Hydrogels help grasses grow on remote, arid rangelands

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The number of daughter plants associated with each transplant is an important measure of the transplant's reproductive success. Here, linear stolons emerging from the transplants at the base of each PVC tube produce chains of daughter plants that appear as islands of grass surrounded by bare soil. Credit: Stephen Ausmus.

(PhysOrg.com) -- The arid conditions in the southwestern United States make restoring degraded rangelands extremely difficult, but a U.S. Department of Agriculture (USDA) scientist has found a way to help native grasses survive there so they can be closely studied as restoration tools.

Residential development, mining operations, recreational activities and other changes to the landscape have stripped many southwestern rangelands of their native vegetation. That reduces habitat for wildlife and forage for grazing, makes soils more susceptible to erosion and even increases dust along highways, reducing visibility.

Mary Lucero, a molecular biologist with the Agricultural Research Service (ARS), is conducting long-term studies at the ARS Jornada Experimental Range in Las Cruces, N.M., to see if microbes associated with hardy woody shrubs can be transferred to native grasses to fortify them so they are better equipped to restore degraded rangelands. ARS is USDA's principal intramural scientific research agency, and this work supports the USDA goal of promoting agricultural sustainability.

As part of Lucero's efforts, she is evaluating the competitive abilities of grasses treated with various microbes and transplanted into disturbed, arid rangeland sites. Temperatures in the area can exceed 100 degrees for days at a time and rainfall is scarce and highly variable, so the transplants need to be irrigated to become established. But irrigating on such remote sites can be labor-intensive and costly.

To enhance the ability of a native bunch grass to establish in such hostile environments, Lucero and her colleagues filled tubes fashioned out of PVC pipes with hydrated gels, buried them alongside the roots of the grass, and positioned the pipes so that moisture would be available to the grass roots. Hydrogels are already used in some commercial products for helping establish grass seedlings and for cutting back on how often a gardener has to water a garden. Lucero wanted to see if the hydrogel-filled tubes would provide enough moisture to enhance the survival rates of the grasses she is studying.

Lucero's results show that one liter of hydrogel-bound water was sufficient to support black grama grass (Bouteloua eriopoda) transplants

through reproductive maturity. The results, published in the Journal of Arid Environments, show that hydrogels can be used to irrigate native grasses transplanted into harsh desert environments, and that they may be useful for restoration of rangeland habitats.

In a more recent study, nearly 700 greenhouse-propagated native plants hydrated with the gels have survived transplanting. They became established on remote, disturbed field plots in the Chihuahuan Desert, and have even produced offspring.

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