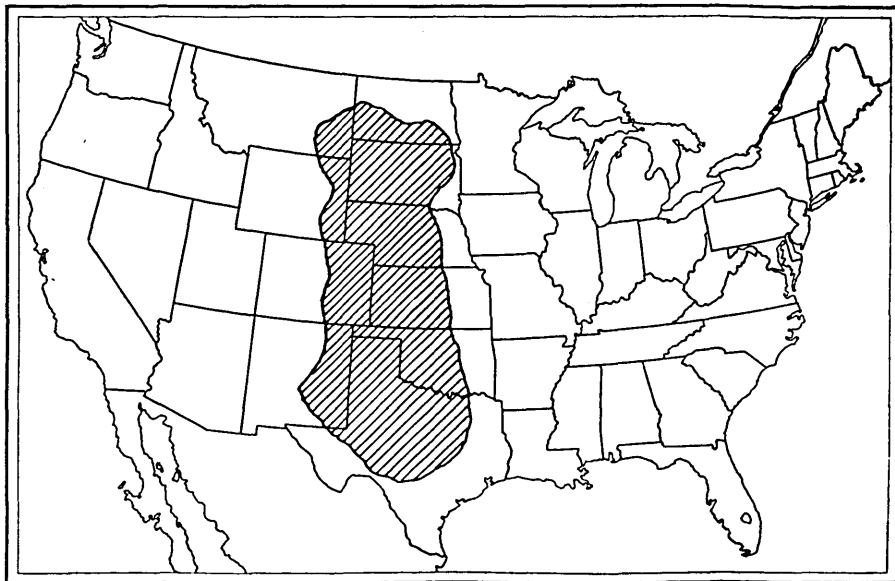


Buffalo Grass for Fairways in the Plains States

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The value of the native buffalo grass (*Buchloe dactyloides*) for fairways in the Plains States has long been recognized by those familiar with the grass. As seed of this grass has, however, never been available commercially, due to the difficulty encountered in gathering it and due also to its low germination, all efforts to establish stands of the grass have been confined to vegetative methods of propagation. These methods of propagation have been under study since 1929 at the Fort Hays Branch Experiment Station, Hays, Kans., by the United States Department of Agriculture in cooperation with the Kansas Agricultural Experiment Station, and have now reached a stage which seems to warrant the recommendation of methods of propagation to golf courses interested in the establishment of this valuable grass on fairways in the Plains States.¹



Area over which buffalo grass occurs naturally.

Buffalo grass occurs naturally over the area shown in the accompanying map. This area embraces over 500,000 square miles of the Great Plains. Throughout this region of major distribution there are many areas in which it occurs sparingly or not at all. It is found in purest stands on the plains west of the 99th degree of longitude in Kansas and east of the 5,000-foot contour line in Colorado. Scattered areas, varying in size from small patches to large meadows, occur east of the 99th meridian, but the principal grasses in this more humid section are the bluestems, which often give way to buffalo grass on the higher lands or when overgrazed. In the region where

¹ A more complete account of these experiments will be published by the United States Department of Agriculture, and in such form will be available to those interested.

it is most widely distributed, buffalo grass will require very little care or attention when once established on fairways. It also grows well and spreads rapidly in the marginal areas when protected from invasion.

Buffalo grass is best adapted to the heavier types of well drained upland soil in the area referred to above. It will not thrive on pure sand or on soils high in sand content, but has been found to grow well on sandy loam soil containing some clay. This grass is especially well adapted to the class of soils regionally referred to as "hard lands," which produce heavy yields of wheat and other crops when placed under cultivation and properly farmed.

The results of limited experiments conducted at this station indicate that buffalo grass may be propagated by setting out rooted or unrooted stolons in moist soil. The stolons will take root and grow in much the same manner as strawberry plants under especially favorable moisture conditions. This is a rather slow, tedious method and will succeed only if the soil is kept moist for some time after the stolons are set out. This method of propagation is not consistently successful on strictly dry land or practical on an extensive scale. Covering an entire area completely with sods is practical only for very small areas, such as lawns, where the chief consideration is immediate results without regard to the costs involved.

Transplanting Pieces of Sod

Source of supply of sods.—The buffalo grass sods should be obtained from a virgin stand of nearly pure buffalo grass. It is possible to find such areas in most localities throughout the central Great Plains. Most of these areas contain a small mixture of grama grass, which is not very objectionable. Under natural conditions buffalo grass occurs in mixtures containing about equal numbers of staminate and pistillate plants with occasional patches consisting of pure stands of one sex. Whenever it is feasible to do so the exclusive use of pistillate or so-called female plants for lawn or fairway purposes is preferred. A turf composed entirely of pistillate plants with leaves wholly covering the stems is much more attractive than a turf containing staminate or so-called male plants. The brown spikelets of the latter rise above the leaves and detract from the green appearance of the turf.

