Science Session

Saturday June 7, 2025

Grand Junction, CO
CFO Convention

Thank you Bird Conservancy of the Rockies for sponsoring the 2025 CFO Science Session.

Schedule

1:00–1:30	Sharon Tinianow; Heading Afield Together: 90 years of Colorado birding
1:30–1:50	William C. Anderson; Cryptic Speciation in the Northern Pygmy Owl (*Glaucidium gnoma*)
1:50–2:10	Kelsey Crona; Evaluating Body Condition and Apparent Survival in Migratory Songbirds
2:10–2:30	Ted Floyd; Lies, Damned Lies, and Spectrograms: Interpreting and Overinterpreting Computer Printouts of Birdsong
2:30–2:50	Edward Landi; Local Birds in Far Away Places: Population Status of Colorado's Grassland Birds Overwintering in the Chihuahuan Desert
2:50–3:00	Break - *Thank you Colorado Crane Conservation Coalition for sponsoring.*
3:00–3:05	Comments from Bird Conservancy of the Rockies.
3:05–3:25	Megan Miller; Investigating the Role of Wildfire Smoke on Oxidative Status in Different Diet Guilds of Migratory Birds in Southern Colorado
3:25–3:45	Sara Padula; Mapping Memory: How Chickadees Remember Their Caches—And What Their Genes Can Tell Us
3:45–4:05	Kurt L. Riggin; Ecomorphology and Phylogenetic Signal of Hindlimbs in North American Sparrows and Blackbirds (Passerellidae & Icteridae)
4:05–4:30	Chuck Hundertmark; The Evolution of Birding Tools: Birding Hotspots.org and eBird Checklist Media

Abstracts

Sharon Tinianow; Denver Field Ornithologists

Heading Afield Together: 90 Years of Colorado Birding

In January 1935, two Denver women invited students from an ornithology class at the University of Denver extension to a meeting about forming a birding club. As a result, two organizations came into being: Denver Field Ornithologists and Colorado Field Ornithologists. This presentation will touch on significant moments in the 90 year history of both groups and some of the individuals whose time and energy made it all possible. Sources include photos, interviews, and other materials from the archives at the Denver Museum of Nature and Science and the Denver Public Library, as well as articles published in area newsletters and journals.

William C. Anderson, University of Colorado Boulder

Cryptic Speciation in the Northern Pygmy Owl (*Glaucidium gnoma*)

The taxonomic status of the Northern Pygmy Owl (*Glaucidium gnoma)* has long been debated. Ranging from Guatemala north to southern Canada, this diminutive owl exhibits minor plumage variation and vocal variation across 5 different subpopulations. Some taxonomic organizations recognize each of the 5 subspecies as their own species-level group, but others recognize only one species. Prior genetic work using a reduced representation approach was unable to clarify the taxonomic placement of each subpopulation. To address this uncertainty, we sampled at least one individual from each of the five Northern Pygmy Owl populations: *G. g. californicum* on the west coast of the United States N = 15, *G. g. pinicola* in the southern rocky mountains from Wyoming to northern Arizona N = 8, *G. g. gnoma* in the Sierra Madre from southern Arizona to the Isthmus of Tehuantepec N = 5, *G. g. cobanense* on the Guatemalan Plateau N = 4, and *G. g. hoskinsii* in southern Baja California N = 1. We used whole genome sequencing to untangle the phylogenetic relationships between the different populations of Northern Pygmy Owl and definitively determine the taxonomic status of each population. Additionally, we conducted vocal analyses to explore the relationship between vocal and genomic divergence. We find that one population currently lumped in the Northern Pygmy Owl, the Guatemalan Pygmy Owl, *G. g. cobanense*, displays sufficient genomic divergence for species-level consideration, while the other populations show relatively low levels of genomic differentiation.

Kelsey Crona and Claire Varian-Ramos; Colorado State University-Pueblo

Evaluating Body Condition and Apparent Survival in Migratory Songbirds

Little research has been done on the direct impacts of climate change on the fitness of birds during migration periods. While body condition measurements are a common tool used by

ornithologists to assess the individual fitness of birds, these health indicators have yet to be correlated with survival during migration. We predict birds in poor condition will have lower apparent survival during migration. We also predict that migrating birds will have lower apparent survival during extreme drought and air pollution from wildfire driven by climate change. Using Cellular Tracking Technologies Hybrid Tags, we tagged six migratory songbirds in the fall of 2024, four of which have been detected by the Motus network. A total of 100 tags will be deployed by spring migration of 2026. Findings from this research will help understand the accuracy of using body condition measurements to predict survival as well as the impacts of climate change on songbirds during migration.

