Oklahoma Crops and Soils 1947

Research Reported at the Second Annual Oklahoma Crops and Soils Conference

OKLAHOMA AGRICULTURAL EXPERIMENT STATION
Oklahoma A. and M. College, Stillwater
W. L. Blizzard, Director **Louis E. Hawkins, Vice Director**
Experiment Station Bulletin No. B-319 March, 1948

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Vegetation for Use in Water Channels

By HARRY M. ELWELL
Soil Conservationist, Red Plains Conservation Experiment Station, Guthrie, Oklahoma*

When planning a complete program of land use for conservation farming on a farm or ranch there is usually some cultivated land that needs terracing. But before terraces are constructed provision must be made for disposing of the runoff water. Broad natural vegetated drainage ways (4) are most desirable for this purpose. When they are not available the runoff must be disposed of through constructed channels. Certain grasses and legumes have proved satisfactory for preventing erosion in these waterways. The success, however, of a water channel will depend upon proper design (2, 3), condition of soil, selection and establishment of plants, and method of maintenance.

EXPERIMENTAL RESULTS

Bermuda grass (**Cynodon dactylon**) was planted in two broad flat water channels on the Red Plains Conservation Experiment Station at Guthrie, Oklahoma, in 1932. A special study of vegetation suitable for such channels (Figure 1) was also started in 1942 on the Wheatland Conservation Experiment Station, Cherokee, Oklahoma. Fourteen channels were constructed, ranging in length from 400 to 1,800 feet, and located on land slopes varying from practically level to four percent. They were planted to alfalfa and different kinds of sod and bunch grasses. The results are given in Table I. Observations were also made in several soil conservation districts and at the hydraulic laboratory near Stillwater, Oklahoma, where a study of the hydraulic characteristics of vegetal lined water channels is being made.

In general, these studies show that individual species of native and introduced plants respond differently under different soil conditions. They also show that after channels are properly graded and the construction work completed a seed bed should be prepared. Where the topsoil was removed during the construction process on the Guthrie station it was necessary to apply manure or grow legumes before the grass was established.

SOD GRASSES

The sod-forming grasses were the best type of plants for water channels (3). They spread and soon tied down small areas that became damaged or covered by silt. These grasses were successfully seeded, but the most rapid development of cover was obtained from sod plantings. When the clumps were spaced a foot or less apart a good cover was usually obtained within a year. When immediate protection was needed the channels were set to a solid cover of these grasses.

Bermuda Grass: Experiments at the Guthrie station showed Bermuda grass was the best vegetation for waterways. It has been seeded in soil conservation districts in the extreme southeast part of Oklahoma (7), but usually sod or root sprigs were the most satisfactory method of establishment. Fresh clumps of sod or roots were placed in shallow furrows and the soil pressed firmly around them. Another method used was to mulch the channel area with root sprigs and cover them with a plow or disk. Where it was necessary to establish channels on steep land slopes they were heavily

* This paper is a cooperative contribution from the Oklahoma Agricultural Experiment Station and the Soil Conservation Service (Research).

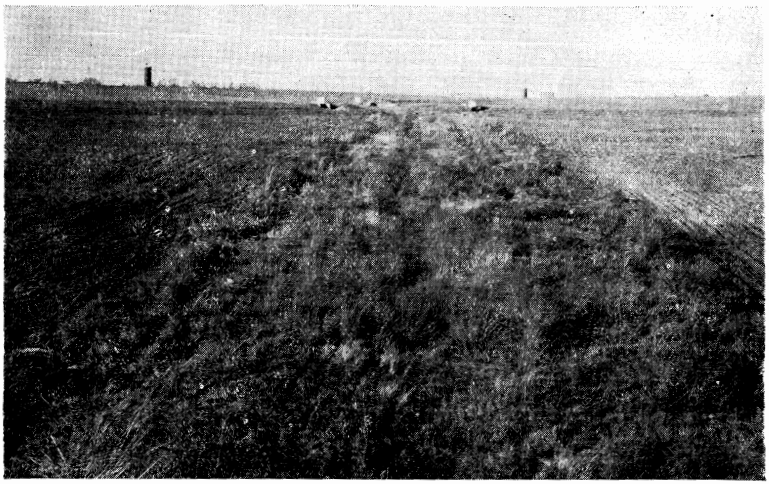

Fig. 1. —A broad, flat water channel protected with vegetation.

sodded, fertilized, and carefully maintained. This grass grew best on sandy loam soils that had medium to high fertility. Bermuda grass has performed satisfactorily in water channels at the Guthrie station during the last fifteen years. Although it was occasionally necessary to remove the silt from the channels, the roots left in the soil soon developed protective cover.

Buffalo Grass: Good cover for channels on the Cherokee station was provided by Buffalo grass. It made the best growth on the heavier types of soil with high fertility. This grass withstood considerable deposition of silt of a sandy nature. **Vine Mesquite** survived only on heavy soils and in moist places in channels at Cherokee. Turfs of these grasses were readily obtained from fresh sod clumps set firmly upright, so that the top was not covered with soil.

