Jeffrey K. Gillan, Ph.D.

Remote Sensing Data Scientist

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Summary of Expertise

Remote Sensing/GIS

I have 17 years of geospatial experience in the realms of applied research, government, and contracting. My core expertise is executing multi-scale imagery (drone, airplane, satellite) projects for forest and rangeland ecosystem monitoring. I collect, process, and analyze LiDAR, photogrammetry, and hyperspectral data to provide meaningful management insights. I am specifically interested in *Cloud-Native* geospatial to scale reproducible workflows and data sharing.

CyberInfrastructure

I deliver compute, storage, and sharing solutions for research projects looking to scale and automate their science impact. I am well versed in cloud infrastructure deployment using tools like Cyverse and Jetstream2. I am specifically interested in containerized processing pipelines.

Ecology & Environment

The majority of my career has been focused on land and natural resource management. I am a dryland ecologist trained in assessing the health of land and have been involved in projects related to carbon cycling, forest disturbance and recovery, wildlife management, erosion, and animal agriculture.

Teaching

I am a data science educator tasked with training the next generation of scientists in advanced computational techniques and Open Science skills. I lead a variety of technical workshops on geospatial data analysis, AI Tools, and Cloud Computing. I mentor a Ph.D fellowship group in scientific computing and have designed and taught a university course on drone mapping.

Computing Tools

QGIS | ArcGIS Pro & Online | ENVI
DuckDB | PostgreSQL | PostGIS
Geospatial Python | Geospatial R
Earth Engine | Planetary Computer
GDAL | PDAL | CloudCompare
Pytorch | Cyverse
Markdown | html
SpatioTemporal Asset Catalogs
Agisoft | Pix4D | OpenDroneMap
TiTiler | MapServer
HPC | OpenStack Cloud | Jetstream2
Docker | Singularity | Nextflow
Terraform | Ansible | Kubernetes
Conda | JuypterLab | Git | Github

Work Experience

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

Research

- Provided cyber infrastructure and data expertise for geospatial research grants:
  - 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

Teaching & Training

- Instructed technical workshops on Reproducible Scientific Computing | Cloud Native Geospatial | AI Tools | Processing Pipelines
- Trained scientists to use cloud computing and deploy cyber infrastructure for scientific computing

Remote Sensing Scientist – 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 drone imagery for dryland vegetation productivity and identification
- Researched drone and airborne LiDAR for fire risk of homes in wildland/urban interface
- Developed terrestrial LiDAR workflow to estimate individual tree biomass

Teaching and Mentoring

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

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

Research

- Led drone 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 - USDA-Agricultural Research Service | New Mexico State University
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*

Certifications

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

Select Publications & Reports

Swetnam, T.L., et al. 2024. Cyverse: Cyberinfrastructure for Open Science. *PLoS Computational Biology 20(2): e1011270.* https://doi.org/10.1371/journal.pcbi.1011270

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.

Gillan, J.K. 2022. Supporting restoration of the Santa Cruz River in Tucson, AZ, with remotely sensed mapping and monitoring of vegetation. Final Report Pima County Regional Flood Control District. https://data.cyverse.org/dav-anon/iplant/projects/santa_cruz_river/SCR_drone_report_Gillan_2022.pdf

Gillan, J.K. 2022. Assessing watershed impacts of Bighorn Fire. Final Report Pima County Regional Flood Control District. https://data.cyverse.org/dav-anon/iplant/projects/bighorn_fire/Bighorn_Fire_Imagery/Bighorn_Fire_final_report_ARSC.pdf

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

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

Recent Grants

Year	*Granting Agency*	*Type*	*Name*	*Role*	*Amount $*
2023	University of Arizona	research grant	Aeolus - Airborne Environmental Observatory & Laboratory for Uncrewed Systems	Co-Principal Investigator	$141,215
2023	Agricultural Genome to Phenome Initiative	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	Service Contract	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	Service Contract	Assessing watershed impacts of Bighorn Fire	Co-Principal Investigator	$77,762

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