# Joshua D. Carrell

Dept. of Forest and Rangeland Stewardship
Warner College of Natural Resources
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## EDUCATION

**Bachelor of Science: Geospatial Computing** — April 2019
Brigham Young University – Idaho, Rexburg, Idaho

**Master of Science: Ecology** — May 2022
Minor: Climate Adaptation Science
Utah State University, Logan, Utah

**Doctor of Philosophy: Forest Sciences** — August 2022 – Present
Emphasis: Spatial Landscape Analysis
Colorado State University, Fort Collins, Colorado

## EXPERIENCE

**Graduate Research Assistant** — August 2022 - Present
Department of Forest and Rangeland Stewardship, Colorado State University — Hrs./Week: 20
1401 Campus Delivery
Fort Collins, Colorado 80523
Supervisor: Sarah J. Hart, Assistant Professor

- Developing a hierarchical Bayesian model to quantify the effects of climate variability and forecast subalpine forest growth.
- Analyzing growth-climate relationships, post-disturbance recovery, and defoliation dynamics in Douglas-fir across spatial scales and topographic wetness in the Colorado Front Range using GIS and Dendrochronology software.

**Instructor** — January 2024 – May 2024
Department of Forest and Rangeland Stewardship, Colorado State University — Hrs./Week: 20
1401 Campus Delivery
Fort Collins, Colorado 80523
Supervisor: Sarah Hart, Assistant Professor

- Lectured on contemporary issues in ecology to management of forest stands, disturbance regimes, and silvicultural treatments for approximately 90 undergraduate natural resource majors for Forestry 325, *Silviculture,* and Forestry 335, *Applications in Silviculture.*

**Environmental Sustainability Leader (Fellowship)** — August 2023 – May 2024
School of Global Environmental Sustainability, Colorado State University — Hrs./Week: 5
108 Johnson Hall
Fort Collins, Colorado 80523
Supervisor: Diana Wall, Professor

- Received innovative training to effectively communicate science to the media and public, professional development skills and techniques, and strategies to build careers that incorporate engagement and interdisciplinarity.

**Field Crew Lead** — June 2022 – August 2022
Institute of Arctic and Alpine Research, University of Boulder, Colorado — Hrs./Week: 40+
Campus Box 450
Boulder, Colorado 80309
Supervisor: Nancy Emory, Professor

- Surveyed, installed, and collected field data in long-term subalpine monitoring plots for radial growth, mortality, and disturbance agent at the Niwot Ridge Long-term Ecological Research station.

**Graduate Research Assistant** — January 2020 – June 2022
Department of Wildland Resources, Utah State University — Hrs./Week: 40
5230 Old Main Hill, NR 206
Logan, Utah 84322
Supervisor: Thomas C. Edwards, Research Ecologist (USGS)/Professor Emeritus

- Developed species distribution models (Random Forest, Generalized Linear and Additive, Bayesian Additive and Boosted Regression Trees) for avian and flowering plant species of concern in Utah.

- Collaborated with the Utah Department of Natural Resources and Wildlife Resources on the development of modeling and R programming tutorials for internal use.
- Developed spatially explicit conservation optimization models using Marxan systematic conservation planning software.
- Published peer-reviewed manuscript analyzing spatial and financial relationships among rare plant species conservation and oil and gas well-head production in the Colorado Plateau.

**Climate Adaptation Science Trainee (Fellowship)** August 2020 – May 2022
The Ecology Center, Utah State University Hrs./Week: 20
5205 Old Main Hill
Logan, Utah 84322
Supervisor: Nancy Huntly, Professor

- Led data-driven research on multiscale ecological niche modeling of tree species under climate change using R programming and Machine Learning algorithms. Manuscript published in *Frontiers in Ecology and Evolution*.

