



Weeping lovegrass and sericea lespedeza control erosion. Woody Plants become established on slopes.

For Highway Rights-of-Way

Direct Plantings

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NEW HIGHWAYS yearly add thousands of acres of vegetation for state highway departments to maintain. Maryland alone seeds and mulches 2,000 acres of disturbed soil on highway projects annually. Such vegetation costs more to maintain than woody cover.

Thus in 1966, the Maryland State Roads Commission and the Soil Conservation Service signed a cooperative agreement, with the approval of the Bureau of Public Roads, to study effective and economic ways to establish woody plant materials on roadside sites. Establishment of low-maintenance plants on part of the normal right-of-way would allow more adequate treatment of sod areas.

Rather than miles of neatly mowed, or somewhat neglected grass, the motorist would have a varied landscape of trees, shrubs, wildflowers, and grass. Idea was to reduce maintenance costs, but not compromise stabilization, erosion control, and natural beauty.

Plant testing and studies are now

being conducted in the three climatic zones of Maryland. Many test sites in the Coastal Plain are problem areas. These consist of sandy, infertile, and droughty soils. The Piedmont soils rate fair to good in fertility, organic matter, and water-holding capacity, though sites with poor fertility and excessive drainage can be found. Shallow, poorly developed, rocky, and droughty shale soils are typical of many Appalachian sites. Both field and laboratory testing has also been done in sandy loam.

Hand-planting seed of many woody species—in the greenhouse, in cold frames, and on roadbank sites—to evaluate emergence results has been tried. Based on favorable emergence results, a corn planter was modified to direct-plant woody species. The machine includes a scalper, sod-seeding shoes, a press wheel, and a drag chain to incorporate seed and fertilizer into the soil. This machine will scalp a 10-inch sod strip, place seed of woody species $\frac{1}{4}$ inch to $\frac{1}{2}$ inch deep, place fertilizer to the side

and below the seed, and cover the seed and fertilizer. In one operation this machine plants two rows of woody seed and places a high phosphorus fertilizer under the soil surface for seedling use.

'Arnot' bristly locust (*Robinia fertilis*), silky dogwood (*Cornus amomum*), smooth sumac (*Rhus glabra*), and indigobush amorpha (*Amorpha fruticosa*) have produced the best stands to date. Using the modified corn planter drawn by a wheel-type tractor, plantings could be made on level areas and on relatively flat slopes in order to control erosion, drifting snow, and noise, or to serve as a natural screen.

One of the test hydroseedings of the cooperative project was the seeding of woody species on 40 acres of the John F. Kennedy Memorial Highway, Interstate 95. Since initial construction in 1963, the original seeding had failed. Slopes were actively eroding. Sedimentation in drainage ditches, roadside unsightliness, and increasing maintenance costs prompted action.

In October 1966, problem areas were checked. Plant materials adaptable to these soils were selected. Soil types included Tuxedo, Glenelg, Aura, and Beltsville. A report recommended that basic erosion repair and slope reconstruction were needed on 40 acres. Several low-maintenance cover-companion and woody plant species were recommended for use in the reseeding attempt. Plans were carried out in the spring of 1968.

Following erosion repair and slope reconstruction, the contractor applied 2 tons of dolomitic limestone and 250 pounds of triple superphosphate (0-46-0) per acre to all areas. Lime and fertilizer were worked into the top 2 inches of soil by dragging the slope with a harrow. The basic seed mixtures, woody species additives, and fertilizer used are shown in the accompanying box.

Basic seed mixtures were required to provide immediate erosion control on the slopes and to allow woody plant establishment between bunchgrass plants. Basic Mixture No. 1 was used on 8.36 acres, and Basic Mixture No. 2, on 31.10 acres. In the actual hydroseeding operation, woody species 1-A was added to a hydroseeder filled with Basic Mixture No. 1 and seeded on a designated site. Woody species 1-B through 1-E were added later, each to a separate tank of Basic Mixture No. 1 and seeded on separate sites. Basic Mixture No. 2 with its woody seed additives was seeded the same way.

