TECHNICAL NOTES

U S Department of Agriculture   Natural Resources Conservation Service

TN - PLANT MATERIALS - 49   June 1997

NATIVE GRASSES AND CLEAR WATER: RESTORATION OF THE GRASS VALLEY CREEK WATERSHED TRINITY COUNTY, CALIFORNIA

The Grass Valley Creek watershed covers an area of 23,000 acres, 17,000 of which contain decomposed granitic (DG) soils. The Natural Resources Conservation Service (NRCS) has estimated a high natural rate of erosion in the watershed due to the nature of the soil and an accelerated rate of erosion--235,000 tons annually--due to the activities performed in the past. The Bureau of Reclamation (BOR) and Department of Water Resources (DWR) constructed Buckhorn Dam in 1991 to prevent sediment from reaching the Trinity River and smothering the salmon spawning grounds. Because of private lands at the lower end of the watershed, the dam was built in a place where only one-third of the watershed lies above it. With two-thirds of the total sediment still left to be addressed, the Trinity River Task Force commissioned the Resource Conservation District (RCD) to do erosion control work with the remaining funding as a part of the ten year, multi-agency Trinity River Rehabilitation Project.

The RCD began groundwork in the summer of 1992 supervising California Conservation Corps (CCC) crews and California Department of Corrections inmate crews. The work consisted exclusively of building log structures in gullied roads and channels to hold back sediment then seeding around these structures with non-native grasses. This construction work was followed up in the spring of 1993 with an increase in RCD staff and a full season of conifer and shrub planting. Planted areas included harsh, denuded slopes (sheet and rill), abandoned logging roads, and the banks and channels of gullies. That summer began with continued construction, but materials had evolved from logs to cement-filled sand bags.

> This paper provides an excellent source of new information and background for personnel involved with restoration and revegetation on decomposed granitic soils. It is an outstanding example of the Natural Resources Conservation Service and Resource Conservation District's working together.

Prepared by Dana S. Sandifer, Revegetation Coordinator, Trinity County Resource Conservation District, Box 140, Weaverville, California and reviewed by David Dyer, Manager, Lockeford Plant Materials Center, Natural Resources Conservation Service, Lockeford. California

Logging practices of the past consisted of building landings and roads on mountain ridges and hillsides. Skid roads were constructed in, adjacent to, and often crossed stream channels. This additional soil in the channels and altering of the corridor resulted in the formation of hundreds of headcuts throughout the watershed. Over time, headcuts eat their way up stream channels and send thousands of cubic yards of soil downstream into Grass Valley Creek and eventually into the Trinity River. The new cement bag headcut structures were designed by the NRCS and intended to stop the headcuts from migrating upstream, It was thought that before a structure was rendered useless by weathering, vegetation would take over and stabilize the existing headcuts and gullies forever. Visits to other untreated gullies and headcuts in the watershed showed that even ones well vegetated continue to erode. Trees and other vegetation up to 50 years old have toppled into gullies. After months of monitoring, it was discovered that many of the structures had to be repaired or rebuilt completely, and the banks that were planted would not stop widening with vegetative cover alone. By the middle of the same summer RCD and NRCS staff determined that building structures and planting in gullies was merely a "band-aid" approach and addressed only the effects of much bigger problems.

Turning to watershed restoration specialists outside of the area and discussing options with other government agencies involved in the Grass Valley Creek rehabilitation project, the RCD changed its approach entirely. Realizing the *sources* of the erosion problems needed to be addressed, heavy equipment was brought in to excavate-the sediment placed in channels by past logging activities. Excavated sediment is returned to the stable areas it came from using equipment the same size as that which did the damage. This new rehabilitation work results in a hydrologically correct stream pattern and a completely recontoured landform..

Just as the RCD design team changed from in-stream structures to restoring natural stream patterns, the RCD revegetation crew wanted to change from non-native grass species to the vegetation that occurred naturally in the watershed. This applied not only to the seed being sown on the disturbed soil, but also to the trees, shrubs, and grasses to be planted each year. The RCD wanted to mimic nature as much as possible in order to create an environment that would closely parallel the biodiversity created by natural succession. With our arguments questioning the revegetation practices implemented in the past, we encountered skepticism from other agencies as well as from our own.

Because we did not want to exclude others' theories and still had much to discover about our own, our treatment of the disturbed sites was not at all standardized. Treatments done in 1993 and 1994 consist of many different test sites designed to cover all concerns and possibilities, From these we have chosen sites representative of all the treatments for continued monitoring.

In the spring of 1994, after the first year's tests had weathered a winter and growth had begun, inter-agency staff, along with invited professionals Vic Claassen (Soils Scientist, UC Davis), Frank Chan (Horticulturist, PG&E), and Paul Kephart (Botanist, Elkhorn Ranch), visited our representative sites to determine which treatments had succeeded in controlling erosion as well as establishing acceptable vegetative cover. The RCD realizes that for such a short time span our conclusions cannot be relied on completely. Based on what we observed from the many test sites implemented between 1993 and 1994, what follows are a description of the main practices and their effectiveness.

Critical Area Treatment (CAT) is the general method utilized to provide immediate erosion control and stabilization of recently disturbed soils and denuded sheet an rill slopes. Native grasses and/or native straw mulch are used to immediately control erosion and help establish native vegetation. Native grasses are adapted to the soil and climate conditions in a given area, and exist in a natural and symbiotic relationship with other plant species.

