

Control of Soil Subject to Wind Erosion

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•EROSION by wind is a particularly serious problem on light soils and pure sands. These soils usually lack cohesiveness except when they are moist. As they have low water-holding capability, they dry rapidly and begin moving early in periods of high-velocity winds. It is important, then, to take special precautions to provide prompt protection for disturbed soils susceptible to wind erosion. Failure to do so may result in heavy soil loss, damage to plant cover, and unwanted depositions on highway rights-of-way and adjacent crop fields or other property susceptible to damage of this sort.

On heavier soils, temporary wind-erosion control may be gained by employing tillage methods that bring clods to the surface. However, these clods soon weather down to erodible particles. Regardless of soil type, permanent control of wind erosion requires that the soil surface be protected by a cover of living plants or by dead vegetation continuously replenished. Surface protection may be gained by employing one or more soil-conserving practices such as stubble-mulching, cover-cropping, strip-cropping, windbreaks, establishment or permanent herbaceous or woody plant cover, and mulching. The proven practices of major interest and value for highway use are mulching, establishing permanent plant cover, and cover cropping.

MULCHES

The use of mulch offers immediate protection against wind erosion. Wheat straw or hay applied at the rate of $1\frac{1}{2}$ to 2 tons per acre, and anchored properly, is effective on soils and pure sand. Even if permanent species are to be established, mulch should be applied as soon as the land is prepared, either before or right after seedings or plantings are made. In addition to its soil-stilling value, mulch promotes conditions in the seedbed favorable to the germination and establishment of the permanent species adapted to the problem soils of the various regions.

There are a number of practical methods of anchoring mulch against wind movement. Where the site permits machinery to run over the land, mulch can be anchored cheaply by using a tractor-drawn mulch-anchoring tool. This device is made of notched coulters on an axle mounted under a frame which holds varying weights of ballast. The ballast weight is varied according to soil type and condition so that the mulch is partially poked into the soil. The method is very practical and effective and is being used widely on watershed and other stabilization projects.

Another well-known method of anchoring mulch is through the use of asphalt emulsion applied simultaneously, or sprayed over the mulch after it has been placed. In areas of severe wind velocities, larger quantities of emulsion may be needed to prevent movement. The chief value of this method is that it can be used on terrain too steep or too small to permit the use of tractor-drawn machinery.

Mulch may also be anchored securely on certain areas where it is not feasible to use the methods just described. There are several open-mesh fabrics of twine and paper which are effective for holding mulch and can be stapled over critical areas. For example, "Mulch-Net" and similar materials can be used on areas difficult to access at crests of slopes, or in cuts where wind velocities may roll back asphalted mulches.

Industrial firms are developing and testing chemical-mulching and soil-binding materials which show promise for stilling soil and sand subject to wind erosion. Chem-



Figure 1. An anchoring tool being used effectively to tie down mulch on a watershed project.

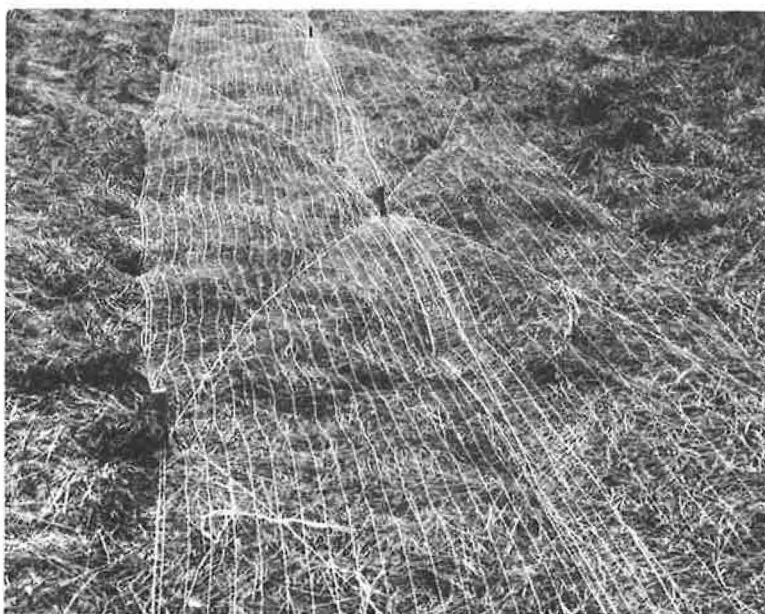


Figure 2. Pegs hold paper netting in place over mulch. Staples and stapling guns can be used to fasten netting instead of driven stakes and twine.

icals are used to bind soil particles together so as to prevent wind movement. These materials are said to be non-toxic to plants, and when applied properly, they will hold the soil while vegetation becomes established. As these chemical materials become

more widely tested and their range of use and adaptability become known, they may become valuable tools for those concerned with wind-erosion control.