Inoculant for leguminous plants was used at four times the recommended rate per unit of seed. All seeded areas were mulched with 2½ tons of wheat straw, and this mulch was cut in with a mulch-anchoring tool drawn by a small bulldozer. Areas inaccessible with the bulldozer were tacked with asphalt. Near the crest of many slopes, oak (*Quercus*) and maple (*Acer*) were hand planted in clumps using seven seeds per group at 1-inch to 2-inch planting depths.

Over the past three growing seasons the seeded areas have progressed from early cover-companion stabilization to present woody plant establishment. By August 1968, all slopes were stabilized with weeping lovegrass and sericea lespedeza. A followup fertilization of 10-20-20 and 38-0-0 at 500 lbs. per acre each was made. No woody seedlings were observed in 1968, and areas seeded to Basic Mixture No. 1 contained a sparse stand of crownvetch in addition to weeping lovegrass and sericea lespedeza.

In 1969 weeping lovegrass and sericea lespedeza were providing most of the plant population, but crownvetch and coralberry were the next most numerous species on their respective seeding sites. Other woody species observed in good distribution but in fewer numbers were as follows:

Scotch broom	<i>Cytisus scoparius</i>
fragrant sumac	<i>Rhus aromatica</i>
flameleaf sumac	<i>Rhus copallina</i>
Siberian crabapple	<i>Malus baccata</i>
cockspur hawthorn	<i>Crataegus crusgalli</i>
lespedeza	<i>Lespedeza daurica</i>
lespedeza	<i>Lespedeza daurica shimadai</i>
lespedeza	<i>Lespedeza japonica intermedia</i>

During 1969 weeping lovegrass set a good crop of seed, and sericea

Modified tool bar planter (F-76) with winged-sweep opener removes 10-inch sod strip, places fertilizer in 1-inch band to side and one inch below seed. Seed is planted ¼" to ½" deep and drag chain aids covering of seed. Large zero



BASIC SEED MIXTURE No. 1

Common Name	Scientific Name	Rate/Acre
weeping lovegrass	<i>Eragrostis curvula</i>	3 lbs.
sericea lespedeza	<i>Lespedeza cuneata</i>	20 lbs.
Scotch broom	<i>Cytisus scoparius</i>	2 lbs.
flameleaf sumac	<i>Rhus copallina</i>	} mixed
fragrant sumac	<i>Rhus aromatica</i>	
crownvetch	<i>Coronilla varia</i>	20 lbs.

Woody Species Additions to Basic Seed Mixture No. 1:

Code No.	Common Name	Scientific Name	Rate/Acre
1-A	Scotch pine	<i>Pinus sylvestris</i>	2.16 lbs.
1-B	Amur honeysuckle	<i>Lonicera maackii</i>	.79 lbs.
1-C	memorial rose	<i>Rosa wichuraiana</i>	1.5 lbs.
1-D	Siberian crabapple	<i>Malus baccata</i>	1.19 lbs.
1-E	black-eyed-Susan	<i>Rudbeckia hirta</i>	} .33 lbs.
	common lilac	<i>Syringa vulgaris</i>	
	New Jersey tea	<i>Ceanothus americanus</i>	

Fertilizer: Inorganic: 10-20-20 @ 400 lbs./acre
Organic: 38-0-0 @ 440 lbs./acre

BASIC SEED MIXTURE No. 2

Common Name	Scientific Name	Rate/Acre
weeping lovegrass	<i>Eragrostis curvula</i>	3 lbs.
sericea lespedeza	<i>Lespedeza cuneata</i>	20 lbs.
bayberry	<i>Myrica pensylvanica</i>	6 lbs.
coralberry	<i>Symphoricarpos orbiculatus</i>	3 lbs.

