Native Grasses and Graminoids: Tools for Protecting Water Quality

Presented at:

California Native Grass Association, 2004 Annual Conference, April 16, Modesto

Authors:

Misty Sharff, Caltrans/CSUS Office of Water Programs

Disclaimer:

This work reflects the author's opinions and does not represent official policy or endorsement by the California Department of Transportation, the California State University, or the University of California.

Native Grasses and Graminoids: Tools for Protecting Water Quality

California Native Grass Association
2004 Annual Conference

Misty L. Scharff, CPESC, APSS
Office Of Water Programs
California State University Sacramento
6000 J Street, Modoc Hall Room 1001
Sacramento, CA 95819-6025
(916) 278-8106

Biographical Sketch

Misty Scharff is a research soil scientist and Certified Professional in Erosion and Sediment Control with the Office of Water Programs at the California State University, Sacramento. She has been performing erosion and sediment control research for the California Department of Transportation since 2000 and has been involved in numerous projects including storm water treatment effectiveness of vegetated slopes, biofilters, constructed treatment wetlands, bioretention and infiltration areas. She received both her master's and bachelor's degrees in soil science from the California Polytechnic State University, San Luis Obispo, where she focused on erosion control research studies.

Title: Water Quality Treatment by Native and Non-Native Vegetated Areas in the Highway Environment.

Abstract:

To assess the effectiveness of water quality treatment of native and non-native vegetated areas adjacent to highways, the California Department of Transportation (Caltrans) has initiated a number of pilot studies. Vegetation established adjacent to highways provides: erosion control, storm water treatment, safety, environmental mitigation, aesthetics, and conveyance of runoff. Caltrans has performed studies on vegetated swales and filter strips, constructed treatment wetlands, a wetpond, and bioretention areas to assess storm water pollutant removal. This paper acts as an overview of three individual pilot studies where vegetation was used for erosion control, in biostrips, and in a bioretention area in the highway environment.

A study conducted at the Erosion Control Research Facility at Cal Poly State University, San Luis Obispo (CPSU, SLO) tested the performance of various planting techniques over one growing season. The study compared flats, plugs, hydroseed and compost applications by measuring the affect of each on runoff volume, sediment load, sediment concentration, vegetative cover, and nutrient composition. The techniques were applied to boxes set at a 2:1 slope with clay loam soil. Combinations of techniques utilized were: hydroseeding, flats or plugs on top and toe, and flats or plugs on toe only. Species composition of the flats and plugs included California Brome (Bromus carinatus) and Common Yarrow (Achillea millefolium). The boxes were exposed to natural rainfall measured and recorded by a weather station onsite. Runoff was collected and analyzed for sediment,

WATER PROGRAMS
Sacramento State
Research
Training
Public Education

pH and salt composition. Understory and overstory vegetative cover were measured by a modified transect method.

A second study was conducted to assess vegetated strips, also called biofilter strips, which receive sheet flow from the roadway before reaching the point of discharge. Benefits of biofilters include infiltration, adsorption, filtration, and reduction of storm water flow and erosion. The pilot study was conducted over a 2-year period. Eight sites were equipped between two to five 30-m collection systems and automated samplers designed to capture highway runoff as it passed through various lengths of vegetated areas at the edge of pavement (EOP). Test strip lengths between EOP and collection channels were 1.1 to 13.0 m. Slopes ranged from 5 to 52 percent. Vegetation was unmodified and included grasses, forbs, and legumes. Water quantity and quality data from flowcomposite samples of storm water runoff were collected and evaluated during representative storms.

A third study is currently underway to assess a bioretention area, a soil and plant-based storm water treatment area modeled after those developed in the late 1980s in Prince George's County, Maryland. Pollutants are removed through biological and physical processes. To date, little performance data has been documented on storm water treatment. The pilot site is located in Southern California along State Route 73. The BMP is an on-line system with a drainage area of approximately 1.6 ha (4.0 ac). The BMP includes two pretreatment devices to help remove litter and sediment. Storm water runoff is ponded to a depth of 150 mm (6 in). The ponding area will be planted primarily with Creeping Wildrye (*Leymus triticoides*), Salt Grass (*Distichlis spicata*), Mexican Rush (*Juncus mexicanus*), and Clustered Field Sage (*Carex praegracilus*). The bioretention area consists of a 75 mm (3 in) organic layer, a 1.2 m (4 ft) planting soil layer, a 0.3 m (1 ft) sand layer, and a 0.3 m (1 ft) gravel layer with an underdrain system. The BMP will be installed with automated samplers at influent and effluent points. Water quantity and quality data from flow-composite samples of storm water runoff will be collected and evaluated during representative storms over a 3-year period.

Erosion control planting techniques were shown to greatly affect the success of vegetative establishment in removing sediment from runoff, increasing infiltration and promoting vegetative cover. Similarly in biostrips, substantial reduction in pollutant concentrations and load reduction occurred in vegetated areas adjacent to highways, even in areas not originally designed for treatment. It is anticipated that pollutant removal will be similar in bioretention systems due to the soil and vegetation matrix. Thus, vegetated areas adjacent to highways could be effective and sustainable storm water treatment systems for highways.