WEEPING LOVEGRASS FOR HIGHWAY SLOPES IN THE VIRGINIAS

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Research investigations were conducted in several geographical sections of Virginia and West Virginia to determine the general adaptability of weeping lovegrass to the various soils and climates along roadsides in these two states. Weeping lovegrass gave quick-establishing cover and slope protection during the hot summer periods in both states. In contrast, cool-season species such as Kentucky 31 fescue generally established much slower and were not as effective for obtaining quick erosion control during the summer period. Liming appeared to be necessary only on certain acid soil formations in the mountainous regions and on the very acid pyrite soil materials in the coastal plain region of Virginia. The use of a 10-20-10 fertilizer at 750 lb/acre was generally satisfactory for obtaining quick-establishing stands of weeping lovegrass and for allowing gradual botanical shifts to sericea lespedeza, crown vetch, or woody vegetation. Increasing this fertilizer rate to 1,500 lb/acre greatly increased the density and persistence of lovegrass on the vary steep slopes. Applying lateral furrows to the slope face prior to seeding greatly improved the rapidity of obtaining lovegrass stands, especially with the low fertilizer rates on loose, friable, and steep slopes. The best and fastest establishing lovegrass stands were obtained with seedings made during the late spring and early summer periods. Seeding in early spring often gave good lovegrass stands, but these grew very slowly during the cool spring and were subjected to frost kill at higher elevations. Seeding before late summer was necessary to allow lovegrass to complete seedling development prior to the end of the growing season to ensure winter survival.

•ESTABLISHING good persistent sods rapidly is a major problem along highways, especially in areas with steep slopes where soil materials are acid, infertile, and poor in physical properties. It is necessary to grow good sods soon after grading to aid in controlling erosion and siltation and to avoid polluting water courses. Ideally, slopes should not be made steeper than 2½:1, and 3:1 grades are preferable for ease of establishing and maintaining suitable soil vegetative cover. However, because of steep terrain, difficulty of obtaining sufficient right-of-way, and costs, many roadside slopes in the Virginias have 1:1 or steeper grades. In gently rolling terrain, such steep slopes are common along secondary roads that have been widened where additional right-of-way for flatter slope construction was not obtained.

It is expedient to first establish vigorous-growing grass sods to provide quick soil stabilization and water control. Where the soil fertility level and plant population density are carefully manipulated, such sods provide suitable environments for the establishment of perennial legumes and woody vegetation. Kentucky (Ky.) 31 tall fescue has produced good sods on steep slopes where slow-release (urea-formaldehyde) nitrogen or periodic applications of maintenance fertilizers were used (2). However, it is

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difficult to establish Ky. 31 fescue or other cool-season perennials during late spring and summer because of adverse high temperatures and drought.

Weeping lovegrass [Eragrostis curvula (Schrad) Nees.] develops quickly during the late spring and summer on steep and infertile roadside slopes in some southern states (1, 3). There is little information that shows methods of establishing and maintaining lovegrass stands for quick erosion control and for establishing perennial legumes in humid-region states having fairly cold winters.

This paper summarizes many experiments giving information on the adaptability of weeping lovegrass to Virginia and West Virginia soils and climates along roadways. Data and practical results from experiments with variable fertility, mulches, seeding dates and rates, companion grasses, and sloping cuts and fills with diverse environmental conditions are included so that lovegrass culture can be implemented in highway turf programs.

EXPERIMENTAL PROCEDURES

Experiments were established along highways on cool and warm cuts and fills in the different geographical regions of Virginia and West Virginia to investigate (a) general adaptability of weeping lovegrass to different soils, slopes, and climates and (b) responses to lime, fertilizer, companion grasses, and seasons of seeding. Mulching for a given experiment was not varied; either small-grain straw at 3,000 to 4,000 lb/acre, tacked with asphalt, was used or wood cellulose mulch at 1,250 to 1,500 lb/acre. Experimental treatments were generally applied to cut and fill slopes on plots 10 to 20 ft wide that extended vertically from the top to the bottom of the slope. Slopes along newly constructed highways or bare eroding slopes were used. The slopes were generally graded and scarified before applying experimental variables. Most of the experiments were established on sites along highways where cool-season grasses had failed because of adverse slope or soil conditions.

