



# USGS NSF GRIP, GSP Opportunity

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● <b>USGS Center:</b>	Western Geographic Science Center
● <b>Project Title:</b>	Assessment of Infiltration and Recharge due to Wetland Restoration in a Semiarid Ecosystem
● <b>Summary:</b>	<p>This intern will work with an exciting team of scientists to develop novel approaches to assess wetland restoration. Methods include documenting baseline conditions and monitoring site evolution, hydrologic modeling, using shallow piezometers to estimate recharge and storage change, tracking streambed water exchanges using heat as a tracer, and estimating percolation using electrical resistivity.</p>
● <b>Project Hypothesis or Objectives:</b>	<p>Hypothesis: Wetland restoration is inherently linked to groundwater rehabilitation. This can be documented via subsurface monitoring of infiltration and recharge over the course of restoration. Subsurface response is expected before increases in surface water flow and vegetative response become evident. We propose that preliminary hydrologic modeling combined with rapid, low-cost methods (temperature and ponding for infiltration flux, changes in electrical resistivity for unsaturated zone percolation, and shallow piezometers for changes in storage) will allow early assessment of restoration success when compared with traditional methods such as changes in streamflow permanence and long-term vegetation monitoring.</p> <p>Objectives: Develop rapid, low-cost, methods to assess the surface and subsurface hydrologic effects of restoration of a historic wetland located at Cienega Ranch, in the foothills of the Dos Cabezas Mountains (SE AZ). This proposal is designed to complement the existing USGS Aridland Water Harvesting Project, which includes efforts to characterize historic conditions and current lithology using soil profiles and geophysical methods, and to monitor ecological responses to restoration. The work proposed herein also builds on previous work completed by the student (with USGS mentors), to test soil-moisture assessment methods for</p>

newly-installed gabions in a tributary of the San Pedro River. Our objective is to expand this preliminary research by coupling groundwater measurements and aquifer recharge into the initial infiltration design test and adding instrumentation to document how riparian restoration impacts the soil-water balance. An additional goal is to identify the most cost-effective and time-efficient methods for assessing these impacts.

**Duration:** Up to 12 months

**Internship Location:** Tucson, AZ

**Field(s) of Study:** Geoscience

**Applicable NSF Division:** EAR Earth Sciences

**Intern Type Preference:** NSF Graduate Research Fellow (GRF) via the Graduate Research Intern Program (GRIP)

**Keywords:** Restoration, Infiltration, Soil-water Balance, Temperature, Surface Flow, Electrical Resistivity

**Expected Outcome:** USGS will mentor the intern and support fieldwork, documentation, and interpretation of results in relationship to other components of study. This project will yield a baseline hydrologic characterization of the site prior to restoration, using field data, existing information, and preliminary hydrologic modeling. The project will also result in the site being instrumented for continued monitoring and data collection as restoration proceeds. Our findings will be summarized and published for use during future monitoring of the site.

**Special skills/training Required:** Interested interns should have:  
-Familiarity with methods in field hydrology:  
    i. logistics and safety  
    ii. mapping  
    iii. water quality & flow measurements  
    iv. soil sampling, etc.  
-Familiarity with or willingness to learn numerical hydrologic modeling; and  
-Advanced understanding of saturated and unsaturated groundwater flow theory.

**Duties/Responsibilities:** Intern will work with USGS mentors to:  
- Instrument site prior to restoration and as restoration begins. This will require regular (at least monthly) visits to the site to set up instrumentation and collect data. Specifically, he/she will install:  
    i. temperature sensors in streambed sediments to identify point infiltration fluxes.  
    ii. time-lapse cameras to record surface flow behavior and ponding extent, as well as to monitor general site evolution.

- iii. staff gauges and marker posts in-channel as reference points for cameras.
  - Sample channel sediments and analyze in University of Arizona lab to determine thermal and hydraulic properties.
  - Aid in the collection of electrical resistivity measurements
  - Compile existing information about the site (regional geologic context, historic records of wetland status, land use history, etc.).
  - Consult with other researchers on-site to coordinate interdisciplinary research efforts and timing.
  - Identify locations for additional monitoring and help with the installation to investigate the connection between infiltration through streambed sediments and deeper recharge.
  - Help analyze data
  - Write and submit a summary of findings to be used later in publication in peer-reviewed journal (with PIs)
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