Ted Floyd; American Birding Association

Lies, Damned Lies, and Spectrograms: Interpreting and Overinterpreting Computer Printouts of Birdsong

With the advent of websites like Xeno-Canto and the Macaulay Library, and especially the Merlin Bird ID app, birders and field ornithologists today have ready access to high quality scrolling spectrograms of bird vocalizations. With a bit of study and experience, birders and field ornithologists can learn how to interpret the squiggles and scratches online—and confidently identify many birds. A reasonably good spectrogram, easily obtained by simply pressing a red button on one's phone, is like "DNA for birdsong." But in the same way that DNA is best analyzed with some amount of care, so it is advisable to apply a modicum of prudence to the interpretation of sound spectrograms. Microphones and human ears are transducers—they detect sound energy, convert it to an electrical signal, and transmit it to a receiver. But what happens in our motherboards and auditory cortexes, respectively, is not entirely congruent. In particular, it is important to understand the dynamical properties of frequency sensitivity, age-related hearing loss, and the subjective impressions of amplitude, intonation, and modulation as they relate to the interpretation of natural sounds. Some Colorado birds that serve as nice case studies for these interesting challenges are the Great Horned Owl, Red-eyed Vireo, House Sparrow, Red Crossbill, and Spotted Towhee.

Edward Landi; Bird Conservancy of the Rockies

Local Birds in Far Away Places: Population Status of Colorado's Grassland Birds Overwintering in the Chihuahuan Desert

Traditionally, grassland bird conservation efforts have focused on monitoring populations during the breeding season using standardized point count protocols. However, many grassland birds spend the majority of the year on their non-breeding grounds. The non-breeding season of a grassland bird's annual life cycle is understudied yet crucial for conserving grassland birds. Many of Colorado's breeding grassland bird species like Lark Bunting (*Calamospiza melanocorys*), Chestnut-collared Longspur (*Calcarius ornatus*) and Thick-billed Longspur (*Rhynchophanes mccownii*) spend the winter in the Chihuahuan desert grasslands of New Mexico, Texas and Mexico. Bird Conservancy of the Rockies developed a

standardized protocol to monitor grassland birds during the non-breeding season using a transect line and spatially balanced design. After 7 years of implementing this protocol, we have started to put together short-term trends and regional density estimates in Bird Conservation Region 35 across New Mexico, Texas, and Mexico of many grassland species. Also, this protocol is being implemented on private ranches to measure the impact of shrub removal treatments in West TX. We have found that grassland bird populations are slow to respond positively to shrub removal treatments. Also, many species of grassland birds like Chestnut-collared Longspur, Sprague's Pipit (*Anthus spragueii*), Baird's Sparrow (*Centronyx bairdii*), and Grasshopper Sparrow (*Ammodramus savannarum*) have shown lower densities in drought years.

Megan Miller and Claire Varian-Ramos; Colorado State University-Pueblo

Investigating the Role of Wildfire Smoke on Oxidative Status in Different Diet Guilds of Migratory Birds in Southern Colorado

The association between oxidative status and measures of individual fitness such as cell damage, reduced fecundity, and shortened life span make oxidative damage a valuable tool for assessing physiological impacts of wildfire smoke on avian migration. Changes in oxidative status during annual migration are often caused by increases in metabolism and/or exposure to pollutants, such as wildfire smoke. To investigate these impacts, this research is focused on how oxidative status is influenced by wildfire smoke. Air pollution exposure is predicted to increase oxidative damage while suppressing antioxidant response. All data, including blood samples, were collected during migration-banding in the spring and fall of 2024. Blood samples were centrifuged, plasma separated, and frozen within 8 hours of capture. Hydroperoxides (oxidative stress markers) and Total Antioxidant Capacity (TAC; endogenous/exogenous antioxidants) were quantified via d-ROM and TAC assays. A 24-hour air quality station was installed at our field site, and drought index scores from the Environmental Protection Agency were used at a local and national level. If compounding climate change events like wildfire, drought, and unseasonal weather are reducing birds' ability to maintain oxidative status during migration, this could reduce overwintering survival, overall fecundity, and nest success, among other factors. This research will pinpoint species most risk to the detrimental effects of wildfire smoke and allow for more informed conservation actions.