Parameters for evaluating the treatments were as follows: population of lovegrass and companion species, botanical compositions, seedling development of weeping lovegrass measured by heights and weights of seedlings, percentage of soil cover, and winter survival.

Because there were many different experiments, this summary report excludes details. Experiments were replicated 2 to 4 times by using randomized or split-plot design. All data were subjected to analysis of variance to ascertain significant differences among treatments.

RESULTS AND DISCUSSION

Lime and Fertility Responses

Growth responses of lovegrass to surface applications of hydrated and finely ground limestone on acid soils materials were variable. Both sources of lime improved lovegrass growth and persistence on acid soil in the Appalachian region, but growth and stands from liming on most acid soils in the Piedmont and coastal plains regions of Virginia were small or nil (Table 1). In mountainous regions, lovegrass plants on limed areas produced more top and root growth and were stronger during winter than those without lime.

On highly oxidized and extremely acid pyrite soil materials (pH of 2.5 to 3.0) in the coastal plains region, the use of 8 to 16 tons of dolomitic lime/acre in the top 4 in. of soil was essential for establishing lovegrass. Even then, roots of lovegrass grew only in the limed soil layer. Consequently, after heavy rains there was slippage of plants with surface soil on some plots. Because of shallow rooting, the soil cover of lovegrass degenerated from 80 to 100 percent at 60 days after establishment to less than a 50 percent cover 2 years later. Although it was not persistent on such extremely acid soils, the lovegrass did reduce erosion and encourage the encroachment of broom sedge and certain woody plants.

Growth and persistence of lovegrass with a 10-20-10 fertilizer were generally good but varied with soil, slope, exposure, and construction of lateral furrows (Table 2).

Table 1. Influence of liming on weeping lovegrass stands.

Region and Location	Slope Grade	Initial pH	Lovegrass Soil Cover (percent) No Lime (year) 1	2	4	2 Tons of Lime[a] (year) 1	2	4
Appalachian								
Marion I	1:1	4.8	55	40	12	95	85	76
Marion II	1:1	4.7	30	22	5	70	92	68
Blacksburg I	2:1	5.4	72	53	32	75	50	27
Blacksburg II	2:1	5.0	88	90	79	87	78	70
Piedmont								
Lynchburg I	2:1	5.1	89	82	56	94	86	68
Lynchburg II	1:1	4.9	100	95	72	97	92	59
Danville	1:1	4.5	89	100	66	94	100	81
Altavista	3:1	5.0	—	—	—[b]	97	85	—
Coastal plains								
Dinwiddie	3:1	4.7	100	—	74	100	—	81
Suffolk	1:1	5.2	87	—	73	94	—	82
Fredericksburg[c]	2:1	2.8	16	1	—	87	51	22

[a]8 to 16 tons of finely ground dolomitic lime were applied and incorporated in the top 4 in. of soil in the Fredericksburg experiment. In all other experiments, the lime was applied on the surface.
[b]Data not obtained.
[c]Very acid pyrite soil materials.

Figure 1. Weeping lovegrass stand on steep highway slope with encroaching woody plants.

Table 2. Growth of weeping lovegrass with fertilizer.

Location	Slope Grade	Lovegrass Soil Cover (percent) Fertilizer 750 lb/acre Lateral Furrows	No Lateral Furrows	Fertilizer 1,500 lb/acre Lateral Furrows	No Lateral Furrows
Marion	1:1	88	64	96	75
Lynchburg I	1:1	92	57	100	86
Lynchburg II	2:1	87	—	100	—
Dinwiddie	3:1	100	94	100	98

Note: Data were collected during the second growing season of each experiment.

Table 3. Growth of weeping lovegrass and sericea lespedeza as influenced by seeding date, nitrogen rate, and companion species.

