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Short Communication

Using hydrogel filled, embedded tubes to sustain grass transplants for arid land restoration

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ABSTRACT

Grass restoration on remote arid rangelands may require irrigation to stimulate establishment. However, irrigation on undeveloped sites is costly. Vertical irrigation tubes that direct applied moisture to subsurface zones where evaporation is reduced, and hydrogels that prevent applied moisture from infiltrating beyond plant root zones can maximize the portion of applied water available for plant uptake. The survival and growth of *Bouteloua eriopoda* (Torr.) Torr. transplants irrigated with either starch- or acrylic-based hydrogels contained in one of three embedded watering tube styles were evaluated in a greenhouse trial. A field trial evaluated differences in transplant survival and cover between treatments consisting of embedded watering tubes with or without acrylic hydrogels. Greenhouse transplants from all treatments grew 146 days on less than 1 L of water. Plants irrigated with starch hydrogels consumed the most water and exhibited the most growth. Variations in tube styles had minor effects on plant growth and water loss from tubes. In the field, heavy growing season precipitation was observed, and transplant survival was high for both treatments. No significant differences in cover were detected. Greenhouse data demonstrate potential for hydrogel filled, embedded tubes to provide adequate moisture for establishment and growth of deep-rooted black grama transplants. Field data indicate deep-rooted black grama transplants establish successfully when adequate moisture is available.

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Reseeding grasses on remote arid sites is expensive and failure prone (Ethridge et al., 1997). Irrigation during germination and establishment phases could improve survival rates, but substantially increases remediation costs. Bainbridge (2007) described watering into buried perforated pipes or clay pots to minimize irrigation water for desert plant establishment. Use of containerized transplants with long root balls and application of hydrogel dips also increases establishment success (Bainbridge, 1995; Miller and Holden, 1993; Rodgers, 1995; Thomas, 2008). The United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) has combined the use of 30″ long root systems, embedded watering tubes and a starch-based hydrogel (Soil Moist™ Natural, JRM Chemical, Inc., Cleveland, Ohio) to provide a long-lasting store of soil moisture available for plant uptake with minimal evaporation and percolation losses (Los Lunas Plant Materials Center, 2004). This technique provided for greater than 80% long-term survival of various shrub species and appreciable vegetative growth after eight growing seasons in a semiarid environment experiencing prolonged drought (Dreesen, 2009, personal communication).

Interest in restoring surface disturbances on arid grasslands, combined with high reseeding failure rates prompted interest in evaluating grass transplants for restoration. Transplants of stoloniferous species may establish and reproduce more successfully than plants initiated from seed, but establishment using starch hydrogels could be difficult to manage at the shorter root depths required for grasses. Acrylic gels, which are less fluid and slower to degrade, may offer a more satisfactory solution.

In the greenhouse study, we compared the survival, growth, and development of *Bouteloua eriopoda* (Torr.) Torr. (black grama) irrigated with either starch- or acrylic-based hydrogels encased in various styles of watering tubes embedded to the maximum depth (46 cm) expected for mature black grama root systems (Gibbens and Lenz, 2001).

Irrigation tubes were constructed by cutting 5.08 cm schedule 40 PVC pipe into 50.8 cm (20″) segments. A single line of 13 holes 1.27 cm in diameter placed 3 cm apart, was drilled beginning at the

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