

**Jeffrey K. Gillan, Ph.D.**  
**Remote Sensing Data Scientist**  
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## Education

- Ph.D. in Natural Resources/Remote Sensing, University of Arizona, 2019  
Dissertation: Rangeland Monitoring with unmanned aerial system imagery  
Advisor: Willem van Leeuwen, Ph.D.  
Committee Members: Mitch McClaran Ph.D., Steve Archer Ph.D., Jason Karl Ph.D.  
GPA: 4.0
- M.S. in Environmental Science, Certificate in GIS, University of Idaho, 2011  
Emphasis: geographic information systems, remote sensing, and wildlife habitat modeling  
Advisor: Eva Strand, Ph.D.  
Committee Members: Kerry Reese Ph.D., Raymond Dezzani Ph.D., Tamara Laninga Ph.D.,  
GPA: 4.0
- Honors B.S. in Park Management and Conservation, Kansas State University, 2005  
Secondary Major in Natural Resources of Environmental Science  
Minor in Business Administration  
GPA: 3.7  
Gamma Sigma Delta Agriculture Honor Society; Phi Kappa Phi Honors Society; Golden Key

## Technical Skills

- Unmanned Aerial Imagery for Natural Resource Applications: Mission Planning, Image Acquisition, Soft-copy photogrammetric processing, 2D and 3D image analysis methods to measure vegetation, soil, and habitat characteristics
- Rangeland vegetation and soil field methods for monitoring land health
- Knowledge of machine learning image analysis algorithms for object-oriented and pixel-based imagery products
- Software knowledge: R statistics, Pix4D, Erdas Imagine & LPS, Agisoft Metashape, ArcMap & ArcGIS Pro, Exelis ENVI, Open Drone Map, QGIS, CloudCompare, Adobe Creative Suite, Google Earth Engine, PDAL, GDAL, Git and Github, Docker
- Languages: R, Python, some html, Javascript, markdown
- Using high performance computing (HPC) and container environments for big-data analysis and archival
- Total Station Surveying/RTK GPS Surveying/Terrestrial Laser Scanning

## Certifications

- Remote Pilot sUAS Rating – 2017 to present (500+ flying hours)

## Work Experience

**Data Scientist III** - University of Arizona, Bio5 Institute

Sept. 2022-Present

- Trained scientists to use cloud computing resources and deploy cyber infrastructure using Cyverse and Jetstream 2
- Led educational workshops on: 1. Open Science Skills, 2. AI LLMs, 3. Cloud Native Geospatial

- Developed drone imagery processing pipelines using containerized software on cloud resources
- Led open science fellowship program for 10 Phd students across multiple science disciplines

**Data Scientist III & Drone Pilot** – University of Arizona, School of Natural Resources & Environment

Feb. 2019-Aug. 2022

- Led research on drone-mounted hyperspectral/LiDAR imagery for dryland vegetation species productivity and identification
- Led multi-scale remote sensing project (drone, aerial LiDAR, satellite) to thematically map time-series of wildfire vegetation change in Coronado National Forest, AZ
- Led multi-scale remote sensing project (drone, aerial LiDAR & imagery) to map vegetation time-series along Santa Cruz River, AZ.
- Lead instructor of 3 credit university course on UAS mapping of natural resources
- Used drone and aerial LiDAR point clouds to assess fire risk to homes adjacent to Santa Fe National Forest, New Mexico
- Developed terrestrial LiDAR processing workflow to calculate biomass/carbon for individual trees
- Developed method of using close-range photogrammetry to estimate plot-scale vegetation structure
- Supervised and mentored a student employee

**Graduate Research Asst.** - Arizona Remote Sensing Center, University of Arizona

Sept. 2017 – May 2018

- Led unmanned aerial imagery projects related to pecan orchard disease, wetland restoration, dryland geomorphology, and invasive species mapping
- Processed and interpreted airborne hyperspectral, LiDAR, Landsat, and PlanetScope imagery

