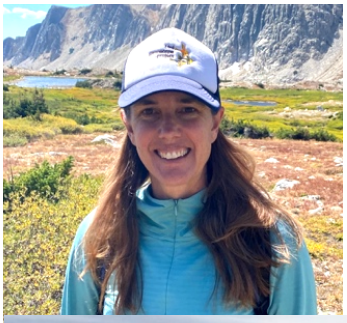
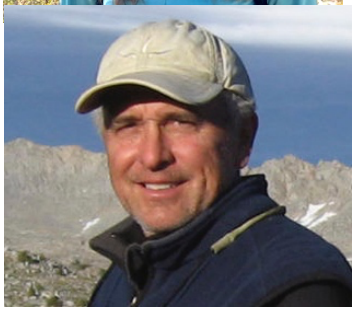
Bird Genoscape Project's Annual Newsletter

Issue 3, Fall 2023

Message from the Directors

Welcome to the Bird Genoscape Project's 2023 newsletter!





2023 has been a very busy year for the Bird Genoscape Project and we're excited to share that news with you! Our team members continue to work hard with our collaborators across the Western Hemisphere. This work resulted in the completion of genoscapes for Painted Bunting, Canada Warbler, and American Redstart, and we are nearing the completion of many others, including Loggerhead Shrike, Grasshopper Sparrow, and Swainson's Thrush.

2023 also saw members of our flock migrate on after successfully completing their degrees and moving on in their careers. We also gained a member as Amanda Carpenter migrated in as our new Lab Manager to help keep us moving forward in our mission to create genoscapes for migratory birds across the hemisphere. Read on to dive into the feathery details of all of this and more from our very productive year!

What is inside this issue?

Happy reading!

Sincerely,

Kristen & Tom

Kristen Ruegg Thomas B Smith

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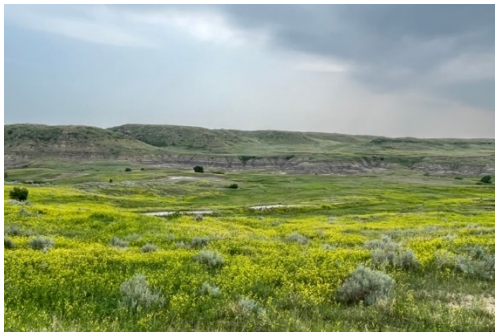
Collaborator Highlights

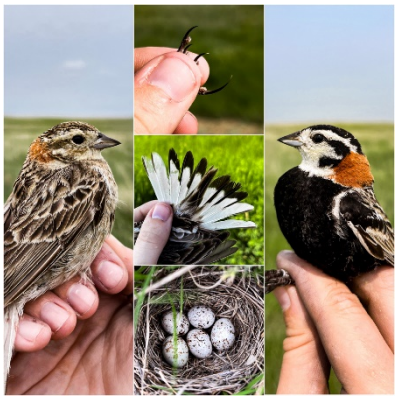
From the breeding grounds….

Newly appointed BGP Lab and Collections Manager Amanda Carpenter and Ruegg Lab Postdoctoral Researcher Dr. Sheela Turbek traversed the Great Plains this summer, sampling grassland obligate breeding bird species for a new project in partnership with the Bird Conservancy of the Rockies. New to the team, Amanda brings a wealth of population genetics experience from her time at the University of Lethbridge where she examined range-wide population genetic structure of the Warbling Vireo (*Vireo gilvus*) complex. Together, Sheela and Amanda worked to help us better understand population trajectories of several grassland bird species.



Prairie scene outside Lemmon, South Dakota.

Grassland birds are one of the fastest declining groups in North America. In the face of climate change, some grassland birds are especially vulnerable. For this project, the four species of interest were Grasshopper Sparrow (*Ammodramus savannarum*; GRSP), Baird's Sparrow (*Centronyx bairdii*; BAIS), Chestnut-collared Longspur (*Calcarius ornatus*; CCLO), and Western Meadowlark (*Sturnella neglecta*; WEME). Two of these species, BAIS and CCLO, are considered Tipping Point Species by the Road to Recovery program, meaning they need immediate scientific action to help study and slow population declines.



