, of whom 9 are from historically-underrepresented populations. These students participate in faculty-mentored research projects and specialized coursework related to avian migration, including a 12-day field ecology course in Costa Rica. Graduate students serve as near-peer research mentors and organizers of informal 'Migration Mixers'. Students also participate in professional development workshops, community outreach through an annual Migration Day, and summer internships with governmental agencies and other partners. These activities prepare students for placement with federal agencies, graduate programs and postdoctoral positions. We encourage students with an interest in avian migration, particularly those from underrepresented populations, to contact us at migration.nmsu.edu.

Intra-feather variation in stable hydrogen isotope measurements of Rosy-finch feathers

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Hydrogen stable isotopes are a valuable tool for examining species migratory patterns; however, little is

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known about the variation of stable hydrogen ratio measurements within parts of a feather. Previous studies have found differences in the measurements of the ratio of deuterium (^2H) to protium (^1H), or $\delta^2\text{H}$, between the vane and the rachis of feathers, and migratory movements during feather growth could result in different ratios along the length of a feather. We measured $\delta^2\text{H}$ in feathers from the three North American Rosy-Finch species-Black (*Leucosticte atrata*), Brown-capped (*L. australis*), and Gray-crowned (*L. tephrocotis*)-that were collected over 18 winter seasons in the Sandia Mountains of northern New Mexico. Rosy-Finches are alpine tundra-obligate songbirds that molt right after breeding and before migrating to lower elevations and/or latitudes for the winter. These three species have breeding distributions that vary markedly in total area, which may necessitate variation in fall movements during the molting period. Therefore, we expected hydrogen isotope measurements to vary across the different species and at different locations within individual feathers. Five subsamples of individual feathers ($n=105$; 21 per species) were analyzed at different points along the length of the feather with some sections containing rachis material while others only contained vane material. The results showed that feather sections containing the rachis had lower $\delta^2\text{H}$ than the sections only containing the vane. We found, however, no longitudinal differences in sections along the length of the feather. Our results show that stable hydrogen isotope measurements can vary depending on where you sample the feather, indicating that consistency in sampling methods is important for accuracy and reproducibility.

Comparison of riparian and upland habitats as stopover sites for migrating songbirds in Central Texas

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Migration is the period of extreme energetic demand in a migratory songbird's annual cycle. It has profound effects on breeding success and survivorship. High-quality stopover sites with abundant food resources allow for rapid replenishment of fat reserves used to fuel flight during migration and for timely arrival to the breeding grounds. Riparian habitats are recognized as important stopover sites, particularly in arid and semi-arid regions whereas upland habitats provide adequate stopover sites in more mesic regions. Central Texas lies squarely in the Central Flyway, yet stopover habitat quality in this region is largely unexplored. We assessed relative quality of riparian and upland habitats in Central Texas by comparing refueling performance in taxa and foraging guilds of mist-netted migrating songbirds during spring migration in 2022 and 2023. Refueling performance, measured by triglyceride concentrations, did not differ between riparian and upland stopover habitats. However, refueling performance was significantly lower in 2022 than in 2023 for both habitat types across taxa. Refueling performance was higher for the ground foraging guild than the foliage foraging guild. When accessing refueling performance by individual species, thrushes had the highest refueling rates while tanagers had the lowest rates. This difference is likely due to a variation in diet between the two groups. Our results suggest that riparian and upland habitats provide comparable stopover habitat quality in this region. However, habitat quality varies annually likely due to natural variation in weather conditions associated with the El Niño-Southern Oscillation.

***The impacts of differential migration on energetic condition in parulid warblers during spring migration.**

M Sutton, M Gianvecchio, M Deutschlander

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Individual variation in the timing of spring migration affects survival and may impact subsequent reproductive success. Pressure to breed early influences arrival to the breeding grounds, with differential migration often occurring between sexes and ages. Earlier arriving individuals may face difficult

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conditions, such as poor resource availability, thermoregulatory challenges, and limited refueling opportunities during stopover or at breeding grounds. The goal of our study was to understand how sex, age, and arrival date influence energetic condition during spring stopover in warblers. We created path analysis models to examine the direct and indirect effects of sex, age, and arrival date on energetic condition in 11 species of parulids captured at Braddock Bay Bird Observatory. Energetic condition was estimated using standardized mass index. Mass gain was examined to estimate refueling rates; 10 species gained mass during stopover. Differential timing in migration was associated with sex and age for all 11 species. Variation in energetic condition explained by our models ranged from 10-30%, but trends were consistent across species. Later arriving individuals, females, and juveniles were associated with higher energetic condition. Arrival date was the best predictor of condition for 8 species, and sex was the best predictor in 3 species. In most species, the direct effect of age and sex was greater than indirect effect of age or sex through arrival date. Differential timing explains some of the variation in energetic condition associated with sex and age, but there are inherent sex and age differences in condition independent of migration timing.

Northern Saw-whet migration patterns in the northern Sierra Nevada foothills **C Giannini, K Sobon, D Garcia, P Serge**

Presenting author: **Charlie Giannini**, chazgiannini721@gmail.com

The Big Chico Creek Ecological Reserve (BCCER) Northern saw-whet owl banding station has been operating since 2005. Located 15 miles east of Chico, CA in the foothills of the northern Sierra Nevada mountains, BCCER is a 7835 acre reserve spanning across ridges and canyons (elevation 213-623m) along 4.5 miles of Big Chico Creek. It includes many different types of habitats but is dominated by oak savannas and mixed forest, and is part of a contiguous landscape of parks, ranches, and public land. Banding occurred during fall migration (Oct-Nov; approximately 1600 net-hours/year, but highly dependent on weather) and owls were lured in with male mating calls. In 18 years, we banded 1330 saw-whet owls and the data was contributed to the nationwide Project OwlNet. The majority of the banded owls were juveniles (52% hatch year), and females (68% female; 9% male; 23% unknown). We also recaptured five owls that were previously banded at other sites (Montana, Iowa, British Columbia x2, and Central California). Two owls banded at BCCER were recaptured in British Columbia. A previous telemetry study showed that some owls established temporary territories in the California foothill canyons at this time of year. Our data corroborated this finding, since every year we captured some of our recently banded owls multiple times. However, very few owls banded at BCCER were recaptured in subsequent years. Taken together, our data suggests that some owls move along North-South and East-to-West corridors. Yet, the vast majority of Northern saw-whet owls in Northern California exhibit substantial but unknown movement patterns.

