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Expt. Sta. Bul.
No. 281
June, 1944

Weeping Lovegrass in Oklahoma

by

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U. S. Department of Agriculture

SUMMARY

Weeping lovegrass (*Eragrostis curvula*) is a bunch type perennial recently introduced from South Africa. This grass has made excellent stands and yields in both broadcast strips and rows in various parts of Oklahoma. It has completely controlled weeds or other undesirable competing plants on poor, eroded soil. It is also a good seed producer and easy to establish. It makes a vigorous growth on various soil conditions and has excellent value for erosion control purposes. Another possible use is in a crop rotation system for adding organic matter to the soil. It has an enormous root system, but is easily eradicated by cultivation.

There are some differences of opinion regarding the pasture and hay value of weeping lovegrass, but with more information regarding management and utilization, a better understanding should be obtained as to its use for these purposes. From present data it appears that lovegrass should be stocked heavily enough to keep the grass in a green, growing condition. Results also show that better quality hay is produced when it is cut in a lush growing period. Since this grass remains green well into the winter and starts growth earlier in the spring than the native grasses, there are possibilities that it may have an important pasture value at these particular times. However, more study must be given to its hay and pasture value at different stages of growth before it can be fully recommended for such use.

C O N T E N T S

Summary	2
Possible Uses	5
Erosion Control	5
Grazing	7
Hay	8
Description and Growth Habit	11
Adaptation	13
Climate	13
Soils	13
Cultural Practices	13
Establishing a Stand	13
Seeding	14
Seedbed	14
Rate of Seeding	14
Date of Seeding	14
Seeding Equipment	14
Vegetative Plantings	15
Cultivation	15
Harvesting	15
Establishment and Production Tests in Oklahoma	16
Experimental Plantings	16
Guthrie	16
Stillwater	16
Lone Grove and Heavener	17
Cherokee	17
Nursery Plantings	17
Forage and Seed Yields	19
Literature Cited	22

WEEPING LOVEGRASS IN OKLAHOMA

By HI W. STATEN and HARRY M. ELWELL¹

Thick growing vegetation is very effective in controlling runoff and erosion, even on poor, eroded soils (3, 4).^{*} There is need, however, for a productive hay and pasture grass that can be readily established on land being retired from cultivation. A plant which seems to have such possibilities is weeping lovegrass (*Eragrostis curvula*).

It is a bunch type perennial which is easily established under adverse conditions and makes a rapid, vigorous growth on a wide range of soils.

POSSIBLE USES

Erosion Control

Weeping lovegrass is a very promising plant for revegetating eroded and abandoned land. It has made favorable growth on exposed sub-soil and on eroded land which is very low in available phosphorous and nitrogen. This ability to grow on poor and disturbed soil gives it a very important place for stabilizing gullies and outlet water channels from terraced fields or diversion ridges and ditches (Figure 1). In fact, it has provided a protective cover quicker than any of the native grasses tested. Experiments on vegetated waterways, similar to those reported by Cox (2), show that this grass successfully withstood water flows at the rate of 5 feet per second on land slopes from 1 to 16 percent.

This plant has an enormous root system and therefore is of value in changing the physical structure of badly eroded soil. One or two seasons of growth on soils at the station near Guthrie appear to have caused considerable increase in rainfall absorption.

This grass has produced from two to four tons of forage

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^{*} There is need, however, for productive hay and pasture grass that can be readily established on land being retired from cultivation. A plant which seems to have such possibilities is weeping lovegrass (*Eragrostis curvula*).



Fig. 1.—Weeping lovegrass protecting a terrace outlet water channel in a soil conservation district near Guthrie. This picture was taken in the fall after the grass was planted from sod the preceding spring.

per acre the season it was planted. If all the vegetative growth were left on the land, it should be of considerable importance in increasing the organic matter content of the soil. These characteristics, and the fact that this grass can be easily destroyed by cultivation, suggest the possibility of its use in a crop rotation system.

