Cindy Libantino Norton

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Research Interest

Long-term goal is to understand natural systems through scientific research and provide products to aid in natural resource conservation and management. Specialize in using remote sensing and other geospatial data at different spatial scales for environmental research within reproducible and automated scripts.

Education

2023 – Present
University of Arizona, Tucson, Arizona – Doctor of Science Degree Major:
Natural Resources Studies

2017 – 2019
University of Arizona, Tucson, Arizona - Master of Science Degree Major:
Natural Resources Studies - Ecosystems Ecology.

2012 - 2016
University of Arizona, Tucson, Arizona - Bachelor of Science Degree
Major: Natural Resources: Conservation and Management of Wildlife
Minor: Geographic Information System (GIS) - Graduated: Diploma

2010 - 2014
Pima Community College, Tucson, Arizona - transfer credits

2006 - 2009
Sahuarita High School, Sahuarita, Arizona - High School Diploma - *Early Graduation Scholarship 2009*

Work Experience

1/21 - Present
Research Scientist III, University of Arizona - Mapping species specific woody vegetation cover for the USDA - Agricultural Research Service (ARS) - Southwest Watershed Research Center (SWRC) - Create and automate workflow. Tree ring and LiDAR data fusion for long-term volume estimates. Thermal camera for sapwood detection for species drought resilience. Grazing impacts on woody cover dynamics.

5/19 – Present
Photovoltaic Data Monitoring Technologist, Technicians for Sustainability - Utilize photovoltaic production data monitoring platforms, information technology and customer service

to assure fleet optimal performance, monitor solar savings and quantify environmental impact. Create script/functions and package in R to automate and optimize data monitoring tasks.

8/17 – 5/19
Graduate Research Assistant, University of Arizona - Google Earth Engine scripts to map agricultural active and fallow crops. Statistical analysis/linear regression/correlations of climate and agriculture productivity. Integrate field-based remote sensing and model data to improve understanding of vegetation growth and biophysical components.

6/17 – 8/17
Vegetation Management Crew - Internship - Saguaro National Park, National Park Service - *American Conservation Experience* - Restoration Ecology - Vegetation Management - Growth rate surveys, herbicide effect surveys, I.D. grasses, border impacts, saguaro monitoring, invasive species herbicide spraying and physical extraction.Higher elevations transects on monitoring and mapping forest health, cultural resources and species of interest. Aspen grove mapping. Community outreach table events.

8/16-12/16
Undergraduate Researcher - University of Arizona, *The Laboratory of Tree-Ring Research*, Valerie Trouet Lab - ORD Jet Stream Phenology Project - Researching phenology data of different plant species all over the world - Arizona Remote Sensing Center (ARCS) - GIS phenology and Jetstream mapping

2/16-6/16
Laboratory Technician - University of Arizona*, The Laboratory of Tree-Ring Research*, Valerie Trouet Lab - Master's Student, Amy Hudson; Past climate, forest ecosystems, and their interactions. Master's Student, Emma Williams, Fire Ecology - Fire and Restoration Ecology Laboratory Technician - Measuring the width of annual growth rings

05/15-10/15
Field Technician - University of Arizona, *School of Natural Resources and Environment*, Master's Student, Maria Altemus, Antelope Jackrabbit Research – Dr. John Koprowski – Conservation Research Laboratory - *Animal handling:* Assist with antelope jackrabbit capture (radio collar, tag and measure) *Telemetry:* Conduct VHF telemetry and collect GPS points for radio collared antelope jackrabbits *Camera traps:* Assist in set up and take down camera traps *Data Entry*: Organize and categorize images captured by motion sensor cameras. *Vegetation Surveys*: Studying, identifying, measuring and surveying native flora

Papers
Norton, C. L., Hartfield, K., Collins, C. D., van Leeuwen, W. J., & Metz, L. J. (2022). MultiTemporal LiDAR and Hyperspectral Data Fusion for Classification of Semi-Arid Woody Cover Species. Remote Sensing, 14(12), 2896. https://doi.org/10.3390/rs14122896

Hartfield, K., Gillan, J. K., **Norton, C. L**., Conley, C., & van Leeuwen, W. J. (2022). A Novel

Spectral Index to Identify Cacti in the Sonoran Desert at Multiple Scales Using Multi-Sensor Hyperspectral Data Acquisitions. Land, 11(6), 786. https://doi.org/10.3390/land11060786

Norton, C. L., Dannenberg, M. P., Yan, D., Wallace, C. S., Rodriguez, J. R., Munson, S. M., ... & Smith, W. K. (2021). Climate and socioeconomic factors drive irrigated agriculture dynamics in the lower Colorado river basin. Remote Sensing, 13(9), 1659. https://doi.org/10.3390/rs13091659