SEEDING AND PLANTING PERMANENT SPECIES

As indicated, mulches should usually be used to protect permanent seedlings or plantings on soils subject to wind erosion in the same manner as on other critical areas. Without mulching, even the best adapted species may fail to establish because of sudden drying or blowing away. Under ideal season and moisture conditions, permanent species may become well established and then fail because of injury by the abrasive action of windblown particles. However, under these conditions, permanent species planted without mulch may be protected from soil movement and abrasion during their vulnerable

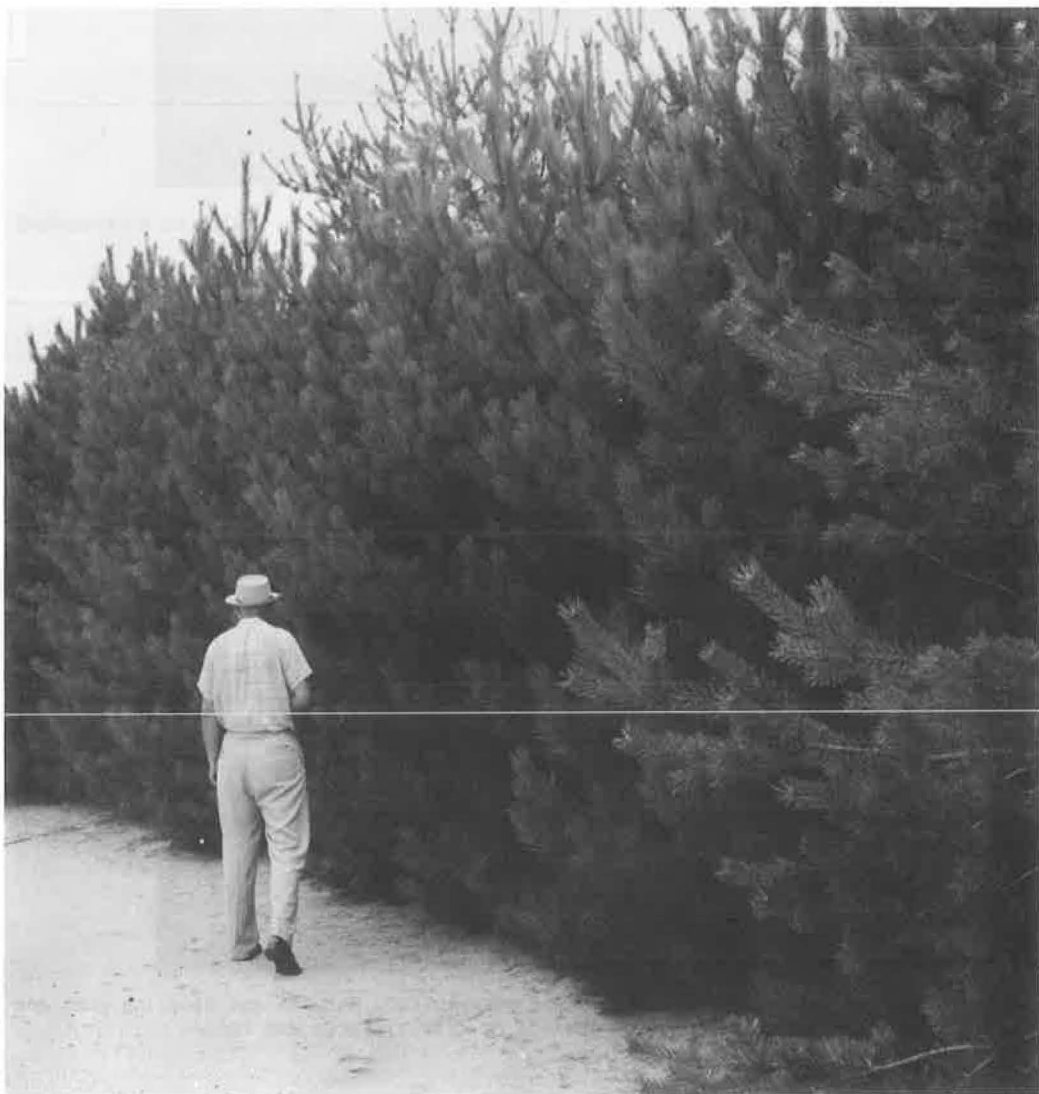


Figure 3. Red and Scotch pine provide effective permanent cover on sandblows in the Northwest. They grow well if the seedlings are protected from sandblasting until well established.