Grazing

There are some differences of opinion regarding proper utilization of weeping lovegrass. Like many of the native and tame grasses, it becomes tough and fibrous as the seeding stage approaches. However, when it is grazed or mowed and maintained in a succulent condition, it is eaten readily by cattle, horses and sheep. Some utilization of this grass has been observed on the various experiment stations and by farmers and technical workers throughout Oklahoma. Weeping lovegrass was established on a 10-acre field at the station near Lone Grove in the spring of 1942. It was grazed the following summer with cows and horses. It was eaten as readily as young crab grass in the same field. A mature growth which developed on a field at Stillwater in 1942 was allowed to go into the dormant stage. It was then subjected to winter grazing and mules readily consumed this mature vegetation. Similar results were reported by Savage (6) of the Woodward Station, who says that cattle appeared to eat the coarse, wiry winter-cured weeping lovegrass with equally as much relish as they did the better native grasses.

Plantings made in the pastures on the station at Guthrie in 1941 were grazed with yearling steers from May through September during 1942 and 1943. The cattle had free access to little bluestem and a mixture of other native grasses. The percentage of utilization of these grasses is given in Table I.

TABLE I.—Percentage of Grass Utilized by Steers in Grazing Tests at Red Plains Conservation Experiment Station, Guthrie, Oklahoma¹

Grass	PERCENT OF UTILIZATION		
	1942	1943	Average
Weeping Lovegrass (Seed) ²		18.14	
Weeping Lovegrass (Sod) ²		13.82	
Weeping Lovegrass (Seed and Sod) ²	27.36	15.14	21.25
Little Bluestem ³	45.84	47.30	46.57
Native grass mixture ⁴	43.60	31.94	37.77

¹ Grazing period May 1 to September 30. ² Seeded in spring 1939.

² Planted in spring of 1941.

⁴ Cleared of black-jack oak in 1934.

These results were obtained by comparing clippings from enclosures to those taken from the grazed areas. The weeping lovegrass started about three weeks ahead of the other grasses and made a very rapid growth in early spring. It also produced seed in June and was mowed. After the mature vegetation was removed the steers readily grazed the new growth of grass.

Sheep were grazed on a small area of well established weeping lovegrass at Stillwater in October, 1942 (Figure 2). This grass had previously produced two cuttings of hay and had a growth ranging from 16 to 18 inches in height before grazing started. The sheep had previously been on Bermuda grass pasture, but they cropped the weeping lovegrass close to the ground and ate it quite readily.

A grazing report given at the 1943 field day (5) of the Panhandle Agricultural Experiment Station, Goodwell, Oklahoma, showed that cattle on weeping lovegrass when properly utilized made larger per acre gains than those on native grass.

From present information, it appears that this grass is most useful for pasture when utilized sufficiently to remain in a succulent, green, growing condition. But more study must be given to its pasture value throughout both the growing and winter seasons before definite recommendations concerning its use can be made.

The history of other introduced grasses and clovers shows considerable time and experimentation were required to determine their merits and demerits. Bermuda grass and sweet clover are examples.

Hay

Information on the value of weeping lovegrass hay is somewhat limited. Chemical analysis of grass samples collected at Guthrie showed the calcium and phosphorous con-

TABLE II.—*Mineral and Nitrogen Content of Mature Grass Hay, Red Plains Conservation Experiment Station, Guthrie, Oklahoma, 1940 and 1941.**

Grass	Calcium (percent)	Phosphorus (percent)	Nitrogen (percent)
Weeping lovegrass	.357	.065	1.510
Little Bluestem	.474	.073	1.087
Native grass mixture	.494	.066	1.129
Blue grama	.357	.084	1.145

* Analysis by Department of Agricultural Chemistry Research, Oklahoma Agricultural Experiment Station.