Woody Species Additions to Basic Seed Mixture No. 2:

Code No.	Common Name	Scientific Name	Rate/Acre
2-A	American bittersweet	<i>Celastrus scandens</i>	.75 lbs.
2-B	cockspur hawthorn	<i>Crataegus crusgalli</i>	1.0 lbs.
2-C	eastern redcedar	<i>Juniperus virginiana</i>	1.0 lbs.
2-D	lespedeza mixed	<i>Lespedeza daurica shimadai</i>	2.0 lbs.
		<i>Lespedeza daurica</i>	
2-E	lespedeza	<i>Lespedeza japonica intermedia</i>	2.0 lbs.
2-F	Austrian pine	<i>Pinus nigra</i>	1.0 lbs.

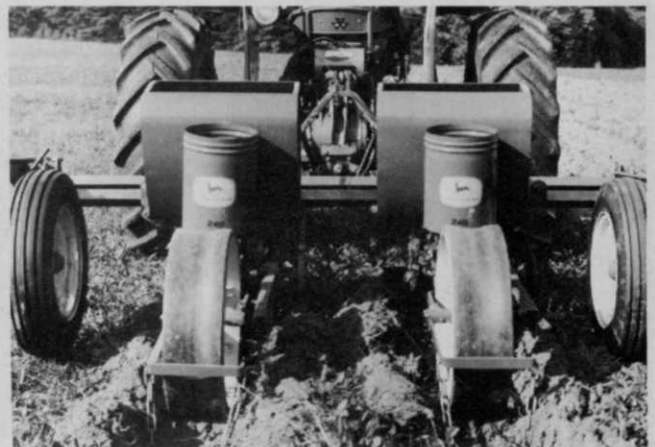
Fertilizer: Inorganic: 10-20-20 @ 500 lbs./acre

lespedeza produced some seed for reseeding sparsely vegetated areas. Spot planted species emerged and were very successful. Woody volunteers, including poplars (*Populus* sp.), black locust (*Robinia pseudoacacia*), staghorn sumac (*Rhus typhina*), smooth sumac, and flameleaf

sumac were noted with several colonies of sumac becoming extensive.

Observations of the seeded sites were made in June and August 1970, the third growing season following seeding. All slopes were stabilized. Areas seeded to the mixture con-

pressure tires and wheels drive seeding and fertilizer units. Outer gauge wheels (3.90 x 15") aid in controlling depth. Note the larger 24-inch drive wheel and drag chain.





Cover-companion species (weeping lovegrass and sericea lespedeza) allow seedling of woody lespedeza to establish (Spring '69).



Mulch anchoring tool for incorporation of seed and mulch with soil requires heavy power unit. Work was done on the John F. Kennedy Memorial Highway in the state of Maryland. Effort was a government research project in cooperation with state.

taining crownvetch are being dominated by this plant. The crownvetch is setting an excellent crop of seed. Areas seeded to the mixture containing coralberry have good plant stands of that species 8 to 36 inches high. Density varies, with the heaviest stands occurring in areas of low-

est competition. All other woody species observed in 1969, with the exception of Scotch broom and Siberian crabapple, are present in 1970. Most are 8 to 10 inches tall, but some of the lespedeza is blooming and should set seed this year.

Weeping lovegrass and sericea lespedeza are acting as a cover-companion crop. They are stabilizing the slopes with a protective canopy of vegetation and an extensive root system, and acting as a living mulch for volunteer and seeded woody species. They will provide an attractive low-maintenance cover until the later stages of succession dominate.

In addition to being tested in direct mechanical seedings and hydroseedings, many species have been tested and compared in line-out stock plantings, row seedings, herbicide trials, mulch trials, and peat pellet seedling trials.

Acceptable species for use on roadsides must be easy to establish, adaptable to subsoil sites, and relatively free from pests. They must have aesthetic value, including desirable form and size. And they must have conservation value. Many species have failed to meet

these criteria in one or more test plantings; some species have been successful.

