



2023 ANNUAL REPORT

RESEARCH,
EDUCATION,
AND OUTREACH



THE CENTER FOR
HUMAN-CARNIVORE COEXISTENCE

The Center for Human-Carnivore Coexistence

The Center for Human-Carnivore Coexistence (CHCC) at Colorado State University (CSU) is an academic institution focused on integrating transformative science, education, and outreach to minimize conflict and facilitate coexistence between people and carnivores. This annual report summarizes our research, education, and outreach activities during 2023.



THE CENTER FOR
HUMAN-CARNIVORE COEXISTENCE

TABLE OF CONTENTS

PAGE 2 CHCC TEAM

PAGE 4 SOCIAL AND ECOLOGICAL RESEARCH

PAGE 8 STUDENT EDUCATION AND MENTORING

PAGE 11 OUTREACH AND ENGAGEMENT

PAGE 16 2024 GOALS



Team Growth

- Mireille (Ray) Gonzalez officially joined the CHCC Leadership Team as CHCC Co-Director. After successfully defending her PhD, she is now a Research Associate within the Center.
- The CHCC added 5 faculty members, 2 postdoctoral fellows, and 4 Associates in 2023.
- In total, 20 CSU faculty members across multiple departments and colleges were members of the CHCC in 2023.

CHCC Leadership Team

- **Director:** Kevin Crooks, Professor, Department of Fish, Wildlife, and Conservation Biology (FWCB); carnivore ecologist
- **Co-Director:** Jonathan Salerno, Assistant Professor, Human Dimensions of Natural Resources (HDNR); human ecologist
- **Co-Director:** Mireille Gonzalez; Research Associate, Center for Human-Carnivore Coexistence; social psychologist

CHCC Faculty Team

- **Larissa Bailey:** Professor, FWCB; wildlife conservation biologist
- **Meena Balgopal:** Professor, Department of Biology; science education researcher
- **Joel Berger:** Barbara Cox Anthony University Chair in Wildlife Conservation, FWCB; wildlife conservation biologist
- **Sara Bombaci:** Assistant Professor, FWCB; wildlife conservation biologist
- **Stewart Breck:** Research Wildlife Biologist, USDA Wildlife Services; Faculty Affiliate, FWCB; carnivore ecologist
- **Paul Evangelista:** Senior Research Scientist, Natural Resource Ecology Laboratory; landscape ecologist
- **Brian Gerber:** Assistant Unit Leader, Colorado Cooperative Fish and Wildlife Research Unit, FWCB; wildlife ecologist
- **Dana Hoag:** Professor, Department of Agricultural and Resource Economics; agricultural economist
- **Rick Knight:** Emeritus Professor, HDNR; wildlife conservation biologist
- **Mike Manfredo:** Department Head and Professor, HDNR; conservation social scientist
- **Rebecca Niemiec:** Assistant Professor, HDNR; conservation psychologist
- **Barry Noon:** Emeritus Professor, FWCB; wildlife conservation biologist
- **Courtney Schultz:** Associate Professor, Department of Forest and Rangeland Stewardship; political scientist
- **Ken Shockley:** Holmes Rolston III Chair in Environmental Ethics and Philosophy, College of Liberal Arts; environmental philosopher
- **Tara Teel:** Professor, HDNR; conservation psychologist
- **Bastian Thomsen:** Assistant Professor, HDNR; socio-cultural anthropologist
- **George Wittemyer:** Professor, FWCB; wildlife conservation biologist
- **Barb Wolfe:** Associate Professor in the Department of Clinical Sciences in the College of Veterinary Medicine and Biomedical Sciences; veterinarian
- **Robin Young:** Archuleta County Director/Agriculture and Natural Resources Extension Specialist, CSU Extension
- **Veronica Yovovich:** Assistant Professor, FWCB; CSU Extension; wildlife conservation biologist

CHCC Postdoctoral Fellows and Researchers:

- **Heather Abernathy:** CHCC Postdoctoral Fellow. FWCB, advised by G. Wittemyer and M. Ditmer. Quantifying human recreation patterns across the American West and assessing its impact on human-wildlife conflict.
- **Ben Ghasemi:** CHCC Postdoctoral Fellow. HDNR, advised by R. Niemiec, M. Manfredo, and T. Teel. Conservation social science and human-carnivore coexistence in the Western U.S.; Global Wildlife Values Study.
- **Treana Mayer:** CHCC Postdoctoral Fellow. Microbiology, Immunology, Pathology, advised by S. VandeWoude. Emerging zoonotic disease at the wildlife-public interface; Echinococcosis in canids and people; spillover risk of Highly Pathogenic Avian Influenza.
- **Redae Tesfai:** CHCC Research Associate. Natural Resource Ecology Lab, advised by P. Evangelista. Combating illegal cheetah trafficking for the pet trade.
- **Patricia Tricorache:** CHCC Research Assistant. Natural Resource Ecology Lab, advised by P. Evangelista. Combating illegal cheetah trafficking for the pet trade.
- **Rekha Warriar:** CHCC Postdoctoral Fellow. HDNR, advised by J. Salerno. Interactions among agropastoral households and their environment and the implications for large carnivore conservation in Tanzania.