**Instructor of Record** January 2022 – May 2022
Quinney College of Natural Resources, Utah State University Hrs./Week: 30
5230 Old Main Hill, NR 206
Logan, Utah 84322
Supervisor: Shannon Belmont, Senior Lecturer

- Developed course curriculum, assignments, and tutorials for the graduate course, NR6950: Geospatial Analysis for Natural Resources as the instructor of record.
- Instructed 16 graduate students how to use the R programming language for spatial analysis, remote sensing, species distribution modeling, and data management.

**Graduate Teaching Assistant** August 2021 – Dec. 2021
Wildland Resources 3820: Forest Biology Hrs./Week: 20
Department of Wildland Resources, Utah State University
Supervisor: Jim Lutz, Professor

**Graduate Teaching Assistant** January 2021 – May 2021, January 2022 – May 2022
Wildland Resources 1800: Introduction to GIS Hrs./Week: 15
Department of Wildland Resources, Utah State University
5230 Old Main Hill, NR 206
Logan, Utah 84322
Supervisor: Douglas Ramsey, Professor

- Developed GIS course curriculum, supervised GIS laboratory hours, and graded assignments for undergraduate students in natural resources majors.

**Graduate Teaching Assistant** August 2019 – Dec. 2019
Geography 572: Geodatabase Design Hrs./Week: 10
Department of Geography, New Mexico State University
Supervisor: Michael DeMers, Professor

**Graduate Teaching Assistant**
Geography 578: Fundamental of Geographic Information Science August 2019 – Dec. 2019
Department of Geography, New Mexico State University Hrs./Week: 10
1525 Stewart St.
Las Cruces, New Mexico 88003
Supervisor: Michael DeMers, Professor

- Supervised department open GIS laboratory hours, graded student assignments, developed course curriculum using ESRI ArcGIS Pro software focused on spatial analysis and database management.

**Land Planning Analyst (Internship)** June 2019 – August 2019
Pacific Gas and Electric Company, Rapid Wildfire Review Team Hrs./Week: 40
5555 Florin Perkins Rd,
Sacramento, California 95826

- Developed ESRI Survey123 field audit for vegetation maintenance review projects.

**Geographic Information Systems Analyst (Internship)** May 2018 – August 2018
Freeport McMoRan Copper and Gold, Environmental Sciences Hrs./Week: 40
333 N Central Ave.
Phoenix, Arizona 85004

- Digitized hardcopy mineral resource maps in ESRI ArcGIS Pro for rare metal mining in the Southwestern U.S.
- Created water resources web application in ESRI ArcGIS Online for private use wells in Arizona.

**Geographic Information Systems Technician** February 2017 – Sept. 2017
Department of Public Works, Fremont County, Idaho Hrs./Week: 20
125 North Bridge, Suite #3
St. Anthony, Idaho 83445

- Used ArcGIS Pro to create a road characteristics workbook for County snow plowing maintenance.
- Created county emergency management map in ArcGIS Pro for public use during the 2017 Great American eclipse.

**Teaching Assistant** January 2017 – July 2017, January 2018 – April 2018
Geology 340: Introduction to GIS for Geoscientists Hrs./Week: 15
Department of Geology, Brigham Young University – Idaho
Supervisor: Julie Willis, Professor

**Teaching Assistant** September 2017 – Dec. 2018
Geology 341: Introduction to Mobile GPS and GIS Hrs./Week: 10
Department of Geology, Brigham Young University – Idaho
Supervisor: Mark Lovell, Professor

**Teaching Assistant** September 2017 – Dec. 2018
Geology 440: Advanced GIS and Remote Sensing Hrs./Week: 10
Department of Geology, Brigham Young University – Idaho
Supervisor: Mark Lovell, Professor

**Teaching Assistant** September 2017 – Dec. 2018
Science 201: Natural Disasters Hrs./Week: 10
Department of Geology, Brigham Young University – Idaho
Supervisor: Robert Clayton, Professor
10 East 2nd South, Romney #150
Rexburg, Idaho 83460

- Supervised GIS laboratory hours and graded assignments for undergraduate geology students.
- Developed natural resource-based GIS course curriculum using ESRI ArcGIS Pro software.

