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Education

- 1997 Ph.D. in Population Biology, *University of California, Davis*
1991 M.S. in Biology, *University of California, San Diego*
1990 B.A. in Ecology, Behavior and Evolution, *University of California, San Diego*

Career employment

- 2015-Present *Research Scientist, Institute for Bird Populations*: Hierarchical modeling of point count data on bird species in western national parks
2008-Present *Research Associate, Institute for Arctic and Alpine Research, University of Colorado, Boulder*: Ecology of sub-surface habitat specialists
2014 *Research Associate, Museum Collections, University of Colorado, Boulder*: User interface development and research applications for several data archives
2008-2013 *Research Associate, Ecology and Evolutionary Biology, University of Colorado, Boulder*: Modeling metacommunity dynamics of vernal pool plants
2008 *Instructor, Ecology and Evolutionary Biology, University of Colorado, Boulder*: Graduate seminar in population biology—modeling and data analysis
2002-2007 *Research Associate, Ecology and Evolutionary Biology, University of Colorado, Boulder*: Modeling the dynamics of plague in prairie dogs and alternate hosts
2001-2005 *Independent contractor, US Fish & Wildlife Service*: Black-footed ferret endangered species recovery plan revision
1998-2003 *Research Associate, University of Nevada, Reno*: Developing predictive models of population dynamics and population genetics for species at risk

Peer-reviewed publications (mentored student authors underlined)

- Whipple AL, **Ray C**, Wasser M, Kitchens JN, Hove AA, Varner J, Wilkening JL. 2021. Temporal vs. spatial variation in stress-associated metabolites within a population of climate-sensitive small mammals. *Conservation Physiology* 9(1): coab024; doi:10.1093/conphys/coab024.
- Klingler KB, Jahner JP, Parchman TL, **Ray C**, Peacock MM. 2021. Genomic variation in the American pika: signatures of geographic isolation and implications for conservation. *BMC Evolutionary Ecology* 21, 2. <https://doi.org/10.1186/s12862-020-01739-9>.
- Brinkerhoff RJ, Rinsland HS, Sato S, Maruyama S, **Ray C**. 2020. Vector-borne pathogens in ectoparasites collected from high-elevation pika populations. *EcoHealth* 1-12. <https://doi.org/10.1007/s10393-020-01495-8>.