CHCC Associates

- **Santiago Chiquito:** CHCC Associate. Director, Neotropical Innovation. Protection-production systems for nature coexistence.
- **Pratik Desai:** CHCC Associate. PhD Student, HNG University, Patan, India. Human-sloth bear coexistence in Gujarat, India.
- **Nishith Dharaia:** CHCC Associate. Director, Associate Professor, HNG University, Patan, India; Founder, WSB Research Foundation; Registrar, Center of Excellence for Wildlife and Conservation Studies. Carnivore conflict and coexistence in India.
- **Angélica Diaz:** CHCC Associate. Director. Neotropical Innovation. Community engagement and conservation technology in Colombia.
- **Mark Ditmer:** CHCC Associate. USFS Research Ecologist, Rocky Mountain Research Station, USFS. Spatial modeling of carnivore habitat suitability and conflict hotspots.
- **Anthony J. Giordano:** CHCC Associate. Chief Conservation Science Officer, S.P.E.C.I.E.S. International carnivore conservation practice and research.
- **Seth Wilson:** CHCC Associate. Executive Director, Blackfoot Challenge. Applied practitioner focused on human-carnivore coexistence.

SOCIAL AND ECOLOGICAL RESEARCH

Conflict between humans and carnivores results from the interaction between people and predators. Consequently, solutions to conflict require effective integration of both social and ecological science. A primary goal of the CHCC is to conduct social and ecological research to understand how and where humans and carnivores can coexist and to develop approaches to reduce conflict. We have developed research projects in a variety of systems where coexistence is proving difficult and there is substantial need for interdisciplinary, collaborative efforts to reduce conflict.

RESEARCH PROJECT HIGHLIGHTS

- Rancher sustainability in landscapes with predators, including wolves and grizzly bears in the Rocky Mountain West and jaguars and pumas in Colombia
- Wolf restoration in Colorado
- Mapping risk of wolves killing livestock throughout U.S. wolf range
- Technology development to develop non-lethal tools to prevent livestock losses to carnivores
- Community-based land stewardship and carnivore conservation in Guatemala
- Human-black bear coexistence in developed areas in the Western US
- Sloth bear and leopard conflict in India
- Conflict between carnivores and livestock keepers in East Africa
- Tourism impacts on carnivore-prey interactions in South African food webs
- Combating illegal cheetah trafficking in the Eastern Horn of Africa
- Impacts of scavengers on spread of Chronic Wasting Disease



33 SCIENTIFIC PUBLICATIONS

CHCC researchers published a total of 33 scientific publications on carnivores and coexistence in 2023.

Ashish, K., Ramesh, T., Kalle, R., & Giordano, A. J. (2023). Spatial heterogeneity facilitates coexistence between striped hyaenas and sympatric carnivores. *Journal of Biogeography*.

Bal, A. K., Giordano, A. J., & Gouda, S. (2023). Hunting of the Indochinese clouded leopard (*Neofelis nebulosa*) in Murlen National Park (Mizoram, India): An indication of hunting pressure and regional trade along the India- Myanmar border? *Cat News: Special Issue*.

Bardales, R., Hyde, M., Gallo, J., & Boron, V. (2023). National parks and conservation concessions: A comparison between mammal populations in two types of tropical protected areas in Ucayali, Peru. *Journal of Tropical Ecology*, 39, e3.

Boron, V. Deere, N. Hyde, M. Stasiukynas, D. Bardales, R. Payán, E. (2023) Habitat modification destabilises spatial associations and persistence of Neotropical carnivores. *Current Biology* 33(17), 3722-3731.

Breck, S. W., Davis, A. J., Oakleaf, J. K., Bergman, D. L., deVos, J., Greer, J. P., & Pepin, K. (2023). Factors affecting the recovery of Mexican wolves in the Southwest United States. *Journal of Applied Ecology*, 60(10), 2199-2209.

Breck, S., Schultz, J. T., Prause, D., Krebs, C., Giordano, A. J., & Boots B. (2023). Integrating robotics into wildlife conservation: Testing improvements to predator deterrents through movement. *Peer J*, 11, e15491.

Chiaravalloti, R., Tomas, W., Giordano, A. J., Restel, A., & Goncalves Morato, R. (2023). Achieving conservation through cattle-ranching: The case of the Brazilian Pantanal. *Conservation Science & Practice*, 1-11.

Ditmer, M. A., Wittemyer, G., Zeller, K. A., Breck, S. W., Fletcher, R. J., & Crooks, K. R. (2023). Predicting dispersal and conflict risk for wolf recolonization in Colorado. *Journal of Applied Ecology*, 60(11), 2327-2339.

Durant, S.M., Broekhuis, F., Evangelista, P., Tricorache, P., Asfaw, T., Gedow, O. & Marker, L. (2023). *Acinonyx jubatus* ssp. *soemmeringii*. The IUCN Red List of Threatened Species 2023: e.T231957008A232671735.

Fennell, S. R., Copeland, K., Thomsen, B., Copeland, S., & Duggan, M. (2023). Toward an era of multispecies livelihoods in coastal and marine community-based tourism. *Routledge Handbook of Nature-Based Tourism Development*. Ed. A. Madić and S. Walia. Routledge.

Frank, K. M., Ditmer, M. A., Stoner, D. C., Currie, W. S., Olson, D. D., & Carter, N. H. (2023). Dark roads aid movement but increase mortality of a generalist herbivore in the American Southwest. *Ecosphere*, 14(5), p.e4508.

Ghasemi, B., Kyle, G., Sell, J., & Varner, G. (2023). Conservation scholars' perspectives on the morality of trophy hunting for the sake of conservation. *People and Nature*, 1-13.

Ghasemi, B. & Kyle, G. T. (2023). Hunters' opposition to harmful hunting practices on ecosystems: Values, beliefs, norms, and identities. *The Journal of Wildlife Management*, e22449.