**Outdoor Education Counselor / Staff Manager** May 2015 – August 2016
Adventure for Youth Hrs./Week: 10-80+
1710 W 10000 N,
Tetonia, ID 83452

- Supervised groups of ~20 individuals weekly for 11 weeks and facilitated outdoor adventure activities.
- Hired, trained, and supervised 30+ student staff members in outdoor education, risk management, and leadership.

## PEER-REVIEWED PUBLICATIONS

2023 **Carrell JD**, Phinney AI, Mueller K, Bean B. Multiscale ecological niche modeling exhibits varying climate change impacts on habitat suitability of Madrean Pine-Oak trees. *Frontiers in Ecology and Evolution*. 2023, 11. https://doi.org/10.3389/fevo.2023.1086062

2022 **Carrell JD**, Hammill E, Edwards TC. Balancing Rare Species Conservation with Extractive Industries. *Land*. 2022; 11(11):2012. https://doi.org/10.3390/land11112012

## MAGEZINE ARTICLES

2023 **Carrell, J.D.** The Conflict between Rare Plant Conservation and Extractive Industries. *Aquilegia*. Volume 47 No. 3. Fall 2023. Colorado Native Plant Society.

## PRESENTATIONS

2023 **Carrell, J.D.** Your Modeling Choices Influence Ecological and Financial Outcomes. Colorado State University Graduate Student Showcase. Poster.

**Carrell, J.D.** Recruitment and tree growth limitations of subalpine trees under a shifting climate toward extended summer. All Niwot Long-term Ecological Research Spring Meeting. Oral Presentation.

**Carrell, J.D.** Species Distribution Modeling Algorithm Selection Facilitates Economic Costs in Conservation Planning Frameworks. 29th Annual Front Range Student Ecology Symposium. Poster.

2022 **Carrell, J.D.** Ecological Niche Modeling Under Climate Change at Multiple Spatial Scales. Colorado State University Graduate Student Showcase. Poster.

**Carrell, J.D.** Subalpine Forest field methods. Field-Intensive Research Emphasizing Diversity UP in the alpine (FIRED UP). University of Colorado Boulder, Mountain Research Station, 08/09 – 08/10. Invited Instructor.

2021 **Carrell, J.D.** If You Want to Go Far, Go Together: The Importance of Ensemble Species Distribution Models in Conservation Planning. 48th Quarterly Salt Lake GIS Users Group (SLUG) Meeting. Invited student speaker.

**Carrell, J.D.** An Introduction to the sf Package and Geospatial Analysis in R. The Ecology Center, Utah State University. Invited guest speaker: R programming and data science series. Workshop.

**Carrell, J.D.** Making Geography Cool Again: Perceptions of Geospatial Education and the Formation of TERRA: USU Geospatial Society. 29th Annual Utah Geographic Information Council Conference. Oral Presentation.

**Carrell J.D.** The Role of Species Distribution Modeling in Conservation Planning: A Look at Conserving Listed Flowering Plants in the Colorado Plateau. 29th Annual Utah Geographic Information Council Conference. Oral Presentation.

**Carrell J.D.**, Mueller K., Phinney A. Conserving the Future: Climate Change and Encinal Woodland Conservation in Colorado National Forest. Climate Adaptation Science & Management Policy Exchange, Utah State University. Oral Presentation.

2020 **Carrell J.D.**, Edwards TC. Species Distribution and Habitat Modeling: Developing Consistent Workflows for Sensitive Terrestrial Utah Species. Utah Cooperative Fish and Wildlife Research Unit Annual Meeting, Utah State University. Oral Presentation.

2019 **Carrell J.D.** Species Distribution Modeling of Arboreal Mammals in Oregon: Examining Effects of Climate Change on Red Tree Vole Distributions. Brigham Young University Idaho, Research & Creative Works Conference. Poster.

