RECLAMATION OF ORPHAN ERODED SITES WITH VOLUNTEERS

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Abstract. There exist numerous small, 5-20 m^2 eroded areas, which are typically along roadsides, behind businesses or on abandoned areas. A good name for these areas are 'orphan' sites because they are hard to manage and few people care about them. These sites have little likelihood of revegetation without input. Reclaiming these small areas is a challenge due to very low soil pH, high P fixation capacity, sometimes high slope, exposed saprolite and lack of soil structure.

The objective of this work is to enlist local schools, civic groups and environmental organizations to locate orphan sites, offer advice how to proceed, and provide materials such as lime, seed, hand tools, rip-rap and wheatstraw. Preference is given to eroded areas near watercourses.

This project was paid for by the Newland Family Foundation with assistance from the Sierra Club Foundation, and has been in progress for about 5 years and will continue into the future. The primary goal is educational but since many of these sites are actively eroding, some conservation work is also accomplished. Participants are also generally enthusiastic about returning to see their accomplishments.

INTRODUCTION

This project was inspired by Channing Cope, a columnist for the Atlanta Constitution in the 1930's, who grew kudzu on his farm near Atlanta. He organized the Kudzu club of America, whose members planted the vine wherever they could. They were wildly successful. Towns had kudzu queens and festivals. But kudzu's vigor and rapid growth later proved a virtue in excess.

Copes efforts proved volunteers could make a difference during a period when soil erosion was arguably the biggest environmental problem in the Southeast. Now, with the rise in popularity of watershed protection groups, it seems fitting to attempt to enlist volunteers to reclaim eroded land. The work is physically challenging but rewarding. This contrasts with a lot of environmental activism that is physically non-challenging and unrewarding.

THE CLASS

Participants come from a variety of sources. Students at Gainesville Community College, local high schools and The University of Georgia are typical participants, along with environmental groups such as watershed protection and Sierra Club groups. One critical ingredient is, since this is hard work, a younger aged group is always desired.

Upon selection of a site by either myself or 'the Class', the site is viewed and rills and gulleys noted, along with pedestaling (Fig. 1). An estimate of the amount of erosion from the site is made. Classes that choose their own site invariably try to do a larger site than is feasible. They underestimate the work involved.

During the initial class participants are made aware that about 50% of the subsoil is clay and that this gets transported off site, since Southeastern subsoils are very dispersive. We measure pH on site. A question of why the area has not revegetated is made to the group. Our answer is low pH, lack of nutrients and active erosion carrying away nutrients and seed. If soil crusting can be identified, this is included as a factor in continuing erosion. Then the most important part of the work is formulated: the plan. And then we get to work.

Fig. 1. Soil pedestaling due to erosion. Note four inches have been removed from around the vegetation.

THE PLAN

Permanent grasses are exclusively used as they are 99% effective in reducing off site transport of soil (Renard, et al., 1991). On one site blue rug junipers and compost were used due to high slope. Engineering practices such as rip rap and other structures are not used except in areas of concentrated flow. The orientation on these types of problematic soils is to avoid dispersion and transport of clay, since these soils contain around 50% clay (Perkins, 1987).

Mehlich-1 extractable P and K are determined prior to the individual reclamation project. Excelsior mats are used in areas of concentrated flow or in areas with a slope greater than 2.5:1, which is now a Georgia requirement (Lyles, 2000). Lime rates are adjusted depending on the soil pH.

The potential for soil erosion varies throughout the year. The greatest amount of soil erosion occurs during the summer months of May through September due to high intensity thunderstorms. The peak month is July. The plan always includes avoidance of these times as it is difficult to establish vegetation. In Northeast Georgia, it is critical to plant warm season grasses between 15 March and 15 April, and cool season grasses before 1 Nov.

MATERIALS

A portable pH meter (omega model PHH-152) is used to measure soil pH. Pick axes and a rotary type garden tool commonly called 'the weed weasel' are used to break up soil and incorporate lime. A finely ground limestone (80% which passes mesh size 60 or better) is used to maximize reaction time. Commercial purchased fertilizer (20-27-5) is used as these soils are typical adequate in potassium (note Table 1 for ranges of soil parameters in orphan sites) (Plank, 1989). Spring planting consists of bermudagrass or centipede as sod and fall planting consists of mixtures of annual and perennial ryegrass or fescues. Seeders are of the crank case scatterbox type. Gypsum is spread on the surface at a rate of 0.25 kg 10 m^2. Wheatstraw or hay is used to cover about 80% of the soil after seeding. A tackifier, Hercules Soil Lok–E, is spread after straw or hay is spread to hold the cover against the soil.

Rip rap, also known as surge stone, is used to form check dams in areas of concentrated flow and ditches. Burlap is wrapped around piles of riprap to trap sediment.

DISCUSSION

Typical soils are severely eroded Madison, Cecil, Appling or Pacolet series. Together these are the pre-dominant highly weathered soils, or Hapludults, found in Northeast Georgia. These make up around 75% of the land area. These eroded sites chosen are almost always located along right of ways of secondary roads. An attempt is made to locate these sites near watercourses.

Table 1. Range of commonly measured soil parameters on orphan sites

Parameter	Range	Methodology
soil pH	4.4 – 5.1	1:2.5 ratio in water
cation exchange capacity	2 – 15 cmol(+) kg^{-1}	neutral salt displacement
exchangeable acidity	0.5 – 12 cmol(+) kg^{-1}	sum of Mehlich-1 acidic cations

Fertility status

Parameter	Range	Soil test rating for summer grasses
Mehlich-1 extractable P	4.5 - 22 kg ha^{-1}	very low
Mehlich-1 extractable K	90 - 215 kg ha^{-1}	low to medium

These soils tend to be lower in pH than most subsoils and have limited buffer capacity and variable potential acidity, making lime recommendations difficult (Table 1). These values tend to be lower in pH with more variable reserve acidity than that described by Perkins (1987). To make matters worse, lime cannot always be worked into the soil beyond the first two to three inches, due to induration and difficulty in using hand tools.

Lime is mixed with wet potting soil beforehand for ease of application. An application rate of half a kilogram per 10 square meters is chosen, but if conditions warrant (very low active pH, high buffer capacity or the rare ability to work the lime into the top 15 cm of ground), an increased rate is used. Experience has shown that rakes and hoes tend to redistribute amended soil so that areas without any lime are exposed. Weed weasels are encouraged to be used to fully mix lime into the soil.

One-half kilogram of 20-27-5 fertilizer is spread per 10 m^2. This gives an equivalent of 90 pounds of N per acre. Seed are spread on the surface then walked over to ensure close soil to seed contact. Gypsum has been shown to increase flocculation of soil particles, increase infiltration and reduce off site clay transport (Miller, 1987).

Wheatstraw is applied so that the soil is still visible within each square foot. A tackifier has been found to be most helpful to keep the straw in place during wind.

Soil pH is measured after one year, and surface lime reapplication is done at a rate of 0.20 kg per 10 m^2. Fertilizer applications are repeated after one year at a rate of one-half the original rate.

Before and after photographs are taken of each site reclaimed.

CONCLUSION

The contribution of sedimentation and turbidity from these sites are unknown but deserves further study. On the education side, concepts of raindrop impact, soil cover, fertilization and soil erosion processes are impressed upon interested students. The Classes are quite enthusiastic. Many return and send comments about the progress, not unlike a proud gardener. Besides getting a little conservation work done and including the learning experience, these projects are designed to be fun also.

Future plans are to continue this project with two events in the Spring and Fall during the next 3 years.

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