Giordano, A. J., Winstead, L., Imrom, M. A., Rustam, Sompud, J., Kumaran, J. V., & Pei, K. J.-C. (2023). Dark clouds ahead: Anecdotal evidence for an illegal live trade in Sunda Neofelis diardi and Indochinese N. nebulosa clouded leopards (Mammalia: Carnivora: Felidae). *Journal of Threatened Taxa*, 15(6), 23441-23445.

Greenspan, E., Montgomery, C., Stokes, D., K'lu, S. S., Moo, S. S. B., Anile, S., Giordano, A. J., & Nielsen, C. K. (2023). Occupancy, density, and activity patterns of a Critically Endangered leopard population on the Thailand-Myanmar border. *Population Ecology*, 65(3), 167-182.

Hayes, F. P. & Berger, J. (2023). Snow patch refugia benefits for species of periglacial zones—Evidence from a high-elevation obligate, *PNAS Nexus*, 2(11), 339.

Hoag, D. J., Burkhardt, J., Ghasemi, B., & Young, R. (2023). Economic wins and losses from reintroducing wolves. *CSU Regional Economic Development Institute (REDI)*.

Hoag, D. J., Burkhardt, J., Ghasemi, B., Breck, S., Niemiec, R., & Crooks, K. R. (2023). Willingness to pay for reintroducing wolves in a divided voting base. *Global Ecology & Conservation*, 46, e02576.

Hyde, M., Payán, E., Barragan, J., Stasiukynas, D., Rincón, S., Kendall, W. L., ... & Boron, V. (2023). Tourism-supported working lands sustain a growing jaguar population in the Colombian Llanos. *Scientific Reports*, 13(1), 10408.

Kee, S. L., Sompud, J., Pei, K. J.-C., Giordano, A. J., Gilbert, E., Sudin, M., Liao, P., & Goh, C. (2023). Sunda clouded leopard (*Neofelis diardi*) occupancy using vehicle spotlight transects: Results of a pilot research survey in Borneo. *Journal of Threatened Taxa*, 15(2), 22559-22566.

Kozakiewicz, C., Burrridge, C. P., Lee, J. S., Kraberger, S., Fountain-Jones, N. M., Fisher, R. N., Lyren, L. M., Jennings, M. K., Riley, S. P. D., Serieys, L. E. K., Craft, M., Funk, W. C., Crooks, K., VandeWoude, S., & Carver, S. (2023). Habitat connectivity and host relatedness influence virus spread across an urbanising landscape in a fragmentation-sensitive carnivore. *Virus Evolution*, 9(1), veac122.

Lasky, M. and S.P. Bombaci. (2023). Human-induced fear in wildlife: A review. *Journal for Nature Conservation* 74:126448.

Moure- Noori, F., Hemami, M. R., Rezvani A., & Ghasemi, B. (2023). The influence of superstitions and emotions on villagers' attitudes towards striped hyena in southwestern Iran. *PLoS One*, 18(8), e028554.

Nanni, A. S., Regolin, A. L., Fernandez, P. D., Giordano, A. J., Martello, F., Bailey, L. L., & Lucherini, M. (2023). Woody cover is the major driver of puma occupancy in agroecosystems of the Argentine Dry Chaco. *Journal for Nature Conservation* 75:12647575.

Perez, J., Oliva, L. M., Chi, R., Schmook, B., Calme, S., Lecuyer, L., & Giordano, A. J. (2023). Manual de practicas de salud animal para productores de Calakmul. Unidad Movil Veterinaria Coexistencia Humano-Jaguar. S.P.E.C.I.E.S. & EcoSur. 34p.

Rojano, C. Delgado-V, C. A., Diaz-Pulido, A., & Hyde, M. (2023). Fototrampeo para el estudio de hormigueros. Manual de campo para el estudio de hormigueros. Published online: ISBN 978-958-5820-1-1

Schmidt-Küntzel, A., Yashphe, S., Hamalwa, H., Ismail, S. H., Tricorache, P., Brewer, B., O'Brien, S. J., & Marker, L. (2023). Genetic support to uplist an African cheetah subspecies, *Acinonyx jubatus soemmeringii*, imperiled by illegal trade. *Conservation Science and Practice*, e13052.

Shruti, P., Pratik, D., Shalu, M., Dhaval, G., Giordano, A. J., & Nishith, D. (2023). Livestock loss and financial compensation related to leopard depredations in the Chhota Udepur district of Gujarat, India. *Human-Wildlife Interactions*, 17(1).

Torres, R., Kuemmerle, T., Baumann, M., Romero-Munoz, A., Altrichter, M., Boaglio, G. I., Cabral, H., Camino, M., Campos Krauer, J. M., Cartes, J. L., Cuellar, R. L., Decarre, J., Gallegos, M., Giordano, A. J., Lizarraga, L., Maffei, L., Neris, N. N., Quiroga, V., Saldivar, S., Tamburini, D., Thompson, J., Velilla, M., Wallace, R. B., & Yanosky, A. (2023). Partitioning the effects of habitat loss, hunting, and climate change on the Chacoan Peccary. *Diversity & Distribution*, 1-15.

Torres-Romero, E. J., G. Ceballos, F. Botello, J., Gonzalez Rojas, I., Giordano, A. J., & Lopez-Bao, J. V. (2023). Jaguar conservation across the American continents: The role of protected landscapes and human-impacted biomes. *Revista de Biología Tropical* 71:e50507.

White, R. M., Schmook, B., Calme, S., Giordano, A. J., Hauser, Y., Kimmel, L. Lecuyer, L., Lucherini, M., Mendez-Medina, C., & Pena-Mondragon, J. L. (2023). Facilitating biodiversity conservation through partnership takes time, trust, tools, to achieve transformative outcomes. *Conservation Biology*, 37(3), e14057.