Seed Mixture	Seeding Rate (lb/acre)	Height of Plants (in.) on 10/12/70 Seeded 4/15/70 75 N	150 N	Avg.	Seeded 6/15/70 75 N	150 N	Avg.	Seeded 8/14/70 75 N	150 N	Avg.
Lovegrass										
Lovegrass	5	17.1	22.8	20.0	19.1	21.4	20.3	7.2	7.2	7.2
Lovegrass and annual ryegrass	5, 5	17.0	22.0	19.5	21.2	22.6	21.9	7.4	8.3	7.9
Lovegrass and Ky. 31 fescue	5, 40	18.2	24.9	22.1	18.2	22.1	20.0	6.9	7.5	7.2
Average		17.4	23.2	—	19.5	22.0	—	7.2	7.7	—
Sericea Lespedeza										
Lovegrass	5	8.3	6.6	7.5	5.4	6.0	5.7	2.3	4.1	3.2
Lovegrass and annual ryegrass	5, 5	6.4	7.3	6.9	6.3	5.4	5.9	3.1	3.0	3.1
Lovegrass and Ky. 31 fescue	5, 40	7.5	8.0	7.7	6.1	6.8	6.5	4.0	3.6	3.8
Average		7.4	7.3	—	5.9	6.1	—	3.1	3.6	—

Note: Date averages that are different by greater than the following numbers are significantly different at the 5 percent level: for lovegrass, 4.2; for sericea lespedeza, 2.7.

Table 4. Influence of seeding date, nitrogen rate, and companion species on soil cover of various grasses.

Seed Mixture	Seeding Rate (lb/acre)	Soil Cover (percent) on 6/28/71 Seeded 4/15/70 75 N	150 N	Seeded 6/15/70 75 N	150 N	Seeded 8/15/70 75 N	150 N
Weeping Lovegrass							
Lovegrass	5	71	87	72	93	19	7
Lovegrass and annual ryegrass	5, 5	72	84	80	83	7	4
Lovegrass and Ky. 31 fescue	40	64	78	77	89	10	6
Sericea[a]							
Lovegrass	5	13	3	2	1	22	3
Lovegrass and annual ryegrass	5, 5	12	2	3	2	17	2
Lovegrass and Ky. 31 fescue	40	13	1	5	6	18	14
Companion Species and Weeds							
Lovegrass	5	1	0	0	0	32	61
Lovegrass and annual ryegrass	5, 5	5	3	0	0	41	53
Lovegrass and Ky. 31 fescue	40	3	2	0	0	27	72
Total Soil Cover							
Lovegrass	5	85	90	74	94	73	71
Lovegrass and annual ryegrass	5, 5	89	89	83	85	65	59
Lovegrass and Ky. 31 fescue	40	80	81	82	95	55	92

[a]All mixtures had 45 lb/acre "Interstate sericea lespedeza."

In the mountainous region near Marion, Virginia, sod establishment and soil cover during the first 3 years on sunny slopes were much better using 1,500 as compared to 750 lb/acre of 10-20-10 fertilizer. On cool slopes 1,500 lb/acre of 10-20-10 fertilizer was essential for maintaining lovegrass for more than 2 years. With 750 lb/acre of 10-20-10 fertilizer, sods of weeping lovegrass completely degenerated on cool slopes in this experiment during the first 2 years. In the Piedmont and coastal plains regions, excellent sods of lovegrass persisted for more than 4 years when fertilized with 750 lb/acre of 10-20-10 fertilizer at establishment. In all cases, the higher rates of fertilizer (1,500 lb/acre of 10-20-10) have produced denser and darker green foliage. The reduced growth with 750 lb/acre of 10-20-10 fertilizer appeared to be desirable when using lovegrass as a companion species in establishing sericea or crown vetch.

A sod of lovegrass having a high nitrogen content or receiving periodic maintenance with nitrogen fertilizer becomes dense, but with a low nitrogen content it gradually thins, which makes possible a botanical shift to woody plants, sericea, or crown vetch (Fig. 1).