- Pandolfino ER, **Ray C.** 2020. Comparison of the songs of Cassin's and Plumbeous vireos. *Western Birds* 51:293-306. <https://doi.org/10.21199/WB51.4.2>.
- Ray, C.**, R.M. Rochefort, J.I. Ransom, J.C.B. Nesmith, S.A. Haultain, T.D. Schaming, J.R. Boetsch, M.L. Holmgren, R.L. Wilkerson, R.B. Siegel. 2020. Assessing trends and vulnerabilities in the mutualism between whitebark pine (*Pinus albicaulis*) and Clark's nutcracker (*Nucifraga columbiana*) in national parks of the Sierra-Cascade region. *PLoS ONE* 15(10): e0227161. <https://doi.org/10.1371/journal.pone.0227161>.
- Benedict LM, Wiebe M, Plichta M, Batts H, Johnson J, Monk E, Ray C. 2020. Microclimate and summer surface activity in the American pika (*Ochotona princeps*). *Western North American Naturalist* 80:316-329.
- Smith AB, Beever EA, Kessler AE, Johnston AN, **Ray C** et al. 2019. Alternatives to genetic affinity as a context for within-species response to climate. *Nature Climate Change* 9:787-794. <https://www.nature.com/articles/s41558-019-0584-8>.
- Ray C**, DR Cluck, RL Wilkerson, RB Siegel, AM White, GL Tarbill, SC Sawyer, CA Howell. 2019. Patterns of woodboring beetle activity following fires and bark beetle outbreaks in montane forests of California, USA. *Fire Ecology* 15:21. <https://doi.org/10.1186/s42408-019-0040-1>
- Ray, C.**, M. L. Holmgren, R. L. Wilkerson, R. B. Siegel, and J. I. Ransom. 2019. Trends in landbird density at two national parks in fragmented, mixed-use landscapes of the Pacific Northwest. *The Northwestern Naturalist* 100(1):1-25; <https://doi.org/10.1898/NWN18-11>.
- Castillo, J. A., C. W. Epps, B. Frable and C. Ray. 2018. Identification of a contact zone and hybridization for two subspecies of the American pika (*Ochotona princeps*) within a single protected area. *PLoS ONE* 13(7): e0199032. <https://doi.org/10.1371/journal.pone.0199032>.
- Ray, C.**, J. F. Saracco, M. L. Holmgren, R. L. Wilkerson, R. B. Siegel, K. J. Jenkins, J. I. Ransom, P. J. Happe, J. R. Boetsch, and M. H. Huff. 2018. Landbird population trends in mountain and historical parks of the North Coast and Cascades Network: 2005–2016 synthesis. Natural Resource Report NPS/NCCN/NRR—2018/1673. National Park Service, Fort Collins, Colorado. [Available from the NPS Data Store at: <https://irma.nps.gov/DataStore/Reference/Profile/2253865>]
- Smith, A. T., E. A. Beever and **C. Ray**. 2018. *Ochotona princeps* (Richardson, 1828) American pika [species account]. In Smith, A. T., C. H. Johnston, P. C. Alves, and K. Hackländer. *Lagomorphs: Pikas, Rabbits, and Hares of the World*. Johns Hopkins University Press: Baltimore.
- Ray, C.**, J. F. Saracco, A. L. Holmgren, R. L. Wilkerson, R. B. Siegel, K. J. Jenkins, J. I. Ransom, P. J. Happe, J. R. Boetsch, and M. H. Huff. 2017. Recent stability of resident and migratory landbird populations in National Parks of the Pacific Northwest. *Ecosphere* 8(7)e01902. <http://dx.doi.org/10.1002/ecs2.1902>
- Ray, C.**, J. Saracco, K. Jenkins, M. Huff, P. Happe, and J. Ransom. 2017. Development of a robust analytical framework for assessing landbird population trends, dynamics and relationships with environmental covariates in the North Coast and Cascades Network. Natural Resource Report NPS/NCCN/NRR—2017/1483. National Park Service, Fort Collins, Colorado.
- Foley, P., T. Roth, J. Foley and **C. Ray**. 2017. Rodent-pika parasite spillover in western North America. *Journal of Medical Entomology* 54(5):1251–1257. <http://dx.doi.org/10.1093/jme/tjx085>
- Waterhouse, M., S., Bryson, C. Ray, L. Erb, J. Wilkening and M. Russello. 2017. Individual-based analysis of hair corticosterone reveals factors influencing chronic stress in the American pika. *Ecology and Evolution* 7(12):4099–4108. <http://dx.doi.org/10.1002/ece3.3009>
- Koju, N.P., K. He, M.K. Chalise, **C. Ray**, Z. Chen, B. Zhang, T. Wan, S. Chen and X. Jiang. 2016. Multilocus approaches reveal underestimated species diversity and inter-specific gene flow in pikas (*Ochotona*) from southwestern China. *Molecular Phylogenetics and Evolution* 107:239–245. <https://doi.org/10.1016/j.ympev.2016.11.005>
- Wilkening, J. L., and C. Ray. 2016. Characterizing predictors of survival in the American pika (*Ochotona princeps*). *Journal of Mammalogy* 97(5):1366–1375. <https://doi.org/10.1093/jmammal/gyw097>

