

Colorado Chapter of The Wildlife Society
Annual Meeting
Feb 5th-7th, 2019
Hilton Hotel, Fort Collins, Colorado



Wednesday, February 5, 2020 **Workshop: Camera Trapping**

Workshop Organizer: Nate Seward

This workshop will require a fee with meeting registration (workshop limited to 25 people, must preregister). A laptop with Microsoft Access 2007 or newer is required for this workshop.

8:00-10:00 Benefits of camera traps for wildlife monitoring and how to organize and manage photos in CPW's Photo Database
Jake Ivan, Colorado Parks and Wildlife

10:00-10:15 Break – refreshments provided

10:15-12:00 Managing photographs and analyzing camera trap data: Focus on MS Access database
Jake Ivan, Colorado Parks and Wildlife
Eric Odell, Colorado Parks and Wildlife
Eric Newkirk, Colorado Parks and Wildlife

Wednesday, February 5, 2020 **Workshop: Bat Bioacoustics**

Workshop Organizer: Matt Rustand

This workshop is free and open to all.

8:00 am Introduction – *Matt Rustand, CCTWS/Bureau of Land Management*

What is bat acoustic monitoring?

8:10-8:40 Bat Acoustics – What it is and is not – *Dan Neubaum, Colorado Parks and Wildlife*

8:40-9:10 How it works – *Jeremy Siemers, Colorado Natural Heritage Program*

Examples of how acoustic data can be used

9:10-9:25 Colorado National Monument Project – *Dan Neubaum, Colorado Parks and Wildlife*

9:25-9:40 State monitoring program – *Tina Jackson, Colorado Parks and Wildlife*

9:40-10:00 Rocky Mountain National Park Project – *Jeremy Siemers, Colorado Natural Heritage Program*

10:00-10:15 Break – refreshments provided

10:15-10:30 NABat – *Brian Reichert, U.S. Geological Survey*

10:30-11:40 Equipment Demonstrations

Three stations will be available to get hands on experience with a selection of the different set ups available. Presenters will walk through the equipment and discuss pros and cons of each. Groups will rotate every 20 minutes.

- Wildlife Acoustics
- Petterson – *Jeremy Siemers, Colorado Natural Heritage Program*
- Anabat – *Dane Smith, U.S. Geological Survey*

11:40-12:00 Q and A between workshop participants and presenters.

12:00-1:00 Break for lunch (lunch not provided)

Wednesday, February 5, 2020 Workshop: Wildlife Acoustics Equipment and Software

Organizer: Wildlife Acoustics

1:00-5:00 Hands-on training

Please join Wildlife Acoustics for a hands-on training session in bat bioacoustics tools. This is a rare training opportunity for researchers just starting or already involved in using acoustics to monitor bats. During this comprehensive session, Wildlife Acoustics' staff will host a hands-on workshop to teach participants the features and set up of the Song Meter SM4BAT, Song Meter Mini Bat and Echo Meter Touch 2. Participants will also learn how Kaleidoscope Pro can be used to process large and small datasets to produce quantifiable outputs.

Wednesday, February 5, 2020 Symposium: Wildlife Disease

Organizer: John Hughes

- 1:00 Welcome and introductions – *John Hughes, CCTWS*
- 1:10-1:30 One Health and the National Park Service Wildlife Health Branch – An Overview
Dr. Danielle Buttke, National Park Service
- 1:30-1:50 Recent developments in the management of sylvatic plague – *Dan Tripp, Colorado Parks and Wildlife*
- 1:50-2:10 Chronic wasting disease monitoring in Colorado – *Dr. Mike Miller, Colorado Parks and Wildlife*
- 2:10-2:30 Management of white-nose syndrome in bats – *Kim Dickerson, U.S. Fish and Wildlife Service*
- 2:30-3:00 Break – refreshments provided
- 3:00-3:20 Population level effects of chytrid fungus for amphibians in Colorado – *Dr. Timothy Korpita, Colorado State University*
- 3:20-3:40 Status of West Nile Virus in Colorado – *Dr. Nick Komar, Centers for Disease Control*

- 3:40-4:00 New developments in the management of disease in free-ranging bighorn sheep populations in Colorado – *Dr. Karen Fox, Colorado Parks and Wildlife*
- 4:00-4:20 Genome-wide Association Analyses reveal differential response of feral swine to enzootic pathogens - *Dr. Timothy Smyser, USDA APHIS National Wildlife Research Center*
- 4:20-4:50 Roundtable – wildlife diseases dynamics in the face of climate change (all speakers)
- 4:50-5:00 Closing remarks

Wednesday, February 5, 2020 Internal Meetings

- 1:00-5:00 USFWS Colorado Partners for Fish and Wildlife Program meeting
1:00-5:00 US Forest Service Wildlife Biologist meeting

Wednesday, February 5, 2020 Opening Networking reception

Organizers: Nathan Galloway and Andrew Don Carlos
Co-Sponsored by Backcountry Hunters and Anglers

- 6:00-9:00 Location: Fort Collins Hilton, donated beer and cash bar, heavy appetizers



Thursday, February 6, 2020 Student Networking Breakfast

- 7:00-8:00 Invite only, Location & sign up: <https://forms.gle/GVW79Q35MhrZaNb2A>

Students who are interested in attending should contact their local student chapter president.
Professionals: if you are interested in helping with this event or mentoring future wildlife biologists please contact Katie Gray. Contact info can be found on CCTWS website.