In a study near Altavista, Virginia, an increase in the nitrogen rate from 75 to 150 lb/acre did not affect the rapidity of lovegrass establishment, but added nitrogen increased the growth (Table 3) and cover (Table 4) and caused the sod to be dark green for April and June seedings.

Delaying seedings until August substantially depressed populations (Table 5) of lovegrass regardless of companion species. However, stand reductions for the August seeding were greatest when annual ryegrass was used to seed, especially where nitrogen rates were increased from 75 to 150 lb/acre. Lovegrass seeded without a cool-season companion grass in August allowed noticeable erosion during the subsequent winter.

Soil Preparation

On steep 1:1 slopes with loose, friable soil, lateral furrows (approximately 3 in. deep and 18 in. apart) parallel to roads were very desirable and often necessary to get rapid satisfactory lovegrass establishment (Table 2). The microclimate was improved by applying lateral furrows. Seedlings emerged and grew rapidly in the furrows to stabilize soils on the steep slopes.

Lovegrass germinated and grew faster in the furrows, but these were only necessary on the steep slopes with loose surface soil materials. Applying fertilizer, especially nitrogen, in a two-step operation (before late summer) generally improved lovegrass growth and appearance. This practice appeared to be especially desirable on slopes where lateral furrows were not constructed.

Dates and Rates of Seeding and Slope Environments

Experiments in different locations with different seeding dates show that the seedling vigor of lovegrass was generally good but variable with location and season of seeding. The best growth and stands of weeping lovegrass were obtained on sunny slopes with late spring to early summer seedings. As compared with May to June seedings, March to April seedings often gave poor stands because of poor germination, frost damage, and slow seedling growth due to cool temperatures. However, in the absence of severe frost damage to seedlings, early spring seedings often gave good lovegrass stands if competition during the spring months from cool-season associates was not excessive.

Observations of seedlings from March seedings near Lynchburg and Wytheville indicated that death occurred because of heavy April frost. At Blacksburg, good lovegrass stands were obtained by using winter and early spring seedings with mulches and without companion species. This occurred because the lovegrass did not germinate and grow until late spring, thereby escaping frost damage. Young lovegrass seedlings do not withstand hard frost, and they grow very slowly until temperatures become moderately warm in spring. With an April seeding along a secondary road in the coastal plains area, it also took about three times as long to get a lovegrass stand suitable for slope protection as for a June seeding (Table 6).

Seedings of weeping lovegrass made at two locations in West Virginia gave excellent stands from April 17, 1970, and May 5, 1971, seedings (Tables 7 and 8). Weeping lovegrass at Lewisburg, West Virginia, was distinctly superior to all other grasses in density and ground cover throughout the summer of 1970 (Table 7). The extremely droughty soil conditions at Lewisburg in the summer of 1970 gave unsatisfactory sods of all grasses except lovegrass, which was on a very dry, warm, stoney, and compacted 5:1 slope (Fig. 2).

Near Beckley, West Virginia (Table 8), May seedings on a hot compacted 2:1 slope (pH of 5.3) showed that weeping lovegrass and orchard grass gave the best stands and soil cover for prevention of erosion.

Spring seeding on warm slopes or summer seeding on all slopes with cool-season grasses along with lovegrass generally gave predominately lovegrass sods. Lovegrass grows much better during the summer months than do the cool-season grasses.

Seeding lovegrass at 5 to 6 lb/acre has given quick stands of dense sods for late spring and early summer seedings (Fig. 3). Seeding lovegrass at high rates (8 to 15 lb/acre) gave dense stands but did not improve the rate of obtaining soil cover over lower rates. Seeding rates should not exceed 2 to 5 lb/acre when using lovegrass to stabilize slopes while establishing crown vetch or sericea. If a very dense sod of lovegrass is produced, it competes aggressively for light, moisture, and nutrients, thereby exterminating slow-growing crown vetch and sericea seedlings.

Excellent slope cover for erosion control with lovegrass has been obtained in all soils and climatic areas of Virginia, but stands on cool shaded slopes at higher altitudes west of the Blue Ridge Mountains have thinned the first 4 years. Stands in mountainous regions on southerly slopes and in all other areas on cool and warm slopes have now persisted for 5 years in Virginia and 1½ years in West Virginia.