Yovovich, V. & Gage, J. (2023). Conservation Assessment of Big Game Migration on Idaho's Salmon-Challis National Forest. *Pew Research Center*, Washington, D.C. 20036. 27pp.

Yovovich, V., Robinson, N., Robinson, H., Manfredo, M. J., Perry, S., Bruskotter, J. T., Vucetich, J. A., Solórzano, L. A., Roe, L. A., Lesure, A., Robertson, J., Bulter, T., Elbroch, L. M. (2023). Determining puma habitat suitability in the Eastern USA. *Biodiversity and Conservation*, 32, 921-941.

SCIENTIFIC PRESENTATIONS

CHCC researchers presented multiple scientific presentations in 2023. Examples include:

January: Crooks, K. (2023, January). Center for Human-Carnivore Coexistence. CSU One Health Institute Affiliate Event, Fort Collins, CO, United States.

April: Crooks, K. (2023, April). Center for Human-Carnivore Coexistence. Mission Moment presentation to the CSU Foundation Board of Directors, Fort Collins, CO, United States.

April: Crooks, K. (2023, April). Center for Human-Carnivore Coexistence. WCNR Dean's Advisory Council, Fort Collins, CO, United States.

May: Breck, S., Carlisle, K., Schultz, J., Young, J., & Gese, E. (2023, May). Effectiveness and producer perception and interest of fladry and range riding employed by USDA Wildlife Services Operations to protect livestock from depredation. Pathways: Human Dimensions of Wildlife, Fort Collins, CO, United States.

May: Breck S., Hyde, M., Young, J., Few, A., & Beaver, J. (2023, May). Coproducing knowledge to aid human-carnivore conflict mitigation. Pathways: Human Dimensions of Wildlife, Fort Collins, CO, United States.

May: Camara, C., Niemiec, R., & Gonzalez, M. N. (2023, May). Mastering media: lessons from Colorado's wolf reintroduction on navigating media. Wolves Across Borders, Stockholm, Sweden.

May: Camara, C. (2023, May). Wolves & Gen Z: How to communicate to the next generation about wolves. Wolves Across Borders, Stockholm, Sweden.

May: Camara, C. (2023, May). Wolves & Gen Z: How to communicate to the next generation about wolves. Center for Biological Diversity. Remote.

May: Hyde, M., Teel, T., Diaz-Pulido, A., Breck, S., & Crooks, K. (2023, May). Jaguar tolerance and retaliation on Colombian ranchlands. Pathways: Human Dimensions of Wildlife, Fort Collins, CO, United States.

May: Tricorache, P., Evangelista, P., Young, N., Schulte, D., & Luizza, M. (2023, May). Tracking illegal cheetah trade in East Africa. Pathways: Human Dimensions of Wildlife, Fort Collins, CO, United States.

June: Camara, C. (2023, June). Howling for change: Effectively communicating conservation for Wolves. Yellowstone Wolf Summit, Gardiner, MT, United States.

June: Ghasemi, B., Kyle, G., Crooks, K., & Niemiec, R. (2023, June). Developing and validating psychometric scales to measure willingness to coexist and attitudes towards coexistence with terrestrial carnivores. Pathways: Human Dimensions of Wildlife, Fort Collins, CO, United States.

June: Ghasemi, B., Manfredo, M., & Teel, T. (2023, June). A global perspective on wildlife values - methodology. Pathways: Human Dimensions of Wildlife, Fort Collins, CO, United States.

June: Ghasemi, B., Teel, T., Crooks, K., & Niemiec, R. (2023, June). Public perspectives on hunting black bears and mountain lions in Colorado. Pathways: Human Dimensions of Wildlife, Fort Collins, CO, United States.

September: Salerno, J. (2023, September). Human-wildlife conflicts, changing climate, and adaptation in dryland socio-environmental systems. Invited lecture, Department of Environmental Science, University of Virginia, Charlottesville, VA, United States.

November: Breck, S.W. (2023, November). Challenges of human-carnivore coexistence: A U.S. perspective. Keynote Address at Forum for Human-Carnivore Coexistence, Rome, Italy. Sponsored by U.S. State Department Embassy in Italy.

November: Hyde, M., Oakleaf, J.K., Bergman, D.L., Crooks, K.R., Young, J.K., Goljani Amikrhiz, R., Frey, J.K., Breck, S.W. (2023, November). Anthropogenic subsidies reduce livestock depredations by Mexican wolves (*Canis lupus baileyi*). The Wildlife Society, Louisville, KY, United States.

November: Venumière-Lefebvre, C., Breck, S., Johnson, H., Alldredge, M. & Crooks, K. (2023, November). Bears, watch your step: fine-scale individual bear movements in Durango. Graduate Student Showcase, Colorado State University, Fort Collins, CO, United States.

2023 FUNDING BY THE NUMBERS



\$5,117,034

TOTAL ONGOING CHCC FUNDING ADMINISTERED THROUGH CSU



\$4,392,534

EXTERNAL GIFTS & GRANTS



\$724,500

INTERNAL CSU FUNDS



\$8,420,289

TOTAL ONGOING FUNDING FOR CHCC AND PARTNERS

These funds will advance our human-carnivore coexistence research, education, and outreach efforts. Funding sources have included a mixture of gifts from private foundations and donors, external grants from governmental agencies and non-governmental organizations, and internal CSU funds.

EXTERNAL GIFTS: \$1,712,160 (ongoing in 2023)

Private Donor: Philanthropic gift to the Center for Human-Carnivore Coexistence. \$1,000,000. Pls K. Crooks, R. Niemiec (2021-2026).