**Asst. Professor/Geospatial Specialist**- New Mexico State University/USDA-ARS Jornada Experimental Range

March 2011-Sept. 2017

- Researched high-resolution aerial photography from manned and unmanned platforms to map and monitor vegetation, soil erosion, and surface hydrology in dryland ecosystems
- Developed remote sensing monitoring methods for Bureau of Land Management's Assessment, Inventory and Monitoring (AIM) national program
- Developed and managed science websites:
  - landscapetoolbox.org* : A platform for knowledge exchange for field, remote sensing, and statistical methods
  - journalmap.org*: A science literature search engine that empowers scientists to find research based on topic, location, and ecological context
- Managed 5 student employees

**GIS Technician** – Yellowstone National Park, National Park Service

June 2010-Sept. 2010; GS-5 STEP

- Developed bison pasture monitoring program using satellite imagery (MODIS)
- Updated remotely sensed land cover maps using fire history
- Managed GIS databases and created maps for park projects including comprehensive planning and biological inventories
- Attributed geospatial product metadata using Federal Geographic Data Committee standards

**Graduate Research Asst.** – University of Idaho Department of Rangeland Ecology and Management  
June 2008 – Jan. 2011

- Researched and wrote sage-grouse habitat guide book for Idaho landowners
- Worked with BLM, Idaho Fish and Game, U.S. Fish and Wildlife Service, ranchers, and other stakeholders to complete the book

**Contract Technical Writer** – The Nature Conservancy  
Sept. 2009 – Feb. 2010

- Wrote web content related remote sensing methods, rangeland ecology, and wildlife habitat

**Geographic Information Specialist, Intern** – National Park Service, Petersburg National Battlefield  
Dec. 2007 – May 2008

- Managed geodatabase of invasive flora, earthworks, utilities, and other park data
- Created maps for park projects
- Collected field data with GPS unit
- Attributed geospatial product metadata using Federal Geographic Data Committee standards

**Botany/Biology Field Technician** - National Park Service, Whiskeytown National Recreation Area  
Sept. 2006-Nov. 2006

- Managed exotic plant species using hand tools, power tools, and chemical agents
- Mapped and managed spatial data with GPS and GIS technology

**Prairie Ecology Research Assistant** – Konza Prairie, The Nature Conservancy and Kansas State University  
July –Aug. 2003

- Gathered vegetation field data on plant pathogens at varying fire intervals
- Installed vegetation plots
- Organized data on computer spreadsheets

### **Aerial Photography Contract and Collaborative Work**

Riparian Vegetation Mapping, Palo Verde Ecological Reserve, CA, April & Oct. 2021

Watershed mapping and delineation, Santa Rita Experimental Range, August 2020

Woody plant encroachment, Walnut Gulch Experimental Watershed, Oct. 2019

Pecan orchard health study, San Simon, AZ, Oct. 2017

Geomorphic research, Walnut Gulch Experimental Watershed, Sept. 2017

Woody plant establishment, Santa Rita Experimental Range, August 2017

Squirrel surveying, Santa Rita Experimental Range, April 2017

Wetland restoration, Cibola National Wildlife Refuge, March 2017, 2018

Post-fire monitoring, Santa Rita Experimental Range, March 2017

Photogrammetric modeling of biological soil crust and erosion, Bandelier National Monument, May 2015, 2016

## Publications

Ponce-Campos, G.E., M. McClaran, P. Heilman, & **J.K. Gillan**. 2023. UAV and satellite-based sensing to map ecological states at the landscape scale. *Open Journal of Ecology*, 13(8). DOI: 10.4236/oje.2023.138035.

Hartfield, K., **J.K. Gillan**, C.L. Norton, C. Conley, & W.J.D. van Leeuwen. 2022. A novel spectral index to identify cacti in the Sonoran desert at multiple scales using multi-sensor hyperspectral data acquisitions. *Land* 11, 786. DOI: 10.3390/land11060786

**Gillan, J.K.**, G. Ponce-Campos, T.L. Swetnam, A. Gorlier, M.P. McClaran, & P. Heilman. 2021. Innovations to expand drone data collection and analysis for rangeland monitoring. *Ecosphere*, 12(7). DOI: 10.1002/ecs2.3649