Thursday, February 6, 2020 Wildlife Photo Contest

Organizer: Marcella Tarantino

Bring up to three of your best photos to display at the conference. Photos will be judged by popular vote in the following categories: 1. Amphibians, Reptiles, and Fish; 2. Birds; 3. Invertebrates; 4. Mammals; 5. Game Camera; 6. Human Dimensions; 7. Landscapes and Still Life (including flora); and 8. Creative/Comedic. Prizes will be awarded in each category. See CCTWS website for details: <https://wildlife.org/colorado/meetings/annual-meeting/#PHOTO%20CONTEST>

Thursday, February 6, 2020 Plenary Session: Emerging Topics in Wildlife Conservation

Organizers: Marcella Tarantino and Jesse McCarty

- 8:00 am Welcome and introductions – *Jesse McCarty, President CCTWS*
- 8:10-8:50 Overview of emerging wildlife issues in 21st century - *Bill Gains, Conservation Science Institute*
- 8:50-9:10 Climate Change and wildlife – *David Inouye, Rocky Mountain Biological Laboratory*
- 9:10-9:30 Wildfire in the 21st century – *Brian Logan, U.S. Forest Service*

- 9:30-9:50 Avian beetle outbreak impacts – *Quresh Latif, Bird Conservancy of the Rockies*
- 9:50-10:20 Panel Discussion Q&A
- 10:20-10:40 BREAK – refreshments provided
- 10:40-11:00 New Disease Interactions – *Erik Hofmeister, U.S. Geological Survey*
- 11:00-11:20 Invasive Species Impacts (cheatgrass) – *Derek Sebastian, Bayer*
- 11:20-11:40 Impacts of tech on Naturalism – *Karl Malcolm, U.S. Forest Service*
- 11:40-12:00 Panel Discussion Q&A
- 12:00-12:05 President’s closing remarks
- 12:05-1:45 Business meeting and lunch for all members**

Thursday, February 6, 2020 Emerging Wildlife Technologies and Solutions

Organizers: Marcella Tarantino and Jesse McCarty

- 1:45 Welcome and introductions – *Jesse McCarty, President CCTWS*
- 1:50-2:50 *Emerging Challenges in Human/Wildlife Conflict Resolution*
- Moderator – *Chris Parmeter, DWM Colorado Parks and Wildlife*
- Human-Wildlife Conflicts: Nature Disconnect – *Cassidy English, DWM Colorado Parks and Wildlife*
- Human-Wildlife Conflicts: Messaging for the Masses – *Elissa Slezak, DWM, Land Use Specialist Colorado Parks and Wildlife*
- Human-Wildlife Conflicts: Science vs Emotion – *Lucas Martin, DWM Colorado Parks and Wildlife*
- 2:50-3:10 Collar-Based Biologging – *Dr. George Wittemyer, Colorado State University*
- 3:10-3:30 Drones/UAVs used in wildlife conservation – *Dr. David Bird*
- 3:30-3:50 UAV-RT Software development and uses– *Michael Shafer, Northern Arizona University*
- 3:50-4:10 New Telemetry Possibilities – *Michael Crawford, LOTEK*
- 4:10-4:20 Panel Discussion Q&A
- 4:20-4:25 President’s closing remarks

Thursday, February 6, 2020

Contributed Papers Related to the Plenary

Organizers: Aran Johnson and Marcella Tarantino

4:25-4:45 The dissonance between doing science and achieving conservation to protect long distance migration corridors – **Joel Berger** (CSU and Wildlife Conservation Society)
Abstract: We need more than science for conservation to succeed across broad scales. While Brownian Bridge and other models are useful for detecting and predicting suitable areas of animal movement, for the successful conservation of migration as an ecological process the public must be motivated and attendant concerns rendered into policy actions. Indeed, despite burgeoning data sets on ungulate movement and habitat use, there remains only a single federally protected migration route: ‘Path of the Pronghorn’ –70 km long by 2 km wide – in Wyoming (“2008 Corridor Forest Plan Amendment”). However, we now have a new call to address big game migration at the federal level, and S. 1499, Wildlife Corridors Conservation Act (2019 submission to Congress), which follows on the heels of previously unsuccessful models including national trails and historic corridors as policy actions to achieve protective legislation. However, while the statutory scaffolding may hopefully soon exist, conservation needs improved tactics to implement it into action. The confusing array of terms such as corridor, dispersal, connectivity, crossing, and migration lack in clarity and hinder progress. Here, I address some of these concerns by first clarifying and operationalizing the diverse terms associated with landscape level animal movements, identifying important similarities and differences along with examples involving caribou, elk, and pronghorn. I highlight tactics to achieve protection of critical migration routes, some of which have worked, others of which may be dreams, and the merits of top-down and bottom-up approaches when data are available or more limited, and the populace confused.

Thursday, February 6, 2020

IGNITE Session

Organizers: Aran Johnson and Marcella Tarantino

4:45-5:15 Introduction to the IGNITE session
Changes in chronic wasting disease ecology in elk at Rocky Mountain National Park – **Nathan L. Galloway** (National Park Service), Jenny G. Powers (NPS), Ryan J. Monello (NPS), and Margaret A. Wild (Washington State University)
Abstract: We conducted two key studies at Rocky Mountain National Park, Colorado, to investigate the population-level effects of chronic wasting disease (CWD) in elk with historically high densities (up to 110 elk/km² on portions of the winter range). CWD was first detected in this population in 1981 and by the early 2000’s half of the adult elk found dead tested positive for CWD. We estimated disease prevalence of ~13% (8-19%; n=136) in adult females in 2008. Additionally, we estimated that the population growth rate in female elk was flat ($\lambda \sim 1.0$) and that CWD can reduce adult female survival and decrease population growth rate of elk (Monello et al. 2014). In a subsequent study, we investigated disease dynamics in the elk population and monitored changes in disease transmission pressure associated with locally specific reduced elk density and increased elk dispersion. We have a preliminary estimate of prevalence for 2012-2016 of ~8.5% (4.6-13.3%; n=138). Results corroborate that CWD reduces adult female elk survival and this increased mortality decreases the population growth rate. Concurrent with our study, elk are re-distributing to lower elevations outside of the park, where CWD prevalence has always been lower, resulting in much lower densities within the park. The

effects of this on CWD prevalence are unclear; movement may simply spatially dilute disease across the landscape or lower densities may reduce disease transmissio