- Ray, C.**, E. A. Beever and T. J. Rodhouse. 2016. Distribution of a climate-sensitive species at an interior range margin. *Ecosphere* 7(6):e01379. <http://dx.doi.org/10.1002/ecs2.1379>
- Castillo, J. A., C. W. Epps, M. R. Jeffress, **C. Ray**, T. J. Rodhouse and D. Schwalm. 2016. Replicated landscape genetic and network analyses reveal wide variation in functional connectivity for American pikas. *Ecological Applications* 26:1660-1676. <http://dx.doi.org/10.1890/15-1452.1>
- Schwalm, D., C. W. Epps, T. J. Rodhouse, W. B. Monahan, J. A. Castillo, **C. Ray** and M. R. Jeffress. 2016. Habitat availability and gene flow influence diverging local population trajectories under scenarios of climate change: a place-based approach. *Global Change Biology* 22(4):1572–1584. <http://dx.doi.org/10.1111/gcb.13189>
- Wilkening, J. L., **C. Ray** and J. Varner. 2016. When can we measure stress non-invasively? Post-deposition effects on a fecal stress metric confound a multi-regional assessment. *Ecology and Evolution* 6(2):502–513. <http://dx.doi.org/10.1002/ece3.1857>
- Bhattacharyya, S., and **C. Ray**. 2015. Of plants and pikas: evidence for a climate-mediated decline in forage and cache quality. *Plant Ecology & Diversity* 8(5-6):781–794. <http://dx.doi.org/10.1080/17550874.2015.1121520>
- Wilkening, J. L., **C. Ray**, N. Ramsay and K. Klingler. 2015. Alpine biodiversity and assisted migration: the case of the American pika (*Ochotona princeps*). *Biodiversity* 16(4):224–236. <http://dx.doi.org/10.1080/14888386.2015.1112304>
- Ray, C.**, D.M. McKnight, M.D. Bidwell, T. Fourment, C. Flanagan Pritz and A.H. Rinehart. 2015. Children’s book series and associated curricula support elementary education and outreach in water resources. *Plant Ecology and Diversity*, DOI: 10.1080/17550874.2015.1050711.
- Wilkening, J. L., and **C. Ray**. 2015. Parks, pikas, and physiological stress: implications for long-term monitoring of an NPS climate-sensitive sentinel species. *Park Science* 32(1):42–48. <https://www.researchgate.net/publication/282033306>
- Wilkening, J., **C. Ray** and J. Varner. 2015. Relating sub-surface ice features to physiological stress in a climate sensitive mammal, the American pika (*Ochotona princeps*). *PLoS ONE* 10(3):e0119327. doi:10.1371/journal.pone.0119327
- Ray, C.** and S. K. Collinge. 2014. Quantifying the dominance of local control and the sources of regional control in the assembly of a metacommunity. *Ecology* 95:2096–2108. <http://dx.doi.org/10.1890/13-0628.1>
- Erb, L. P., **C. Ray** and R. Guralnick. 2014. Determinants of pika population density versus occupancy in the Southern Rocky Mountains. *Ecological Applications* 24:429–435. <http://dx.doi.org/10.1890/13-1072.1>
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- Wilkening, J. L., **C. Ray** and K. L. Sweazea. 2013. Stress hormone concentration in Rocky Mountain populations of the American pika (*Ochotona princeps*). *Conservation Physiology* 1:cot027 (13 pp.). <http://dx.doi.org/10.1093/conphys/cot027>
- Jeffress, M. R., T. J. Rodhouse, **C. Ray**, S. Wolff and C. W. Epps. 2013. The idiosyncrasies of place: geographic variation in the climate-distribution relationships of the American pika. *Ecological Applications* 23:864–878. <http://dx.doi.org/10.1890/12-0979.1>
- Cuddington, K., M.-J. Fortin, L. R. Gerber, A. Hastings, A. Liebhold, M. O’Connor, and **C. Ray**. 2013. Process-based models are required to manage ecological systems in a changing world. *Ecosphere* 4:art20. <http://dx.doi.org/10.1890/ES12-00178.1>
- Ray, C.**, E. Beever and S. Loarie. 2012. Retreat of the American pika: up the mountain or into the void? Pages 245-270 in Brodie, J. F., E. Post and D. F. Doak (eds.) *Wildlife conservation in a changing climate*. University of Chicago Press. 416 pp.