Hartfield, K., W.J.D. van Leeuwen, and **J.K. Gillan**. 2020. Remotely Sensed Changes in Vegetation Cover Distribution and Groundwater along the Lower Gila River. *Land*, 9(9), 326. DOI: 10.3390/land9090326

**Gillan, J.K.**, J.W. Karl, W.J.D. van Leeuwen. 2020. Integrating drone imagery with existing rangeland monitoring programs. *Environmental Monitoring and Assessment* 192(5). DOI: 10.1007/s10661-020-8216-3

**Gillan, J.K.**, M.P. McClaran, T.L. Swetnam, & P. Heilman. 2019. Estimating forage utilization with drone-based photogrammetric point clouds. *Rangeland Ecology and Management*, 72(4), 575-585. DOI: 10.1016/j.rama.2019.02.009.

Swetnam, T.L., **J.K. Gillan**, T.T. Sankey, M. McClaran, M. Nichols, P. Heilman, and J. Mcvay. 2017. Considerations for achieving cross-platform point cloud data fusion across different dryland ecosystem structural states. *Frontiers in Plant Science*. doi: 10.3389/fpls.2017.02144

**Gillan, J.K.**, J.W. Karl. And M.C. Duniway. 2017. High-resolution repeat topographic surveying of dryland landscapes using UAS-based structure-from-motion photogrammetry: assessing accuracy and precision against traditional ground-based erosion measurement. *Remote Sensing* 9(5), 437. DOI: 10.3390/rs9050437

**Gillan, J.K.**, J.W. Karl, N.N. Barger, A. Elaksher, and M. Duniway. 2016. Spatially explicit rangeland erosion monitoring using high-resolution digital aerial imagery. *Rangeland Ecology and Management*, 69, 95-107. DOI: 10.1016/j.rama.2015.10.012.

**Gillan, J.K.**, J.W. Karl, M. Duniway, and A. Elaksher. 2014. Modeling Vegetation Heights from High Resolution Stereo Aerial Photography: An Application for Broad-Scale Rangeland Monitoring. *Environmental Management* 144: 226-235. DOI: 10.1016/j.jenvman.2014.05.028

Browning, D. M., J. Franklin, S. R. Archer, **J. K. Gillan** and D. P. Guertin. 2014. Spatial pattern of grassland-shrubland state transitions: a 74 year record on grazed and protected areas. *Ecological Applications* 24: 1421-1433. DOI: 10.1890/13-2033.1

Karl, J. W., **J. K. Gillan**, N. N. Barger, J. E. Herrick, and M. Duniway. 2014. Interpretation of high-resolution imagery for detecting vegetation cover composition change after fuels reduction treatments in woodlands. *Ecological Indicators* 45: 570-578.

**Gillan, J.K.**, E. K. Strand, J. W. Karl, K. P. Reese, and T. Laninga. 2013. Using spatial statistics and point pattern simulations to assess the spatial dependency between greater sage-grouse and anthropogenic features. *Wildlife Society Bulletin* (37) 2: 301-310. DOI: 10.1002/wsb.272

Karl, J.W., J.E. Herrick, R. S. Unnasch, **J.K. Gillan**, E.C. Ellis, W.G. Lutters, and L. J. Martin (2013). Geo-semantic searching: discovering ecologically-relevant knowledge from published studies. *Bioscience* (63)8: 674-682. DOI:10.1525/bio.2013.63.8

Karl, J. W., **J.K. Gillan**, and J. E. Herrick (2013). Geographic searching for ecological studies: a new frontier. *Trends in Ecology and Evolution* (28)7: 383-384. DOI: 10.1016/j.tree.2013.05.001

University of Oregon Geography Department (2012) *Atlas of Yellowstone*. University of California Press. Contributing author on sagebrush steppe chapter that included Sage-grouse distribution modeling.

**Gillan, J. K.** and E. K. Strand. 2010 (version 1), 2017 (version 2). *Sage-grouse Habitat in Idaho: A Practical Guide for Land Owners and Managers*. University of Idaho Department of Rangeland Ecology and Management.