Examining the impacts of prey availability and snow compaction on Canada Lynx –
Courtney L. King** (Western Colorado University)

Abstract: Crested Butte Mountain Resort has been approved to construct ski trails and other infrastructure in an undeveloped section of the Gunnison National Forest that has previously been identified as potential habitat for Canada lynx. In continuation of a pilot study, I will determine whether this area contains adequate snowshoe hare density to support Canada lynx through conducting fecal pellet-count surveys. I will survey two sites, the ski resort expansion area and another site within the National Forest that is not used for recreational purposes, from July 2020 through the following fall. I will also incorporate a third site currently used for backcountry recreation activities to examine the impacts of winter recreation on prey abundance and snow compaction. Researchers hypothesize that recreational activities such as Nordic skiing, snowshoeing and snowmobiling could allow mesopredators to travel through deep snow on snow compacted surfaces, thereby increasing competition with lynx for snowshoe hare. Understanding these dynamics is complicated, as various forms of recreation and aspects of species' ecology must be considered, and results have differed by study area. Therefore, my study will focus on questions that allow me to form conclusions with implications for a local lynx population. This research will allow me to better understand prey availability within my study areas, make recommendations relevant to the conservation of Canada lynx in western Colorado, and add to the limited research regarding the impacts of winter recreation on lynx and other mesopredators.

Revisiting GPS fix success and habitat selection – **Ryan M. Nielson** (Eagle Environmental, Inc.), David Vales (Muckleshoot Indian Tribe), and Michael Middleton (Muckleshoot Indian Tribe)

Abstract: Why are we still ignoring GPS fix success when modeling habitat use/selection by animals? Do we believe that fix success is only a matter of collar manufacturer, old technology, the number of visible satellites or the fix-rate schedule? Are these issues truly independent of habitat characteristics like canopy cover, terrain ruggedness, or aspect? What if fix success is influenced by animal behavior, which is in turn related to habitat? If we don't recognize these potential issues, we are providing biased estimates of animal-habitat relationships. We can do a better job of recognizing the potential biases in our habitat use models, or even use a modeling approach that is designed to account for habitat-related fix success. We will provide an example, along with a solution.

Questions for Ignite Presenters

Thursday, February 6, 2020 **Poster Session, Reception, Banquet, Auction, Awards**

Organizers: Aran Johnson and Marcella Tarantino

5:30-6:30 Reception and Poster Session

Marking duration of Rhodamine B from opportunistic sampling of raccoon whiskers –
Alison P. Barbee (APHIS – Wildlife Services – National Wildlife Research Center), Shylo R. Johnson (APHIS), Molly Selleck (APHIS), Chad Wickham (APHIS), Amy T. Gilbert (APHIS)

Abstract: Rhodamine B (RB) has been used as a systemic and physical biomarker to quantify bait-uptake by wildlife. Understanding the duration of biomarker detection is important for planning sample collection and multiple applications of biomarkers. We collected whiskers from captive raccoons as part of an initial study to test the marking and consumption of a bait formulation containing RB, then opportunistically to evaluate marking duration. Seventeen raccoons were offered a fishmeal polymer bait with a gummy insert containing 150 mg of RB. We sampled 12 to 15 raccoons that consumed RB baits at 3, 19, 34, 40, 44, and 106 weeks post-consumption. At each time point, we collected an average of 8 whiskers to detect RB bands using a fluorescent microscope with TRITC filter. We found 100% (15/15) of raccoons presented with fluorescent bands at weeks 3 and 19, and then 33% (4/12), 27% (4/15), and 21% (3/14) were marked during weeks 34, 40, and 44, respectively. However, to standardize collection methods and data analysis we combined the data from weeks 34 to 44 to report overall marking of 47% (7/15). Results from week 106 are pending. Our results indicate that in an application using RB multiple times, an exposure at a subsequent offering may be indistinguishable from an exposure at an initial offering for up to 44 weeks and perhaps longer. As this was an opportunistic study of RB marking longevity, our recommendation is to replicate this study in a controlled fashion.