Fig. 2.—A field of weeping lovegrass being grazed on the Experiment Station farm, Stillwater. Left: First day of grazing, October 8, 1942. Right: Same field after 12 days of grazing.

tent was similar to that of native grasses while the nitrogen content was higher (Table II). A digestibility test made by the departments of Animal Husbandry and Agricultural Chemistry of the Oklahoma station was reported as follows:

The coefficient of digestion study was conducted with weeping lovegrass hay. The hay was the second summer clipping made in late July 1942, from grass which was 12 to 24 inches in height. The analyses are given in Table III. Four grade Rambouillet yearling wethers were started on the ration of lovegrass hay on August 2, 1942. Three of the wethers were very hesitant in eating the hay, while one ate more readily. The hay was increased according to appetite and at the end of 20 days the three wethers were eating 350 grams per feed and the hearty eater about 540 grams. The wethers were then started on a ration of 726 grams per day and fed for a 10-day preliminary feeding period. Fecal collections were made September 2 to 10, 1942. The hearty eating wether failed to eat the second day on collection and never regained his appetite. He was removed from the trial but the other three maintained fair appetites throughout the test.

The data (Table III) indicate that high quality, fine stemmed green lovegrass hay as used in this experiment is quite digestible when fed to sheep under conditions of this trial. During the 30 days the test was conducted, the wethers

TABLE III.—*Apparent Digestion Coefficient of Weeping Lovegrass Compared with Common Hays.*¹

Item	PERCENT				
	Protein	Fat	Fiber	Nitrogen Free Extract	Nutrients Per Hundred Weight
Hay Analysis					
Weeping lovegrass ²	9.18	2.79	30.86	43.46	
Digestion Coefficient					
Weeping lovegrass ³	63.70	45.60	65.30	53.40	52.30
Prairie hay ⁴ (Good quality western)	46.00	40.00	60.00	59.00	49.20
Prairie hay ⁴ (Western mature)	18.00	42.00	60.00	54.00	47.10
Alfalfa hay ⁴ (All analysis)	72.00	32.00	33.00	71.00	50.30

¹ Results of cooperative studies of Agricultural Chemistry, Agronomy and Animal Husbandry Department, Okla. Agr. Exp. Sta. (1).

² The grass was cut in late July 1942. It was No. 1 extra green hay and had a water content of 8.8% and an ash of 4.91%.

³ Sheep used were 3 grade Rambouillet wethers and the results were collected during a 10-day period. (Average of 3 wethers).

⁴ Data taken from Morrison's "Feed and Feeding," Edition No. 20, Year 1936.



Figure 3.—Work horses eating weeping lovegrass hay.

lost approximately 3 pounds each. This loss in weight, however, may be due to changing of the sheep from green pasture in the middle of the summer to experimental confinement and being placed on a dry hay ration.

It has been observed that open range cattle and work horses (Figure 3) eat good quality weeping lovegrass as readily as prairie hay, but more information is needed regarding its value at different stages of growth.

DESCRIPTION AND GROWTH HABIT

Weeping lovegrass was recently introduced from South Africa through the efforts of Franklin J. Crider.* It is one of the species of *Eragrostis*, many of which occur commonly in Oklahoma. It is a hardy, long lived, tufted perennial, particularly when grown in the southern part of the Great Plains. A single plant, as shown in the cover picture, will develop into a dense turf 12 to 15 inches in diameter within two to three years. The heavy turf bunches consist mainly of a dense mat of basal leaf growth. The leaves are extremely long, slender and pliant, giving the plant a drooping effect when vegetative

* According to a letter of May 6, 1944 from Forrest G. Bell of the Research Division of the Soil Conservation Service, Washington, D. C., to Harley A. Daniel, Guthrie, Oklahoma.

growth is well advanced. The flexuous leaves perhaps account for the common name "weeping lovegrass." The seed stems are numerous, ranging from 24 to 48 inches in height, and usually produce a heavy seed crop. The seed (Figure 4) is borne in loose panicles 8 to 12 inches long. The seed is very small, shaped much like a wheat kernel, and threshes free of glumes. There are 1,750,000 to 2,000,000 seed per pound. The seed, to the naked eye, appears dark brown in color, but actually the endosperm is practically transparent and very hard in texture. The germ is very large and has a characteristic black band encircling it. Well cleaned and mature weeping lovegrass seed will weigh 60 pounds or more per bushel.