Female *Agelaius phoeniceus* coloration and body size variation for social signaling

C Walker, L Benedict

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Vibrantly colored birds can be found at every turn, with plumage coloration impacted by variables such as sexual selection, social signaling, and diet. Red-winged blackbirds (*Agelaius phoeniceus*) are known for their red-orange epaulets used to signal to competitors and potential mates. Much research has been done on males, but female red-winged blackbirds have been less well studied in analyses of coloration. One such female study compared epaulet brightness to reproductive condition and age using color analysis from photographs (Johnsen et al., 1996). This study found that brightness has a positive correlation with age and reproductive condition. Since age and reproductive condition can impact societal positions, we wanted to expand on this research by quantifying female epaulet coloration in relation to body size. We used photography techniques to compare female red-winged blackbird epaulet coloration on both wild birds and museum specimens. While predicted to have a positive correlation between body size and epaulet color, specifically that larger females will have redder epaulets, no correlation was found. Possible reasons include extra external factors contributing to both or either trait, such as age or

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seasonality, or the lack of societal function of the epaulets or the mass. Follow-up work will be conducted to compare epaulet color with song to see how females use multiple signals in social interaction.

***Evaluating the costs and constraints of feather morphology and wettability across the avian class.**

F Muzio, M Rubega, C Dove

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Birds have evolved aquatic lifestyles multiple times throughout evolutionary history. Fortunately, their feathers are among the most hydrophobic structures in the natural world. How feathers repel water has been a perplexing area of study, still with major gaps in our overall understanding. Previous research focuses on a material science model that places emphasis on the size of, and distance between barbs of pennaceous feathers. The role of barbules, the smallest division of the feather, has been largely ignored, despite constituting the basic structure of the feather surface area and playing a key role in keeping the feather vane intact. The vast morphological variation in barbules, the comprehensive effects they have on wettability, and how both vary across species from different habitats have not yet been thoroughly investigated. Here, we study microstructure morphology and wettability in 10 phylogenetic groups of birds that have at least one ecological shift to more aquatic lifestyles. Each group demonstrates an independent evolutionary change in water interaction over time. We investigate the variation in microstructure morphology between these representatives while directly measuring wettability. We use phylogenetic comparative methods to analyze feather structure and wettability in the context of species relatedness to further assess the relationship between the two. Focusing on these groups will further elucidate the costs and constraints of microstructure development and water repellency in the context of evolutionary gains and losses of aquatic lifestyles in birds.

Qualitative spectroscopic investigations on the nature of chromophores in bird plumage

T Pagano, L Walter, L Macisco, S Pagano

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The diverse array of colors displayed by avian plumage is the result of a variety of pigment molecules, the environment in which the pigments reside, feather structures, and the interplay of these factors. Plumage color patterns can be characterized through different spectroscopic techniques that can help to elucidate the nature of the chromophore responsible for the coloring. Using non-invasive fiber optic-based spectroscopy in the visible wavelength range, we measured the reflectance of plumage from preserved, whole-bird specimens (as well as feather samples) representing a sampling of passerine and non-passerine families. Our spectral measurements were modeled and data reveal qualitative characteristics of carotenoid-like pigments, particularly for yellow, orange, and red feathers. The developed technique is useful for the rapid, non-destructive analysis of feather pigments in vivo that can be used to monitor and discriminate plumage coloring in different specimens. Modeled in vivo spectra were compared to absorbance spectra of corresponding in vitro thermochemical extracts. Comparisons give clues as to the roles of solvent shifts (polarity), refractive index (polarizability), protein binding (planarization, molecular motion, and aggregation), and feather micro-/nano- structures (structural color) on the photophysics of the color-responsible molecules. Given that the native electronic transitions of the chromophores, thus the perceived color, in feathers are influenced by the environment in which the chromophores reside, in vivo biospectroscopic techniques with favorable sensitivity, specificity, and resolution will be further developed.

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****Wintering birds in a highly variable environment: abundance, physiology, and survival****G Gibler, K Silber, A Boyle***Presenting author: Gloria Gibler*, Kansas State University, gloria87@ksu.edu

Despite the importance of the nonbreeding season to avian demography, we know far more about the factors affecting physiology, survival, and abundance during the breeding season. In the central Great Plains, environmental conditions are highly variable and unpredictable. Thus, we expected that birds wintering in the Great Plains would exhibit dynamic responses that enable them to cope with winter weather. We evaluated weather-related changes in abundance, body composition, and monthly and annual variation in apparent survival at the Konza Prairie, Kansas. We collected monthly mark-recapture data December-April, 2016-2023 (2630 captures, 62 species), and obtained 744 sets of body composition measurements using Quantitative Magnetic Resonance (QMR). We documented a surprising amount of winter site fidelity in long-distance migrants. Abundance varied greatly between months and years, but was not obviously related to surface water, proxies of food availability, or cold snaps. Body composition also varied monthly with birds carrying the most fat during the coldest months and following snowfall. Results of Cormack-Jolly-Seber models revealed similarly large monthly and species-level differences in apparent survival but not in ways clearly related to temperature or precipitation. In sum, these results reveal that birds spending the winter in the central Great Plains employ a variety of mechanisms to cope with environmental variability, with strategies likely different between migrants and residents. These results shed light on an understudied and crucial aspect of the demography and annual cycle of birds wintering within the USA.

Divergence between sister hummingbird species across the Isthmus of Tehuantepec in Mexico**A Barnard, B Ramirez, F Rodríguez-Gómez, J McCormack***Presenting author: Amelia Barnard*, Moore Lab of Zoology, barnarda@oxy.edu

The Wine-throated Hummingbird (*Selasphorus ellioti*) and Bumblebee Hummingbird (*Selasphorus heloisa*) are recognized as two different species but phenotypically are very similar. The two species are found on either side of the Isthmus of Tehuantepec, a low-lying barrier between mountain regions in Mexico. However, their phenotype and genomic differences have never been quantified in detail, in addition to the reported instance of hybrids. We quantified morphometric differences of 88 specimens at the Moore Lab of Zoology to determine if the two species are diagnosably different. We combine these measurements with genomic data to assess divergence and gene flow and understand how the geological barrier of the Isthmus of Tehuantepec has influenced their speciation compared to other divergences across this important barrier in Mexico.

