Jeffrey K. Gillan, Ph.D.

Remote Sensing Data Scientist

jgillan@arizona.edu | www.gillanscience.com

Education

Ph.D. in Natural Resources/Remote Sensing | University of Arizona | 2019
Dissertation: *Rangeland Monitoring with unmanned aerial system imagery*

M.S. in Environmental Science | University of Idaho | 2011
GIS Certificate
Thesis: *The influence of man-made features on the presence of greater sage-grouse*

Honors B.S. in Park Management and Conservation | Kansas State University | 2005
Secondary Major in Natural Resources of Environmental Science
Minor in Business Administration

Work Experience

Data Scientist III - Cyverse & Data Science Institute **|** University of Arizona
Sept. 2022-Present

Research

- Open-source online platform for UAS high throughput phenotyping data management
- High-resolution aerial forest mapping infrastructure and database to support forest and disturbance ecology research
- FACTS: A scalable cyber ecosystem for acquisition, curation, and analysis of multispectral UAV image data

Teaching & Training

- Instructed workshops: Open Science Skills | Cloud Native Geospatial | AI Tools
- Trained scientists to use cloud computing resources and deploy cyber infrastructure
- Lead educator for graduate student fellowship (Roots for Resilience)

Data Scientist III & Drone Pilot – School of Natural Resources & Environment | University of Arizona
Feb. 2019 - Aug. 2022

Research

- Led multi-scale remote sensing projects (drone, aerial LiDAR, satellite) to map time-series of forest and riparian vegetation change
- Researched hyperspectral/LiDAR imagery for dryland vegetation species productivity and identification
- Developed terrestrial LiDAR workflow to estimate individual tree biomass
- Developed close-range photogrammetry method for plot-scale vegetation structure
- Deployed drone and aerial LiDAR for assessing fire risk of homes in wildland/urban interface

Teaching and Mentoring

- Lead instructor of 3 credit university course on UAS mapping of natural resources
- Supervised and mentored a student employee

Graduate Research Asst. - Arizona Remote Sensing Center | University of Arizona
Sept. 2017 - May 2018

Research

- 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

Research

- 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* | *journalmap.org*

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

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

- Wrote sage-grouse habitat guide book for Idaho landowners in partnership with BLM, Idaho Fish and Game, U.S. Fish and Wildlife Service, and landowners

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

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

GIS Specialist, Intern – Petersburg National Battlefield | National Park Service
Dec. 2007 – May 2008

- Managed geodatabase of invasive flora, earthworks, utilities, and other park data
- Created GIS maps for park projects
- Collected field data with GPS unit

Aerial Mapping Contract and Collaborative Work

Riparian Vegetation Mapping | Palo Verde Ecological Reserve, CA | 2021
Watershed mapping and delineation | Santa Rita Experimental Range, AZ | 2020
Woody plant encroachment | Walnut Gulch Experimental Watershed, AZ | 2019
Pecan orchard health study |San Simon, AZ | 2017
Geomorphic research | Walnut Gulch Experimental Watershed, AZ | 2017
Woody plant establishment | Santa Rita Experimental Range, AZ | 2017
Squirrel surveying | Santa Rita Experimental Range | 2017
Wetland restoration | Cibola National Wildlife Refuge, CA | 2017-2018
Post-fire monitoring | Santa Rita Experimental Range | 2017
Biological soil crust and erosion | Bandelier National Monument, NM | 2015-2016

Certifications

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

Grants and Fellowships

Year	Granting Agency	Type	Name	Role	Amount $
2023	Agricultural Genome to Phenome Initiative (AG2PI)	seed grand	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			

Publications

Swetnam, T.L., et al. (*In Review*) Cyverse: Cyberinfrastructure for Open Science. bioRxiv 2023.06.16.545223; DOI: 101101/2023.06.16.545223

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 |Arizona Geographic Information Council Symposium | Prescott, AZ | 2023

Make your drone imagery open and cloud native | International Association of Landscape Ecology North America Riverside, CA | 2023

Remote Sensing for Land and Resource Management, Tucson Arizona | Arizona Geographic Information Council Prescott, AZ | 2022