2017 **Carrell, J.D.** Small Bug Yields Large Impacts: Change Detection of Northern Colorado Forests and Quantifying Impacts of the Mountain Pine Beetle. Brigham Young University Idaho, Research & Creative Works Conference. Poster.

## VOLUNTEER EXPERIENCE

**Research Mentor** August 2022 – May 2023
Department of Ecosystem Science and Sustainability, Colorado State University Hrs./Week: 10
Skills for Undergraduate Participation in Ecological Research

- Mentored two undergraduate seniors in the development of a research project focusing on conservation biogeography, species distribution modeling and spatial modeling.

**Society President/Founder** May 2021 – May 2022
Geospatial Society, Utah State University Hrs./Week: 5+

- Created and presided over *TERRA*, geospatial society of Utah State University.
- Secured university funds, marketed society meetings, organized speaking events, and created society officer election system for future membership.

**Forest Entomology Intern** May 2021 – August 2021
USU Climate Adaptation Science / USDA Forest Service, Rocky Mountain Research Station Hrs./Week: 10
Mentor: Barbara Bentz, Research Entomologist

- Surveyed post-wildfire mortality and bark beetle presence in Caribou-Targhee National Forest.
- Surveyed Balsam Wooley Adelgid presence in Uinta-Wasatch National Forest.

## GRANTS AND SCHOLARSHIPS

2023 Understanding the Drivers of Variation in Subalpine Tree Recruitment and Growth Response to Warming Across a Topoclimatic Gradient. Hart SJ, Andrus R, **Carrell JD**, Chai R, Veblen TT.
Niwot Ridge Long-term Ecology Research VIII. $6,500

2022 GIS Scholarship.
Rocky Mountain Urban and Regional Information Systems Association $500

Professional Development Scholarship.
Colorado State University Graduate School $250

2021 Student Conference Scholarship.
Utah Geographic Information Council $585

## MEDIA ATTENTION

2022 Balancing mining activities with the survival of Utah's rare plants.
*Localtoday.news Utah News.*

New model allows for balancing rare plant protection and mine development.
*Mining.com*.

US FWS lists Tiehm's buckwheat as an endangered species: balancing resource extraction with survival of rare plants.
*greencarcongress.com.*

Mapping the Middle Ground: Balancing Mining Activities with Survival of Utah's Rare Plants.
*Utah State Today: Land & Environment*.

2019 Graduate Spotlight: Josh Carrell.
*BYU-Idaho Interdisciplinary Studies.*

## AWARDS

2023 Second Place, Graduate Poster Session
29th Annual Front Range Student Ecology Symposium

2022 Top Scholar, Warner College of Natural Resources
Graduate Student Showcase, Colorado State University

2019 Excellence in Research
Department of Geology, Brigham Young University – Idaho

2017 Best in Session, Poster Session
Research and Creative Works Conference, Brigham Young University – Idaho

## SKILLSET

Scientific Programming
- R (RStudio)
- Python (IntelliJ IDEA, Jupyter Notebook, ArcPy)

Geospatial Computing
- Species Distribution Modeling (Random Forest, Boosted Regression Trees, Maximum Entropy, GLMs, GAMs) - *R*
- Spatial Statistics (Point-Pattern Analysis, Regression, Autocorrelation, Interpolation) – *R, Python, ESRI ArcGIS Pro*
- Remote Sensing (Classification, Change Detection) – *Google Earth Engine, R, ESRI ArcGIS Pro*
- Data Management, manipulation, and visualization – *R, Python, ESRI ArcGIS Pro, SQL, GitHub*
- ESRI ArcGIS (ModelBuilder, Spatial Analyst, Geostatistical Wizard, Network Analysis, ArcGIS Online)

Statistical Analysis
- Regression (Linear, Multiple, Generalized Linear)
- Mixed Models (Generalized linear mixed effect, random effects)
- Hierarchical Bayesian (DAGs, JAGS, MCMC, multi-level models)

Language
- Portuguese (Advanced)