Annual Report

Fiber Rolls as a Tool for Re-Vegetation of Oil-Brine Contaminated Watersheds

Period Covered by Report: 07-14-06 to 10-14-06
Date of Report: 02-01-07
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Title: Fiber Rolls as a Tool for Re-Vegetation of Oil-Brine Contaminated Watersheds
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Project Amount: $70,740
Research Category: Brine Scar Remediation

Description:

Historic oil brine scars (sites that repeatedly received produced water) are extremely difficult to remediate because these sites possess degraded, highly saline soils, erosion damage, little or no plant cover and an altered microbial community. Ecosystem function is diminished as a result of these impacts.

We are evaluating the contribution of fiber rolls to restoration of a historic oil brine scar in south Arkansas. Four treatments (natural attenuation, standard soil reclamation techniques, fiber rolls, and soil reclamation with fiber rolls) have been applied to plots within the site. Fiber rolls are tubes formed with a geotextile material and filled with organic fiber, mycorrhizal fungal inoculum, bacterial inoculum (soil) and salt-tolerant plants. Consequently, fiber rolls may serve a variety of ecological functions including primary productivity, filtering of sediments and moisture and nutrient retention. Rolls also serve as a source vegetative growth, seeds, microbial spores, organic matter and nutrients.

Objective(s) of the Research Project:

Our primary objective is to examine the utility of fiber rolls as an effective, inexpensive, and easy-to-use remediation tool at oil brine spill sites. Established fiber rolls and adjacent brine affected plots will be examined to determine the:

1) Structural integrity and ability of fiber rolls to withstand periodic flooding/water flow,
2) Amount of sediment accretion behind fiber rolls,
3) Survival, extent and type of vegetative growth in fiber rolls, and
4) Type and extent of vegetation expansion from fiber rolls onto adjacent soils.

Soil reclamation as a result of treatments will also be assessed through measurements of electrical conductivity, sodium adsorption ratio, and cation exchange capacity.

Progress Summary/Accomplishments:

Several significant events occurred during the performance period.

1. An evaluation of soil accretion was conducted during the fall. Our initial hypothesis was that fiber rolls, place in a down-slope "v" configuration would stop sediments that would otherwise wash from surface soil layers. A laser level was used to measure elevation at three different locations above and below each fiber roll "dam". While fiber roll integrity remained high, no significant differences in elevation above and below the fiber rolls were detected. The change in elevation from the top to the bottom of each plot (or treatment area) averaged only 13 cm. The lack of slope and the absence of significant flood flows during the study period probably reduced the effectiveness of fiber rolls in blocking sediment runoff.

2. Post-treatment soil samples were collected from surface and deep soil layers from all 12 plots. As in pre-treatment samples, surface and sub-surface soil was obtained from 3 randomly selected sites (3 surface and 3 deep from each of 12 plots) within each plot, mixed, bagged and sent to the Agricultural Diagnostic Laboratory, University of Arkansas, for analysis.

Plant cover in plots that received tilling, chicken litter, hay and fiber rolls continues to flourish. Plot surfaces that received no treatment along with surfaces in plots between rolls without soil treatments continue to be devoid of plant cover Of special note is the occurrence of several volunteer *Baccharis halimifolia* (Groundsel) within three of the plots that received fiber rolls, chicken litter and hay.

Publications/Presentations

Future Activities:

Pre- and post-treatment soil samples will be analyzed for differences in pH, EC, P, K, Ca, Mg, S, Na, Fe, Mn, Zn, Cu, B, Cl, No3, NH4, and total carbon. Completion of the final report is anticipated for June, 2007.