Bohemian Foundation: Centering the voices of BIPOC youth in wildlife conservation in the West: A project-based learning and leadership program. \$15,000. Pls A. Lavoie, R. Niemiec, K. Crooks, M. Balgopal, S. Bombaci, Rain Bear Stands Last, R. Frierson, N. Stafford (2021-2023).

Donald Slavik Family Foundation: Fighting illegal trafficking of cheetahs in Somaliland through strategic capacity building in the classroom, field, and courts of law. \$100,000. PI P. Evangelista (2022-2024).

Greater Yellowstone Coalition: Interactions between grizzly bears and livestock: a pilot effort to enhance understanding with noninvasive methods. \$4,800. Pls S. Breck, M. Hyde, (2023-2024).

Lordi Foundation: Improving the reproductive success in the ferret using new minimally invasive assisted reproductive techniques. \$500,000 Pls B. Wolfe, F. Hollinshead (2023-2028).

Riverstyx Foundation: Automated Mineral Bin (ABM) development for reducing predator-livestock conflict. \$50,000. Pls C. Krebs, S. Breck (2023-2024).

Riverstyx Foundation: Effective messaging and community engagement for carnivore coexistence: Wolf restoration in Colorado. \$25,000. PI C. Camara (2022-2023).

Various Donors: CSU Wolf Conflict Reduction Fund. \$17,360. PI K. Crooks (2022-2024).

EXTERNAL GRANTS: \$2,680,374 (ongoing in 2023)

NSF Decision Risk and Management Sciences Directorate: A longitudinal investigation of the social outcomes of participatory stakeholder engagement processes. \$195,413. Pls R. Niemiec, M. Quartuch (2021-2023).

NSF Human-Environment and Geographical Sciences: Adaptive human migration in changing environments: Leveraging geographic sciences to advance new models of migration decision-making. \$399,940. PI: J. Salerno. Co-Is: R. Boone, A. Gaughan, L. Hunter, J. Hartter (2021-2024).

U.S. National Academies of Sciences and Agency for International Development Partnerships for Enhanced Engagement in Research (PEER): Livelihood change in the context of community conservation - Chobe, Botswana. \$160,000. PI: L. Cassidy. Co-Is: A.E. Gaughan, J. Salerno (2020-2023).

USDA National Wildlife Research Center Cooperative Agreement: Non-lethal tool development and evaluation for predator management. \$55,000 Pls K. Crooks, S. Breck (2023-2024).

USDA National Wildlife Research Center Cooperative Agreement: The role of scavengers on the spread of CWD. \$230,021. PI: G. Wittemyer (2021-2023).

USDA Western Sustainable Agriculture Research and Education (SARE): Training Colorado educators about sustainable coexistence between ranchers and wolves. \$100,000. Pls: D. Hoag, S. Breck, K. Crooks (2021-2023).

U.S. Fish and Wildlife Service. Combating illegal cheetah trafficking: An adaptive management strategy for building regional and national capacity in the Horn of Africa. \$1,000,000. PI: P. Evangelista (2022-2025).

USFS Rocky Mountain Research Station. Evaluating wildlife responses to recreation and other anthropogenic disturbances using novel data streams. \$540,000. Pls: G. Wittemyer, M. Ditmer (2022-2025).

INTERNAL CSU FUNDS: \$724,500 (ongoing in 2023)

CSU 50% match to \$1M philanthropic gift: CSU Provost; Office of Vice President for Research; Warner College of Natural Resources; Department of Fish, Wildlife, and Conservation Biology; One Health Institute. \$500,000 (2021-2026).

Dean's Fund for Transdisciplinary Approaches to Solve Environmental Wicked Problems. A One Health transdisciplinary approach to human-wildlife coexistence. \$49,000. Pls: K. Crooks, J. Salerno (2023-2024).

WCNR Hatch Competitive Grants Program. Impacts of livestock-carnivore conflict mitigation tools on rangeland ecology and management. \$175,500. PI V. Yovovich (2023-2026).

COLLABORATORS, ADMINISTERED OUTSIDE CSU: \$3,303,255 (ongoing in 2023)

Parex: Expedición Tigre Pinta Menuda: Promoting jaguar conservation and tourism in the Colombian Llanos. \$65,000. PI: M. Hyde; Collaborator: Fundación Cunaguaro; administered external to CSU (2023-2024).

USDA-NRCS Regional Conservation Partnership Program (RCPP): Stewarding the Working Wild in MT, OR, and CO: Non-lethal Predator Risk Management on Agricultural Operations. \$2,000,000. Collaborators: Heart of the Rockies, Western Landowners Alliance; administered external to CSU (2024-2029).

USDA NRCS Conservation Innovation Grant (CIG): Landowner collaborative strategies for nonlethal predator control. \$888,255. PI: S. Breck; Collaborators: USDA, Western Landowners Alliance; administered external to CSU (2020-2023).

USDA Western Sustainable Agriculture Research and Education (SARE): Landowner collaborative strategies for nonlethal predator control. \$350,000. PI: S. Breck; Collaborators: Montana State University, Utah State University, Western Landowners Alliance; administered external to CSU (2022-2024).

A black bear is walking towards the camera on a forest floor covered in dry leaves and twigs. The bear has dark fur and a lighter-colored snout. The background is a blurred forest with green foliage and trees.

STUDENT EDUCATION AND MENTORING

A key goal of the CHCC is educating and mentoring future leaders in the field of human-carnivore coexistence, including graduate students and undergraduate students from the U.S. and abroad.

STUDENT MENTORING

The CHCC added 4 new graduate students in 2023. In total, 14 graduate students were members of the CHCC in 2023.