## Professional Presentations

### *Intro to cloud native geospatial*

Presentation - Arizona Geographic Information Council Symposium  
Prescott, AZ, Aug. 2023

### *Make your drone imagery open and cloud native*

Invited talk - International Association of Landscape Ecology North America  
Riverside, CA, March 2023

### *Remote Sensing for Land and Resource Management, Tucson Arizona*

Invited talk – Arizona Geographic Information Council, Prescott, AZ, May 2022

### *Rangeland Drones: Latest Innovations and Next Steps*

Presentation – Society for Range Management conference, virtual, Feb. 2021

### *Enhancing rangeland monitoring with unmanned aerial systems*

Symposium – Society for Range Management conference, Denver, CO, Feb. 2020

### *Rangeland Monitoring with unmanned aerial system imagery*

Presentation – Dissertation defense, Tucson, AZ, April 15, 2019

### *Rangeland Monitoring with Drone Imagery*

Presentation – Hereford & Whitewater Draw Natural Resource Conservation Districts, Douglas, AZ, Feb. 25, 2019

### *Estimating Forage Utilization with Drone-based 3D imagery*

Presentation – Society for Range Management conference, Reno, NV, Jan. 2018

### *Estimating Forage Utilization with Drone Imagery*

Poster – University of Arizona GIDP Student Showcase, Dec. 2017

### *Rangeland Monitoring with Drone-based 3D Imagery*

Presentation – University of Arizona GIS day, Nov. 2017

### *Estimating Forage Utilization with Unmanned Aerial Imagery (2<sup>nd</sup> place award)*

Poster – Research Insights in Semi-Arid Environments, Tucson, AZ, Oct. 2017

### *Extensifying Rangeland Monitoring with Unmanned Aircraft Systems (2<sup>nd</sup> place award)*

Poster – University of Arizona Earth week Graduate Student Showcase, March 2017

*Using small unmanned aircraft to monitor public rangeland ecosystems*

Poster - Achievement Reward for College Scientists Banquet, Phoenix, AZ, April 2016

*Aerial Photogrammetry Referencing: Producing Accurate Imagery Products from your drone*

Poster – University of Arizona Graduate Interdisciplinary Degree Program Showcase, December 2015

*Protocols for Vegetation and Habitat Monitoring with Unmanned Aerial Vehicles*

Presentation – Ecological Society of America meeting, Baltimore, MD, August 2015

*Leveraging the Where of Ecological Research: Lessons from JournalMap*

Ignite Presentation – Ecological Society of America meeting, Baltimore, MD, August 2015

*Aerial Photogrammetry Control: Producing Accurate Image Products from your Drone*

Poster – Ecological Society of America meeting, Baltimore, MD, August 2015

*Monitoring rangeland soil erosion from a Unmanned Aerial System*

Presentation – American Society for Photogrammetry and Remote Sensing Pecora Symposium, Denver, CO, November 2014

*Monitoring rangeland soil erosion from an Unmanned Aerial System*

Presentation – Southwest Association of American Geographers meeting, Albuquerque, NM, October 2014

*Using JournalMap to improve ecological knowledge discovery and visualization*

Poster – Ecological Society of America Conference, Sacramento, CA, August 2014

<http://fl1000.com/posters/browse/summary/1096636>

*Modeling Rangeland Soil Erosion with High-Resolution Aerial Photogrammetry*

Poster – Ecological Society of American Conference, Minneapolis, MN, August 2013

<http://fl1000.com/posters/browse/summary/1094146>

*Modeling Vegetation Heights from High Resolution Stereo Aerial Photography: An Application for Broad-Scale Rangeland Monitoring*

Presentation – Society for Range Management conference, Oklahoma City, OK, February 2013

*JournalMap: Discovering Ecologically-Relevant Knowledge from Published Studies*

Poster – Southwest Association of American Geographers meeting, Las Cruces, NM, October 2012

*Modeling Vegetation Heights from High Resolution Stereo Aerial Photography: An Application for Broad-Scale Rangeland Monitoring*

Presentation – Southwest Association of American Geographers meeting, Las Cruces, NM, October 2012