Conference and Presentations
12/12 – 16/22: American Geophysical Union Fall Meeting – Poster Session
11/16/22: YCEDA Desert Ag Research Symposium
11/05/22: Research Insights in Semiarid Ecosystems – Poster Session
08/30/22: Arizona Geographic Information Council Education and Training Symposium - Panelist
05/24 – 25/22: Arizona Geographic Information Council Spring Symposium – Presenter
12/10 – 14/18: American Geophysical Union Fall Meeting – Poster Session
10/16/18: Arid Lands Resource Sciences 50th Anniversary – Poster Session
10/20/18: Research Insights in Semiarid Ecosystems – Poster Session
05/14-18/18: MadCon Sky Island Alliance
08/15: JAM, AZ-NM Chapters of Wildlife Society and American Fisheries Society

Fellowships
2018 College of Agriculture and Life Sciences, Clifford W. Carstens, Jr. Endowment
2018 Southwest Climate Adaptation Science Center, Madrean Conference
2018 College of Agriculture and Life Sciences, Ervin H. Zube Scholarship
2018 College of Agriculture and Life Sciences, Dewhirst Student Award

Mentorship
Teach Summer Upward Bound GIS Class for High School Students - Summer 2021
Student Researchers
• Angie Chambers, UA, Spring 2021 – Spring 2022
• Seth Irwin, UA, Fall 2021 – Spring 2022

Skills
Lab: Remote sensing data processes, Tellervo-tree ring measurements, ArcGIS, Soils lab preparation

Field: Remote Pilot sUAS Rating, Leave No Trace Certification, Safety Course (SNP), GPS (Trimble), WFA, CPR, IACUC certification 4848529, 4x4 Vehicle, Clinometer, Tree Coring, Field Transects, Soil Sampling and identification, wildlife and vegetation ID, PIV Federal Background Check (on file NPS), Wildlife capture

Languages: R statistics, Python, Google Earth Engine, Tagalog (fluent)

Volunteer Experience

07/06/18 & 07/14/18 & 11/16/18
Tucson POD 500WS - *Spacefest IX STEM Event, Summer Science Saturday, Arizona STEM Adventure – Community outreach table*

8/27/17
University of Arizona, PhD Candidate, Martha Gebhard, Southwestern US shrub and grassland soil microbial community interactions and controls on plant growth through nutrient dynamics via microbial activities and abundance. Soil sample collections and litter measurement. Vegetation measurements: diameter and height. Use ASD Fieldspec to collect leaf reflectance and flew drone to gather high resolution images of sites

8/15-8/17
Independent Researcher: University of Arizona - "Geophagy's Function as a Possible Micronutrient Supplement by Antelope Jackrabbits - (Lepus alleni) in the Buenos Aires National Wildlife refuge" - Advisers: Monica Ramirez-Andreotta and John Koprowski. *Field work:* Collected soil samples from Buenos Aires National Wildlife Refuge *Lab work:* Prepping samples in Soils, Water and Environment lab, Sieving and placing in oven before sending to ALEC Labs *Written work:* Wrote proposal to get Advisor to fund lab work; Wrote a note for publication

10/3/15
University of Arizona, Master's Student, Brett Blum, Human Impacts on Bighorn sheep. Field Technician - *Field animal o*b*servation:* Field behavior observation on a group of Bighorn sheep. *Telemetry:* Conduct VHF telemetry and collect GPS points for radio collared antelope jackrabbits. *Camera traps:* Assist in set up and take down of camera traps

5/13/15
University of Arizona, PhD Candidate Sarah Hale, Prairie Dog Research - Vegetation impact survey

05/14-08/14
Saguaro National Park, Tucson, Arizona - Field and Outreach Volunteer
Saguaro Census: To keep track of the health of saguaros, information is gathered. Measurements include height using a clinometer, density of arms on one saguaro and number of cavity nests. *Frog Survey*: Hiked slowly to various tenajas and recorded the density of the different species of frogs. *Water Survey:* Hiked to various tenajas and measured the depth of the tenaja at the datum. Observed and noted the native fauna and flora within the tenajas. Gathered water samples and sent them to the lab. *Border Impacts:* Hiked line transects at a plot and counted the amount of trash and invasive native flora in each transect. *Outreach*: Participated in a Tucson Children's Museum outreach event

08/13-12/13

University of Arizona, Dr. David Christianson, Pronghorn Antelope Research Data entry intern
- Described and categorized wildlife camera photo

References
University of Arizona
- William Kolby Smith - Associate Professor, University of Arizona
  wksmith@email.arizona.edu
- Wim Van Leeuwen - Director, Arizona Remote Sensing Center
  leeuw@arizona.edu
- Chandra D Holifield Collins - Soil Scientist chandra.holifield@usda.gov

Technicians for Sustainability
- Nicole Koch – Co Owner – nicole@tfssolar.com
- Kevin Koch – Co Owner – kevin@tfssolar.com
- Mike Kanne – Co Owner – mike@tfssolar.com