Rangeland Drones: Latest Innovations and Next Steps | Society for Range Management | 2021

Enhancing rangeland monitoring with unmanned aerial systems | Society for Range Management | Denver, CO | 2020

Rangeland Monitoring with unmanned aerial system imagery | Dissertation defense, Tucson, AZ | 2019

Rangeland Monitoring with Drone Imagery | Hereford & Whitewater Draw Natural Resource Conservation Districts, Douglas, AZ | 2019

Estimating Forage Utilization with Drone-based 3D imagery | Society for Range Management |, Reno, NV | 2018

Estimating Forage Utilization with Drone Imagery | University of Arizona GIDP Student Showcase | 2017

Rangeland Monitoring with Drone-based 3D Imagery | University of Arizona GIS Day | 2017

Estimating Forage Utilization with Unmanned Aerial Imagery (2nd place award) | Research Insights in Semi-Arid Environments, Tucson, AZ | 2017

Extensifying Rangeland Monitoring with Unmanned Aircraft Systems (2nd place award) | University of Arizona Earth Week Graduate Student Showcase | 2017

Using small unmanned aircraft to monitor public rangeland ecosystems | Achievement Reward for College Scientists Phoenix, AZ | 2016

Aerial Photogrammetry Referencing: Producing Accurate Imagery Products from your drone | University of Arizona Graduate Interdisciplinary Degree Program Showcase | 2015

Protocols for Vegetation and Habitat Monitoring with Unmanned Aerial Vehicles | Ecological Society of America | Baltimore, MD | 2015

Leveraging the Where of Ecological Research: Lessons from JournalMap | Ecological Society of America | Baltimore, MD | 2015

Aerial Photogrammetry Control: Producing Accurate Image Products from your Drone | Ecological Society of America | Baltimore, MD | 2015

Monitoring rangeland soil erosion from a Unmanned Aerial System | American Society for Photogrammetry and Remote Sensing Pecora Symposium | Denver, CO | 2014

Monitoring rangeland soil erosion from an Unmanned Aerial System | Southwest Association of American Geographers meeting | Albuquerque, NM | 2014

Using JournalMap to improve ecological knowledge discovery and visualization | Ecological Society of America Conference Sacramento, CA | 2014

Modeling Rangeland Soil Erosion with High-Resolution Aerial Photogrammetry | Ecological Society of American | Minneapolis, MN | 2013

Modeling Vegetation Heights from High Resolution Stereo Aerial Photography: An Application for Broad-Scale Rangeland Monitoring | Society for Range Management | Oklahoma City, OK | 2013

JournalMap: Discovering Ecologically-Relevant Knowledge from Published Studies | Southwest Association of American Geographers | Las Cruces, NM | 2012

Modeling Vegetation Heights from High Resolution Stereo Aerial Photography: An Application for Broad-Scale Rangeland Monitoring | Southwest Association of American Geographers | Las Cruces, NM | 2012

JournalMap: Discovering Ecologically-Relevant Knowledge from Published Studies | Ecological Society of America | Portland, Oregon | 2012

JournalMap: Harness the Power of Geography to Find Relevant Ecological Research | International Dryland Symposium | Las Cruces, NM | 2012

Deriving Vegetation Heights from High Resolution Stereo-Pair Aerial Photography: An Application for Broad-Scale Rangeland Monitoring | Society for Range Management | Spokane, Washington | 2012

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

Peer-Review

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

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.

Professional References

Tyson Swetnam, Ph.D.
Associate Research Professor - University of Arizona
tswetnam@arizona.edu
520-247-2293

Mitchell P. McClaran, Ph.D.
Professor – University of Arizona; Director – Arizona Experiment Station
mcclaran@arizona.edu
520-621-1673

Phil Heilman, Ph.D.
Research Leader – Southwest Watershed Research Group, USDA-ARS
Phil.heilman@usda.gov
520-982-2841

Jason Karl, Ph.D.
Associate Professor – University of Idaho
jkarl@uidaho.edu
208-885-0255