

USGS NSF GRIP, GSP Opportunity

● Point of Contact Name:	Miguel Villarreal
● Point of Contact Email:	mvillarreal@usgs.gov
● USGS Center:	Western Geographic Science Center
● Project Title:	High-resolution remote sensing of biological soil crust communities for dryland ecosystem modeling
● Summary:	<p>Although small in stature, biological soil crusts have a large role in dryland ecology. We seek an intern to join a multi-disciplinary group of USGS scientists who are using novel remote sensing techniques to improve our knowledge of the biogeography and ecology of biocrusts. This information will provide insight into the role of biocrusts on plant and soil heterogeneity over large landscapes.</p>
● Project Hypothesis or Objectives:	<p>Biocrusts (communities of mosses, lichens, and cyanobacteria) are ecologically important in arid lands for their role in stabilizing soils and reducing erosion, fixing carbon, and cycling nutrients, but their condition and extent are difficult to determine in remote and rugged areas like Utah's Canyonlands. Trampling of biocrusts by livestock and humans can cause irreparable damage; remote sensing technologies therefore provide an ideal platform for collecting data on fragile biocrust communities.</p> <p>Utilization of remote sensing techniques to map the distribution of biocrust communities is an important step to quantifying biocrust contributions to biogeochemical and hydrologic cycles across landscapes and to understanding heterogeneity of resource distributions that directly influence plant communities. For this project we will use small Unmanned Aerial Systems (UAS) to collect high-resolution (<1 cm) near-infrared and color images over a number of biocrust monitoring plots established by USGS in 2006. Plot data and UAS imagery will be used to "train" a biocrust classification from high-resolution Worldview-3 satellite data (31 cm panchromatic, 1.24 m multispectral and 3.7 m short-wave infrared) that was acquired over Canyonlands National Park and adjacent BLM management units in May 2016. Mapped, landscape-scale biocrust data can provide insights into the relationships between biocrust distributions and heterogeneity of plant population</p>

distributions and community assembly, and provide input into regional ecosystem models (e.g. dust production, carbon cycle).

● **Duration:** Up to 12 months

● **Internship Location:** Menlo Park, CA

● **Field(s) of Study:** Geoscience, Life Science

● **Applicable NSF Division:** DEB Environmental Biology

● **Intern Type Preference:** Either Type of Intern

● **Keywords:** Biological soil crusts, remote sensing, dryland ecology,

● **Expected Outcome:** Remote sensing and field data will be used to map the distribution of biological soil crusts across a large landscape, and therefore provides an opportunity to extend ecological concepts and findings derived from previous field-level studies to a regional scale. The intern will directly contribute to the development of methods to accomplish this remote sensing task, and work with USGS researchers to analyze and interpret the data. The intern will have the opportunity to collaborate with a group of interdisciplinary USGS researchers, including remote sensing scientists from USGS Western Geographic Science Center, as well as and ecologists and soil scientists from the USGS Southwest Biological Science Center. We anticipate the publication of spatial data (maps) and peer-reviewed research papers.

● **Special skills/training Required:** Skill/training in the following are useful: computer programming, remote sensing image processing, statistics and data analysis, terrestrial ecology, botany.

● **Duties/Responsibilities:** The intern will work directly with USGS investigators and research associates to develop models of biocrust distribution using remote sensing data. The intern will help the USGS team collect biocrust field samples in conjunction with UAS imaging, and after data acquisition will work to develop statistical models and analyze the data.