- Sackett, L. C., T. B. Cross, R. T. Jones, W. Johnson, K. Ballare, C. Ray, S. Collinge, and A. P. Martin. 2012. Connectivity of prairie dog colonies in an altered landscape: inferences from analysis of microsatellite DNA variation. *Conservation Genetics* 13: 407–418. <http://dx.doi.org/10.1007/s10592-011-0293-yL> [LINK BROKEN].
- Garrett, L., M. Jeffress, M. Britten, C. Epps, C. Ray and S. Wolff. 2011. Pikas in peril: multiregional vulnerability assessment of a climate-sensitive sentinel species. *Park Science* 28:9–13.
- Guralnick, R., L. P. Erb and C. Ray. 2011. Mammalian distributional response to climatic change: A review and research prospectus. Pages 85-106 in E. A. Beever and J. Belant (eds.) *Ecological consequences of climate change: Mechanisms, conservation, and management*. CRC Press (Taylor and Francis Group). 302 pp.
- Collinge, S. K., C. Ray and F. Gerhardt. 2011. Long-term dynamics of biotic and abiotic resistance to exotic species invasion in restored vernal pool plant communities. *Ecological Applications* 21(6):2105–2118.
- Erb, L. P., C. Ray and R. Guralnick. 2011. On the generality of a climate-mediated shift in the range of the American pika (*Ochotona princeps*). *Ecology* 92: 1730–1735.
- Beever, E. A., C. Ray, J. L. Wilkening, P. W. Mote, and P. F. Brussard. 2011. Contemporary climate change alters the pace and drivers of extinction. *Global Change Biology* 17(6):1–17. DOI: 10.1111/j.1365-2486.2010.02389.x
- Wilkening, J. L., C. Ray, E. A. Beever, and P. F. Brussard. 2011. Modeling contemporary range retraction in Great Basin pikas (*Ochotona princeps*) using data on microclimate and microhabitat. *Quaternary International* 235:77–88.
- Johnson, T.L., J.F. Cully, Jr., S.K. Collinge, C. Ray, C. Frey and B. Sandercock. 2011. Spread of plague among black-tailed prairie dogs is associated with colony spatial characteristics. *Journal of Wildlife Management* 75(2):357–368
- Rodhouse, T. J., E. A. Beever, L. K. Garrett, K. M. Irvine, M. R. Jeffress, M. Munts, and C. Ray. 2010. Distribution of American pikas in a low-elevation lava landscape: conservation implications from the range periphery. *Journal of Mammalogy* 91:1287–1299.
- Cully, J. F. Jr., S. K. Collinge, R. E. VanNimwegen, C. Ray, W. C. Johnson, B. Thiagarajan, D. B. Conlin and B. Holmes. 2010. Spatial variation in keystone effects: small mammal diversity associated with black-tailed prairie dog colonies. *Ecography* 33:667–677. DOI: 10.1111/j.1600-0587.2009.05746.x
- Cully, J.F., Jr., T.L. Johnson, S.K. Collinge, and C. Ray. 2010. Disease limits populations: plague and black-tailed prairie dogs. *Vector-Borne and Zoonotic Diseases* 10(1):7-15.
- Beever, E. A., C. Ray, P. W. Mote, and J. L. Wilkening. 2010. Testing alternative models of climate-mediated extirpations. *Ecological Applications* 20:164–178.
- Torres-Pérez, F. L. Wilson, S. K. Collinge, H. Harmon, C. Ray, R. A. Medina, and B. Hjelle. 2010. Sin Nombre virus infection in field workers, Colorado, USA. *Emerging Infectious Diseases* 16:308–310. DOI: 10.3201/eid1602.090735
- Brinkerhoff, R. J., C. Ray, B. Thiagarajan, S. K. Collinge, J. F. Cully, Jr., B. Holmes and K. L. Gage. 2010. Prairie dog presence affects occurrence patterns of disease vectors on small mammals. *Ecography* 31:654–662. DOI: 10.1111/j.0906-7590.2008.05336.x
- Brinkerhoff, R. J., S. K. Collinge, Y. Bai, and C. Ray. 2009. Are carnivores universally good predictors of plague? *Vector-Borne and Zoonotic Diseases* 9(5):491-497. DOI: 10.1089/vbz.2008.0075.
- Collinge, S. K., and C. Ray. 2009. Transient patterns in the assembly of vernal pool plant communities. *Ecology* 90:3313–3323.
- Collinge, S. K., and C. Ray. 2009. Ecology and restoration of vernal pools: A ten-year study of plant community dynamics. Pages 281–290 in P. Fraga i Arguimbau (ed.) *International conference on mediterranean temporary ponds: Proceedings and abstracts*. Consell Insular de Menorca. Recerca 14. Mao, Menorca, Spain.