GRADUATE STUDENTS

Jenna Brager: MS in Conservation Leadership, HDNR, advised by V. Yovovich and M. Gonzalez. Rancher perceptions of livestock protection and conflict mitigation tools.

Cassi Camara: PhD Student, HDNR, advised by R. Niemiec. Analysis of outreach and messaging strategies regarding wolf reintroduction in Colorado.

Sarah Carroll: PhD Student, HDNR, advised by R. Reid. Human-wildlife interactions to support coexistence in pastoralist communities in East Africa.

Andie Conlon: MS Student, HDNR, advised by J. Salerno. The role of community-based conservation in promoting human-carnivore coexistence in East Africa.

Tim Helming: MS in Conservation Leadership, HDNR, advised by B. Bruyere and M. Gonzalez. Analyzing the collaborative process regarding wolf restoration to Colorado.

Tom Hilton: PhD Student, HDNR, advised by J. Salerno. Systems impacts of human-wildlife interactions - modeling multilevel economies from households to nation states.

Matt Hyde: PhD Student, GDPE, advised by S. Breck and K. Crooks. Using non-lethal tools to reduce conflict between ranchers and predators in Colombia and the Rocky Mountain West.

Tamara Layden: MS Student, GDPE, advised by S. Bombaci. The role of community-based land stewardship in shaping carnivore conservation in the tropics of Guatemala.

Cori Persinger: MA Student, Department of Philosophy, advised by K. McShane and K. Shockley. A critique of animals rights theory from northern indigenous hunting ethics; hunting and environmental values.

Cole Purdy: MS in Conservation Leadership, HDNR, advised by M. Gonzalez. Influencers of trust and social conflict related to wolf restoration and management in Colorado.

Kelly Russo: MS Student, FWCB, advised by G. Wittemyer. Impacts of scavengers on Chronic Wasting Disease spread.

Cassandra Venumière-Lefebvre: PhD Student, FWCB, advised by K. Crooks and S. Breck. Integrating social and ecological science to identify effective strategies for human-bear coexistence.

Erin Weingarten: PhD Student, GDPE, advised by A. Lavoie. Teaching racial equity in conservation higher education.

Becca Windell: PhD Student, FWCB, advised by G. Titcomb, L. Bailey, and J. Malmberg. Behavioral responses, transmission hotspots, and disease-predation interactions in Chronic Wasting Disease infected mule deer.

CHCC Graduate Student Research and Outreach Mini-Grant

In March, CHCC announced the recipients of the second annual CHCC Student Research and Outreach Mini-Grants (up to \$2000 each).

Tim Helming: Cooperative camera trap monitoring for wolf coexistence on private lands

Matt Hyde: Harnessing hierarchical models to reduce bias in human-carnivore conflict studies

Tamara Layden: The role of community-led stewardship in shaping carnivore conservation in the tropics of Guatemala

Cori Persinger: Ethical dimensions of human-wildlife interactions

Cassandra Venumière-Lefebvre: Promoting human-carnivore coexistence through management and policy

Erin Weingarten: An investigation of justice, equity, diversity, and inclusion in the current U.S. undergraduate and graduate wildlife ecology curriculum

CHCC Undergraduate Research Experience

CHCC instituted the first annual CHCC Undergraduate Research Experience (URE) program. The URE aims to provide applied, social-ecological research experiences and skills to undergraduates, while also engaging and supporting CHCC faculty, graduate students, and partners. In addition to their research, URE students participated in the CHCC Fall lab where they received mentoring and research design support.

Kelsey Sonius: advised by T. Layden and S. Bombaci. The role of indigenous land stewardship in shaping carnivore conservation in the tropics of Guatemala.

Annika Fridberg: advised by C. Venumière-Lefebvre, S. Breck, and K. Crooks. Global systematic review of the effects of management on tolerance for carnivores.

Jay Finley: advised by M. Hyde, S. Breck and K. Crooks. Systematic review of fencing to reduce livestock losses on ranchlands;

Lyssa Lini: advised by C. Wells. Evaluating feral cat diets through fecal metabarcoding.

CHCC International Fellows Program

The CHCC International Fellows Program aims to advance the mission of the CHCC by supporting social-ecological science beyond North American systems in important landscapes for coexistence. The Fellows Program provides small grants to support early-career scientists working on coexistence challenges and solutions, while integrating Fellows and their science within the CHCC community.

Pratik Desai: PhD student, HNG University, Patan, India. Receiving CHCC mentorship from S. Breck, A. Giordano, J. Salerno. Human-sloth bear coexistence in Gujarat, India.

Elizabeth Ruiz Elejalde: MS student, Javeriana University Bogota. Receiving CHCC mentorship from M. Hyde. Community ecology and mammal conservation in the Colombian Llanos.

Shweta Shivakumar: PhD student, Manipal Academy of Higher Education, Manipal, India. Receiving CHCC mentorship from M. Gonzalez. Human-leopard conflict and coexistence in Himachal Pradesh, India.

