Project Narrative

Name of Project: Restoration of Hydrologically Dis-functional Rangeland Watersheds, Wi

Is This a New Project or Request for Continuation?: Request for Continuation

Geographic Area of the Project: southern Rolling Plains, northern and western Edwards Plateau, eastern Trans Pecos land resource areas

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Amount of Funding Requested: $15,000

Project Need, Description and Expected Outcomes

A high percentage, perhaps as much as 75%, of the rangeland watersheds, wildlife habitats, and improved pastures in the western half of Texas are "at risk" due to the impacts of drought and concomitant attacks by desert termites or grasshoppers. The combined effects of prolonged drought, termites and/or grasshoppers and, in some cases, previous management have created hydrologically dis-functional ecosystems that are unable to absorb and hold rainfall and recover naturally when rainfall events occur. Vast landscapes are now dominated by annual grasses and forbs and may be beyond the threshold for natural recovery because the mortality of perennial, warm-season grasses has been extremely high and little or no mulch, standing dead vegetation, or deep-rooted grasses remain to facilitate rainfall infiltration. Without intervention, this conversion of vast landscapes from warm-season, perennial grass dominance to cool-season, annual forb/grass dominance will have long-term negative impacts on water availability/quality, wildlife habitat, livestock production, and sediment yield into the State's streams, rivers, and reservoirs. Repairing the hydrological processes on these vast landscapes will restore the land for watersheds, wildlife habitat, livestock production, recreation, aesthetics, and real estate, while encouraging the economic viability of rural communities.

Desert termites (*Gnathamitermes tubiformans*) have played a key role in the current, severe desertification cycle via their removal of mulch, litter, standing dead plants, live plants, and the feces of livestock and wildlife from the soil surface. Removal of the vegetative cover leaves the soil surface unprotected from the energy of raindrop impact, resulting in excessive intertill erosion, the destruction of surface soil aggregates, soil puddling, inadequate rainfall infiltration, excessive loss of water to overland flow, and excessive silt loads in runoff water. Strategies for control of desert termites on rangelands or pastures have not been developed, but some highly effective termiticides are currently available for field evaluation.

Water conservation practices which modify the soil micro-relief and fracture impervious soil layers, such as ripping (sub-soiling) and contour furrowing, can be highly effective, when integrated with appropriate grazing management strategies, in restoring healthy hydrological cycles and productivity of degraded wildlands and pasture lands. Research on rangeland ripping at the San Angelo Center during the

current drought has shown that rangeland can be ripped 15 - 18 in. deep, on the contour on 20- to 30-ft. spacings, for <$4/acre; that a 5-in. rainfall event infiltrated >5 ft. deep along rips compared to only about 10 5 in. on unripped areas; that herbage production was almost 1700 lb/acre on ripped landscapes compared to only 400 lb/acre on untreated rangeland; and that ripping increased the livestock carrying capacity to about 29 animal units/section compared to about 8 animal units/section on unripped rangeland. This work has stimulated significant interest in water conservation treatments among ranchers, rangeland resource managers, wildlife biologists, and the U.S.D.A. Natural Resources Conservation Service. The research mentioned above stimulated the NRCS to develop technical guidelines for ripping and contour furrowing and to include these treatments for cost-sharing under EQUIP in 2002. Many ranchers in western Texas have begun ripping or contour furrowing as a result of the above-mentioned research.

Twelve experiments and/or demonstrations on mechanical water conservation treatments which range in size from 5 to several hundred acres were installed in the following counties in western Texas in 2002: Tom Green, Crockett, Val Verde, Pecos, Upton, Ector, Edwards, Howard, Reagan, and Runnels. Water conservation treatments have included ripping, ripping + contour furrowing, contour furrowing, and aeration with a Lawson aerator. Mixtures of grasses have been planted on the upslope margins of rips and rip/furrows, where water will stand following rainfall events, to determine the feasibility of seeding for establishing permanent vegetative cover. A 1-row seeder for slick and chaffy grass seeds has been provided by the Truax Co. (Minneapolis, MN) for this project. Soil moisture monitoring equipment has been installed at the Reagan County study site. The continuing drought at most study sites has precluded the germination and establishment of perennial grasses. Herbicide treatments have been installed in bands along rips or furrows in some experiments where annual weeds were dense to conserve soil water for the establishment of perennial, warm-season grasses. Field work to determine the colony size of desert termites, the acceptability of insecticide baits to these insects, and the impact of insecticide treatments on establishment of vegetative cover along rip and rip + furrow treatments has been initiated.

The continuation funding requested by this proposal would: 1) facilitate the expansion and completion of several rangeland restoration/water conservation studies that are underway; 2) allow us to make significant progress toward developing integrated pest management strategies for desert termites; 3) examine the interactions between water conservation treatments and termite control practices on rangeland restoration; and 4) initiate the development of an effective technology transfer program to enhance and expedite the adoption of water conservation/termite management technologies by land owners, resource managers, and resource management agencies.

This project will: 1) greatly expand our knowledge base on the biology and ecology of desert termites and the values of water conservation treatments for reversing the desertification cycle on rangeland watersheds; 2) develop a cost-effective integrated pest management program for desert termites; and 3) develop an effective marketing program to expedite the transfer of valuable water conservation/desert termite management technology to ranchers, rangeland resource managers, and natural resource management agencies.

Specific Issues Addressed

- water management and conservation
- soil management, quality/health
- mulching (natural mulching via plant growth)
- land management related to soil and water conservation

Collaboration

Texas Agricultural Experiment Station: (Ueckert and Whisenant - evaluate effects of water conservation treatments, seeding, herbicide treatments, etc. on vegetation recovery, runoff, infiltration, etc.; Hamilton - technology transfer to producers; Rollins - evaluate impacts of water conservation treatments on wildlife)
Texas Cooperative Extension: (Sansone - evaluate insecticides for desert termite control; McGinty - technology transfer to producers)

Entomology Department - Texas A&M University: (Roger Gold - determine colony size of desert termies and evaluate acceptability of termite baits)
Rangeland Ecology & Management Department - Texas A&M University: (Whisenant, Hamilton)
Wildlife & Fisheries Sciences Department - Texas A&M University: (Rollins)
San Angelo Center: (Ueckert, McGinty, Sansone, Rollins)

Submitted by _____
(Darrell N. Ueckert)

Approved for submission _____
(John W. Walker, Resident Director - San Angelo)

TAES/TWRI
Water Conservation and Soil Management
Project Budget Form

Expenditure Description	**Amount Requested**	**Other Sources**	**Total**
Staffing Requirements:			
1)			
2)			
3)			
Fringe Benefits			
Total Staff Costs			
Travel	$2,000		$2,000
Supplies and Materials	$11,000		$11,000
Capital Equipment (purchases over $5,000)			
Printing and Publications			
Other Direct Costs (describe in detail)	$2,000 (equipment repairs, etc.)		$2,000
Total Project Costs	**$15,000**		**$15,000**