- Bai, Y., M. Y. Kosoy, **C. Ray**, R. J. Brinkerhoff and S. K. Collinge. 2008. Temporal and spatial patterns of *Bartonella* infection in black-tailed prairie dogs (*Cynomys ludovicianus*). *Microbiology Ecology* 56:373-382.
- Bai, Y., M. Kosoy, A. Martin, **C. Ray**, K. Sheff, L. Chalcraft and S. K. Collinge, 2008. Characterization of *Bartonella* strains isolated from black-tailed prairie dogs (*Cynomys ludovicianus*). *Vector-Borne and Zoonotic Diseases* 8:1-5.
- Collinge, S. K., **C. Ray** and J. F. Cully, Jr. 2008. Effects of disease on keystone species, dominant species, and their communities. *Pages* 129-144 in Ostfeld, Keesing and Eviner (eds.) *Infectious disease ecology*. Princeton University Press. 520 pp.
- Snäll, T., R. O'Hara, **C. Ray** and S. Collinge, 2008. Climate-driven spatial dynamics of plague among prairie dog colonies. *American Naturalist* 171:238-248.
- Ray, C.** and S. K. Collinge, 2007. Introducing the trophic vortex. (Invited letter.) *EcoHealth* 4:122-124.
- Bai, Y., M. Y. Kosoy, J. F. Cully Jr., B. Thiagarajan, **C. Ray** and S. K. Collinge. 2007. Acquisition of non-specific *Bartonella* strains by the northern grasshopper mouse (*Onychomys leucogaster*). *Microbiology Ecology* 61:438-448.
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- Collinge, S. K. and **C. Ray**, 2006. Community epidemiology. *Pp.* 1-5 in Collinge, S. K. and C. Ray (eds.), *Disease ecology: community structure and pathogen dynamics*. Oxford University Press, New York. 227 pp.
- Collinge, S. K., W. C. Johnson, **C. Ray**, R. Matchett, J. Grensten, J. F. Cully, Jr., K. L. Gage, M. Y. Kosoy, J. E. Loye and A. P. Martin, 2005b. Landscape structure and plague occurrence in black-tailed prairie dogs on grasslands of the western USA. *Landscape Ecology* 20:941-955.
- Collinge, S. K., W. C. Johnson, **C. Ray**, R. Matchett, J. Grensten, J. F. Cully, Jr., K. L. Gage, M. Y. Kosoy, J. E. Loye, and A. P. Martin, 2005a. Testing the generality of a trophic-cascade model for plague. *EcoHealth* 2:1-11.
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- Harrison, S. and **C. Ray**, 2002. Plant population viability and metapopulation-level processes. *Pp.* 109-122 in Beissinger, S. and D. McCullough (eds.), *Population viability analysis*. University of Chicago Press. 577 pp.
- Ray, C.**, 2001. Maintaining genetic diversity despite local extinctions: effects of population scale. *Biological Conservation* 100:3-14.
- Debinski, D. M., **Ray, C.** and E. H. Saveraid, 2001. Species diversity and the scale of the landscape mosaic: do scales of movement and patch size affect diversity? *Biological Conservation* 98:179-190.
- Peacock, M. and **C. Ray**, 2001. Dispersal in Pikas (*Ochotona princeps*): combining genetic and demographic approaches to reveal spatial and temporal patterns. *Pp.* 43-56 in Clobert et al. (eds.) *Dispersal: causes, consequences and mechanisms of dispersal at the individual, population and community level*. Oxford University Press. 480 pp.
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- Sjögren-Gulve, P. and **C. Ray**, 1996. Using logistic regression to model metapopulation dynamics: large-scale forestry extirpates the pool frog. *Pp.* 111-137 in D. R. McCullough (ed.), *Metapopulations and Wildlife Conservation & Management*. Island Press, Washington D.C.

- Ray, C.**, M. Gilpin, T. Philippi and C. Biehl, 1993. Modeling raven predation on the desert tortoise: a structured approach. *Pp.* 118-124 in Proceedings of the 1992 Desert Tortoise Council Symposium.
- Ray, C.**, M. Gilpin and A. T. Smith, 1991. The effect of conspecific attraction on metapopulation dynamics. *Pp.* 123-134 in Gilpin, M. and Hanski, I. (eds.) *Metapopulation Dynamics, Empirical and Theoretical Investigations*. Academic Press, London.

Edited volume

- Collinge, S. K. and **C. Ray**, 2006. *Disease ecology: community structure and pathogen dynamics*. Oxford University Press, New York. 227 pp.