Sara Padula; University of Colorado Boulder

Mapping Memory: How Chickadees Remember Their Caches—And What Their Genes Can Tell Us

Each winter, chickadees do something extraordinary: they hide thousands of food items across their environment and rely on memory alone to find them again. But how do they accomplish such a complex cognitive task—and do different species solve this challenge in the same way?

My research explores the genetic basis of spatial memory in two closely related food-caching songbirds, Mountain Chickadees (*Poecile gambeli*) and Black-capped Chickadees (*Poecile atricapillus*), that co-occur in Colorado's Rocky Mountains. To uncover how these birds evolved such impressive memory skills, I've established two high-elevation field sites equipped with automated RFID-enabled feeder arrays. These arrays allow me to test the memory abilities of wild chickadees by programming each feeder so that each bird only receives food from their assigned feeder. This setup allows me to quantify memory performance in a natural setting. I will then sequence the genome of each individual and use a genome-wide association study (GWAS) to identify genetic variants linked to memory performance. To date, I've captured and banded over 100 chickadees, completed cognitive testing on more than 30 individuals, and begun sequencing their genomes. One of the most exciting early findings is that Black-capped Chickadees—though less common at my sites—have been among the top performers in memory tasks this season. This research brings together field biology and genomics to uncover how cognition evolves in the wild, and sheds light on the genetic underpinnings of one of nature's most fascinating behaviors.

Kurt L. Riggin, Zoe J. Sicat, and Tyler S. Imfeld; Regis University

Ecomorphology and Phylogenetic Signal of Hindlimbs in North American Sparrows and Blackbirds (Passerellidae & Icteridae)

Links between functional morphology and ecological niches are extensively documented in birds, although the majority of this research has been focused on bills and wings. Despite being the direct connection between birds and physical substrates and despite their role in thermoregulation, ecological roles of hindlimb morphology have been relatively overlooked in birds. We explored relationships between hindlimb morphology and ecological behaviors in sparrows (Passerellidae) and blackbirds (Icteridae). We measured 9 traits from the tarsometatarsus, middle toe, and hallux from natural history specimens, and we documented habitat and degree of ground use in the foraging, vocalization, and nesting of these species from the literature. We also quantified phylogenetic signal for these traits, or the degree to which trait variation matches expectations of relatedness between species. We found that hindlimb size and shape had significant relationships to habitat type, foraging, and nesting behaviors in both families. Essentially all hindlimb measurements showed strong, significant phylogenetic signal, such that our original significant relationships disappeared in analyses accounting for phylogenetic relatedness. Altogether, we found that morphological variation in the hindlimbs of these birds appears to track diversification and to possess notable ecological signal. However, the lack of detailed ecological data for most tropical species constrained our ability to explore these relationships at broader taxonomic and geographic scales.

Chuck Hundertmark; Colorado Field Ornithologists

The Evolution of Birding Tools: birdinghotspots.org and eBird Checklist Media

In 2023, Colorado Field Ornithologists (CFO) agreed to migrate its Birding by County data to birdinghotspots.org, a crowd-sourced online bird-finding application. Birding by County had been developed by CFO volunteers to guide birders to the best birding spots in each Colorado county, though it was not tied to eBird hotspots. There are 3,681 eBird hotspots in Colorado and all of them are covered in birdinghotspots.org: much information still needs to be added for many of those hotspots by volunteers. The birdinghotspots.org administrators have been in conversations with eBird staff about the potential for Cornell Laboratory of Ornithology to take over administration of the app. Early this year eBird launched the beta test of a new checklist function called Checklist Media. When launched, Checklist Media will allow birders to add habitat photographs, soundscape recordings, and photos of other animals as well as birds to their checklists. This presentation will provide an update on how these tools will help birders and how birders can support development of the tools.

Thank you to Bird Conservancy of the Rockies for sponsoring the 2025 CFO Science Session and to Colorado Crane Conservation Coalition, Inc for sponsoring the coffee break.

Bird Conservancy of the Rockies

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