Female Chestnut-collared Longspur (left), male Chestnut-collared Longspur (right), their hallux (top middle), spread tail (middle middle), and nest (bottom middle).

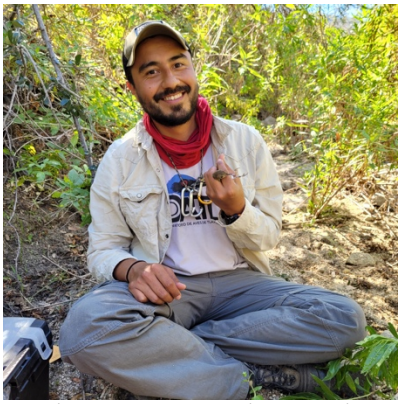
Amanda and Sheela focused their sampling efforts on populations across the Dakotas, while collaborators collected samples in other Great Plains states where each focal species breeds. Banding success varied by species. GRSPs were abundant and easy to catch, CCLOs were plentiful but somewhat difficult to catch, WEMEs were even more difficult to catch despite their conspicuous nature, and although BAISs are cryptic, singing males ended up being easy to catch with the use of playbacks. Other notable avian species caught and/or observed included Bobolink (*Dolichonyx oryzivorus*), Upland Sandpiper (*Bartramia longicauda*), Sprague's Pipit (*Anthus spragueii*), Clay-colored Sparrow (Spizella pallida), and Marbled Godwit (*Limosa fedoa*). In general, the team sampled five to ten individuals from each of the four focal species.

With feather samples in hand, the next step is to determine whether any of these species have genetically distinct breeding populations that might be facing steeper declines than others. For example, do CCLO populations in South Dakota differ from Saskatchewan populations? Using genomics, we'll also investigate other measures of population genetic health (e.g., inbreeding) and overall genetic diversity. Finally, a bigger picture goal is to connect breeding and wintering populations across the full annual cycle, which can then help to develop decision support tools that prioritize conservation efforts for these four species where they are most needed. Stay tuned for updates as this crucial project continues to move forward!

Collaborator Highlights

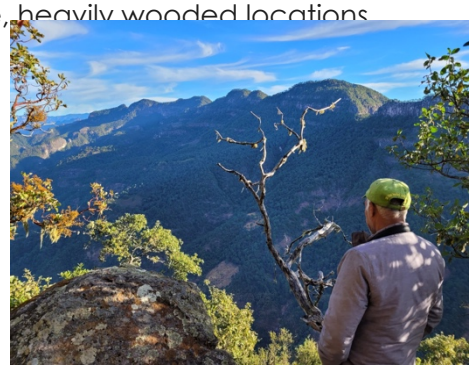
....to the wintering grounds

Down on the wintering grounds, Sergio Gómez Villaverde led a small team of field biologists to locate wintering Hermit Thrushes in Mexico. The team captured, banded, and collected feathers and blood samples from Hermit Thrushes in the states of Baja California Sur and Sinaloa. This work complements our Hermit Thrush genoscape by identifying where birds from each breeding population overwinter in parts of Mexico.



Sergio bands a Hermit Thrush in Baja California Sur.

Sergio, a biologist from Oaxaca and who runs the bird conservation non-profit 'Chicatana', assisted us with similar work in 2021. Back then, he helped identify which breeding populations individual Wilson's and Yellow Warblers wintering in Baja California Sur and Sinaloa came from. You can view those maps here. This year, Sergio and his team returned to some of the same locations they visited in 2021. They began work in Baja California Sur. Here he teamed up with Dr. Daniel Galindo, a research scientist from Universidad Autónoma de Baja California. Sergio used Daniel's extensive knowledge of the area and network of local bird watchers to identify spots where Hermit Thrushes had been recently sighted. It turns out Hermit Thrushes overwinter here in somewhat unexpected habitats. Twenty Hermit Thrushes were caught near a populated area in the foothills of the Sierra de la Laguna. This was surprising since Hermit Thrushes usually prefer more remote, heavily wooded locations.