Professional reports

- Ray, C.**, S. Albert, L. Schofield and J. Schillaci. 2021. Fort Bragg landbird monitoring program: report for the 2020 field season. The Institute for Bird Populations, Petaluma, CA.
- Kaschube, D. R., **C. Ray**, R. Taylor, S. Albert, R. Keith, B. Keith and J. Brenneman. 2021. An analysis of point count and demographic monitoring data from Fort Custer Training Center and the Kalamazoo Nature Center 1990-2019. The Institute for Bird Populations, Petaluma, CA.
- Kaschube, D.R., J.F. Saracco, **C. Ray**, and P. Pyle. 2020. Minimum estimated sample sizes to obtain reliable vital-rate estimates using Boreal MAPS data. The Institute for Bird Populations, Petaluma, CA.
- Ray, C.**, D.R. Cluck, R.L. Wilkerson, R.B. Siegel, A.M. White, G.L. Tarbill, S.C. Sawyer, and C.A. Howell. 2020. Chapter 9 - Woodboring beetle colonization of conifers killed by fire and bark beetles: implications for forest restoration and black-backed woodpecker conservation. In Potter, K.M., and B.L. Conkling, eds. Forest health monitoring: national status, trends, and analysis 2019. Gen. Tech. Rep. SRS-250. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 179-186.
- Albert, S., D. Kaschube, **C. Ray**, R. Taylor, and B. Carnes. 2020. Landbird monitoring at Fort AP Hill, Virginia: report for the 2019 field season. The Institute for Bird Populations, Petaluma, CA.
- Albert, S., **C. Ray**, J. Schillaci, and L. Schofield. 2020. Fort Bragg landbird monitoring program: report for the 2019 field season. The Institute for Bird Populations, Point Reyes Station, CA.
- Whipple A, Garrouette E, Mueller M, **Ray C**. 2019. Establishing capacity for long-term monitoring of the American pika, a sentinel species, by citizen scientists in Rocky Mountain National Park. Final report on University of Colorado FY18 NPS Task Agreement P18AC00585, December 30.
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- Beers, A., **C. Ray**, and T. J. Rodhouse. 2017. Final report: Developing a protocol for long-term population monitoring and habitat projections to track a sentinel of ecosystem change in Rocky Mountain National Park. Submitted to Rocky Mountain National Park in fulfillment of Task Agreement Number P16AC00704/UCOB-112, under Cooperative Agreement P14AC00749 between the United States Department of the Interior National Park Service and University of Colorado-Boulder Office of Contracts and Grants, 3100 Marine St., Boulder, CO 80309.
- Epps, C. W., D. Schwalm, J. Castillo, T. J. Rodhouse, M. Jeffress, and **C. Ray**. 2013. Analysis of proposed rock quarrying and trail improvement impacts on American pikas in Grand Teton National Park. Natural Resource Technical Report NPS/UCBN/NRTR—2013/756. National Park Service, Fort Collins, Colorado.
- Ray, C.** and E. Beever, 2007. Distribution and abundance of the American pika (*Ochotona princeps*) within Lava Beds National Monument. Submitted to US National Park Service, May 2007. 62 pp.

Ray, C., 2006. Species recovery plan for the black-footed ferret (*Mustela nigripes*): Revised and fully annotated outline. Submitted to US Fish and Wildlife Service, June 2006. 140 pp.

Data archived publicly

Whipple, A. and C. Ray. 2021. Subsurface Temperature Data from Seven Rock Glaciers in Rocky Mountain National Park and Niwot Ridge LTER, Colorado, USA, 2018-2019 ver 1. Environmental Data Initiative. Accessed 2021-08-19. <https://doi.org/10.6073/pasta/929e2f61cb0926cf58ebac09d187148f>.

Craighead, A. and C. Ray. 2021. Talus Subsurface and Surface Temperature Data from Southwestern Montana, USA, 2010-2020 ver 1. Environmental Data Initiative. Accessed 2021-08-18. <https://doi.org/10.6073/pasta/6f19d3e6e6bc609ad1aa57b853395f30>.

Ray, C. and Niwot Ridge LTER. 2021. Pika demography data for west knoll and Indian Peaks wilderness, 2008 - ongoing ver 4. Environmental Data Initiative. Accessed 2021-05-19. <https://doi.org/10.6073/pasta/0a786c99fe3d4e1dfb8c57424ce79091>.

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Package and software development

Chamberlain, S., C. Ray and Vijay Barve. c 2015. rvertnet: an R interface for the VertNet database.

<https://github.com/ropensci/rvertnet> and <https://cran.r-project.org/web/packages/rvertnet/rvertnet.pdf>

Ray, C., c 2000. POPNET: model of structured population dynamics, based on movement and survival patterns implied from demographic census data.

Ray, C. and G. Hoelzer, c 1999. VISCOUS: cellular automata model of genetic viscosity in spatially structured populations.