Phylogeny of Pacific starlings (genus *Aplonis*) reveals cryptic diversity and diverse biogeographic patterns**E Gyllenhaal, M Andersen***Presenting author: Michael Andersen*, University of New Mexico, mjandersen@unm.edu

Pacific island taxa have long informed our understanding of speciation and biogeography. However, until genomic data became commonplace, many explosive radiations have remained unresolved. One underappreciated radiation is the genus *Aplonis*, a clade of starlings distributed across the Pacific from continental Sundaland to the far-flung Cook Islands. Of note are the high levels of secondary sympatry in *Aplonis* relative to other geographic radiations in the region. Here we resolve relationships in this group by sampling all extant and three extinct taxa. We sequenced ultraconserved elements from 141 ingroup samples (approximately 2 per subspecies), of which 104 were derived from historic toepad samples. By taking careful precautions in extraction, library preparation, and bioinformatics, we were able to infer a strongly supported phylogeny with strong concordance between replicate samples from given subspecies (with exceptions limited to those sampled on multiple islands, pointing to paraphyletic subspecies limits).

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We used this phylogeny to infer the biogeographic history of the genus, which largely followed two one-way colonization routes via a stepping-stone pattern from west to east. However, there was evidence for three independent, long-distance colonizations of Micronesia, and two cases of back-colonization from more distant to more nearby islands. Furthermore, based on patterns of sympatry and rules of monophyly, we found evidence for three species-level splits, including two in the widespread and polyphyletic Asian Glossy Starling (*Aplonis panayensis*).

***Whole-genome phylogenomics of the tinamous (Aves: Tinamidae): comparing gene tree estimation error between BUSCOs and UCEs illuminates rapid divergence with introgression**

L Musher, T Catanach, T Valqui, R Brumfield, A Aleixo, K Johnson, J Weckstein

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Incomplete lineage sorting (ILS) and introgression increase genealogical discordance across the genome, which complicates phylogenetic inference. In such cases, identifying orthologs that result in gene trees with low estimation error is crucial because phylogenomic methods rely on accurate gene histories. We sequenced whole genomes for the tinamous (Aves: Tinamidae) to dissect the sources of gene and species-tree discordance and reconstruct their interrelationships. We compared results based on four ortholog sets: (1) coding genes (BUSCOs), (2) ultraconserved elements (UCEs) with short flanking regions, (3) UCEs with intermediate flanks, and (4) UCEs with long flanks. We hypothesized that orthologs with more phylogenetically informative sites would result in more accurate species trees because the resulting gene trees contain lower error. Consistent with our hypothesis, we found that long UCEs had the most informative sites and lowest rates of error. However, despite having many informative sites, BUSCO gene trees contained high error compared to long UCEs. Unlike UCEs, BUSCO gene sequences showed a positive association between the proportion of informative sites and gene tree error. Thus, BUSCO and UCE datasets have different underlying properties of molecular evolution, and these differences should be considered when selecting loci for phylogenomic analysis. Still, species trees from different datasets were mostly congruent. Only one clade, with a history of ILS and introgression, exhibited substantial species-tree discordance across the different data sets. Overall, we present the most complete phylogeny for tinamous to date, identify a new species, and provide a case study for species-level phylogenomic analysis using whole-genomes.

****Need for Speech: A Parrot Vocal Learning Survey**

W Webster, K Vilches Castaño, L Benedict, C Dahlin

Presenting author: **Wynn Webster**, University of Northern Colorado, wynndov@gmail.com

Vocal production learning is rare across the animal kingdom. Parrots are one of the few animal groups widely recognized as highly cognitive vocal learners. Companion parrots present the opportunity to study this ability without the limitations researchers face in the wild. Based on this, we created a survey to gather information about the vocal repertoires of companion parrots. Currently, we have over 1000 submissions from around the world and have multiple branching projects from this data. Projects include studies on parrot musicality, acoustic analysis of vocal learning accuracy, and phylogenetic comparative analysis of how factors including brain size, body size, longevity, flock size, coloration, and ecology may drive vocal learning ability. We are looking to expand our dataset through public participation and contributions from people who live with companion parrots in order to develop an even stronger foundation for each of these avenues of research. Every entry helps us further the understanding of how vocal learning functions, in not only parrots, but in all other species that present this trait. We invite you to join us in broadening the scope for parrot vocal research!

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One does not simply fly into Mordor: Investigating avian physiology in the scar of a California megafire*L Schaefer, Z Cheviron**Presenting author: **Linnea Schaefer**, linneanoelle@berkeley.edu

Wildfires in Western North America have grown in severity and size over the last century, with undetermined impacts on animal behavior, health, and physiology. Birds, due to their dispersive ability, are some of the first wildlife to return after a wildfire, but little research has explored the physiological effects of occupying a burn scar. In the scar of a high-severity fire, birds will experience radically different physiological pressures related to thermoregulation and water balance, as well as variable resource availability compared to intact forests. Limited research suggests that songbird fat deposition decreases during and following wildfires, particularly in migratory birds, but no studies have comprehensively quantified body condition of individuals occupying burn scars compared to intact habitat. Following a wildfire, birds may experience increased chronic stress as a result of lower-quality food sources or increased exposure to reactive oxygen species and toxic contaminants dispersed by wildfire smoke and ash. These factors may also impact post-fire disease and host-parasite dynamics by compromising avian immune function. Here, I will present preliminary data from my pilot field season. I will sample several species of songbirds across the northern portion of the Dixie Fire burn scar during the 2024 breeding season and measure key indices of avian body condition (lean muscle/fat mass ratio, water content), chronic stress (feather corticosterone, heat shock proteins), and disease (malarial infection, acute-phase proteins) to quantify the physiological effects of living in a burn scar.