Test plantings have shown that establishment procedures can differ from species to species. Some species are unadaptable to certain soils and sites. The grass used for initial erosion control when seeding woody plants must be a bunchgrass to reduce competition and allow woody seedlings to establish between grass plants. In several plantings adequate mulch and mulch tacking have proven beneficial for erosion control and stand establishment. Many sites have proven unacceptable as test areas because herbaceous plants grow rapidly after the sites are fertilized.

As a result of fertilizer applications, some sites prepared for test seedings by mowing, spraying, and grubbing out sparse vegetation looked, 2 years after seeding, as though they had never been disturbed.

In plantings where the seed of woody species is incorporated into the soil, germination and establishment have been higher per unit area. Merely broadcasting the seed on the roadside does not, in most

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Oak seedlings were four feet high by August '70.



Spot planted oak seedlings on John F. Kennedy Memorial Highway emerged in the spring of 1969.

cases, produce a satisfactory stand of woody plants.

Establishment of many shrub and tree species may be possible by direct seeding. Additional tests are needed and will be carried out. A beginning has been made and when the final plantings have been evaluated, direct seeding of woody plant material should be a commonplace.

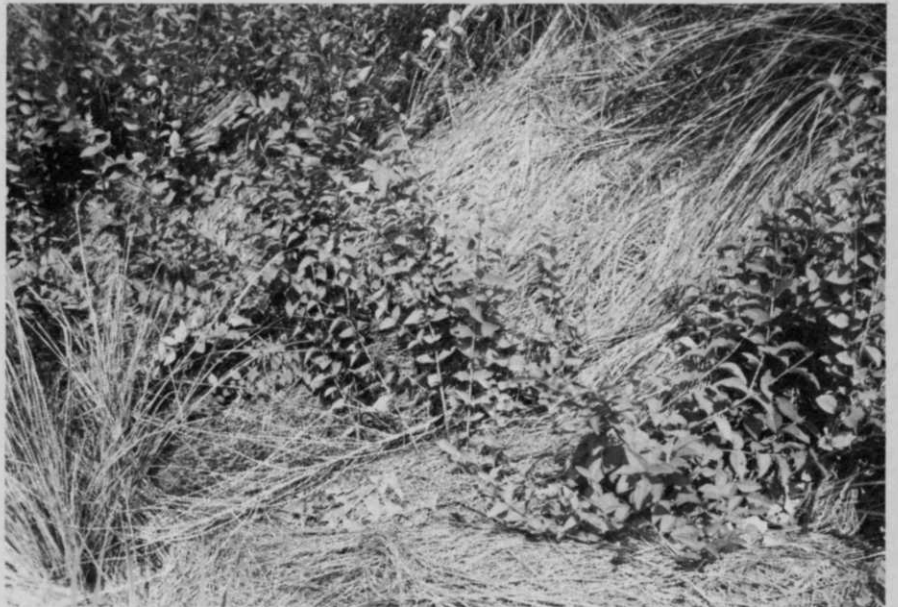
Adapted from a report by H. W. Everett, Charles R. Anderson, Gary V. Schultz, and Richard Dudley, Agricultural Research Center, Beltsville, Md., presented by Mr. Everett at the Twenty-ninth Ohio Roadside Development Short Course at Columbus, Ohio.

Toro Purchases Viking Corporation

Toro Manufacturing Corporation at Minneapolis, Minn., has just purchased Viking Manufacturing Corporation of Manhattan, Kan.

Viking makes a roller blade line of turf-conditioning equipment, a tool which handles various cultural practices from rough grading through seeding and fertilizing. The new addition to Toro's line of mowers and others turfgrass care equipment will be known as the Toro Landscaper. It will be produced in Toro's Minneapolis plant and marketed through Toro's Turf Products Division.

Toro's president, David T. McLaughlin, in announcing the purchase said that key markets sought for the new machine would include golf courses, parks, schools, cemeteries, landscape contractors, and sod growers.



Coralberry seedlings grow through weeping lovegrass cover — companion species. Photo made August 1970.

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