2022 COOPERATIVE SUMMER FELLOWSHIP PROGRAM – PROJECT PROPOSAL

APPLICANT TYPE: ESA;

PROJECT TITLE: ENHANCING SOIL HEALTH ON DEGRADED RANGELANDS IN THE SOUTHWESTERN U.S.

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Discipline: Ecology;

PROJECT DESCRIPTION

BACKGROUND

Degraded soil conditions on rangelands due to extreme drought, invasive species, land use, and other stressors have resulted in reduced plant productivity and biodiversity. Revegetation projects on degraded rangelands are often focused on seeding, without addressing the underlying soil conditions that can limit ecosystem recovery. We plan to test inexpensive and logistically simple soil management strategies to improve soil health and improve plant establishment on working lands (used for livestock grazing). Our treatments include: seeding, seed balls, and soil pits, singularly and in combination with topsoil transfers and livestock. The goal of our project is to enhance soil health (structure, soil water holding capacity), improve plant establishment of desirable species, and work with ranchers to develop rangeland improvement strategies that are useful in the presence of livestock. We will install these treatments on degraded rangeland sites that span climate and disturbance gradients throughout the Southwestern US (AZ, UT, NM, southwestern CO, southern CA). Our research objectives are to: 1) determine the effects of seeding and soil treatments with and without livestock on plant emergence and establishment, and forage quality and quantity, and 2) examine the effects of seeding and soil treatments with and without livestock on soil health indicators. This is a collaborative project co-produced with land manager, rancher, NGO, tribal, and university partners and coordinated by the USGS Restoration Assessment and Monitoring Program for the Southwest (RAMPS) (www.usgs.gov/sbsc.ramps). The intern will be based in Flagstaff, AZ and will assist in the installation of this experiment in 10+ locations across beautiful southwestern landscapes. RAMPS is a diverse network of researchers and land managers coordinated by USGS working to improve land conditions across the desert Southwest. As a member or our team, the intern would engage with partners throughout the project, gain experience developing applied research questions, conduct ecological field research, and work in a small team to problem-solve and achieve results useful for land managers and owners.

INTERN TASKS

1. Collect soil samples for analysis and for use in future soil health treatment options

2. Install treatment field plots at existing field sites across the southwestern US, in partnership with university, NGO, and land management agency stakeholders. Field work will occur in the summer, requiring the ability to work in high temperatures, and throughout the rainy monsoon season. Work will require using hand tools for seeding and site maintenance, lifting up to 40 pounds, and potentially camping overnight at field sites.

3. Work in the lab to make and deploy seedballs (seeds covered in clay and inoculated soil)

4. Collect and clean local seeds, requiring hiking throughout the work day and basic plant identification skills, especially of southwestern US species.

5. Collect vegetation data from a long-term drought experiment near the San Francisco Peaks.

6. Help install a new rangeland improvement site with a partner from Colorado State University

7. Assist with plant and soil monitoring efforts at field sites; assist with data entry, QA/QC, and preliminary analyses.

8. Write blog or a series of photos and captions about the research and their experience for distribution in the RAMPS newsletter.

BENEFITS TO INTERN

The intern will gain real-world experience and technical skills that are desirable for future employment, including: learning plant and soil sampling techniques, understanding how to turn research questions into a deployable experiment, learning plant identification of southwestern plant species, best data management practices, as well as gaining experience working collaboratively in a team setting. The intern will also regularly interact with the diverse RAMPS partners and stakeholders as they will be working on site and amongst land management partners throughout the Southwest. These interactions can serve as an opportunity to explore career path options in natural resources as well as a networking opportunity. Lastly, the intern will be mentored in research and land management topics, where they will learn (through reading/research assignments/shadowing/lectures/etc.) about professional and academic subject matter that supports making land management decisions and working towards management or research goals.

MENTORING PLAN

The intern will receive mentorship and learning opportunities throughout the Cooperative Summer Fellowship in a number of ways: WELCOME & BACKGROUND: Before field work begins, the intern will attend a team meeting with our group for a welcome, introductions and background on our work and the project. They will then be given resources to review: a small list of relevant scientific publications, information briefs, and web material that provide important background and insight into the project; TRAINING: Field training will be conducted on-site by project PI, post-doc, and field manager, including trainings on heat stress and field safety, driver's safety, plant identification, and tool use. CHECK-INS: Interns will report to the project PI and/or post-doc once a week throughout the project to both give and receive feedback about internship progress. Interns will be working directly with USGS field staff regularly and will be able to check-in with staff daily. NETWORKING: General exposure to ecological research & topics relevant to land managers and owners in the southwestern US. Monthly attendance at ecology brown-bag sessions hosted by Southwest Biological Science Center covering anything from fish in the Grand Canyon to carbon sequestration in soil to ecosystem restoration. Opportunities to attend seminar series at nearby Northern Arizona University. Participation in stakeholder meetings, including those that cover topics important to rangelands. SPECIAL TOPICS: Focused mentoring with scientists from RAMPS, including women and early-career researchers: www.usgs.gov/sbsc/ramps . Techniques in science communication and stakeholder engagement: How to effectively engage stakeholders and conduct applied and meaningful science; Learning about scientific monitoring techniques; the pros and cons of different methods for assessing ecological health; The basics of soil ecology and how soil ecology is being considered in restoration ecology; Experimental and sampling design. Intern will be invited to write a short blog or photos with captions about their experience for the RAMPS newsletter and YES website. Invitation to an optional informal social gathering at the end of their

internship to celebrate their accomplishments. We will also ask the intern for feedback: what went well and what could be improved for our next intern.

ADDITIONAL DETAILS

STUDENT SKILLS AND INTERESTS

Skills and interest in plant ecology, botany, restoration ecology, rangeland ecology, and soil science. Experience in plant identification, especially of southwestern US species is a plus but not required. General understanding of soil taxonomy, soil health, and soil sampling is helpful but not required. Applicant should be interested in gaining hands-on skills in the fields of ecology and botany. Applicant should be detail-oriented, able to follow scientific protocols and instructions, and interested and willing to perform fieldwork in sometimes inclement weather.

LOCATION: Flagstaff, AZ

ACTIVITY LEVEL:

Level 8-2: The work requires some physical exertion such as long periods of standing, walking over rough, uneven, or rocky surfaces; recurring bending, crouching, stooping, stretching, reaching, or similar activities; or recurring lifting of moderately heavy items. The work may require specific, but common, physical characteristics and abilities such as above-average agility and dexterity.

FIELD WORK	50-75%	VIRTUAL?	No
LAB WORK	0-25%		
OFFICE WORK	25-50%		
OTHER	None		

PROJECTED START DATE	5/9/2022
EXPECTED DURATION	3.5 months