Investigating the effects of PFOS on tree swallow (*Tachycineta bicolor*) metabolism**A Smith, M Thiel, E Pavlovic, J Haselman, M Etterson**Presenting author: **Angelica Smith**, smi02328@d.umn.edu

Passerine birds, such as tree swallows (*Tachycineta bicolor*), play ecologically important roles, like controlling insect populations and serving as indicators of environmental health. However, they are often overlooked in ecotoxicological studies despite potential exposure to pollutants through contaminated emerging aquatic insects. We aimed to assess the impact of perfluorooctane sulfonate (PFOS) on the metabolism of nestlings using field flow-through respirometry. PFOS is part of a class of chemicals known as per- and polyfluoroalkyl substances (PFAS), which are persistent and stable manufactured chemicals known to adversely affect physiological systems like the hypothalamus-pituitary-thyroid (HPT) axis and metabolism. Five treatments were administered daily starting from day 5 post-hatch, including low and high doses of PFOS, vehicle and handling controls, and methimazole as a positive control for HPT inhibition. Respirometry measurements were taken at three nestling ages (5, 8, and 12 days) and used to calculate metabolism. Contrary to expectations, we found no significant difference in metabolic rates between PFOS doses and control treatments. However, we observed a consistent pattern of increasing metabolism with mass that exceeded the expected $\frac{1}{4}$ scale typical of many species, supporting previous reports of higher energetic costs during pre-fledging development. Our study employs field respirometry in ecotoxicology, providing real-time data on developing wild birds and underscoring the need for a deeper understanding of PFAS effects, particularly during critical developmental stages. These insights are vital for informing conservation strategies and mitigating the ecological consequences of chemical pollutants.

Integrating existing demographic data to identify critical data gaps and estimate population dynamics of Cerulean Warblers (*Setophaga cerulea*)**E Metz, E Hunter**Presenting author: **Elaine Metz**, Virginia Tech USGS Cooperative Research Unit, elainemetz@vt.edu

Cerulean Warblers (*Setophaga cerulea*) have experienced long-term declines in abundance. Multiple research efforts over the past decades have resulted in estimates of several demographic parameters; however, substantial uncertainty remains about which life-stages are limiting to population growth and whether there are critical gaps, either spatially or across life-stages. Statistical techniques that can

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combine demographic data while integrating multiple types of data like count, nest productivity, and mark-recapture may better estimate population size and trajectory and thus better inform future management and research. In bird populations, Integrated Population Models (IPMs) have been increasingly employed for species with long-term data like migratory waterfowl, but many species do not have the spatial or temporal overlap in data that IPMs require, despite years of research across their range. Demographic data collection efforts for Cerulean Warblers span decades and are occasionally temporally concurrent, particularly in their breeding range, but the data have not been collated or simultaneously analyzed. We received count, nesting survey, and banding data sets from over 20 contributors spanning North and South America from the past 20 years. We approached developing an IPM by focusing primarily on the inclusion of data sets with the longest duration of collection across at least two demographic data types. We included environmental covariates to explain temporal fluctuations in rates and trends and connect smaller duration data sets. Our results highlight the utility of collation of data sets across research teams to inform data gaps and future management priorities for a sparsely distributed migratory warbler.

****Leveraging long-term demographic data to detect and examine density dependence in North American songbirds**

J Langley, C Francis, S Jennings

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Although density-dependent population regulation is widely accepted, it is surprisingly difficult to detect in nature. A leading challenge is that evidence of density dependence is rarely observable without sufficiently long time series, especially in observational studies. Here, we took advantage of time series data available in the Monitoring Avian Productivity and Survival (MAPS) Program to test the density-dependence theory expectation that local abundance should negatively covary with per capita productivity. To do so, we retained data from 389 MAPS banding stations with >10 years of time-series data, resulting in 50979 observations of annual abundance and productivity from 56 species. We used hurdle log-normal models within a Bayesian framework with weakly informative priors to model per capita productivity, defined as the ratio of first-year birds to adults. We treated the number of unique adults as a fixed effect and MAPS station and year as random effects. We have detected negative covariance between adult abundance and per capita productivity in all of the species we have examined thus far (n=10), although the strength of this relationship varies considerably among species. Ongoing analyses will focus on the remaining species in our dataset to determine whether compensatory density dependence is commonplace among North American songbirds. We will also examine the possibility of trophic guild-level density dependence to clarify whether resource utilization predicts how different songbird species respond to density-dependent factors within their environment.

Spatiotemporal patterns and biases in observations reported to the iNaturalist project, Larder Locker

D Cooper, E Donahue, T Boves, C Duchardt, S Loss, T O'Connell

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Long-term population declines and regional extirpation make the Loggerhead Shrike (*Lanius ludovicianus*) a conservation priority in the US and Canada. Food availability is often considered as a factor connected to the enigmatic distribution of these predatory passerines. Community science platforms create the opportunity to gather data on Loggerhead Shrike diet due to the shrike's habit of impaling its prey in conspicuous places including thorns or barbed wire. The Loggerhead Shrike Working Group established the project Larder Locker in iNaturalist to provide information at a continental scale on the prey items found at shrike larders. We compiled data from Larder Locker to conduct a descriptive analysis of the information contained. Approximately 550 observations of putative shrike caches from the US and Canada represent 160 unique taxa recorded by 99 participants in the database from 2012–2024. Participation in Larder Locker varies widely, with one user contributing at least 25% of all observations and 61 others contributing a single observation. Spatially, 80% of the observations come from the Southeastern US, with over 60% of them from Alabama, Arkansas, and Texas. A higher proportion of

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observations were submitted December–February (31%) than June–August (18%). Taxonomically, insects dominated the cached items (47% of observations, the majority Orthoptera and Coleoptera), followed by reptiles (16%), amphibians (16%), mammals (11%), and birds (5%). Seven additional taxonomic groups accounted for the remaining 5%. Challenges including lack of a sampling protocol, and assumptions about cached items and their consumption limit the inferences that can be made from Larder Locker data. However, addressing and overcoming these challenges will help to unravel emergent range-wide dietary patterns. For example, a presumptive heavy reliance on Orthoptera could lead to testable hypotheses with the potential to reveal management recommendations to reverse population loss.