Ecology of the Great Blue Heron (*Ardea Herodias*) rookery on the Slate River, Crested Butte, Colorado and impacts of human recreation – **Jake Bartholomew*** (Western Colorado University), **Ellie Orr*** (Western Colorado University), and **Patrick Magee** (Western Colorado University)

*Abstract: We studied the breeding phenology, population demography, and effects of human recreation on Great Blue Herons (*Ardea herodias*) in the Slate River wetlands near Crested Butte, Colorado. This montane river valley has attracted stand-up paddle boards and other river craft in recent years that float directly under the heron colony. Many previous studies have documented the sensitivity of nesting populations of Great Blue Herons in the presence of human disturbances, especially if disturbances coincide with vulnerable stages in their life cycle. As a result, the local community formed a working group and developed a management plan to respond to potential impacts on the heronry. We documented breeding season phenology and nesting demography from heron arrival on 17 March to the final fledging event on 2 September 2019. Of the 20 occupied nests and 47 chicks hatched this season, 41 chicks fledged, yielding 87.2% fledgling success. We also quantified human activity in the vicinity of the heronry and documented heron responses. Of the 8,430 human activities recorded in the area, 1% were river recreation events. This small fraction of disturbance accounted for 71% of adult herons alert, 68% of chick herons alert, and 100% of chick hunkering and adult flushing. Our research contributes to a community-based, science-driven management approach to conserve Great Blue Herons in the Slate River ecosystem. It quantifies the impact of recreation on sensitive colonial-nesting waterbirds and tests the effectiveness of innovative management actions, including a voluntary no-float period, to safeguard the heronry during the main nesting season.*

Differences in migratory timing between neotropical migrant populations – **Taylor Bobowski**** (Colorado State University), **Kristen Ruegg** (CSU), **Christen Bossu** (CSU)

Abstract: Migration, the seasonal movement of animals, allows organisms to take advantage of seasonally favorable conditions across a large geographic range. Despite

*having this common purpose, similar species and populations of the same species can exhibit dramatically different patterns of movement. Ruegg et al 2014 showed that in Wilson's Warblers, distinct populations of warblers differed significantly in timing of migration, but the mechanisms driving this pattern of migration are still unknown. Modern genomic methods are allowing for the identification of specific genes underlying migration as well as how they may be influenced by environmental selection. Furthermore, modern genetic methods can be used to identify migrant populations at finer spatial scales and assess the potential for population specific migration timing across species. The goal of this study is to determine the potential drivers of differences in migratory timing between populations. Our hypothesis is that populations migrate at different times due to selection on genes relating to migratory timing, which is different between distinct breeding populations. Common yellowthroats (*Geothlypis trichas*) was chosen as a study species due to its extensive breeding range and large collection of samples. Key sites along the migratory corridor were assessed for the potential for population specific migratory timing. A survey of genetic variation in genes linked the circadian clock in other species was taken in order to assess the potential that population specific variation in migratory timing in Common Yellowthroats is a result of selection on migration timing.*

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

The effects of territory size and territory quality on mating and nesting success of male Cassin's Sparrow (*Peucaea cassinii*) in Southern Colorado – **Augustus W. Forrest**** (Colorado State University – Pueblo), Claire Ramos (CSU – Pueblo), Garrett Visser (CSU – Pueblo)

Abstract: In recent years, many grassland bird species in North American have been in steep decline. The majority of these grassland species are grossly understudied. For example, Cassin's sparrows have declined by 3.2 percent per year over the past ten years in Colorado. Very little is known about this species and its behaviors. Cassin's sparrows exhibit a territorial behavior in which the male bird establishes a territory and then displays within the territory. It is not clear how these territories and their characteristics effect mate choice and nesting or fledgling success. Here we investigated how the size and the vegetation characteristics of the male's territory effects his nesting and fledgling success. Male Cassin's sparrows were caught, and color banded on their specific territories. These males were then re-sighted and their territories were mapped. Nests

were found and monitored to determine nesting and fledging success. The anticipated results are that the Cassin's sparrow male's territory size and characteristics will have an effect on whether or not the nest was successful. This knowledge of how the Cassin's sparrows use these territories could provide is understanding which characteristics of the landscape are needed to assist the conservation and persistence of this species and could assist in the efforts of understanding similar grassland species.

Spatiotemporal dynamics of human-black bear conflict – **Samuel Hudgens**** (CSU), Shelley L. Spear (CSU), Patrick C. Carr (New Jersey Division of Fish and Wildlife), Tony McBride (NJ DFW), and Lise M. Aubry (CSU)

Abstract: As human populations expand, human-wildlife conflict (HWC) has become more prevalent worldwide. In New Jersey, the most densely populated state in the US, human black-bear conflicts may shed light on the future of HWC management. We examined how spatial (e.g., landcover type) and temporal (e.g., bear biological season) factors impact the frequency and intensity of human-black bear conflict using data from 2001 to 2017 (n = 38,881) provided by the New Jersey Division of Fish and Wildlife. We identify each conflict event as: Category I, the most severe conflict where the bear involved was euthanized; Category II, a conflict that results in property damage; or Category III, which includes bears sighted exhibiting normal behavior. Spatially, we found that anthropogenic landcovers experienced the highest frequency of conflict and the most severe conflict (Category I) occurred more than expected in agricultural areas. Temporally, we found that the highest frequency of conflict occurred during the breeding season (June 1–August 31) and the most severe conflict was most likely to take place during hyperphagia (September 1–November 30). Our results also indicate the introduction of an established hunting season coupled with educational campaigns may be effective at reducing human-bear conflict. Overall, patterns demonstrated in our study show that additional management strategies may be the most beneficial when targeted at areas with agricultural landcover and during the period of hyperphagia, particularly when natural forage is limited.

The Status of North American Bat Monitoring (NABat) Program – **Lee O'Brien** (USFWS)
Abstract: An update of the current status in implementing the North American Bat Monitoring Program (NABat).