Figure 4. Annual cover crops provide residues which are used to protect seedings of permanent species on land subject to wind erosion.

period by seeding narrow strips of a fast and tall-growing temporary species. Wheat and rye are effective for fall and winter and sudangrass or sorgham will do well in the spring and summer seasons. Plant 8- to 10-ft wide bands of these species between permanent seedings on strips 20 to 50 ft in width. When the temporary species in the bands approach maturity, but before the seed is ripe, they can be worked partially into the ground (trashy cultivation), and the areas can then be seeded to permanent species. Plantings for temporary windbreak purposes should always be placed as close as possible to right angles in the direction of prevailing winds.

In most regions there are available species of plants that have been proven to be effective permanent stabilizers on most soils. However, on areas of sandblows, dunes, and hydraulic fills, the choice of species is much more limited and the need for stilling techniques is a great deal more critical. Well-anchored mulch again is the top choice for stilling sand, tempering seedbed conditions, and preventing sandblasting when permanent herbaceous species are to be established.

Woody plants may often be the best choice for permanent cover on sands. However, they too need protection from blasting and deposition. In addition to mulching with hay or straw, there are other ways to protect new plantings or trees and shrubs. The placing of brush over the area to be planted will reduce sandblowing, provide partial shade, and protect the interplanted seedlings. Another effective technique is to plant a pioneering sand-loving species such as American beachgrass. When the beachgrass is established it can be interplanted with adaptable woody species. The beachgrass will decline, after a few years of site stability, but by then the woody plants will no longer need protection and will be ready to assume dominance over the area.

COVER CROPS

Annual cover-crops offer a solution to wind-erosion problems in certain instances. They can be used temporarily to stabilize disturbed areas which would otherwise lie bare until brought to final grade and permanently treated. However, they may be used during their season of growth to protect finished graded areas, after which their residues can be used in place for protecting permanent seedings. Cover-crop species



Figure 5. The windbreak in the background is supplemented with perennial sand-stilling species of grass to control a northeastern sandblow problem area.

used for these purposes should germinate rapidly and be fast-growing. Wheat and rye have these qualities for fall sowing and winter cover. Sudangrass and sorghums are among the best for spring sowing and summer growth. Their maximum erosion control and residue-producing values will be realized if they are sown on well-fertilized sites during periods of ample moisture.

If winter or summer annuals such as rye and sudangrass are used temporarily to protect a site and produce residues for permanent seeding protection, the cover crop should be mowed to a 6 to 8-in. height just before maturity. The permanent species can then be seeded into the remaining stubble and fallen mulch. In areas of severe wind erosion, it may be necessary to anchor the residue with a coulter machine in the same manner as with applied mulch.

WINDBREAKS

Although windbreaks are primarily used to reduce wind velocities on large areas such as cultivated fields and around homesteads, they have similar value for protecting smaller areas. Windbreaks reduce the drying effects of wind on grassed areas and plantings of woody species. They can also be used as living snow fences or to control depositions of wind-driven soil. Each section of the country has suitable species available which can be used in establishing effective windbreaks tailored to local needs. Many of the species have supplemental wildlife food and cover and aesthetic values. Generally, windbreaks are not cure-alls for wind-erosion problems, but they should be used to supplement other appropriate practices.

The effectiveness of any barrier depends on such factors as wind velocity and direction, and the shape, width, density, height, and interval of the barrier. When the wind blows at right angles to an average tree windbreak the velocity adjacent to the barrier is reduced 70 to 80 percent. At a distance equal to 20 times the height of the windbreak, the velocity on the leeward side is reduced by 20 percent. Little or no protection is afforded at distances greater than 20 times the height of the windbreak.

Because of wide variations of soil and climate encountered nationally, no attempt is made here to list permanent herbaceous and woody species used for controlling wind erosion. Use should be made of species which are locally adapted and which will provide long-lived, erosion-resistant cover under practical treatment. Highway technicians probably know of species suited to local conditions. If not, information concerning them is available from State agricultural experiment stations, county agricultural extension agents, and Soil Conservation Service offices.

COMMUNITY EFFORT

The most successful results in dealing with wind-erosion problems are obtained when groups of people combine their efforts and recourses and take action on a community level. Individual efforts may be effective for a limited area, however, soil blown from nearly untreated areas can vitiate such efforts and reduce visibility for the motorist, smother established plantings, and clog highways with depositions that are hazardous and expensive to remove.

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