Addressing shorebird disturbance through community-based social marketing

A Dayer, S Livingston

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Shorebirds along the Atlantic Flyway face declining abundance and range due to threats like habitat loss, climate change, and coastal development. Human disturbance exacerbates these issues, reducing the amount of functional habitat; therefore, prioritizing social science in shorebird management, particularly through community engagement, is crucial. Collaborating with land managers and conservation practitioners, Virginia Tech developed a guide using the community-based social marketing (CBSM) framework to address human disturbance to shorebirds. Nine sites piloted CBSM campaigns to reduce disturbance by encouraging behaviors such as leashing dogs and walking around flocks of birds. This presentation serves as an overview of CBSM and its applicability to conservation challenges. Using this project as a case study, we demonstrate how CBSM can facilitate behavior change to improve conservation outcomes. Additionally, we will introduce attendees to a comprehensive toolkit comprising various resources, implementation tips, and more to aid shorebird conservation professionals in effectively engaging communities and implementing CBSM strategies.

What do we know about birder's perceptions, intentions, and challenges for engaging in bird-friendly actions?

T Phillips, B Rodomsky-Bish, C Hebbard

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In this study we sought to understand birders' perceptions of the impact of bird-friendly actions, how likely they were to engage in these actions, as well as barriers to creating bird-friendly habitats. We surveyed people participating between 2020 and 2023 in the Great Backyard Bird Count and received 933 responses. We later conducted six focus groups with a subset of survey respondents (N = 27). Of the 14 possible actions provided to survey respondents, all of them were rated as having medium to high impact, with the three highest impact actions being planting native plants, avoiding or reducing pesticides, and keeping cats indoors. Actions that respondents were most likely to do included: providing food and water for birds, engaging in participatory sciences and avoiding or reducing pesticides. Actions that were the least likely to be undertaken included: keeping cats indoors, buying shade grown coffee, reducing lawn, and turning lights out during peak migration periods. This represents a potential mismatch between perceived impacts and intentions. From the survey and focus groups, we learned that common challenges when creating bird-friendly habitats include: lack of education on what/where/when to plant, inviting unwanted wildlife, cost, space limitations, time, the need for localized information, outdoor cats, neighborhood rules, and other practices by neighbors. Understanding birders' perceptions, intentions, and challenges to bird-friendly actions can provide a baseline for creating strategic and targeted messaging and behavior campaigns designed to minimize barriers and encourage adoption of actions that benefit birds and biodiversity.

Song structure and function in male and female Bullock's Orioles (*Icterus bullockii*)

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Song is most widely known to function in mate attraction and territory defense, particularly in male passerines. Female song is widespread but comparatively understudied. In this study, I investigated song form and function in both male and female Bullock's Orioles (*Icterus bullockii*), a temperate-breeding, migratory songbird. At my field site in central California, mated pairs typically nested semi-colonially, either in neighboring trees or within the same tree as other conspecifics, and territorial behavior was largely absent. I hypothesized that song signals individual identity within mated pairs of Bullock's Orioles, and that singing aids in coordination of biparental care, such as nestling feeding. I conducted focal observations of mated pairs throughout the breeding season, recording song and movements near their nest. To analyze song structure, I employed a dynamic time warping algorithm to create a dissimilarity matrix of recorded songs. Formal analysis of the dissimilarity matrix showed significant differences both between individuals and between sexes. In both sexes, bouts of song were temporally correlated with approaching and leaving the nest. Singing within pairs was not temporally correlated to songs of neighboring conspecifics. This study highlights the importance of investigating song in a wider variety of systems.

Agonistic responses of northern bobwhite quail to closely related heterospecific playbacks*B Buchanan, K Sieving, R Kimball**Presenting author: **Brittaney Buchanan**, buchananbl55@gmail.com

When discussing bird song and vocalization studies, the majority of work cited are those done on passerines which are considered songbirds and are known for learning their vocalizations which can be very complex. However, there are species of non-songbirds that have a variety of vocalizations and songs that have gone unstudied, though these vocalizations are simpler with not as many notes in comparison to songbirds. The northern bobwhite quail (*Colinus virginianus*) is one such non-songbird species that has a variety of vocalizations and a song used only by males to protect territory during the breeding season. The objective of my study is to determine if northern bobwhite males in the breeding season can determine that a song of a closely related heterospecific is not a conspecific by analyzing their aggressive responses. Using playbacks as well as a taxidermy bobwhite quail, I played the songs of two other bobwhite species, the black-throated bobwhite quail (*Colinus nigrogularis*) and the crested bobwhite quail (*Colinus cristatus*), as well as the northern bobwhite in known locations northern bobwhites are found in the northern part of Florida. Aggressive behavior data were collected to 1) determine if northern bobwhite males react with different levels of aggression compared to how they'd respond to a conspecific and 2) if vocal characteristics differ in interactions with heterospecific playbacks. The results will be interesting as the three bobwhite species have songs that are not distinguishable to humans and the geographic ranges of crested and black-throated quail do not overlap with the northern bobwhite. The conclusions will add unknown information about how a non-songbird species reacts to encounters with a previously unknown but similar species. This can give us information on how species whose ranges are expanding into areas previously outside of their range from climate changes can affect the local species.

Understanding the behavioral context of vocalizations of white-necked jacobins (*Florisuga mellivora*)*S James, M Negrette, A Fernandez, J Falk**Presenting author: **Sadoni James**, sadonij@gmail.com

Hummingbirds are a promising taxon to study underlying mechanisms of complex vocal communication: they have song, multisyllabic calls and they are one of very few taxa that show vocal learning. However, hummingbird vocal communication is relatively understudied, and vocal repertoires relating specific vocalizations to behavioral context are rare. Vocal repertoires are crucial for further in-depth studies about vocal communication, including vocal imitation learning. In this study, we characterize the vocal repertoire of the white-necked jacobin (*Florisuga mellivora*), describing different call types and their behavioral

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context. Feeders filled with sugar water were placed at multiple locations around Gamboa, Panamá to attract hummingbirds. Recordings of *F. mellivora* were collected with an Avisoft CM16/CPA ultrasound microphone with recording sessions occurring in the morning, afternoon and evening. While recording, observational notes of behavior were taken to create an ethogram. Subsequently, we measured various acoustic parameters to statistically validate our visual call classification. Our behavioral observations were used to identify the behavioral context of these calls. Results show that *F. mellivora* produces different song types and a variety of context-specific call types associated with feeding, aggression, territorial defense and courtship. This study will be the foundation for studies on intra- and interspecies communication between different hummingbird species. Furthermore, we increase the knowledge on vocal communication in hummingbirds, a diverse group of birds with complex vocal communication systems.