Evaluating the effects of climate change on Yellow Warblers using telomeres as a biomarker of fitness – **Marina D. Rodriguez**** (CSU), and Kristen Ruegg (CSU)
Abstract: The ability of populations to persist when faced with rapidly changing global conditions depends on their capacity to adapt. The genomic vulnerability metric tells us how much allele frequencies across a species' range need to change in order to keep pace with predicted changes in climate by 2050. In Yellow Warblers, genomic vulnerability measures show that the most vulnerable populations largely reside along the Rocky Mountains. These vulnerable populations are also those undergoing recent population declines, suggesting that these populations may already be experiencing negative impacts of climate change. Though the relationship between genomic vulnerability and population trends is suggestive, it is not conclusive, and a direct link between genomic vulnerability and fitness is required to confirm that vulnerable populations are currently undergoing declines due to climate change. A biomarker that captures fitness and long-term stress of an individual is telomere shortening. Telomeres

protect chromosomes from degradation and shorten with age and stress. The correlation between telomere loss and survival in numerous species has led to rate of telomere shortening being used as a fitness proxy in many studies. My proposed work will use telomere shortening as an indication of fitness loss resulting from climate and other potential stressors across the range of the Yellow Warbler. The overarching goal of my proposed work will be to develop independent biomarkers that can be used to test the hypothesis that high genomic vulnerability is correlated with current fitness costs.

What attracts sagebrush obligate birds to breeding sites in a sea of sage? – **Kristin Ross**** (Western Colorado University), **Patrick Magee** (Western Colorado University), and **Kathy Brodhead** (BLM)

*Abstract: The focus of our study is on sagebrush obligate and near obligate avian species including the Brewer's Sparrow (*Spizella breweri*), Sage Thrasher (*Oreoscoptes montanus*), Sagebrush Sparrow (*Artemisiopiza nevadensis*), Green-tailed Towhee (*Pipilo chlorurus*) and Vesper Sparrow (*Pooecetes gramineus*). Several of these species, especially the most abundant sagebrush obligate, the Brewer's Sparrow, have experienced long-term population declines. Habitat loss, fragmentation and degradation have contributed to population declines, but the specific dynamics of these declines is not well understood. Further, land uses including the location and use of roads may impact bird abundance and distribution. Beginning in 2018, using the Integrated Monitoring of Bird Conservation Regions (IMBCR) approach, we sampled 20 plots within the sagebrush ecosystem of the Gunnison Basin. IMBCR includes a distance sampling approach to estimate bird species density. We plan to compare bird species densities obtained from field data collected from 2018-2020 of the five obligate and near-obligate sagebrush songbirds in relation to vegetation cover and physical attributes such as slope, aspect and elevation at the point, plot, and landscape scales. Vegetation monitoring will be done using the line intercept method. We will also determine the effect of invasive species, particularly cheatgrass (*Bromus tectorum*) and road density and proximity to point and plots on presence and abundance of sagebrush birds. The results of our study will inform land managers regarding the habitat use of sensitive management species and the impacts of two major threats, invasive cheatgrass and road fragmentation. We present preliminary bird data from two field seasons.*

The effects of drought on sex biasing in Cassin's Sparrows (*Peucaea cassinii*) – **Alexandria Sinker*** (CSU Pueblo), **Clark B. Jones** (U.S. Fish and Wildlife Service), and **Claire Ramos** (CSU – Pueblo)

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

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

Potential interspecific transmission of *Protostrongylus* species between mountain goats and bighorn sheep in Colorado – **Rocky L. Spencer II**** (CSU – Pueblo), Claire Ramos (CSU – Pueblo), Nate Bickford (CSU – Pueblo), and Brian Vanden Heuvel (CSU – Pueblo)
Abstract: Rocky Mountain goats (*Oreamnos americanus*) are one of the most understudied mammals in North America. Mountain goats became locally extinct and then reintroduced to Colorado. Once restored, the mountain goats expanded into the same habitat as the bighorn sheep (*Ovis canadensis*) causing competition. Bighorn sheep are affected by *Protostrongylus* species, a genus of nematode that causes high mortality in lambs. When multiple potential hosts live in close proximity, the chance of transfer of *Protostrongylus* species between species through the feces is high. The purpose of this project was to determine if mountain goats also contract the *Protostrongylus* species parasite and if proximity to bighorn sheep influences infection rates. Feces of the mountain goats and bighorn sheep were collected from locations in Colorado where they coexist and in locations where species are isolated. *Protostrongylus* species will be extracted from the feces and identified using PCR amplification of parasite DNA to determine if *Protostrongylus stili*, or *P. rushi* the primary parasites affecting bighorn sheep, exists in the mountain goats and if presence of the parasite is influenced by contact with bighorn sheep. Understanding the distribution and interspecific transmission of *Protostrongylus* species could be critical for conservation efforts of both mountain goats and bighorn sheep.

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

*Denotes student presenter (single asterisk = undergraduate student, double asterisk = graduate student)

6:30-10:00 2020 CCTWS Annual Banquet, awards, and auction

Friday, February 7, 2020 **Contributed Papers Session**

Organizers: Marcella Tarantino and Aran Johnson

8:00-8:10 Contributed papers, welcome and introduction

8:10-8:30 Wildlife use of abandoned mines – **Tim Armstrong** (Adams State University), Tyler Cerny (ASU), Brett Fuller (ASU), Jose Mix (ASU), and Wyatt Moran (ASU)

Abstract: Colorado's mining history left a legacy of riches and environmental concerns. Colorado has an estimated 23,000 abandoned mines, only 6000 of which have been remediated. Recent events including the Gold King mine blowout in 2015, the westward spread of white nosed syndrome, and ongoing concerns about human safety have prompted many to propose sealing or gating abandoned mines to prevent drainage and human entry. We know abandoned mines provide important habitat for bats, but we do not know if these mines provide habitat for other wildlife. We have monitored abandoned mines in the Sangre de Cristo mountains in south central Colorado since 2017 using camera traps to determine if 1) wildlife other than bats are visiting mines. Additional research questions include 2) does visitation vary seasonally, 3) are wildlife entering mines, 4) are some mines visited more than others, and 5) are some species visiting mines more frequently? We have observed a variety of wildlife visiting and entering mines, but we focused on carnivores. Carnivores are visiting mines consistently, but at low levels, throughout the year. Visitation varied seasonally, by species, and by mine. After two years of monitoring, we have observed the majority of carnivore species expected to inhabit the Sangre de Cristo mountains at mines, including two species that had not been documented recently. We have also observed some unexpected use by ungulates and carnivores.