Ray, C., c 1996. BRYOGROW: spatially realistic (non-cellular) modeling of clonal growth, competition and integration (developed for study of bryozoans or lichens).

Ray, C., P. Sjogren-Gulve and M. Gilpin, c 1994. METAPO2: general software for modeling patch dynamics in heterogeneous and spatially explicit metapopulations.

Gilpin, M., C. Ray and C. Biehl, c 1989*. LESSON: self-instruction software for learning the True BASIC programming language. (*New version released by M. Gilpin, c 1990.)

Invited presentations (* indicates presenter)

Ray, C.*, R.M. Rochefort, J.I. Ransom, J.C.B. Nesmith, S.A. Haultain, T.D. Schaming, J.R. Boetsch, M.L. Holmgren, R.L. Wilkerson, R.B. Siegel. 2021. Assessing trends and vulnerabilities in the mutualism between whitebark pine and Clark's nutcracker in Sierra-Cascade national parks. Second Conference on the Research and Management of High Elevation Five Needle Pines in Western North America, Virtual, October 5-7.

Ray, C.* 2021. A long-term study by Chris Ray: fieldwork as my life. Betty Ford Alpine Gardens seminar series inspired by Hope Jahrens' book Lab Girl, Virtual, March 17.

Ray, C.* 2020. American pika: climatic influences on distribution throughout western North America. Betty Ford Alpine Gardens seminar series, Virtual, September 24.

Ray, C.*, A. Smith, J. Stewart, A. Whipple, et al., 2020. The little pika who could: lessons in biogeography of a model species. Southern Illinois University, Carbondale, Illinois. Departmental seminar, January 23.

(Invited presentations prior to 2020 omitted.)

Contributed Presentations (* indicates presenter; students underlined)

- Varner J*, Carnes-Douglas ZJ, Dearing MD, **Ray C.** 2021. Nutritional quality and overwinter preservation of pika winter diet over three decades of climate change. Oral presentation. American Society of Mammalogists. Virtual Conference.
- Whipple A*, **Ray C.** 2021. Keeping their cool: do pikas have lower stress-associated hormone levels in habitats with subsurface ice? Oral presentation. American Society of Mammalogists. Virtual Conference.
- Hill PJ*, Wasser M, **Ray C.** 2021. Range retraction in paradise: microclimatic controls on occupancy of core habitat for the American pika. Oral presentation. American Society of Mammalogists. Virtual Conference.
- Ray C**, Vidrio J. 2021. Long-term data reveal a severe decline in recruitment of the American pika on Niwot Ridge. Oral presentation. American Society of Mammalogists. Virtual Conference.
- Holtz S*, **Ray C.** 2020. Same pika, different story: how new genetic analyses offer a different perspective on populations as they respond to climate change. Poster, Annual Meeting of the Ecological Society of America, Virtual, August 3-6.
- Ray C***, Vidrio J. 2020. Trending pikas: what one population might say about its neighbors. Rocky Mountain National Park 2020 Biennial Research Conference, Estes Park, CO, March 10-11.
- Whipple A*, **Ray C.** 2020. Assessing habitat quality using stress measurements in American pika populations. Rocky Mountain National Park 2020 Biennial Research Conference, Estes Park, CO, March 10-11.
- Ray C***, Rochefort R, Ransom JI, Nesmith JCB, Haultain SA, Schaming TD, Boetsch J, Holmgren ML, Wilkerson R, Siegel R. 2020. Assessing vulnerabilities in the mutualism between whitebark pine and Clark's nutcracker in national parks of the Sierra-Cascade region. North American Congress for Conservation Biology, Virtual, July 26-31.
- Holtz S*, **Ray C.** 2020. Using RADseq to illuminate pika metapopulation structure. Poster, Rocky Mountain National Park 2020 Biennial Research Conference, Estes Park, CO, March 10-11.
- Ray C***, Rochefort R, Ransom JI, Nesmith JCB, Haultain SA, Schaming TD, Boetsch J, Holmgren ML, Wilkerson R, Siegel R. 2020. Assessing vulnerabilities in the mutualism between whitebark pine and Clark's nutcracker in national parks of the Sierra-Cascade region. 68th Annual Meeting of The Western Section of The Wildlife Society, Virtual, February 1-5.
- Ray C***, Cluck DR, Wilkerson RL, Siegel RB, White AM, Tarbill GL, Sawyer SC, Howell CA. 2020. Woodboring beetle colonization of conifers killed by bark beetles vs wildfire. USDA Forest Service Forest Health Monitoring Workshop, Raleigh, NC, February 24-27.

