

Establishing Vegetation on Highway Slopes in Arizona

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The Arizona Department of Transportation has the policy of minimizing erosion and sediment damage to the highway and adjacent properties. This is accomplished by applying special techniques to temporarily control erosion and encourage vegetative growth for long-range erosion control and improved esthetic quality of our roadsides. The erosion control seeding is accomplished on the road construction contract, or a separate contract soon after, to lessen the erosion potential.

Most of the areas along our roadsides will not readily support dense vegetation because of soil of low inherent fertility, toxic soil conditions, steep or unstable slopes, low rainfall or temperature extremes. Amendments are used to improve the condition of the soil. Toxic material is plated with suitable soil. Steep slopes are flattened or benched where possible. Species that are adapted to conditions at each site are selected to further the chances for successful seedings. Mulch is used to stabilize the soil surface, modify the temperature and extend the favorable moisture period.

The condition of the soil is of primary importance in establishing vegetation at each new site. The soil is analyzed and amendments selected to provide improvement of the growing medium.

Toxic areas are identified and given special consideration. Sulfur, gypsum or a combination of these can be tilled into soil which has sodium in excess of 10% base saturation. Gypsum at the rate of 400 pounds per acre will reduce sodium saturation by 1%. If there is adequate lime in the soil, the same results can be obtained with 72 pounds of soil sulfur per acre. Sodium as high as 39% has been treated with a combination of 8,000 pounds of gypsum and 400 pounds of sulfur per acre. After the amendments are tilled in, the area is plated with 6 inches of soil to encourage vegetative growth.

Nitrogen and phosphorous are tilled into seedbeds in amounts up to 80 pounds per acre each. The exact amount is more dependent on rainfall than soil analyses. Excessive fertilization seems to induce lush vegetative growth creating competition for the limited moisture available in the lower rainfall areas.

The next consideration for establishment of vegetation is the selection of species suitable for each site. Because each species has its own climatic, physiographic and biologic limitations, those not fitting into the ecological parameters of a particular site will not be successfully established. Each species selected must therefore be adapted to all existing or manipulated factors of each site.



Figure 1. An area where two tons of hay per acre were anchored by crimping after having been seeded.



Figure 2. Vegetation resulting from a mulched seeding two seasons old.



Figure 3. Grass stand from a two-year old mulched seeding.

The same seed mixture is usually used throughout the project being planted. The mixture is usually made up of species indigenous to the area (subject to availability), species that have done well on similar sites and species suitable for special areas within the project.

The seeding rate is determined to provide from 20 to 60 pure live seed per square foot of the primary species combined. The harsher the site conditions become, the higher the seeding rate used. For example, broadcast seeded and unmulched sites require a higher seeding rate than that which is required when planting by drilling with subsequent mulching with hay or straw.

The depth at which seed is planted is an important aspect of success or failure in a planting. Seed planted too deep has difficulty in emerging. If not covered, germination can be hindered. Large-seeded species are usually planted about one half to one inch deep by drilling. Small-seeded species are usually planted by broadcasting and covered by lightly dragging the surface.

The final consideration for establishment of vegetation is the use of mulch over the seeded areas. Mulches can increase infiltration of water into the soil by preventing raindrops from dispersing soil fines that plug the interstices through which water moves into the soil. Mulches also moderate tem-

peratures, decrease evaporation, prolong periods of favorable moisture levels and stabilize surface soils and fertilizer in place while vegetation is becoming established.

The use of mulch is predicated on the erosion potential and the possibility of establishing vegetation without it. Areas that are relatively flat, with soils of low erosion potential, can be vegetated without mulch if the rainfall patterns are suitable. If the erosion potential is high and revegetation potential uncertain, mulches are used to good advantage.

Grain from the straw and weeds from the hay can provide undesirable competition to new seedlings. This type of mulch is readily available however, and less expensive than excelsior or rock mulch. Hay or straw is used at two to two and one-half tons per acre, either crimped into the soil surface or tacked with emulsified asphalt at 400 gallons per acre.

The Arizona Department of Transportation has treated approximately 5000 acres of disturbed land over the past four years. Costs per acre have averaged between five hundred and seven hundred dollars. Even when the initial treatment is expensive, considerable savings in maintenance funds over a period of time are expected.