Don Santos overlooks the Chara Pinta Reserve.

From Baja California Sur, Sergio travelled to Sinaloa to a place called El Palmito. El Palmito is home to the Chara Pinta Reserve, a famous birdwatching destination. Sergio teamed up with Don Santos, a traditional farmer and legendary local bird guide. Don Santos and his family live near the reserve, and have guided countless birdwatchers in hopes of seeing specialty birds, notably Tufted Jays (*Cyanocorax dickey*). Sergio spent the week following Don Santos to locations where he knew Hermit Thrushes lived. Days began at 5AM with a fresh cup of coffee and conchas at Don Santos' home before they travelled to known Hermit Thrush locations. At midday, they would return home for a lunch of machaca quesadillas made with fresh tortillas from corn grown on the property. After an extended rest eating and watching Mexican soap operas with Don Santos' eight grandkids, the two would return to the field until 6PM before calling it a day. Together they captured and gathered samples from 19 Hermit Thrushes.

In total, 39 wintering Hermit Thrushes were captured across two states in Mexico. Those samples have made their way to our lab at Colorado State University, where we are hard at work assigning them to their respective breeding populations across the U.S. and Canada. Together with numerous other Hermit Thrush samples, they will help us paint a clearer picture of where Hermit Thrushes from each breeding population spend the winter. This is turn will help conservationists direct energy and resources to where they are most needed to protect this species. Visit the Hermit Thrush genoscape page to learn more!

Updates

What have we been up to?

Chrstine Rayne is leaving the BGP after three years of work with our team. Christine is migrating to the Pacific Northwest to begin a new chapter of her life and will leave behind a legacy that will be hard to live up to. Under her guidance, the BGP has flourished and migratory birds across the Western Hemisphere are better off for it!

Amanda Carpenter joined the Bird Genoscape Project in May as our new Lab Manager. Amanda previously worked at the University of Lethbridge where she studied population genetic structure of the Warbling Vireo (*Vireo gilvus*) complex. Replacing Christine will be a tall order, but Amanda has already proved valuable and is working to become fluent in all things BGP genomics.

Dr. Kristen Ruegg received a grant from the Knobloch Family Foundation to work with the Bird Conservancy of the Rockies on grassland bird conservation. She also received funding from Colorado Parks and Wildlife and the Alaska Department of Fish and Game to study Brewer's Sparrow populations and Alaskan migratory bird species. Kristen gave invited talks about bird migration, genomics, and the BGP in Sweden, Penn State University, and the San Francisco Bay Bird Observatory. Finally she was a panelist for a climate change and genomics workshop with the British Ecological Society and was a speaker and organizer for the International Ornithological Congress.

Matt DeSaix published two journal articles, with one on Rosy-finches featured by the American Bird Conservancy. He was awarded a National Science Foundation internship and has two more publications in review. Look for those soon!

Whitney Tsai Nakashima returned to the Yucatan Peninsula to continue her field work with Yellow Warblers. She received a UCLA dissertation fellowship, co-authored three publications on quail, towhees, and Azure-hooded Jays, and presented her work for the Conejo Valley Audubon Society and Los Angeles Birders.

Caitlin Miller has fledged! Caitlin successfully defended her Master's thesis. Congrats Caitlin!

Marina Rodríguez submitted the first chapter of her dissertation, which is in review for publication, and continues working on analyzing the data for her second and third chapters. She is active in DEI issues on campus and received the American Association of University Women doctoral completion fellowship and the Kirchner Award for ecology research.

Erica Robertson joined the lab as a PhD student in the fall and completed her first field season with the UC Santa Cruz Rosy-Finch team. She received a grant from the Colorado Field Ornithologists, a Rueth Ecology scholarship from CSU, and a scholarship to attend the University of Washington Bioacoustics Summer Institute.

Sheela Turbek completed the Sustainability Leadership Fellows program through the School of Global Environmental Sustainability and published two perspective articles highlighting recent research and challenges in the field of conservation genetics. She also published a manuscript that uses historical museum samples to investigate climate adaptation in the willow flycatcher. She just returned from North and South Dakota, where she collected genetic samples from various grassland bird species with the help of Amanda Carpenter and Erica Robertson.