Chickadees sing different songs in sympatry versus allopatry

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Character displacement theory predicts that closely-related co-occurring species should diverge in relevant traits to reduce costly interspecific interactions such as competition or hybridization. While many studies document character shifts in sympatry, few provide corresponding evidence that these shifts are driven by the costs of co-occurrence. Black-capped (*Poecile atricapillus*) and mountain chickadees (*P. gambeli*) are closely-related, ecologically similar, and broadly distributed songbirds with both allopatric and sympatric populations. In sympatry, both species appear to suffer costs of their co-occurrence: 1) both species are in worse body condition compared to allopatry and 2) hybridization sometimes yields sterile offspring. Here, we explored character displacement in the songs of black-capped and mountain chickadees by characterizing variation in male songs from sympatric and allopatric populations. We found that mountain chickadees sing differently in sympatry versus allopatry. Specifically, they produced more notes per song, were more likely to include an extra introductory note, and produced a smaller glissando in their first notes compared to all other populations. Combined with previous research on social dominance and maladaptive hybridization between black-capped and mountain chickadees, we posit that differences in sympatric mountain chickadee song are population-wide shifts to reduce aggression from dominant black-capped chickadees and/or prevent maladaptive hybridization.

**Response of daily acoustic activity of city-dweller songbirds across an urban gradient in north central Florida

M Shuler, M Cauffman, Z Colón-Piñero, O Acevedo-Charry

Presenting author: Matthew Shuler, mcshuler11@gmail.com

Urbanization is a global threat to avian wildlife, affecting vital communication via anthropogenic noise and lighting. For songbirds, acoustic communication is a crucial trait for reproductive behavior; thus, urbanization creates communication barriers for urban-dwelling songbirds. However, the full extent of urbanization's impact on songbird communication is still unknown. Here, we explored if urbanization in north central Florida alters the temporal acoustic activity of two urban-dwelling birds: the Carolina Wren (*Thryothorus ludovicianus*) and the Northern Cardinal (*Cardinalis cardinalis*). To determine the change in acoustic activity, we deployed an Autonomous Acoustic Recording Unit (AARU) at five sites across an urban gradient from March 2024 to May 2024, a period that includes pair formation, nest building, and first brood. Sites were selected using an integrative index of human footprint and the change of vegetation ratio 1.5 km around each site. The units recorded continuously from 0400 to 0900 hours and for 1 minute every 15 minutes until the next morning. We use generalized linear models (GLM) to explore the relationship between dawn chorus onset and diel acoustic activity with the urbanization gradient. To explore the mechanism, we measured sound pressure level and lux intensity at each site then compared the relationship of these two urbanization variables with acoustic communication. All recordings were analyzed in the ARBIMON platform and different sets of GLMs were compared using Bayes Information Criteria. Birds in more urbanized areas begin the dawn chorus earlier but had more overall activity during the day than birds in less urbanized areas.

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Investigating effects of noise levels on an indicator species for sagebrush ecosystems*A Nash, P Coates, M Maples, S Mathews-Sanchez, S O'Neil, M Milligan, J Tull, R Ambrose, S Espinosa***Presenting author:* **Austin Nash**, US Geological Survey, anash@usgs.gov

Evidence of widespread impacts of anthropogenic noise disturbance to a range of wildlife taxa including birds, fishes, anurans, and mammals has been growing. Noise affects birds through a variety of pathways including masking communication, modifying habitat selection, and altering reproductive performance. While many aspects of the biology of the greater sage-grouse (*Centrocercus urophasianus*) have been thoroughly described, less is known about the impacts of noise on sage-grouse. Previous research indicates that anthropogenic noise negatively affects sage-grouse abundance, and that these effects could be mediated by increased stress and disruption of acoustic signaling. However, the exact mechanisms and most-sensitive life-stages by which noise may affect sage-grouse remain unidentified. We are investigating the influence of noise on several aspects of sage-grouse biology through a landscape-scale sound monitoring network in Nevada, USA. We are currently deploying acoustic and video recording units at sage-grouse leks along a gradient of anthropogenic disturbance to investigate potential influences of noise on population growth rates and courtship behaviors, such as lek attendance and display rates. Additionally, we are collecting fecal samples at leks to estimate the relationship between noise exposure and stress metabolites. Lastly, we are monitoring nests and deploying GPS transmitters to estimate effects of noise on nest survival and habitat selection. With a stronger understanding of the mechanisms through which noise impacts sage grouse, managers could predict impacts with greater precision. This information is preliminary and is subject to revision. It is being provided to meet the need for timely best science.

****Long-term stability of song dialects in migratory Seaside Sparrows (*Ammospiza maritima*)****M Shah, G Hough***Presenting author:* **Mansi Shah**, Rowan University, shahma44@students.rowan.edu

Seaside sparrows (*Ammospiza maritima*) are songbirds that reside exclusively in salt marshes along the Atlantic and Gulf Coasts. They are vulnerable to environmental changes, so their density is correlated with saltmarsh quality. Like humans, they learn their songs from adults during a critical period in early development. Adults sing between 3-5 distinct songs, though adult songs have not been studied in detail below the subspecies level until recently. They do not sing during their first year of life, so their song relies on the memory of what they were taught in their first season. Since sparrow populations are raised in geographically restricted areas, we hypothesize that this species forms regional-specific dialects of songs that might be regionally-stable across time, similar to what was previously observed in white-crowned sparrows. Sparrows with locally unique repertoires can therefore select songs to establish and defend territories, as well as attract local mates. If stable song dialects evolve when populations of birds are restricted in space, the same songs should be found across time, and locations should differ in their songs. We recorded seaside sparrow songs at three south New Jersey locations across a decade, created spectrograms of the recordings, and analyzed the differences between songs recorded in 2012 and songs recorded in 2022-23. Our findings suggest that across all locations, 40% of songs sung in 2012 were still present in 2022-23. This is remarkable because there is a large variety of different songs at each location, birds migrate each year to more southern areas, and individual seaside sparrows normally have a two to three year lifespan.

