

USGS NSF GRIP, GSP Opportunity

● Point of Contact Name:	Cynthia Wallace
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● USGS Center:	Western Geographic Science Center
● Project Title:	Climate-Landscape Response (CLaRe) Metrics: Applications for managers
● Summary:	Never before has there been a tool to map the location and phenological status of buffelgrass, including nascent populations, on a regional scale. Although developed for a specific management issue, CLaRe metrics hold promise for many natural resource applications. You will demonstrate these metrics in the context of a compelling and important management issue of your choice developed with the principal investigator (PI).
● Project Hypothesis or Objectives:	The USGS has developed a new and innovative suite of landscape metrics (i.e. "Climate-Landscape Response" or CLaRe metrics) that are proven effective in mapping when and where invasive buffelgrass is green in Saguaro National Park (SNP) near Tucson, Arizona (see: doi:10.3390/rs8070524) . Buffelgrass fills the interstices between widely-spaced desert plants with a continuous mat of fine fuels, carrying fire broadly through the non-fire adapted Sonoran Desert landscape, with the potential to transform the iconic, species-rich, ecosystem into a monotypic grassland. CLaRe phenometrics, capture the strength of the landscape greenness response to climate and expose buffelgrass due to its rapid and strong response to recent precipitation. Buffelgrass remains dormant much of the year, but has short windows when it is photosynthetically active and vulnerable to herbicide. By mapping when and where buffelgrass is green, land managers can optimize their treatment activities, saving money. In addition, current results suggest that it is possible to detect nascent populations of buffelgrass comprising <5 percent of the landscape by monitoring the trends of these CLaRe phenometrics. The ability to monitor and interpret trends in land surface phenology informs science-based land management. The CLaRe metrics

capture the landscape response to climate and will complement the current temperate-zone phenometrics; no doubt they will prove broadly useful for many applications, including mapping invasive species (many invasives are observed to respond more rapidly to climate – especially precipitation - than native vegetation, including buffelgrass, Lehman's lovegrass and cheatgrass), monitoring ecosystems (capturing trends between temperature-driven and precipitation driven ecosystems), habitat modeling, and vegetation classification.

In 2 to 12 months, the intern will demonstrate the application of CLaRe metrics to inform a management issue.

-  **Duration:** Up to 12 months
-  **Internship Location:** Tucson, AZ
-  **Field(s) of Study:** Geoscience, Life Science, Climate Science
-  **Applicable NSF Division:** AGS Atmospheric and Geospace Sciences, EAR Earth Sciences, DEB Environmental Biology, BD HS Big Data Regional Innovation Hubs and Spokes, HPC High Performance Computing, EFMA Office of Emerging Frontiers and Multidisciplinary Activities
-  **Intern Type Preference:** Either Type of Intern
-  **Keywords:** Phenology, Invasive species management, Vegetation indices, Climate, Remote Sensing, Spatial Statistics, Computer Science, Ecology
-  **Expected Outcome:** The intern's primary role will be matched to their particular interests, experience, skills and career objectives in remote sensing, ecology, climate and/or related applications of computer technology for geospatial data processing and analysis. The intern will identify an issue of concern for land managers, apply CLaRe metrics to inform this issue, and develop strategies and useful information to address the management issue. The expected outcome is actionable science, whereby science is made useful and accessible to land managers through a practical protocol and detailed action plan.
-  **Special skills/training Required:** Skill/training in two or more of the following are required: remote sensing, digital image processing, geospatial statistics and data analysis, terrestrial ecology, climatology, computer science, scientific programming.
-  **Duties/Responsibilities:** The project will develop and demonstrate a new and innovative suite of landscape metrics (CLaRe) that hold much promise for management and monitoring applications, especially in drylands. The PI is part of a collaborative network of scientists and land managers in the SE Arizona region who have expressed great interest in the potential of the CLaRe metrics to inform their work; the intern will be connected to these partners depending on his/her

interest and proposed project. As such, the intern will benefit from a unique experience to partner with and be responsive to land manager needs and being connected to an inter-disciplinary group of collaborators.