8:30-8:50 Developing a behavioral profile for urban coyotes: do coyotes ignore people? – **Emily Beam**** (University of Colorado – Boulder), Stewart Breck (CSU and USDA National Wildlife Research Center), and Joanna E. Lambert (CU – Boulder)

*Abstract: The behavioral mechanisms by which urban exploiters cope with human-dominated landscapes are poorly understood. Such understanding can be important for resource managers, especially if the species is of management concern, such as most carnivorans. For example, overly bold or aggressive urban coyotes (*Canis latrans*) can become problems for people and their pets, but how and where these behaviors develop remains unclear. Here, we evaluate how coyotes modify their behavior in the presence of humans to better understand the mechanisms by which they cope in urbanized landscapes. We test the hypothesis that in urban open spaces with higher levels of human recreational activity, coyotes are more habituated and thus more readily observed. Using 80x scopes and 10x binoculars, we observed coyotes across six sites of varying human activity in Broomfield, Colorado (April–September 2019). Using continuous focal follow and instantaneous scan sampling rules, we collected data on human density per behavioral bout, distance to observer, speed/direction of flight, and flight destination. Preliminary analyses show that behavior varies by site (Kruskal Wallis $\chi^2 = 25.693$; $P = 0.0001$), though negative binomial models indicate that that these*

differences are not due to human activity ($\beta = 7.306e-01$ [9] $5.733e-01$; $P = 0.2025$), suggesting that human presence is not as robust a predictor of coyote behavior as are site differences (e.g., vegetation, proximity of open space). These data provide a baseline understanding of non-problematic coyote behavior in the presence of humans, which may prove useful to managers when attempting to profile problematic individual animals.

8:50-9:10

Spatiotemporal shifts in use of wildlife corridors as a response to traffic noise and light – **Amy C. Collins**** (University of California – Davis), Travis Longcore (University of Southern California), Winston Vickers (UC – Davis), and Fraser Shilling (UC – Davis)
Abstract: Wildlife corridors in the form of underpasses can reduce the risk of wildlife-vehicle collisions and reconnect fragmented habitat by facilitating safe wildlife passage. However, we understand little about the degree to which traffic-related light and noise disturbance may impact underpass use and in turn, the mitigation value of the underpass. We evaluated the impact of traffic noise and light at WCS on i) species presence-absence, ii) frequency of detection and iii) nocturnality. Four camera traps recorded medium and large-bodied mammals at 26 underpasses located across highways within California for a period of ~one month between 2017-2019. Noise levels (dBA and dBC) were recorded for one week, and light intensity (scalar illuminance) was documented for one night at each underpass. To capture a baseline for noise levels and mammal presence within the surrounding area, we placed two sound meters and eight camera traps ~1km from the underpass, resulting in 9,360 trap nights total. We used a combination of logistic regression, GLM models and overlap analysis to examine the influence of traffic noise, traffic light, as well as traffic volume, human presence, surrounding vegetation, elevation and underpass characteristics. We found that species presence is significantly lower at underpasses than in the surrounding habitat, and certain species (e.g. deer) tolerate a higher threshold of noise at underpasses than others. Preliminary results suggest that wildlife frequent louder underpasses less often, owing to the barrier effect from vehicular noise. Adequate screening of nearby habitat from traffic noise and light could increase underpass use.

9:10-9:30

The American Redstart genoscape – **Matt DeSaix**** (CSU), Christen Bossu (CSU), H. Lisle Gibbs (Ohio State University), Peter Marra (Georgetown University), Thomas Sherry (Tulane University), Thomas Smith (University of California – Los Angeles), Michael Webster (Cornell University), and Kristen Ruegg (CSU)
Abstract: In the past several decades, North American breeding avifauna have declined by approximately 3 billion individuals. In order for these declining species to persist under ongoing environmental change, they must be able to shift their distribution and/or adapt to changing selection pressures. Long-distance migrants in particular are exposed to a wide range of selection pressures throughout their annual cycle. Using genomic tools, the Bird Genoscape Project (BGP) currently focuses on mapping population-specific migratory flyways and climate adaptation in avian species. The objective of the BGP is to map 100 migratory bird species by 2025. Here, we describe a conservation genomics study of the American Redstart (*Setophaga ruticilla*): a recent addition to the species studied by BGP, but a long-time model species for full annual cycle research of migratory songbirds. Our results reveal finer-resolution geographic genetic clustering than previously reported for American Redstarts. We also detail geographic and environmental variables shaping genetic variation on the breeding ground. We highlight

the importance of building on these results and incorporating genomic data into a full annual cycle framework. Specifically, integrating research of migratory connectivity and local adaptation will allow us to tease apart the influence of spatio-temporally variable selection pressures on different avian populations. Ultimately, these conservation genomic models will help us predict how migratory species will respond to climate change and provide an understanding of underlying evolutionary processes.