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Testing immediate song flexibility in a vocal mimic, the gray catbird (*Dumetella carolinensis*) across an urban noise gradient**E Osorio, S Eppert, E Dray, J Calvert, A Williams, D Moseley***Presenting author: Eriberto Osorio*, James Madison University, eribertoosorio.eo@gmail.com

In noisy urban areas, many birds sing songs with higher minimum frequencies, which can avoid the masking effects of low-frequency (low-pitch) anthropogenic noise. Not all species studied show these population differences, and even for those species that do sing higher in urban noise, the mechanism behind this difference is not always clear. Immediate flexibility is the ability to alter song in real-time in the presence of sudden noise, which potentially allows for better signal transmission. We investigated if male gray catbirds (*Dumetella carolinensis*) alter their song in the presence of anthropogenic versus high-frequency noise playback compared to pre-playback. We tested 17 male catbirds along an urban gradient from Virginia to Washington, D.C. Compared to pre-playback, catbirds sang significantly higher minimum and maximum frequencies during low-frequency noise playback, but with a small effect size overall. This result begs the question of whether this shift is a byproduct of the Lombard effect and if the size of this shift would fail to avoid song-masking by urban noise. Habitat was a significant factor as catbirds on noisier, urban habitats both increased minimums more and decreased maximum frequencies more than rural catbirds. Together these shifts may lead to greater energy concentrated in a narrower frequency bandwidth, thus enhancing signal transmission for urban, but not rural, birds. We aim to expand this research by testing immediate flexibility in terms of song amplitude using a highly accurate and precise sound-level meter as well as increasing our sample size of catbirds residing in noisier urban habitats.

****The movement ecology and conservation of Black-crowned Night-herons (*Nycticorax nycticorax*) in Chicagoland, Illinois****S Slayton, M Ward, M Avara, H Adams, B Semel***Presenting author: Sarah Slayton*, University of Illinois, Urbana-Champaign, slayton4@illinois.edu

Black-crowned Night-herons (BCNH) (*Nycticorax nycticorax*) are a colonial wading bird facing notable declines in the Great Lakes region of the U.S. due to wetland habitat loss and degradation. Although BCNH are globally distributed, they are a special-status species in 11 states including Illinois, where the species has been listed as endangered since 1977. The last major rookery in the state is located at the Lincoln Park Zoo (LPZ) near downtown Chicago. Despite the inherent risks associated with nesting in an urban center the colony appears to be flourishing, with over 300 pairs of birds fledging over 400 chicks in 2023. However, little research has been conducted on how birds are acquiring resources and utilizing city habitat to cope with the environmental pressures posed by urban living. BCNH's cryptic nature and nocturnal lifestyle have made them challenging to study solely using traditional field methods, making them ideal species to study using advanced tracking technologies. During the 2023 and 2024 breeding seasons, my team at the University of Illinois partnered with the LPZ and Illinois Department of Natural Resources to deploy GPS/GSM transmitters on BCNH from this colony to identify critical foraging grounds and potential new rookery locations in the Chicago area. So far, these transmitters have illuminated that birds are utilizing a wide variety of natural and manmade waterbodies, some of which are hydrologically influenced by Lake Michigan while others are managed by state and local agencies. They have also revealed unexpected patterns in post-breeding movements and behavioral differences between age classes. These insights will help inform conservation efforts for this species in Illinois, and beyond.

****Outcomes of bird conservation initiatives in urban areas****A Khan, T Rytwinski, E Cheskey, A Jordan, R Buxton***Presenting author: Aalia Khan*, aaliakhan3@gmail.com, carleton.ca

Urban areas contain high concentrations of key threats to avian populations. These include window collisions and predation from domestic and feral cats, which are estimated to kill a combined 4 billion birds annually across Canada and the USA alone. Proposed solutions to major threats are advocated for by conservation programs such as Nature Canada's Bird Friendly Cities program. However, knowledge of

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the effectiveness of these solutions, as well as the outcomes of conservation initiatives in general, remains limited. Using an evidence synthesis of the main certification criteria in the Bird Friendly Cities program, we aimed to: 1) map the academic literature surrounding urban threats and conservation solutions, and 2) summarize the outcomes of implemented solutions in reducing bird mortality. We followed guidelines provided by the Collaboration for Environmental Evidence to gather papers on the following five leading causes of urban bird mortality: cat predation, bird-window collisions, road mortalities, light pollution, and pesticides. Following initial relevance screening, we found that the majority of papers (>55%) focused on cat predation or bird window collisions, while the smallest proportion (10%) focused on urban pesticides. Across all topics, we found that proportionately few studies (<10%) specifically explore outcomes of conservation solutions compared to those that demonstrate the magnitude of threats. Overall findings suggest there is a critical need for greater research on the effectiveness of solutions to all urban threats. Results from this evidence synthesis will be used to inform the BFC program's guidelines, ultimately guiding policies and initiatives for urban birds across Canada.

Mapping and analyzing raptor injury incidences and causes in Orange County, Florida.

A Barath, D Wallin

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Raptor injuries are a significant concern in Orange County, Florida, where a substantial number of injured birds are admitted to the Audubon Center for Birds of Prey in Maitland annually. This study examines data from the center in 2023, focusing on three hundred and forty-four raptors originating from Orange County, accounting for forty-one percent of all statewide admissions. By analyzing data from the Audubon Center for Birds of Prey, spatial hotspots of raptor injuries within the county are identified, along with prevalent injury types and the most vulnerable species. These findings provide crucial insights for pinpointing areas in need of environmental attention with consideration towards potential linkages to urbanization, and facilitate the development of targeted mitigation strategies. Examining and mapping spatial patterns of raptor injuries can help lessen risks to birds of prey populations and enhance their conservation in Orange County, Florida.