STUDENT EDUCATION AND MENTORING



TEACHING

CHCC faculty and students also incorporated human-carnivore coexistence topics into their coursework at CSU. Examples in 2023 include:

- FEBRUARY** | Crooks, K. Socio-ecological scientific insights into Colorado wolf restoration. Guest lecture, FW472 Issues in Animal Conservation and Management.
- FEBRUARY** | Yovovich, V. Presentation on human-mountain lion conflict history and prevention to an 8th grade class in coastal California.
- MARCH** | Venumière-Lefebvre, C. Predators and coexistence. Guest lecture, NR300 Biological Diversity.
- APRIL** | Ghasemi, B. Human Dimensions of Carnivore Conservation. Guest lecture, FW472 Issues in Animal Conservation and Management.
- SEPTEMBER** | Crooks, K. Connectivity and coexistence in fragmented landscapes. Guest lecture, ECOL505 Foundations of Ecology.
- OCTOBER** | Crooks, K. Moderated debate and presented lecture on Colorado wolf restoration in his course FW455 Principles of Conservation Biology.
- OCTOBER** | Crooks, K. Wolf reintroduction to Colorado. Guest lecture, ESS501 Principles of Ecosystem Sustainability.
- OCTOBER** | Crooks, K. Wolf reintroduction to Colorado. Guest lecture, FW469 Large Mammal Ecology and Conservation.
- OCTOBER** | Crooks, K. Wolf reintroduction to Colorado. CSU Student Chapter of the Rocky Mountain Elk Foundation.
- OCTOBER** | Crooks, K. Wolf reintroduction to Colorado. CSU Zoology Club.
- OCTOBER** | Gonzalez, M. A social science perspective of wolf reintroduction in Colorado. Guest lecture, FW455 Conservation Biology.
- NOVEMBER** | Bombaci, S. The impacts of human-wildlife conflict for marginalized communities and developing nations. Module and GIS lab in FW310 Mapping Diverse Perspectives in Conservation.
- DECEMBER** | Yovovich, V. Human-wildlife conflict research and extension. Guest Lecture, FW260 Principles for Wildlife Management.



OUTREACH AND ENGAGEMENT

A primary goal for the CHCC is to transform social and ecological science to real-world action to facilitate coexistence and minimize conflict around carnivores, including direct conflict between carnivores and people and social conflict among people about carnivores. Ultimately, through our outreach and engagement we strive to reduce impacts to both people and predators.

2023 HIGHLIGHT TIMELINE | OUTREACH & ENGAGEMENT EFFORTS

FEBRUARY

V. Yovovich participated in a strategic planning meeting with the Steering Committee of the Central Coast Rangeland Coalition, an organization that convenes rangeland stakeholders to share information on science-based rangeland management and conservation practices.

S. Breck spoke to local communities in Aspen and Carbondale, Colorado, to discuss strategies to reduce conflict with black bears, focused on reducing human food sources.

APRIL

The Wolf Conflict Reduction Fund supported an outreach effort with ranchers in Jackson County in northern Colorado. Funds were used to purchase trail cameras for ranchers to monitor their calving pastures, concurrent with the installation of fencing and flagging by Colorado Parks and Wildlife to protect cattle from potential conflict with wolves.

JANUARY

In collaboration with CSU Extension, CHCC continued administration of the Wolf Conflict Reduction Fund through the CSU Foundation. Donations to the fund support efforts of CSU and partners to implement on-the-ground, non-lethal tools to prevent livestock predation by wolves in Colorado.

M. Hyde and S. Breck visited Casanare, Colombia to engage ranchers about human-jaguar coexistence. They met with owners of the Hato La Aurora ranch and the NGO Panthera Colombia to discuss their research and conservation priorities.

MARCH

R. Young held a workshop in Gunnison for livestock producers to learn about wolf restoration and management in Colorado.

MAY

C. Camara continued her presentations at national and international conferences to enhance understanding of wolves and promote local and communication strategies regarding wolf conservation.

JUNE

With support from the Riverstyx Foundation, S. Breck continued collaborations with Oregon rancher Cameron Krebs to develop non-lethal tools to reduce livestock predation by carnivores. The project included technology development in collaboration with John Mizia, Director for the CSU Rapid Prototyping Lab, with support of high school summer interns through a CSU work-based learning program in engineering wolves.

R. Knight took a two-week pack trip in the Carpathian Mountains of Romania to learn about strategies of sheep and cow pastoralists to coexist with high densities of brown bears and wolves.

SEPTEMBER

CHCC hosted our first Dean's Transdisciplinary Award workshop at CSU. The objectives of the workshop were to: 1) engage the team members in Science of Team Science training; 2) begin developing transdisciplinary research questions, teams, and proposals regarding human-wildlife coexistence; and 3) initiate an annual campus-wide experiential education event for undergraduates: the CSU Transdisciplinary Handprint Challenge Conference.

A. Giordano visited Jackson Wild and Yellowstone National Park, where he connected with filmmakers on the development of new storytelling ideas rooted in human-wildlife coexistence and innovation.

DECEMBER

C. Camara partnered with the Adelphi consultancy as one of their carnivore communication experts to support the European Union Platform on Coexistence between People and Large Carnivores. The project has a heavy focus on outreach and youth engagement.

V. Yovovich visited Casanare, Colombia to meet with ranchers to discuss human-carnivore coexistence in Colombia. She also met with the Panthera Puma Program, Panthera Colombia, and the Panthera Program Director of Latin America to discuss future research and conservation priorities and collaboration opportunities.

AUGUST

P. Evangelista and R. Tesfai led a successful training of federal and regional judges, prosecutors, and investigators in Somaliland focused on international and national wildlife laws on poaching, capturing, and trafficking of cheetah and other wildlife. The training was held in collaboration with the Natural Resource Conservation Network, Somaliland Supreme Court, and Hargeisa University School of Law.

OCTOBER

The Wolf Conflict Reduction Fund supported a series of engagement events, led by CSU Extension, focused on knowledge transfer and peer-to-peer learning with livestock producers regarding the deployment of non-lethal conflict reduction tools in likely wolf reintroduction areas in Colorado. Attending this event were leadership and ranchers from the Blackfoot Challenge, a Montana NGO with deep experience using conflict reduction approaches to prevent livestock losses while living and ranching with wolves and other large carnivores.