Native Straw Mulch We consider this our most important and most basic treatment, Our application rate is 2 bales/1000 square feet (approximately 3.5 tons/acre), with at least 75% ground cover. In areas with good canopy and where natural regeneration is probable, our CAT consists only of native straw mulch. It can retain up to two pounds of residual seed per bale. Native grass seed is expensive in comparison to the non-native grass seed used in the past, therefore using only native straw mulch compensates for money that would he spent on seed used in conjunction with commercial straw mulch (wheat, barley, oat, or rice). Native straw mulch preferred for the Grass Valley Creek area includes:

--*Achnatherum lemmonii*	Lemon's Needlegrass
--*Bromus carinatus*	California Brome
--*Elymus glaucus*	Blue Wild Rye
--*Festuca californica*	California Fescue
--*Festuca idahoensis*	Idaho Fescue
--*Poa scabrella*	Pine Blue Grass
--Wheat or barley*	

*When native straw is not available we **use** commercial, certified weed-free wheat or barley straw in conjunction with native grass seed.

Native Grass **Seed** We are currently seeding areas classified as harsh at a rate of 0.5lb/1000sqft (approximately 20lbs/acre). Characterustics include disturbed soil, bare areas with poor soil quality , and poor canopy (<30% coverage). Our application rate in 1993 was 1.0lb/1000sqft, but we found the cover to be more than adequate. To cut the total amount of seed purchased, we lowered the rate of application. **As** of 1995, our native grass seed mixture consists of the following species with their percentage of the total mix:

--*Bromus carinatus*	*35.3%*	California Brome
--*Elymus glaucus*	29.4%	Blue Wild Rye
--*Festuca idahoensis*	23.5%	Idaho Fescue
--*Deschampsia elongata*	11.8%	Siender Hairgrass

This seed mixture is a combination of three separate mixtures the RCD developed and tried in 1993 and 1994. One was for hot/dry sites, another for warm/moist sites, and the third for stream channels. The grasses observed doing the best were chosen from each of the three combinations to come up with the mixture of species listed above.

Another grass treatment tested was a barley/clover blend which consisted of 90% grain barley and 10% rose or.crimson clover. The intention behind this treatment was to provide a quick, solid ground cover for the first year's immediate erosion control needs and then allow native vegetation to establish itself the following year. We discovered some ground cover in a few cases, but the majority of sites treated with this mixture were affected by the cold Trinity County winters and good growth was not observed. Of the sites that were successful, we have yet to see whether native vegetation will successfully establish itself

Fertilizer After many discussions on the use of fertilizer with native grasses and after many trials involving different kinds and varying amounts, no differences were observed between native seed that was and was not fertilized. Based on these results, in 1994 the RCD decided to use a slow release nitrogen fertilizer (38-0-0), applied at a rate of 2lbs/1000sqft (approximately 80 pounds/acre). In 199 we began experimenting with other types of fertilizers in order to avoid the use of chemicals. Those tried include Biosol (a by-product of penicillin) and Milorganite (made from human waste). Excellent results were observed with the Biosol. Since 1996 Biosol has been used exclusively with our native grass seed applications.

Willow wattles This method of channel bank stabilization involves cutting willow branches less than 1/2" thick to lengths of 3-8', then bundling them together and installing them at the toe of stream banks, alongside the channel . The purpose is to prevent downslope movement of soil particles from channel banks too steep to mulch and to provide some vegetative growth in channels. We have found willow wattles successful when cut and installed while dormant in the winter. Willows installed during spring and summer months of previous years have not shown successful or sustained growth. The cost of willow wattle installation is approximately $5/linear foot (this includes cutting, transporting, and installing).

Contour Furrows This method has been used only on bare sheet and rill sites and not on sites treated with equipment, due to the fragility of the recontoured slopes. Furrows 4-8" deep are carved into the slope to whatever length desired with the purpose of breaking up slope length to slow water runoff and for catching seeds and duff to promote plant growth. Last summer we tried sowing native forbs and grass seed into the furrows; a few we covered with topsoil recruited from an excavated site. We have found this treatment to be very ineffective in the decomposed granitic soils of the GVC watershed. Furrows have either filled up or failed after the first rainv season.

Lop and Scatter (Slash) This treatment is often used in place of straw mulch or in conjunction with straw mulch. Crews cut the lower branches of trees or recruit any existing forest litter to cover excavated areas. We have observed an excellent return of native vegetation in areas that were covered with slash and have noticed a much higher rate of survival for trees and shrubs planted in the microsites provided by the slash. The germination of grass seed under slash, however, is slower than the germination of seed under straw. Another disadvantage of using slash on excavated sites **is** the lack of complete ground cover and the presence of rilling in the soil after rainstorms.

Microsite Planting After the 1993 season of planting bare slopes with conifers—which seemed after one year to result in 80-90% mortality—we decided to continue planting these slopes, but developed a different approach. Utilizing existing vegetation to provide cover and moisture, conifers are now planted adjacent to and underneath other mature trees and shrubs. After planting in the spring of 1994 using this method we have observed a survival rate on the average of 35%. However; after three years we have noticed much different results in the survivability of planted species. It seems to take at least two years for plantings to adjust to the shock of transplanting and to acclamate to the Harsh conditions of DG soil. Areas planted in 1993 and observed in 1994 had an 80-90% mortality rate, as mentioned above. Another visit to the same sites in 1995 showed that many more conifers had survived, despite their earlier bleak appearance.

Since the beginning of the watershed restoration program in 1992, the RCD has been on a continuous, linear jaunt of self-education and inter-agency growth. Our most important achievements have been the patience to listen and take into account the opinions of other people and agencies, the ability to change what we know is not working for us at any given time, and the courage to drop everything and take a step back in order to get a clearer picture of the source of the watersheds problems.