*JournalMap: Discovering Ecologically-Relevant Knowledge from Published Studies*

Poster – Ecological Society of America conference, Portland, Oregon, August 2012

*JournalMap: Harness the Power of Geography to Find Relevant Ecological Research*

Poster – International Dryland Symposium, Las Cruces, NM, July 2012

*Deriving Vegetation Heights from High Resolution Stereo-Pair Aerial Photography: An Application for Broad-Scale Rangeland Monitoring*

Poster – Society for Range Management Conference, Spokane, Washington, January 2012

### Professional Journal Reviewer

Elsevier - *Remote Sensing of the Environment*; *Ecological Engineering*; *Rangelands*

IEEE - *Journal of selected topics in applied earth observation and remote sensing*

MDPI – *Forestry*; *Remote Sensing*; *Sensors*

ESA – *Ecosphere*

*International Journal of Plant Sciences*

*Methods in Ecology and Evolution*

*Journal of Geophysical Research - Biogeosciences*

### Teaching

2023 Foundational Open Science Skills, University of Arizona; Co-Instructor

Intro to chatGPT and Large Language Models

Intro to Cloud Native Geospatial

2022 UAS mapping for Natural Resources, University of Arizona; Lead-Instructor

2021 UAS mapping for Natural Resources; University of Arizona; Co-Instructor

2020 UAS mapping for Natural Resources; University of Arizona; Guest Lecturer

Seminar for Ag and Biosystems Engineering; University of Arizona; Guest Lecturer

2018 Natural Resource Mapping; University of Arizona; Guest Lecturer

2015 Seminar for Survey Engineering; New Mexico State University; Guest Lecturer

### Awards

Midwest Regional Award for Notable Technology Development by the US Federal Labs Consortium for JournalMap.org

### Press Coverage

“The Potential of Drones”, Daniel Stolte, University of Arizona LoQue Pasa. Nov. 27, 2019.

“Researchers use aerial modeling to track soil erosion”, Kristen Sullivan, Las Cruces Sun-News. May 11, 2015.

### Grants and Fellowships

Year	Granting Agency	Type	Name	Role	Amount \$
2023	Agricultural Genome to Phenome Initiative (AG2PI)	seed grant	Open-source online platform for UAS high throughput phenotyping data management	Co-Principal Investigator	\$178,684
2021-2022	Pima County Regional Flood Control District	research grant	Supporting restoration of the Santa Cruz River in Tucson, AZ, with remotely sensed mapping and monitoring of vegetation	Principal Investigator	\$46,599
2020-2021	Pima County Regional Flood Control District	research grant	Assessing watershed impacts of Bighorn Fire	Co-Principal Investigator	\$77,762

2016-2017	Achievement Reward for College Scientists	Ph.D fellowship			
2015-2016	University of Arizona Fellows	Ph.D fellowship			

### **Professional Development**

ASPRS UAS Conference

Palm Spring, CA, September 2016

Responsible Conduct of Research (Spring 2016)

Introduction to the Responsible Conduct of Research: 1.5 hrs

The Ethics of Mentoring: 1.5 hrs

The Ethics of Authorship and Publication: 1.5 hrs

The Ethics of Peer Review: 1.5 hrs

Introduction to Data Acquisition, ownership, and management: 1.5 hrs

Interpreting and Measuring Indicators of Rangeland Health workshop (NRCS, USGS, BLM, ARS)

Las Vegas, Nevada, May 2011

Ecological Site workshop (USDA-ARS)

Society for Range Management Conference, Spokane, Washington, January 2012

Photogrammetric Processing: Surface Model and Orthophotography workshop

ASPRS Conference, Sacramento, California, March 2012

Airborne GPS and Inertia in Support of Triangulation and Orientation of Airborne Framing and Pushbroom Sensors

Workshop. ASPRS Conference, Sacramento, California, March 2012

### **Professional References**

Mitchell P. McClaran, Ph.D.

Professor – University of Arizona; Director – Arizona Experiment Station

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Phil Heilman, Ph.D.

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Jason Karl, Ph.D.

Associate Professor – University of Idaho

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