Updates cont.

BGP in the news....

Denver Post published an article outlining the relationship we have with the Bird Conservancy of the Rockies' banding station at Barr Lake State Park, "A bird's-eye view of population declines" (https://www.birdgenoscape.org/wp-content/uploads/2022/10/DenverPost_Population-Declines.pdf)

The Natural Curiosity Project produced a podcast episode that takes listeners on the journey of how a bird feather leads to the conservation of migratory bird species (https://podcasts.apple.com/us/podcast/episode-201-the-bird-genoscape-project-with-jacob-job/id1443160082?i=1000594364701).

Institute for Bird Populations published an article highlighting the importance of MAPS operators to our work, "MAPS Operators Help Reveal Where Genetically Distinct Bird Populations Live Year Round" (https://www.birdpop.org/docs/misc/MAPS_Chat_2023.pdf)

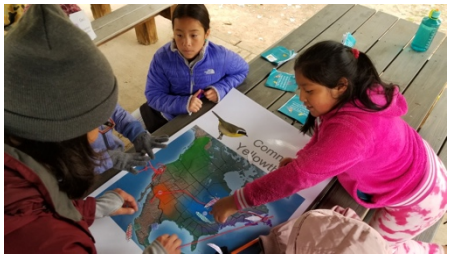
Publications

1. A Contina, CM Bossu, D Allen, MB Wunder & KC Ruegg. 2023. Genetic and ecological drivers of molt in a migratory bird. Scientific Reports 13: 814.
2. SP Turbek, C Bossu, C Rayne, C Gruppi, BE Kis, M Whitfield, TB Smith, EH Paxton, RA Bay & KC Ruegg. 2023. Historical DNA reveals climate adaptation in an endangered bird. Nature Climate Change 13: 735-741.
3. R Rueda-Hernandez, CM Bossu, TB Smith, A Contina, R Canales del Castillo, K Ruegg & BE Hernandez-Banos. Winter connectivity and leapfrog migration in a migratory passerine. Ecology and Evolution 13: e9769.
4. NA Adams, RR Bandivadekar, CJ Battey, MW Clark, K Epperly, J Klicka & K Ruegg. Widespread gene flow following range expansion in Anna's Hummingbird. Molecular Ecology: 10.22541/au.166505052.20953845/v1
5. SP Turbek, WC Funk & KC Ruegg. Where to draw the line? Expanding the delineation of conservation units to highly mobile taxa. Journal of Heredity 114: 300-311.
6. BR Forester, CC Day, K Ruegg & EL Landguth. Evolutionary potential mitigates extinction risk under climate change in the endagered southwestern willow flycatcher. Journal of Heredity: 10.1093/jhered/esac067
7. AA Kimmitt, TM Pegan, AW Jones, CL Brenna, J Hudon, J Kirchman, KC Ruegg, BW Benz, R Herman & BM Winger. Genetic evidence for widespread population size expansion in north american boreal birds prior to the last glacial maximum. Proceedings of the Royal Society Series B: 10.1098/rspb.2022.1334
8. KC Ruegg & S Turbek. Perspective: Estimating global genetic diversity loss – a mathematical framework may help inform conservation efforts. Science 22: 1384-1385.

Updates cont.

9. K Barr, C Bossu, R Bay, E Anderson, J Belthoff, L Trulio, D Chromczak, C Wisinski, T Smith & K Ruegg. Genetic and environmental drivers of migratory behavior in western burrowing owls and implications for conservation and management. Evolutionary Applications: *In revision*.
10. CM Bossu, M Rodriguez, C Rayne, DA Chromczak, PG Higgins, LA Trulio & KC Ruegg. Genomic approaches to mitigating genetic diversity loss in a declining population. Molecular Ecology: *In press.*
11. C Gruppi, P Sanzenbacher, K Balekjian, R Hagar, S Hagen, C Rayne, T Schewizer, D Cooper, T Dietch, TB Smith, K Ruegg & RJ Harrigan. An idenfitication pipeline for samples of avian origin recovered from alternative energy installations. PLOS ONE: *In press*.

