

## LOW COST EROSION CONTROL ON HIGHWAY SLOPES IN SOUTHEASTERN UNITED STATES

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The building of highways through areas of rolling topography results in many cut and fill slopes of exposed soil. Assuming that nature's method of controlling exposed soil by vegetation is the simplest, and most desirable, and that vegetation will become established naturally if undisturbed, it might be expected that all road banks would become naturalized if given a sufficiently long period of time. However, due to artificial conditions generally created by road construction and maintenance, favorable opportunity for the natural establishment of a vegetative cover is the real problem of road bank control.

Highway construction, until recently, has been simply a matter of location and design. Little or no consideration has been given to the possibility of erosion or sloughing on cuts and fills. On old roads, failure to recognize road bank erosion has not only created a problem of increased maintenance but has precluded the establishment of natural vegetative cover that harmonizes the roadway with the surrounding landscape.

Many difficult problems present themselves in obtaining the desired results. The first step in obtaining road bank control is more careful location of the highway in respect to topography and necessary drainage. The next step is, during construction, to adjust the slopes of the banks as nearly as possible to adjacent topography and to provide adequate drainage.

The factors in obtaining desired results in naturalization of exposed highway slopes are soil stability, soil moisture, and soil fertility.

Soil stability is definitely affected by gradient and length of slope. Because the angle of repose varies for different

soils, heavy clay soils are able to remain in place on steeper and longer slopes than are sandy soil types if the effects of frost action are eliminated. In some sections of the southeast, freezing and thawing may occur daily during the cold seasons. By actual measurements during a six-week period in early spring one cubic yard of soil has been sloughed off by frost action from a section of clay road bank nine feet square. This loss of four surface inches is an average rather than an extreme case. In extreme cases an inch of surface soil has been observed to heave and slough from a clay bank as a result of a single freeze and thaw. This instability of exposed soil on highway slopes has been proved to be one of the greatest deterrents to roadbank naturalization.

Equally important is insufficient soil moisture, particularly evident on banks exposed to direct sunshine and where drainage ditches have been constructed too close to the top of the slope. Desiccation of the soil prohibits the normal development of vegetation. This factor is not generally recognized, but experiments have shown that it is a fundamental cause of failure in roadside naturalization.

A third deterrent to successful roadbank fixation is lack of soil fertility. Obviously, roadcuts of any appreciable depth will expose infertile subsoil and parent soil material.

Vegetal planting alone without regard to these deterrents to growth has led to tremendous loss of time and money spent on roadbank control. Miles of plantings have resulted in almost complete failure due to lack of moisture and to the exposure of the root systems by soil erosion and frost action. It is now known that

simple expedients for preserving soil moisture and preventing erosion would have reduced these losses

The landscapers' practice of completely sodding a bank is certainly applicable and gives permanent control wherever sod is easily available, and where the cost of application is considered feasible. But on sterile banks of deficient moisture even this method may be a failure. At the same time, there are many localities where sod suitable for transplanting at a feasible cost is not available. The following methods to be discussed consider how to obtain bank control that will be equivalent to that provided by successfully transplanted sod banks at costs that would be economically sound.

Of all the types of mechanical devices now being employed to provide favorable opportunities for the establishment of vegetation on highway slopes probably the most generally applicable and simplest method that has yet been developed is the use of mulches, of which many kinds are known to be effective.

To date, the most valuable results obtained in low cost erosion control from extensive roadbank fixation projects in Southeastern United States concern the use of mulches. Besides protecting exposed soil from all forms of climatic stress, mulches produce ameliorating effects upon the soil, both chemical and physical. The insulating qualities of mulches prevent the drying out of the exposed slopes. They maintain a more nearly uniform and favorable growing temperature. Organic material and plant nutrients are added to the soil as the mulches decompose. Wherever moisture conditions have been improved and the soil stabilized by application of mulch to highway slopes, plantings have been more successful. There are many instances where plantings of woody shrubs and vines have been brought into vigorous growth by mulching even after

one or more seasons of very meager growth have elapsed since transplanting.

Mulches of local organic materials such as roadside mowings, weed straw, and woods litter are usually the easiest to obtain. Such mulches supply seed of a large number of local plant species. The plants that will establish themselves naturally under the rigorous conditions generally found on a newly cut roadbank have the best chance to survive. Plants that do establish themselves naturally from the local mulching materials are those plants which are indigenous to the locality and will harmonize the roadside with the surrounding landscape.

The method of application of local mulching materials varies with both the site and the nature of the material. To be effective the mulch must remain in place close to the bank without being moved by wind or rain.

On very flat slopes there is little movement of the heavier types of mulching materials, but on steeper slopes it is generally necessary to resort to the use of poles or brush laid over the lighter materials, or to small stakes set at random over the bank. In many instances an occasional shovelfull of tight soil laid on top of the mulch is all that is required.

In general light applications of mulch are more desirable than are heavy applications. Too heavy applications prevent free circulation of the air which may lead to composting and may actually kill the seed, as well as prevent seedling growth.

The growth on roadbanks treated with local mulches will be composed during the first season of weeds and briars which are followed by a sod of local grasses within two or three years. The sod forming grasses may be increased by the introduction of seed into the decomposing organic mulches.

After the roadbank has been stabilized by growth that has established itself naturally a wide variety of plant species

may be selected for landscape planting. Lespedeza bicolor, spiraea, roses, weigela, and Scotch broom are but a few of the many attractive plant species that may be successfully planted after the roadbank has been stabilized and an opportunity for plant growth has been provided.

Erosion can be controlled on most highway slopes and at a low cost if we

are willing to make the effort. Maintenance costs will be reduced and trout streams that follow mountain roads will be protected from silting. Finally, instead of traveling beside bare unstable roadbanks, traffic will move along a naturalized roadside whose vegetated slopes blend into and harmonize with the surrounding landscape.