9:30-9:50

Carnivores that colonize urban habitat – are behavioral changes a cause, consequence, or neither? – **Joanna E. Lambert** (CU – Boulder) and Stewart Breck (CSU and USDA National Wildlife Research Center)

Abstract: Boldness and aggression in animals are two distinct though not always mutually exclusive behavioral states of concern to wildlife managers because animals involved in conflict often display extreme forms of these behaviors, particularly in urban environments. Central to this discussion is whether more bold (and sometimes more aggressive) individual animals are differentially colonizing urban habitat or whether urbanization is resulting in behavioral differences via habituation (diminution of response to repeated exposure to stimulus), active learning (mother-infant), physiological shifts due to xenobiotics (e.g., rodenticide altering neurochemistry), or natural selection resulting in different behavioral profiles at the population level (urban behavioral syndrome). This is more than just an academic question as some of the mechanisms altering behavior result primarily in development of problem individuals, while others can result in adaptive change in entire populations. That colonizing species such as coyotes are also rapid learners, behaviorally plastic, and sometimes genetically introgressed (e.g., coyote x dog), adds to the challenge of identifying how urban behavioral profiles are emerging. Here, we propose a heuristic model by which to explicitly test how learned behavior and individual physiology related to diet assimilates at the population level, resulting in genetic sub-structuring of species into anthropogenic forms (“urban coyotes”) with distinct behavioral syndromes relative to non-anthropogenic populations. Our goal is to demonstrate how behavioral plasticity (regardless of whether it has a genetic basis) can have evolutionary consequences of relevance to wildlife managers who are confronting rapidly colonizing species and must make decisions about whether to target individuals or populations.

9:50-10:10

Determining bat occupancy, colonization, and extirpation probabilities using acoustic point surveys on public land: a two-year study at the Royal Gorge Field Office – **Jordan McMahon** (Bureau of Land Management, Conservation Legacy, and Southwest Conservation Corps)

Abstract: Developing repeatable and defensible acoustic monitoring protocols and analyses for bat species on our public lands is crucial in the face of White Nose Syndrome (WNS). Conservationists know that the lack of baseline or "pre- impact" data may be the biggest shortfall for drawing meaningful conclusions about changes in wildlife populations, as most data are collected after species become negatively impacted by extrinsic factors such as WNS. Our study seeks to combat this issue by generating spatially explicit distribution models for 13 bat species found across southern Colorado. We accomplished this goal by designing an acoustic sampling protocol on public lands in conjunction with the USGS NABat program. Using an acoustic point sampling survey design, we collected bat echolocation calls over a two year period. Once collected, calls were identified to species, and covariate models were fitted to generate detection, occupancy, colonization, and extirpation probabilities for each species. These probability values were converted to spatial distribution maps for use with GIS analysis techniques,

creating a tool meant to aid resource managers when making land use decisions. The quantification of baseline bat populations is imperative for identifying and addressing changes to these populations in the future. Mitigating threats to bats such as wind energy development, mine closures, climate change, and perhaps most importantly WNS will require cooperation between government land managers, academics, decision makers, and the public. We hope our study may be used as a prototype for implementing acoustic monitoring programs across the state.

10:10-10:30 BREAK – refreshments provided

10:30-10:50 Less but better: interaction between habitat amount and quality drives mammalian habitat occupancy in the Pantanal Wetland – **André Luis Regolin**** (CSU and Universidade Estadual Paulista Júlio de Mesquita Filho (UNESP)), Luiz Gustavo Oliveira-Santo (Universidade Federal do Mato Grosso do Sul), Milton Cezar Ribeiro (UNESP), and Larissa Lynn Bailey (CSU)
Abstract: An understanding of species-habitat relationships is required to assess the impacts of habitat fragmentation and degradation. We evaluated how habitat occupancy by frugivorous mammals is shaped by an interaction of habitat amount and quality in the Brazilian Pantanal wetland. We predict that when the amount of habitat is limited an increase in habitat quality will improve frugivore occurrence. We also expect that the habitat quality contribution to species habitat occupancy will vary among species according to species sensibility to habitat loss. We combined mammal detection data obtained from camera traps with land use and land cover maps to estimate the amount of habitat and measured habitat quality using local environment variables and distance to waterbodies (freshwater and saline). We fit univariate, additive, and interactive occupancy models to evaluate the relative support of each model and estimate species-specific occupancy and detection probabilities associated with various habitat features. As expected, our results indicate that high quality habitats can improve occupancy in landscapes with low habitat cover. Our results also demonstrate that habitat quality matters even in landscapes with high habitat cover, i.e., occupancy probability is extremely low in high habitat cover landscapes if the habitat quality is poor. Additionally, our findings suggest species sensitivity to habitat amount can determine the importance of habitat quality on occupancy. Surprisingly, the response of species to habitat quality was divergent across the gradient of habitat cover. Although conservation policies tend to focus mainly on habitat amount, landscape management must include strategies to preserve and improve habitat quality.