BUNCH GRASSES AND LEGUMES

Bunch grasses and legumes did not provide as dense a soil cover as the sod grasses. They were used satisfactorily for channel protection, however, on land slopes of two to three percent at Cherokee and in hydraulic tests at Stillwater (3). These plants were seeded (1) at a rate of about one and one-half to two times that normally used for meadows or pastures. Best results were obtained when the grasses were seeded in a dead stubble of sorghum (8) or with seed hay (5).

Weeping Lovegrass: The most outstanding bunch type grass for soil of medium to low fertility was weeping lovegrass. When properly seeded and frequently mowed it provided a good cover for channels. It is fairly well adapted to many soil types (9).

Yellow Bluestem: Yellow bluestem is a bunch type grass but it makes a rather spreading prostrate growth. This characteristic makes it a desirable plant for water channels as shown from studies at Cherokee and tests in the soil conservation district near Guthrie. **Blue and side-oats gramas** have also given very good results on moderate slopes of permeable soils.

Grass Mixtures: A mixture of blue and side-oats gramas and buffalo grass is performing satisfactorily in two channels at the Cherokee station. This combination is commonly known as a western mixture. These grasses seeded together have protected steeper land slopes than when seeded alone. Another mixture which is working well is switch, weeping lovegrass, blue grama, and buffalo. The cool season grasses—western wheat, Texas bluegrass and smooth brome—have not proved satisfactory on the stations at Guthrie and Cherokee. However, some western wheat grass waterways have been established in southwestern Oklahoma near Altus and Frederick.

Legume: Alfalfa has produced a good cover for channels on gentle slopes of deep, permeable soils at Cherokee. In addition it has made a good yield of hay and seed.

MAINTENANCE

Station studies, field observations and hydraulic data (2, 3) show that for best results vegetation in water channels should be systematically utilized. This practice prevents the vegetation from becoming rank or bunchy and thereby decreasing the capacity of the channel or causing the flow to be rough and erosive. Either mowing or grazing helps to keep a dense, uniform stand. Where such precautions were followed silting was not a serious problem. Where heavy silting occurred on the Cherokee station, an annual rank-growing crop of sudan has been planted along the berms and at the entrance of the channels. This tends

TABLE I.—Plants Tested for Vegetating Broad, Flat Water Channels in Oklahoma.

Species Names[1]	Conditions for Satisfactory Growth			
	Soil fertility level	Slope, maximum percent[2]	Silting	Growing seasons required
GRASSES (Sod Type)[3]				
Bermuda (**Cynodon dactylon**)	medium	15	moderate	1
Buffalo (**Buchloe dactyloides**)	high	8	slight	2
Vine Mesquite (**Panicun obtusum**)	high	5	slight	2 to 3
GRASSES (Bunch Type)[4]				
Weeping Lovegrass (**Eragrostis curvula**) [3] [4]	medium	5	slight	1
Blue Grama (Bouteloua grasilis)	medium	5	slight	2 to 3
Side-oats Grama (Bouteloua curtipendula)	medium	5	slight	2 to 3
Yellow Bluestem (**Andropogon** ischaemum)	medium	5	slight	2 to 3
GRASS (Mixtures)[4]				
Buffalo, Blue, and Side-oats Grama	medium	7	slight	2
Switch, Weeping Lovegrass, Buffalo, and Blue Grama	medium	5	slight	2 to 3
LEGUME[4]				
Alfalfa (Medicago sativa)	high	2	slight	1

[1] These plants have been tested in water channels on the Conservation Experiment Stations at Guthrie and Cherokee.

[2] Maximum slope percent based on reports by Cox and Palmer (2, 3).

[3] Soil condition (6) permeable to slowly permeable.

[4] Soil condition (6) permeable.

to slow down the movement of water and causes it to drop a large amount of the silt before it enters the main channel. These deposits were removed and the barrier replanted during a time of minimum erosion hazard. Similar plant barriers have also been used in soil conservation districts to prevent Bermuda grass from spreading into cultivated fields.

For best results channels must not be used for roadways and should be protected from fires. Damage from rodents or other unavoidable conditions should also be repaired immediately.

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Relative Protection Offered by Two Different Grasses to Conservation Channels in Soils of Different Texture

By W. O. REE

Project Supervisor, Soil Conservation Service Research
Project OK-R-3, Stillwater, Oklahoma

ABSTRACT

One of the experiments conducted at the Stillwater Outdoor Hydraulic Laboratory is described. This experiment was made to determine the protection offered from the erosive action of flowing water by vegetation to conservation channels in soils of different texture. The soil textures employed were a silt loam, a sandy loam, and a fine sand. The grasses used were Bermuda grass and weeping lovegrass. Tentative recommended permissible velocities for use in channel design are presented.