Winter Survival of Lovegrass

Some of the late summer seedings (August) in the Piedmont sections have given good lovegrass stands by the second year, but little growth and inadequate soil cover occurred during the first growing season. However, if the seedings are made so late in the summer that lovegrass plants do not complete seedling development before the first killing frost, they generally do not survive the winter.

The percentage of winter survival of first-year lovegrass plants appears to be closely related to the age and size of lovegrass plants at the end of the first growing season (Tables 3 and 5). Near Altavista, the lovegrass populations were substantially reduced when seeding was delayed from June 15 to August 15. Because of dry weather, lovegrass seedlings from the August 15 seeding did not begin to germinate and grow until September and grew little prior to the first killing frost; these were only about one-third as large as plants from April or June seedings (Table 3).

Data obtained at Lewisburg, West Virginia, in June 1971 (Table 7), show that there was about 5 to 10 percent kill of weeping lovegrass, but there was still about an 80 percent soil cover as compared to a very poor soil cover of 30 to 55 percent for the other species.

Establishing Sericea Lespedeza, Crown Vetch, and Native Woody Vegetation

Perennial legumes such as sericea or crown vetch make excellent persistent vegetative cover for steep highway slopes because they do not require nitrogen and consequently little or no fertilizer for maintenance. These legumes have poor seedling vigor and generally require 2 to 3 years to develop a near total vegetative cover for erosion control. By using medium to low rates of nitrogen fertilizer, we can develop a good soil cover of weeping lovegrass, but the growth stays short and the sod becomes thin after a few years. Lovegrass with restricted nitrogen is very desirable for obtaining a sod quickly. At the same time it allows a gradual botanical shift to slow-establishing legumes such as sericea lespedeza, crown vetch, or woody vegetation.

In two experiments near Lynchburg, there were initially more sericea and crown vetch seedlings in a Ky. 31 fescue than in a weeping lovegrass association because of

Table 5. Winter survival rates of weeping lovegrass populations.

Seed Mixture	Seeding Rate (lb/acre)	Plants per Square Foot									Winter Survival (percent)					
		Seeded 4/15/70			Seeded 6/15/70			Seeded 8/14/70			Seeded 4/15/70		Seeded 6/15/70		Seeded 8/14/70	
		75 N	150 N	Avg.	75 N	150 N	Avg.	75 N	150 N	Avg.	75 N	150 N	75 N	150 N	75 N	150 N
Observation, 9/18/70																
Lovegrass	5	52	48	50	81	100	90	17	22	20	—	—	—	—	—	—
Lovegrass and annual ryegrass	5, 5	31	20	26[a]	89	97	93	12	7	9[a]	—	—	—	—	—	—
Lovegrass and Ky. 31 fescue	5, 40	47	43	45	96	103	100	22	19	20	—	—	—	—	—	—
Average		43	37	—	89[a]	100	—	17	16	—	—	—	—	—	—	—
Observation, 6/28/71																
Lovegrass	5	43	45	44	63	72	68	3	8	5	83	94	78	72	18	36
Lovegrass and annual ryegrass	5, 5	27	22	23[a]	66	69	68	1	4	3	87	100	74	71	9	50
Lovegrass and Ky. 31 fescue	5, 40	44	36	40	71	78	75	7	5	6	94	84	74	76	32	26
Average		38	34	—	67	73	—	4	6	—	—	—	—	—	—	—

[a]Significantly different at the 5 percent level.

Table 6. Effect of seeding date of weeping lovegrass on percentage of soil cover established.

Seeding Date	Soil Cover (percent) on Observation Date				
	4/19/68	5/16/68	6/21/68	7/15/68	8/20/68
4/1/68	1.5	5.0	35.0	73	89
6/4/68	—	—	7.0	66	88

Table 7. Performance of grasses near Lewisburg, West Virginia: Population and soil cover.