Old stands often produce a whorl of aerial bulblets from the nodes 12 to 15 inches above the ground. These bulblets may produce side branches. These aerial growths are most commonly found in row plantings on rank growing plants.

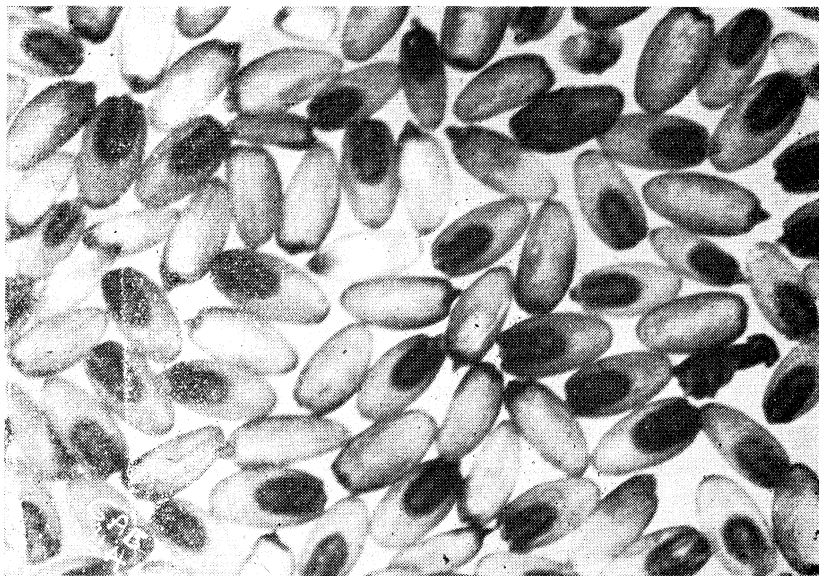


Photo by G. A. Bieberdorf.
Figure 4.—Weeping lovegrass seed magnified about eight times.

ADAPTATION

Climate: Weeping lovegrass has been grown, during the last few years, in most sections of Oklahoma and generally throughout the Southern Great Plains. In many instances the grass has been intentionally subjected to adverse conditions to determine if it would withstand cold and drouth. It withstood temperatures of 11° F. below zero at Guthrie during the dry winter of 1940 with only slight signs of winter killing. A field at Stillwater was mowed in November 1941 to determine the effect of freezing. The same field was closely grazed in October of 1942. During these two winters the temperature dropped to zero or below several times, and in January, 1943, it reached 8° F. below zero. There was a slight indication of some winter killing, but all plants recovered and no difference was noted in the stand during the following summers.

A good stand was established during 1939 at Guthrie when the annual total precipitation was 9.5 inches below average. Excellent growth was also secured during periods of excessive precipitation in 1942. In the dry summer of 1943, weeping lovegrass remained green throughout 110 days of drouth and made excellent forage yield on the stations at Stillwater, Lone Grove, Heavener, Guthrie and Cherokee.

It is the first grass to start growth in the spring and the last to lose its green color in the fall.

Soils: Weeping lovegrass has been observed growing on various soil conditions throughout the state. It seems to grow well on both sandy and clay soils. Good stands and satisfactory growth have been obtained on sub-soil and partially weathered parent material. It has made good yields on soils having very poor physical condition and low in plant nutrients and organic matter. However, like all other grasses, it will produce a better quality of forage and seed on the more fertile land.

CULTURAL PRACTICES

Establishing a Stand

Good stands of weeping lovegrass have been obtained from both broadcast and row plantings. The highest forage yields were obtained from the broadcast areas, but row plantings which were cultivated during the growing season have usually produced the highest and best quality of seed. The grass is easy to establish and may be propagated by seed, sod or vegetative cutting.