Effects of regenerative grazing practices on grassland and sagebrush songbirds in Montana

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Grazing cattle on rangelands is the most widespread use of land on earth, and it is especially pervasive in the western United States. Rangelands have become one of the most sustainable forms of agricultural land because they prevent monoculture crops and urban and suburban development, which can have catastrophic effects on biodiversity and ecosystem services. Given the extirpation of large native grazers, domestic animals on rangelands can fill an important niche in some ecosystems.

Rangeland-management techniques that prioritize heterogeneous vegetation structures and heights can increase avian diversity and abundance at the landscape scale. Such landscape mosaics can be accomplished through regenerative-grazing approaches, which promote plant re-growth, provide nutrients through defecation and urination, and facilitate decomposition through hoof action by altering cattle movement, duration, and intensity. Starting in 2023 in the Centennial Valley, southwest Montana, we initiated data collection to test responses of avian indicator species and vegetation across four alternative approaches for livestock grazing and movement. The alternative approaches include pastures with barbed-wire fences, virtual fences, electric fences, and active herding. We surveyed avifauna and vegetation at 874 points in 2023 and will continue the same design in 2024. We will fit a multi-species occupancy model to predict species diversity in our different grazing treatments. We will also fit multiple covariate distance sampling models, the outputs of which will then be used along with habitat and landscape covariates to fit density surface models, generating spatially-explicit and species-specific density estimates for each treatment.

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Comparative analyses of the gut microbiome in agricultural and non-agricultural Loggerhead Shrikes (*Lanius ludovicianus*)**E Donahue, B Trevelline, A Worm, A Matthews, B DeGregorio, T Boves, L Neuman-Lee***Presenting author: Emily Donahue, Arkansas State University, emilyrdonahue@gmail.com*

The gut microbiome can help its host respond and adapt to its environment by influencing many biological functions beyond the digestive system (e.g., immune and endocrine systems). Environmental changes can alter microbiome community composition and function. Microbiome community shifts may influence a host organism negatively by promoting the growth of harmful bacteria or positively by aiding environmental adaptation through new, beneficial bacterial relationships. Anthropogenic modifications, such as agricultural toxin (e.g., pesticide) application, are environmental changes that can impact microbiome communities. Pesticide exposure is known to increase detoxification abilities in insect microbiota, but vertebrate systems remain understudied. Here, we explored potential agricultural toxin effects in vertebrates by comparing the gut microbiota of Loggerhead Shrikes (*Lanius ludovicianus*) in agricultural and non-agricultural regions of Arkansas, USA. We predicted that agricultural shrikes would have less diverse gut microbiota and more toxin-degrading microbes. We used 16S rRNA sequencing to identify bacterial taxa and calculated community diversity metrics to compare gut microbiota. We found that agricultural shrikes harbored more diverse gut microbial communities that included more bacteria with functions potentially associated with pollutant detoxification. Overall, the gut microbiome in shrikes from both regions was dominated by Actinobacteriota, Firmicutes, and Proteobacteria. These results describe the gut microbiome of shrikes in general and help us understand how microbial-host relationships may assist environmental adaptation, such as through enhanced pollutant detoxification, in anthropogenic landscapes.

Investigating the role of drought and air pollution on oxidative stress in different diet guilds of migratory birds in Southern Colorado**M Miller, C Ramos***Presenting author: Megan Miller, megan.k.miller2473@gmail.com*

Little information is available on the sublethal physiological effects of drought and wildfire on migrating birds. The relationship between oxidative balance, pollutant exposure, and increased metabolic effort makes it an important tool for evaluating sublethal impacts during migration. I intend to focus on the intersection of three questions. How is oxidative balance influenced by diet guild, how is oxidative balance impacted by emaciation and fat load, and how is oxidative balance influenced by drought and air pollution? Independent of diet guild, many species consume antioxidant-rich fruit during fall migration. I predict birds in the fall will have higher antioxidant capacity than birds in the spring. Due to the oxidation of lipids during migration, I expect birds with low fat to have higher oxidative damage. Drought may play a role in the yearly abundance of fruit, therefore, I predict that in dry years, the proportion of birds with emaciation and low fat will increase. Because heavy metals are present in air pollution I predict that oxidative stress will increase when exposed to air pollution. All data will be collected during migration banding. Blood samples will be centrifuged, plasma separated, and frozen on the day of capture. I will run a d-ROM assay to test for hydroperoxides, an early product in the oxidation cascade, and a measure of oxidative stress. I will run a Total Antioxidant Capacity (TAC) assay to capture both endogenous and exogenous antioxidants combined. A 24-hour air quality station is installed at our field site, and drought index scores from the Environmental Protection Agency will be used at a local and national level. If compounding climate events like wildfire and drought are reducing birds' ability to maintain oxidative balance during migration it could mean reduced overwintering survival, reduced fecundity, and other impacts on the birds' life history.

****Analyzing the Factors Affecting Chimney Swift Nest Abundance and Distribution in Urban Landscapes****N Yunes Perez, P Warren, S Lerman, Z Ladin***Presenting author: Nicole Yunes Perez, nyunesperez@umass.edu*

Updated September 26, 2024

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Aerially insectivorous birds are experiencing a drastic decrease in their populations, particularly Chimney Swifts (*Chaetura pelagica*). It is still unclear which ecological factors contribute to these declines and no social factors have been examined. Through this study, I have collected Chimney Swift nest occupancy data in Springfield, MA, USA, to measure population declines and distributions, and to analyze contributing ecological and social factors such as chimney site availability/distribution and income inequality. I anticipate that Chimney Swifts will indeed be in decline compared to previously collected 2016 data, and nesting sites will be more densely distributed in low-income areas as a response to the relationship between house age and income in a small to medium sized city like Springfield, MA. The results of this study can be used to aid in the conservation of Chimney Swifts and other aerial insectivores in Northeast North America. Models developed from these results can be used to predict Chimney Swift distribution and abundance outside of the study area.