Grass	Seeding Rate (lb/acre)	Population (plants/ft²)	Soil Cover (percent)	
		5/19/70	9/28/70	6/14/71
Ky. 31	60	7.8 c	36 bcd	37 bcd
C.R. fescue	50	13.3 bc	54 b	55 b
Ky. blgr.	50	5.1 c	37 bcd	35 bcd
Orchard grass	45	21.4 abc	43 bcd	43 bcd
Redtop	10	7.6 c	40 bcd	35 bcd
P. ryegrass	50	26.4 ab	43 bcd	30 cd
Weeping lovegrass	10	33.1 a	86 a	80 a
Ky. blgr. and C.R. fescue	30	7.8 c	34 cd	36 bcd
Ky. 31 and C.R. fescue	30	20.2 abc	51 bc	51 bc

Notes: The grasses were seeded on 4/17/70 on a hot 5:1 compacted fill slope that was very droughty. Soil pH was 7.2 to 7.6, and all plots were treated with 1,000 lb/acre of 10-20-10 fertilizer.
Treatments not followed by the same letter are significantly different at the 5 percent level of probability.

Table 8. Performance of grasses near Beckley, West Virginia: Population and soil cover.

Grass	Seeding Rate (lb/acre)	Population (plant/ft²)	Soil Cover (percent)
Bromegrass	60	33	40 b
Sand bluestem	64		1 c
Sand lovegrass	10		0 c
Weeping lovegrass	10	98	77 a
Switch grass	50		0 c
Orchard grass	60	142	87 a
Ky. 31 fescue	60	37	47 b

Notes: The grasses were seeded on 5/5/71 on a hot 2:1 compacted fill slope. Soil pH was 5.3 before application of 2 tons of agricultural limestone and 1,000 lb/acre of 10-20-10 fertilizer. Census was made on 9/1/71.
Treatments not followed by the same letter are significantly different at the 5 percent level of probability.

Table 9. Influence of weeping lovegrass and Ky. 31 fescue companion grasses on seedling populations of legumes.

Plant	Population (plant/ft²)		Total Soil Cover (percent)	Soil Cover by Legumes (percent)
	11/3/70	6/2/71		
Weeping Lovegrass				
Crown vetch	8.5	8.7	81	57
Sericea	50	143	77	62
Ky. 31 Fescue				
Crown vetch	6.8	6.7	74	39
Sericea	40	63	66	40

Note: This experiment was seeded on 5/21/70 south of Princeton, West Virginia. The slope is a 2:1 cut (cool exposure) where a previous seeding by a contractor had resulted in a complete failure.

Figure 2. Comparison of perennial ryegrass (lower right), broom grass (lower left), tall fescue (upper left), and weeping lovegrass (upper right).

Figure 3. Weeping lovegrass on steep secondary slopes.

less growth and seedling competition. However, after two seasons, crown vetch soil cover was better with weeping lovegrass than with the fescue association.

On a cool cut slope south of Princeton, West Virginia, weeping lovegrass allowed somewhat more crown vetch and sericea seedlings than did Ky. 31 fescue (Table 9). Sod cover by the two grasses was similar (45 to 60 percent) by September 1970, with tall fescue providing slightly more soil cover than did lovegrass; however, by June 1971, the best soil cover occurred in the lovegrass association. This was attributed to better legume cover from sericea lespedeza and crown vetch, which were seeded with weeping lovegrass rather than with Ky. 31 fescue. This indicates that lovegrass was the least competitive toward the legumes. Although there was some winter kill of the lovegrass during the winter of 1970-71, no erosion occurred, and crown vetch and sericea lespedeza had developed a complete cover by August 1971.

Weeping lovegrass and German millet were seeded at a rate of approximately 5 and 15 lb/acre respectively on June 23, 1971, on a sunny bench slope near Charleston, West Virginia. Observations made in August showed good grass stands for the June seeding.