SEEDING

Seedbed: Weeping lovegrass seems to be similar to most small-seeded grasses in requiring a very fine and weed-free seedbed. Early plowing before the spring rains is usually very desirable, but all weed growth should be destroyed by light surface cultivation immediately before planting. If the seedbed is loose at this time, it is advisable to pack the soil with a heavy roller or cultipacker before and after seeding. In areas where wind erosion is a problem, a mulch cover from some previous crop residue is desirable. Even under this condition, however, all seedlings should be made on firm soil.

Rate of Seeding: The rate of seeding depends on soil conditions and method of seeding. One pound of high quality seed is sufficient to broadcast an acre of good land. On badly eroded poor soil, or for outlet channels, it is desirable to increase this rate to about 1.5 pounds per acre. When weeping lovegrass is used in a mixture with other grasses, about $\frac{1}{3}$ to $\frac{1}{4}$ of a pound of seed per acre is recommended. In mixtures of tall grasses, $\frac{1}{3}$ of a pound should be used.

Careful consideration should be given to the rate of seeding, because over-seeding often results in too many seedlings for best production as well as a waste of seed. This is especially true where plantings are made in rows for seed production. Under average conditions, about $\frac{1}{4}$ to $\frac{1}{2}$ pound of seed per acre is satisfactory for most row plantings.

Date of Seeding: Weeping lovegrass is a summer perennial and should be seeded or sodded in the spring. The month of April is perhaps the best date for most sections of Oklahoma. Seedings were made in April, May, June, July and August in 1942 at Lone Grove and good stands were obtained at all dates. The August plantings made a vegetative growth of 12 to 15 inches in height and established a cover sufficient to withstand the following winter temperatures.

Seed Equipment: Equipment used for seeding this grass is rather limited at present. However, good results have been obtained with several types of garden seeders. There are a few special attachments for various types of drills that are being used, but most of them are in the experimental stage. If a common drill should be used, it is advisable to mix the seed with sawdust or other similar material to reduce the seed rate. Where grass mixtures are seeded, weeping lovegrass should be broadcast prior to planting the other grasses or frequently added in small quantities to the mixture during the seeding process (7). This is necessary because the seeds are so small that they settle out of the mixture quite readily.

Regardless of the method of seeding used, the seed should be planted very shallow and the same careful practices observed as in the planting of any other fine-seeded crop. In most cases, seed placed on the surface of the soil may be adequately covered by the press wheels of a drill or by a cultipacker.

VEGETATIVE PLANTINGS

If the grass is to be established by sod, one small piece placed every 15 to 20 inches in the row is sufficient for a good stand. Best results have been obtained where the sod was dropped into a shallow furrow, covered with a field cultivator, and rolled with a cultipacker.

Sodding may be done in late February and throughout the spring and early summer months. The early spring soddings have been most satisfactory. If the grass is sodded after the plants have made considerable top growth, the leaves should be clipped close to the crowns before setting in the soil.

The aerial bulblets that often develop on old stands may be broken just below the nodes and used for transplanting. The transplanting should be done during the summer growing season for best success.

Cultivation

If seed production is desired, it is advisable to plant in rows and cultivate the grass during the growing season. Tests on the station at Guthrie show that plantings made in standard rows produce 33 percent more seed than broadcast seedings. Under this particular condition, the grass soon shaded the ground between the rows and reduced the number of cultivations to about two annually.

Harvesting

Under favorable conditions, two seed crops may be harvested annually. The first crop usually matures about mid-June and the second in late August or early September. The seed may be harvested with a combine or binder. If the seed is harvested with a binder, the cutting should start when about one-third of the seed head is ripe. The remaining part of the head will mature as the forage dries in the shocks. Where the combine is used, the entire seed head should be nearly mature. The seed shatters easily and care will be needed to obtain the maximum yield while harvesting.

ESTABLISHMENT AND PRODUCTION TESTS IN OKLAHOMA

Weeping lovegrass has been grown on experiment stations and by many farmers in Oklahoma. In addition to the experiment station results reported, statements have been received from a large number of farmers, county agents, and soil conservation work unit leaders and technicians who have had experience growing and observing this grass.