(Contributed presentations prior to 2020 omitted.)

Awards

2020 Rocky Mountain National Park Stewardship Award
2018 Denver Zoological Conservation Award (\$5K)

Honors

Graduated *Summa Cum Laude*, UC San Diego (1990)
Phi Beta Kappa and Caledonian honor society memberships (1990)
Judson Memorial and Sprague Memorial awards for excellence in journalism (1985)

Professional service and society memberships

Chris Ray

IUCN Lagomorph Specialist Group
Ecological Society of America
Society for Conservation Biology
500 Women Scientists
The Wildlife Society
American Society of Mammalogists
NSF Population and Community Ecology Panel (2010, 2011)

Student mentoring

Post-doctoral students (co-advisor)

Tord Snäll, Swedish University of Agricultural Sciences, 2005

Graduate students (co-advisor)

Airy González Peralta, Ph.D. X2024
Ashley Whipple, Masters 2019
Isabel Corona, Masters 2018
Jennifer Wilkening, Ph.D. 2014
Liesl Peterson Erb, Ph.D. 2013

Fulbright students (co-advisor)

Sabuj Bhattacharyya, Fulbright 2010

Undergraduate honors students (advisor)

Jane Hill, ENVS Honors 2021
Hilary Rinsland, Univ. of Richmond VA 2018
Emily Monk, EBIO Honors 2018
Max Wasser, EBIO Honors 2018
Lauren Benedict, Whitman College Honors 2017
Spencer Holtz, EBIO Honors 2016
Maxwell Plichta, EBIO Honors 2016
Meghan Wiebe, EBIO Honors 2015
James Howe Jr., ENVS Honors 2014

Undergraduate student research (supervisor or co-supervisor)

Crystal Gonzalez, RECCS Summer 2021
Patricia Jane Hill, BSI Scholar Winter/Spring 2020/2021
Patricia Jane Hill, BSI Scholar Summer 2020
Daniel D'Souza, RECCS Summer 2020
Claire Atkins, NSF RECCS Summer 2019
Airy González Peralta, Front Range Community College Spring 2019
Caitlin Stiltner, ENVS Spring 2019
Minyue Hu, ENVS Spring 2019
Haley Weaver, NSF REU Summer 2017
Emily Monk, UROP Summer 2017
Max Wasser, NSF REU Summer 2017

Hilary Rinsland, U Richmond Virginia Fellow Summer 2017
Lauren Benedict, NSF REU Summer 2016
Max Wasser, BURST Summer 2016
Jeremy Bonnell, ENVS Summer 2016
Spencer Holtz, UROP Summer 2015
Maxwell Plichta, NSF REU Summer 2015
Jasmine Vidrio, NSF REU Summer 2015
Hilary Brumberg, Wesleyan Fellowship Summer 2015
Max Wasser, UROP Summer 2015
Christian Prince, ENVS Internship Fall 2014, UROP Spring 2015
Maxwell Plichta, UROP Fall 2014
Meghan Wiebe, NSF REU Summer 2013, UROP Spring 2013
Taylor Stratton, NSF REU Summer 2013
James Howe Jr., BURST Summer 2013
Kacey Fitzgerald, UROP Summer 2013
Kayla Barton, EBIO Independent Study Spring 2013
Riley Stuckey, BURST Fall 2012
Sarah McLaughlin, NSF REU Summer 2012
Jessica Johnson, UROP Summer 2012
Brooke Regan, UROP Fall 2011
Gerardo Dillehay, NSF REU Summer 2011
Lindsey Nietmann, NSF REU Summer 2008
Phillip Wasz, NSF REU Summer 2008

Advisors

(Ph.D.) Alan Hastings, University of California, Davis
(M.A.) Michael Gilpin, University of California, San Diego (Retired)

Recent supervisors

Rodney Siegel (rsiegel@birdpop.org)
Director, Institute for Bird Populations, Petaluma, CA

Katharine Suding (Katharine.Suding@colorado.edu)
Professor of EE Biology, INSTAAR Associate and Lead Investigator for the Niwot Ridge LTER, University of Colorado, Boulder, CO