Crown vetch, a cool-season legume, starts growing earlier in the spring than does the warm-season lovegrass. Consequently, crown vetch can grow rapidly during spring—before lovegrass competes for light, nutrients, and moisture. Sparse populations of crown vetch spread rapidly after the first growing season by underground laterally spreading roots that produce many new plants.

A comparison of sericea lespedeza stands in lovegrass with those in the Ky. 31 fescue association near Lynchburg, Virginia, shows that the sericea stands after 2 years were poorer in lovegrass. Lovegrass seedlings established rapidly and produced 90 to 100 percent soil cover 2 months after seedings. This fast growing "shaded out" most of the sericea seedlings during the first year. After the first year, depending on the initial nitrogen rate, the stands of sericea improved.

The vigorous late spring and summer growth of weeping lovegrass with sericea occurs because both species grow during the warm season. Thus, if weeping lovegrass is to be used as a companion grass for establishing sericea, the nitrogen rate should be kept low to reduce lovegrass growth and competition.

SUMMARY AND APPLICATIONS

The work summarizes research on the adaptation and use of weeping lovegrass in the Virginias during the past 5 years. Excellent lovegrass stands were usually obtained with ease on numerous slopes previously considered too difficult for establishing grass vegetation. Lovegrass is widely adaptable and can easily be established on acid infertile soils. Because it is drought-tolerant and makes very efficient growth in the hot summer during periods of ample soil moisture when cool-season species produce little growth, it appears to be especially desirable for use on a wide range of slope environments for obtaining quick and permanent soil cover.

Liming improved lovegrass growth and persistence only on certain acid soils in the mountains and on the extremely acid pyrite soil materials in the coastal plains region of Virginia. Liming was very desirable for establishing crown vetch with the weeping lovegrass association, but it was not necessary for establishing sericea or woody vegetation with the weeping lovegrass association. A 10-20-10 fertilizer spread at 750 lb/acre generally gave quick-establishing lovegrass stands with excellent erosion control and also allowed botanical shifts to slow-establishing legumes or woody vegetation after 1 to 3 years. By increasing the fertilizer rate to 1,500 lb/acre, we obtained much denser and more persistent lovegrass stands. On several steep erosive slopes, applying lateral furrows about 2 to 3 in. deep generally improved lovegrass stands and initial erosion control.

Dates of seeding and companion grasses also influenced the establishment and persistence of lovegrass. Seeding in late spring and midsummer produced rapid-growing sods and quick soil cover; during this period cool-season species usually give poor germination and seedling survival because of high temperature and moisture stresses.

However, early spring seedings generally gave slow establishment and often poor stands of lovegrass because of frost kill and excessive light competition from the

cool-season grasses at low spring temperatures, especially on cool slopes in the mountainous sections. Also, with several of the late summer seedings, lovegrass plants did not complete seedling development the first year, and high seedling mortality resulted during the first winter.

Personnel of highway departments often encounter problems and high costs for establishing vegetation on slopes along roads where seedings made by grass contractors fail or give only partial soil cover and erosion control. Partial failures occur under difficult environments such as steep slopes with erosive, infertile, droughty, and/or acid soil conditions; but, with adequate fertilization, lovegrass has persisted well in such difficult environments where cool-season grasses, such as Ky. 31 fescue, fail to give satisfactory sod cover for erosion control.

The highway department in Virginia is now successfully using weeping lovegrass in many areas for vegetating difficult slope environments and for obtaining quick cover for erosion control during the hot summer. They have found the species to be especially useful on steep secondary road slopes. These slopes are too steep for applying topsoil and are considerably more difficult to vegetate than shallower slopes with topsoil. Using weeping lovegrass has been the most expedient way of rapidly stabilizing these areas. Including sericea lespedeza or crown vetch in the seeding mixture and a fairly low rate of nitrogen has subsequently produced good legume stands. In forested areas, simply reducing the nitrogen rate has allowed botanical shifts from lovegrass to woody vegetation. The relative ease of establishing lovegrass under adverse conditions, its persistence with adequate fertility, and its compatibility with leguminous or woody vegetation make this species particularly suitable for use on roadside slopes in most sections of the Virginias and other eastern states.

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