Experimental Plantings

Guthrie: Plantings of weeping lovegrass were made on the conservation experiment station at Guthrie in April of 1939 on shallow, slowly permeable, fine sandy loam soil. The area, which had previously been in cotton, was plowed and a firm seedbed prepared by rolling with a cultipacker. Seedings were made in broadcast strips, 21-inch rows, and 42-inch rows, each in duplicate. The row plantings have been cultivated with regular cotton type sweeps about twice during each growing season. Plantings were also made on eroded terraced land in duplicate treatment of individual seeding and mixture of little bluestem, blue grama and side-oats grama.

Each year since these initial plantings, areas have been seeded or sodded at Guthrie. The first sod plantings were made in the spring of 1941. One planting was on land which had not been cultivated for several years and was mainly covered by annual weeds and grass. The seedbed preparation was shallow furrows, 42 inches apart, made with a standard two-row lister after the moldboards were removed. This was done in order to disturb as little of the soil as possible. Small clumps of lovegrass roots were then dropped at intervals of 20 inches in these furrows. Some of these rows were drilled to seed at the rate of about one pound per acre. Another sod and seed planting was made in furrows, with the same machine, through a virgin stand of bluestem grasses. A third planting was made by the same method in Bermuda grass sod that was 9 years old. After planting, all areas were rolled with a cultipacker and there has been no additional cultivation. More recently, seed and sod plantings have been made at Guthrie on areas that had been previously cultivated for several years and were eroded to the extent that considerable sub-soil was exposed.

Stillwater: One of the early plantings of weeping lovegrass in Oklahoma was made in a Soil Conservation Service nursery at Stillwater in 1937. In May, 1941, sod plantings were made on heavy clay loam soil on the Oklahoma Experiment



Figure 5.—Weeping lovegrass producing seed 119 days after planting in 1939.

station farm. Small pieces of sod were placed 18 to 20 inches apart in 41-inch rows.

Lone Grove and Heavener: Seed and sod plantings were made in 1941 at the experiment station's farms at Lone Grove and Heavener. The soil at Lone Grove was a sandy loam, typical of the southern cross-timbered area. At Heavener it is a sandy loam, typical of the southern Ozarks. Weeping lovegrass was also successfully established at Lone Grove from seed plantings made at various times from April to August in 1942.

Cherokee: In the spring of 1941, a small area of deep, permeable, very fine sandy loam soil was seeded to weeping lovegrass on the conservation experiment station at Cherokee. A very good stand was obtained. In March and April of 1942, several outlet water channels were planted to this grass, some in pure seedings, and others to a mixture of switch, buffalo, western wheat and blue grama grasses.

Nursery Plantings: Weeping lovegrass was also included in nursery plantings at Guthrie, Cherokee and Stillwater. Good stands were obtained in all trials. In addition, several hundred clusters of aerial bulblets were pulled during mid-winter of 1942 and planted in a green house at the Stillwater station. More than 50 percent of them survived and made hardy plants.

TABLE IV.—Hay and Seed Yield of Weeping Lovegrass on Moderately Deep and Shallow Semi-permeable Fine Sandy Loam Soil at the Red Plains Conservation Experiment Station, Guthrie, Oklahoma.

Method of Planting	Date of Planting (April)	YIELDS—POUNDS PER ACRE											
		Hay ¹						Seed					
		1939	1940	1941	1942	1943	Average	1939	1940	1941 ²	1942	1943	Average
Weeping Lovegrass													
21" Rows	1939	4465	2871	9264	3104	4236	5776	48	149		118	13	82
42" Rows	1939	3070	4035	8143	7819	3931	5400	42	174		160	24	100
Broadcast	1939	5958	4391	7755	9930	6236	6854	----	92		128	29	62
Broadcast ³	1939		1521	6049	5043	4183	4199	----	----		32	11	22
42" Rows ⁴	1941				6013	2353	4183	----	----		45	30	38
Native Grass													
Little Bluestem ⁵	1940			1558	4181	3088	2943						
Mixed Virgin Sod ⁶		3014	3349	3291	3798	2420	3174						

¹ Hay yields calculated on 20 percent moisture basis.