CHCC AND THE MEDIA

Media coverage of our research and education efforts has been extensive. The office of University Communications at CSU conducted an analysis of earned media coverage of the human-carnivore coexistence featuring CSU in 2023. The search reported:



237 media mentions from Jan. 1 – Dec. 31, 2023.



787 million readers, viewers, and listeners for potential reach.



\$7.3 million in advertising equivalency.

SELECT MEDIA COVERAGE

Condon, S. February 7, 2023. Scientist will share insights from researching Aspen bears. [Aspen Daily News](#).

Warrier, R. February 13, 2023. Humans and wildlife at the forest's edge. [The India Forum](#).

Peterson, C. April 4, 2023. Wild game power rankings: What species have the best shot at surviving climate change? [Outdoor Life Magazine](#).

Rewildology. April 27, 2023. How to Coexist with North America's Bears. [Rewildology Podcast](#).

Herbst, A. & Adelson, A. May 18, 2023. A very highly emotionally charged issue: How wolves divided Colorado. [Denver 9News](#).

Kobilinsky, D. May 26, 2023. Ranchers provide insight into carnivore fencing. [The Wildlife Society](#).

PeerJ. June 1, 2023. Integrating robotics into wildlife conservation: Enhancing predator deterrents through innovative movement strategies. [Phys.Org](#).

Vallance, J. July 30, 2023. How wolf reintroduction is supposed to go - and how it's going. [Colorado Sun](#).

Diaz Paez, A. M. July 4, 2023. Lo que pasa cuando científicos y ganaderos se unen para salvar al jaguar en Colombia. [El Espectador](#).

Adelson, A. September 26, 2023. New research pinpoints best locations for wolves in Colorado. [Denver 9News](#).

Blevins, J. October 3, 2023. Ban on hunting mountain lions and bobcats in Colorado could land on the 2024 ballot. [Colorado Sun](#).

DeLoss, J. October 17, 2023. Countdown to coexistence: CSU working to support Colorado livestock producers as wolves reenter the state. [CSU Source](#).

Hitt, J. October 25, 2023. Warner College calls for trans-disciplinary proposals following first round of awards. [CSU Source](#).

Wilson, S. October 31, 2023. Carnivore coexistence team working to help smooth wolf reintroduction in Colorado. [CBS News Colorado](#).

KruegelMcKean, A. November 7, 2023. Colorado sportsmen fight back against proposed mountain lion and bobcat hunting ban. [Outdoor Life](#).

Sack, A. November 22, 2023. Where and how soon will Colorado get its future gray wolves? [Fox21 News](#).

Ross, T. December 1, 2023. How are wildlife officials preparing Coloradans for wolf reintroduction? With a brochure. [Colorado Sun](#).

Schmelzer, E. December 3, 2023. The wolves are coming to Colorado, and the state has stockpiled explosives and deterrents. How are ranchers preparing? [The Denver Post](#).

AGDAILY Reports. December 5, 2023. Colorado's gray wolf reintroduction begins this month. [AGDAILY](#).

Kramer, K. December 19, 2023. Five flying wolves and one tight deadline: A predator returns to Colorado. [The New York Times](#).

Matusek, S. December 19, 2023. Gray wolves return to Colorado. Will they be accepted? [The Christian Science Monitor](#).

Uteuova, A. December 20, 2023. Not sheep's clothing needed: Colorado reintroduces five gray wolves. [The Guardian](#).

Watson, L. December 22, 2023. As wolf reintroduction continues, expert talks potential impact on Coloradans. [CBS11 News](#).





CHCC 2024 GOALS

RESEARCH

Enhance transdisciplinary research on human-carnivore coexistence by strengthening collaborations across disciplines and academic units within CSU, with support from the Dean's Fund for Transdisciplinary Approaches to Solve Environmental Wicked Problems.

Develop and test new technology and tools for reducing human-carnivore conflict, including continued collaboration with Oregon rancher Cameron Krebs and the CSU Rapid Prototyping Lab.

Investigate social outcomes of stakeholder and public engagement, including social conflict, social learning, trust, and acceptability of management options regarding human-carnivore coexistence.

Investigate the behavior and ecology of large carnivores in relation to conflict and coexistence with people.

EDUCATION

Mentor postdoctoral fellows and graduate students on the social-ecological science related to human-carnivore coexistence.

Support graduate students via CHCC Student Research and Outreach Mini-Grants.

Engage undergraduate students in human-carnivore coexistence research or outreach, including via coursework and Undergraduate Research Experience.

Advance development of an international education and outreach program centered on human-carnivore coexistence, including via CHCC International Fellows Program.

OUTREACH

Advance partnership with CSU Extension to continue community-based outreach regarding conflict reduction with wolves and other carnivores in Colorado.

Implement technology and tools for reducing human-carnivore conflict.

Facilitate peer-to-peer learning and knowledge transfer among livestock producers regarding sustainable ranching in landscape with predators.

Disseminate social and ecological science related to human-carnivore coexistence to the general public, practitioners, and policy makers.

Develop events that bring diverse stakeholders together and elevate voices of traditionally marginalized groups to promote human-carnivore coexistence.

FINANCIAL

Pursue goal of ensuring long-term financial sustainability of the Center for Human-Carnivore Coexistence, including securing endowed funds.





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JOIN US!

Join us in building a new era for human-carnivore coexistence, ensuring that humans and carnivores can live together with fewer impacts to both people and predators.

For more information, visit:

<https://sites.warnercnr.colostate.edu/centerforhumancarnivorecoexistence/>



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