

Travis M. Williams

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Research-oriented geographer with a focus on geospatial data modeling. Focused and detailed-oriented with an enthusiasm for graphics, presentation, and the development of interactive user interfaces. Experienced in a variety of GIS- and programming-oriented applications, adept at spatial and tabular data manipulation.

Education

Master of the Arts in Geography - University of Colorado Boulder Aug

Thesis: “Drought index-based insurance for the US cattle ranching industry” 2018

Focus: Climate risk management, drought, weather-based index insurance, geospatial analysis

Cumulative GPA: 3.90

Bachelor of Science in Geography - Florida State University Dec

Focus: GIS, Ecology, French

Minors: French, Biology

Cumulative GPA: 3.39

2009

Skills

GIS Interfaces: ArcGIS, QGIS, GRASS, & DIVA GIS

Coding Languages: Python, R, Geospatial Data Abstraction Library (GDAL), STATA, HTML, & SQL

Applications: Spatial and tabular data manipulation, online application development, econometrics, cloud-based data transfer and storage & imagery analysis

Research and Technical Experience

Visiting Researcher – *Cooperative Institute for Research in Environmental Sciences* May 2019 - Present

- Review the literature surrounding drought, water management, and the economic value of climate information.
- Interview farmers and reservoir managers, model reservoir management schemes, build online decision games, and analyze stakeholder responses to discern decision-making responses to water shortages.
- Build economic farm models to discern the economic value of improved streamflow forecasts for irrigated agriculture in Southwest Colorado.
- Use Python to build, optimize, and automate the classification of satellite-derived fire detections into discrete events for analysis.
- Build, update, and maintain interactive drought information portal.

Research Assistant – *Earth Lab of the University of Colorado Boulder* Jan 2017 -

- Used primarily Python, R, and GDAL to perform and automate spatial analysis of

May 2019

large multi-dimensional earth systems data sets.

- Optimized memory utilization to automate data set building, manipulation and statistical analysis.
- Built automated web-scraping routines or corresponded with various organizations to acquire large climate, market, and policy data.
- Redesigned existing weather index-based insurance system to accommodate drought indices for research into the efficacy of such a design in drought hazard mitigation.
- Developed and deployed interactive, online risk management and decision-making models through various web server applications and cloud-based virtual machines.
- Applied spatial and panel econometric methods to discover climate signals in agricultural market data sets.
- Performed extensive literature review on the history of the Federal Crop Insurance program, cattle ranching in the US, and drought index development.
- Generated descriptive charts, maps, and other graphical representations of research results for publications. Also updated and maintained website content.

Research Assistant – *Agriculture Dept. of Southern Illinois University Carbondale*

Apr 2014 -
May 2016

- Used ArcGIS and SAS to perform spatial analysis into the performance of no-till and cover crop treatment on yield improvements concurrent with extensive research into the practices.
- Used soil survey data, soil content interpolations, and digital elevation model development along with topographical positioning algorithms to test for the effects of the interaction between soil and topography effects on grain yields.
- Collected, geocoded, and/or interpolated climate, yield, and research site information for a large meta-analysis of high-yield fertilizer studies using various GIS programs.
- Collected plant tissue and soil samples with truck mounted soil probes, SPAD and other devices.
- Performed KCL extractions and other laboratory tests for agricultural chemicals content.

Teaching Experience

Graduate Teaching Assistant – *Geography Dept. of the University of Colorado Boulder*

Aug 2016 -
May 2017

- Taught recitation for *World Regional Geography* (GEOG 1982) and *Geography of the Environment and Society* (GEOG 1972) across three semesters. This involved a total of 7 recitations with 25-30 students each.
- Content involved human-Earth system interactions, theories of resource management, natural hazard mitigation, as well as features of five major world regions with a particular focus on culture and social injustice.

Publications

Shrum, T., W.R. Travis, **T. Williams**, E. Lih. "Managing climate risks on the ranch with limited drought information". *Climate Risk Management*, vol. 20, pp. 11-26, 2018.

<https://doi.org/10.1016/j.crm.2018.01.002>

Williams, Travis M. "Drought Index-Based Insurance for the US Cattle Ranching Industry". Geography Graduate Theses & Dissertations. 123, 2018.

Williams, Travis M. and William R. Travis. "Evaluating alternative drought indicators in a weather index insurance instrument." *Weather, Climate, and Society*, vol. 11, pp. 629-649, 2019.

<https://doi.org/10.1175/WCAS-D-18-0107.1>

Visualization Samples

The following is a sample list of interactive, cartographic models that I have designed to support research into drought and climate risk management at the University of Colorado. The underlying data was transformed using GDAL, Python, QGIS, or R. The model calculations are performed primarily in Python, and the applications are served using Plotly's DASH platform, NGINX, Green Unicorn, and either Amazon Web Services or Digital Ocean.

Drought Index Comparison Tool:

This tool brings together a suite of drought indices for quick comparison. It allows the user to select a panel of four indices from a selection of twelve, though I will be adding to this list as I come across the need to assess more data sets. For each index and for any period between 1948 and 2017, a map can be generated using one of a variety of spatial functions (mean percentiles, coefficient of variation, etc.). A time series of values can be generated for any location in the Contiguous United States. It also allows for quick adjustments to the color scale used in each map. In addition to comparisons between indices, this program is designed to help users to identify extremes in any one index.

<https://climate-scatterplot.space>

Insurance Model #1:

This model assesses the performance of a rainfall-based insurance program provided by the U.S. Dept. of Agriculture (USDA). This insurance program bases payment only on precipitation deficits. The program, "Pasture, Rangeland, and Forage" (PRF), is intended to provide livestock producers protection against losses due to precipitation deficits. Policyholders are often displeased with the timing of payments because of the inability of simple rainfall measurements to fully indicate losses to rangeland productivity. Many of these producers pay close attention to the U.S. Drought Monitor (USDM), which provides a more sophisticated assessment of water shortages. These producers are more likely to complain to the USDA if they don't receive payment when the USDM indicates drought. So, I designed the following application to show potential policyholders when and where the PRF is likely or unlikely to align with the USDM.

<https://www.earthlab-riskappone.org>

Insurance Model #2:

This application compares a set of experimental weather index-based insurance models that I designed around the structure of the PRF (described above). It shows the spatial and temporal distribution of insurance payments, premiums, and other outputs based on a suite of drought indices in place of rainfall.

<https://www.earthlab-riskapptwo.org/>