10:50-11:10 Snow information for wildlife research and management applications – **Adele K. Reinking** (CSU), Glen E. Liston (CSU), Kelly Elder (U.S. Forest Service Rocky Mountain Research Center), Stine Højlund-Pedersen (CSU and University of Alaska – Anchorage)
Abstract: The ability of wildlife researchers to effectively evaluate the relationship between animals and the snowy landscapes they experience is dependent upon high quality snow information. Unfortunately, most publicly available snow datasets are inadequate in their spatial and temporal resolution and extent, and often consist of variables that are not relevant for wildlife applications. These deficiencies necessitate snow information that is more appropriate for and tailored to wildlife research, and argue for placing a greater emphasis on incorporating snow measurements in wildlife-focused field campaigns. However, without prior background knowledge in snow

science, many biologists are uncertain of which snow variables to measure and the protocols for doing so in a scientifically and statistically robust manner. Additionally, given limited field time, funding, and personnel, adding additional components to winter field campaigns can be daunting. Here we provide guidance on simple, affordable field measurements that wildlife researchers can incorporate into existing field campaigns to greatly improve snow information with minimal time and financial investment. Additionally, we describe the process of and advocate for coupling such field data with sophisticated modeling tools (SnowModel) that realistically distribute climate and snow variables across space and time to increase the utility of field measurements and expand snow data coverage. We will describe the SnowModel suite of modeling tools, showcase how they can be used to advance the study of snow-wildlife interactions, and introduce new, wildlife-relevant snow variables currently under development.

- 11:10-11:30 Completing the monitoring cycle by using data to improve survey design and participation: an example using Integrated Waterbird Management and Monitoring – **Mindy B. Rice** (U.S. Fish and Wildlife Service), Alexander Kumar (University of Montana), and Heath Hagy (USFWS)
- Abstract: The Integrated Waterbird Management and Monitoring (IWMM) program is a protocol established in 2008 to tie bird abundance to ground unit conditions and management actions. About 35 refuges currently collect IWMM data, but many more refuges created specifically for waterbirds could benefit by adopting it. However, numerous impediments including a lack of resources (staff and money), a lack of training, or prioritizing other surveys can all limit participation in IWMM. We have begun to analyze IWMM data to look at how the data can be incorporated into refuge management. We first used 3 pilot refuges to examine how habitat covariates collected as part of IWMM protocols influence waterbird abundance. Second, we investigated whether we could minimize effort in the field by sub-sampling the wetlands for which IWMM is collected. Overall, we found that most participants were not collecting the data according to the protocol guidelines making analysis especially difficult. We also found that the only waterbird group that had enough data to analyze was waterfowl. Further, our analyses show that the majority of variables collected under IWMM have little to no predictive value for waterfowl abundance. In addition, we found that sampling of wetlands can be reduced substantially while maintaining accurate waterbird counts across the refuge. We recommend surveying at least 2/3 of all the units or 3/4 of the total survey area, leaving the units with the lowest total abundances unsurveyed. We hope that using these analyses to adapt and revise the protocol may increase both participation and adherence to protocols by refuges using IWMM.*
- 11:30-11:50 Effects of source population and release strategy on translocated scaled quail reproduction – **Rebekah E. Ruzicka**** (CSU and Rolling Plains Quail Research Foundation), Paul F. Doherty, Jr. (CSU), and Dale Rollins (Rolling Plains Quail Research Foundation)
- Abstract: Recent research has focused on translocation as a means to reestablish populations of scaled quail (Callipepla squamata). Initial reproductive success post-translocation is critical for establishment in short-lived species such as quail, but factors influencing reproductive success are poorly understood. We evaluated the effect of source population and variation in delayed release strategy (1-9 weeks) on nest initiation and nest survival of wild-caught, translocated quail. We trapped and translocated quail*

over two years (2016-2017) from source populations in the Edwards Plateau and Rolling Plains ecoregions to a large contiguous (>40,000 HA) release site in Knox County, Texas. We used a multi-state mark-recapture model with state uncertainty to test for effects of release treatment, source population, age, release location, and year on nest initiation and survival. We found no effect of release strategy or source population on nest initiation or survival. Juveniles were more likely than adults to initiate nests and the probability of re-nesting was lower during the year with drought conditions. Future scaled quail reintroduction efforts may benefit from prioritizing translocation of juveniles and conducting translocations when drought conditions are not forecasted.

- 11:50-12:10 Ecological drivers of black bear fecundity in an anthropogenic landscape – **Shelley L. Nelson**** (CSU), and Lise M. Aubry (CSU)
Abstract: As the impact of anthropogenic activities intensifies and human populations overlap more extensively with large carnivores, the need to evaluate the consequences of anthropogenic pressure on large carnivore fitness has never been greater. In the northeastern U.S., black bear (Ursus americanus) populations have increased rapidly, more than other populations in the nation, and human-black bear conflicts have steadily been on the rise since the middle of the century. Our goal was to identify whether female fecundity had improved over time from the use of human-modified environments (e.g., increased use of garbage). We used 34 years of black bear den surveys (1984-2017) from 414 females in the northwest region of New Jersey to quantify fecundity and examine the relative effects of anthropogenic change (e.g., annual human population, garbage produced, development), bear characteristics (e.g., age, body condition, behavior), climate shifts (e.g., drought frequency), landscape features, and natural resource availability on fecundity (i.e., number of cubs produced). We found black bear fecundity to be best explained by bear characteristics (e.g., sow age and weight), landscape features (e.g., land use, land cover), and variability in natural resources (e.g., hard and soft mast). Our results help elucidate the ecological factors driving black bear reproductive dynamics in a region that encompasses both anthropogenic cover and high-quality bear habitat. We also demonstrate how black bear reproductive dynamics may further explain the likelihood of human-black bear conflicts in the mosaic of New Jersey landscapes, which sustains the highest coupled densities of humans and black bears in the country.

- 12:10-12:20 Student poster and paper awards, photo contest awards
- 12:20 Conference concludes
- 12:30 CCTWS Board Meeting

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