Education and Outreach



Students learn how bird populations are connected across hemispheres!

Our team engaged several groups of fourth graders from Title 1 schools in the area during our fall Bird Camp. Students first watched our **National Geographic documentary** on migration and how the BGP works to protect migratory birds. Students then brought their knowledge into the field where we guided them through various exercises that taught them how to use binoculars and catch birds in mist nets. Students also got to learn the challenges of migration in a simulated hazards course where they 'migrated' through a landscape riddled with obstacles like saran wrap windows, kids acting as outdoor cats, and disappearing natural habitats. It's safe to say that students had a blast and some even indicated they want to study birds when they get older!

Associate Director Jacob Job and Bioinformatician Christen Bossu led a webinar for the National Loon Center in Minnesota that illustrated how our genoscape work can reveal threats to loon populations throughout the annual cycle. Nearly 80 people attended the webinar!

Completed Genoscapes

Our flock of species with completed genoscapes has grown to 15 species! It includes:

American Kestrel
American Redstart
Anna's Hummingbird
Brown-capped Rosy-finch
Burrowing Owl
Canada Warbler
Common Loon
Common Yellowthroat
Hermit Thrush
Northern Fulmar
Painted Bunting
Tricolored Blackbird
Willow Flycatcher
Wlson's Warbler
Yellow Warbler

Updates cont.

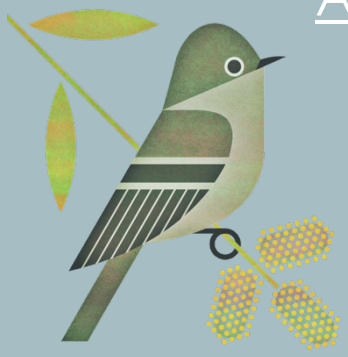
We are nearing the completion of 31 other genoscapes for the following species, many in collaboration with groups including the Winger Lab at the University of Michigan:

American Robin
American Crow
Baird's Sparrow
Bay-breasted Warbler
Black-throated Blue Warbler
Black-throated Green Warbler
Blackburnian Warbler
Blue-headed Vireo
Brewer's Sparrow
Cape May Warbler
Chestnut-collared Longspur
Grasshopper Sparrow
Horned Lark
Least Flycatcher
Loggerhead Shrike
Magnolia Warbler
Mourning Warbler
Palm Warbler
Philadelphia Vireo
Prothonotary Warbler
Rosy-finch Complex
Swainson's Thrush
Tennessee Warbler
Veery
Western Grebe
Western Meadowlark
White-throated Sparrow
Winter Wren
Yellow-bellied Flycatcher
Yellow-bellied Sapsucker
Yellow-billed Cuckoo

Visit our website to learn more!

Sampling update

Since our last newsletter, we received >**17,000** blood, feather, and tissue samples. We're still working through processing those samples, but what a year! Thank you so much to all our amazing collaborators and contributors!!



And speaking of our contributors, thank you!

Al Sherkow
Alison Holloran
Allen Chartier
Amy Kearns
Annie Lindsay
Annie Meyer
Beth Flint
Blaine Carnes
Blance Hernandez Banos
Bob Van Ersvelde
Brent Thompson
Brice Leech
Bruce Rodrigues
Chrissy Kondrat
Christine Bishop
Colin Woolley
Dan Wenny
Eric Demers
Gigi Gerben
Gordon Howard
Gwen Baluss
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Jeff Kozma
Jim McGinity
Judy Woods
Julia Alexander
Kyle Kittleberger
Laura Cook
Lauren Helton
Lori Walewski
Mark Osokow
Megan Dalton
Michael Mahoney
Morgan Wehtje
Richard Bailey
Richard Lewis
Rinchen Boardman
Robert Snowden
Sarah Milligan
Shannon Mendia
Tim Brown
Tully Frain
Walt Sakai

We sincerely apologize if we've overlooked anyone!

Thank you for reading! Visit the 'How to help' section of our website If you or someone you know want to support us.

See you next year!