² Seed for 1941 crop destroyed in fire of machinery shed. Seed yield probably would have been about equal or slightly higher than that of 1942.

³ Seedlings made on terraced, eroded land.

⁴ Seed and seed plantings made in lister furrows (after the moldboards had been removed) on land which had not been cultivated for several years and covered with annual weeds and grass.

⁵ Initial broadcast seeding made in spring of 1939 failed.

⁶ Native grass consisted largely of little and big bluestem, switch, Indian, side-oats grama and blue grama.

Forage and Seed Yields

Weeping lovegrass in about six weeks after the first seeding on the Guthrie Station attained an average height of approximately 8 inches and by the end of 3½ months (Figure 5) the rowed plantings had produced mature seed. Tillage has increased seed production, but the hay yields were constantly higher on the broadcast plots (Table IV). The average yield of forage from these areas was 6,854 pounds per acre, which is much higher than that produced by any of the other grasses. The average of this grass on eroded, terraced land was 4,199 pounds of hay per acre. In addition, it was the predominating species in all mixed plantings.

Sod and seed plantings made in 1941 produced good stands and yields in competition with weeds and other grasses. Clumps in one year have increased in size (Figure 6) and occupy much of the interval between the rows. Some plantings made in good sod of native grass produced vigorous plants during the first season. Other sod and seed plantings on badly eroded soil have produced sufficient stands (Figure 7) to control the growth of crab grass, aristida and weeds. In fact,



Figure 6.—Weeping lovegrass (*Eragrostis curvula*) planted April 1941, in shallow furrows made with a two-row lister without moldboards. This land had not been cultivated for several years and was covered with annual weeds and grass. The rows between the right sign and the rain gage were planted with seed and those on left with sod. Photograph taken October 1942.

weeping lovegrass in all experimental plantings in Oklahoma has completely controlled the growth of undesirable plants. This is highly important since it is often necessary to grow a cover crop in order to remove weeds and create a mulch condition previous to seeding native grass on cultivated land in central Oklahoma.

Yields of weeping lovegrass on the stations at Stillwater, Heavener, Lone Grove and Cherokee are given in Table V. The forage production at Stillwater in 1943 was approximately one-fourth higher than that of the average obtained from 32-inch rows at Guthrie (Table IV), but the average yields at Lone Grove, Heavener and Cherokee were considerably less than those at either Guthrie or Stillwater. Good seed yields were obtained in 1942; but they were low in 1943 due to the dry season and other unfavorable weather conditions.

TABLE V.—Yield of Weeping Lovegrass (*Eragrostis curvula*) From Rows 3.5 Feet Wide.

Location ¹	Soil Condition	YEAR		YIELD (POUNDS PER ACRE)			
		Planted	Har- vested	Seed	Hay ²		
					Annually Average		
Lone Grove ³	Shallow permeable sandy loam	1941	1941		2174		
		1941	1942	282	6500	4337	
Heavener ³	Shallow permeable sandy loam	1941	1942		3715		
		1941	1943		2150	2933	
Stillwater	Deep compact heavy clay	1942	1943	197	7240	7240	
Cherokee ⁴	Deep permeable fine sandy loam	1941	1943	30	3926	3926	

¹ Drouth prevailed at all stations during the major part of 1943.

² Hay yields calculated on 20 percent moisture basis.

³ No seed yields taken, but a good seed crop was produced.

⁴ Wheat-land Conservation Experiment Station, cooperative with Soil Conservation Service. The early spring of 1942 was very dry, but during the period of seed production, unusually heavy moisture conditions occurred.



Figure 7.—Weeping lovegrass the second year after being broadcast seeded on badly eroded soil.

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