Cutting the sods.—For this purpose a sod cutter is preferred to a plow. The former disturbs the roots less and makes a smooth, clean cut which facilitates the handling and transplanting operations. A satisfactory sod cutter may be constructed with comparative ease and at little expense by bolting a sharpened U-shaped, flat steel blade on sled runners or frames similar to those on a walking plow. A series of holes bored in the vertical ends of the blade to which sliders are attached allows for adjusting the depth of the cut. The blade should be shaped so as to cut a strip of sod about 12 inches wide. When the soil is well moistened by heavy rains, a two-horse team can pull a 12-inch sod cutter. Where it is desired to cut the sods in strips narrower than 12 inches, vertical knives similar to the fins of a crowning plow may be fastened to the U-shaped blade, so that two or three strips, 4 to 6 inches in width, may be cut with one operation. These strips usually are cut with a sharp spade to the final size desired before loading them on a wagon or truck for transporting.

Cutting the sods in alternate strips, leaving an uncut area between, allows the buffalo grass to spread and rapidly heal the scars or furrows left by the cutter. Strips of sod cut in this manner in the spring of the year usually have become re-covered with grass by the end of the first season at Hays. If it is desired to maintain the original smooth surface of the prairie, these furrows may be filled in with fresh soil, taking care to leave no heavy deposit of soil on the adjoining uncut areas. A few years after this is done, it is impossible to detect that any sods had been removed. If the native sod is from sloping land, it is important to cut the strips on the contour to control erosion. Observance of these precautions will encourage the owners of buffalo grass grazing land to provide sods to those who have none of the grass available.

Rate of transplanting.—The amount of sod material required to transplant a given area of land depends upon the manner in which the work is done. An acre of cultivated land when transplanted with 4-inch cubes spaced 3 feet apart requires about 2 square rods of original sod material or a strip 12 inches wide and 538 feet long. Four and one-half times that amount or about 9 square rods are required when the cubes are spaced 2 feet apart, and 9 times the amount or 18 square rods when the sods are spaced 1 foot apart. Double broadcasting with a common manure spreader requires the use of sod material equivalent to the amount needed to space 12-inch squares of sod 3 feet apart. By this method $\frac{1}{9}$ of an acre of sod, obtained by the alternate stripping of at least double that area of native grass, will cover an acre of cultivated land.

Optimum transplanting season.—Buffalo grass has been successfully transplanted at Hays every month from March to August, inclusive. The moisture content of the sods at transplanting time and the rainfall conditions afterwards determine the rapidity of spread to a greater extent than the particular month in which the work is done. The slight differences noted in the dates of transplanting indicate that the best time to move the sods is in March and April, preferably before spring growth has started and immediately following a heavy rain.

Sizes of sods.—Twelve different sizes, ranging in surface area from 2 to 17 inches square and in depth from 2 to 4 inches, have been compared in annual transplantings at this station since 1929. According to the results of these studies, the 4-inch cubes were the most convenient size to transplant and the most efficient in spread. Larger sizes spread faster but not so rapidly in proportion to their original areas. Large pieces may be used to advantage if it is found convenient to do so and the source of supply is plentiful. Smaller sods, particularly those 2 inches square and 4 inches deep, spread much more slowly than the 4-inch cubes.

Small sods, ranging in surface area from 2 to 6 inches square, spread considerably faster when cut to a depth of 4 inches than when cut to a depth of 2 inches. The spread of sods larger in surface area was not noticeably affected by the difference in depth of cutting.

Width of spacing.—Experiments in spacing buffalo grass sods were started at this station in 1929 and repeated each year thereafter. The results of these studies indicate that 4-inch cubes or pieces 6 inches square and 4 inches deep, when alternately spaced 1 foot apart, will spread to cover the intervening spaces in one year

under local dry-land conditions. Similar sods spaced 3 feet apart required less than three years to make a complete cover of grass. At the end of five seasons the sods spaced 6 feet apart had spread to cover practically all of the intervening spaces, as shown in the accompanying illustration. Transplantings of the sod in solid rows 6 inches wide and 3 feet apart spread much faster but less efficiently, considering the amount of original sod material used, than individual sods spaced 3 feet apart. The alternate or off-set method of spacing the sods in rows resulted in more efficient spread and faster coverage of the intervening spaces than regular checked spacing.

Precautions in transplanting.—While buffalo grass may be transplanted with reasonable assurance of becoming established and spreading rapidly, considerable care is necessary when it is desired to obtain a smooth, even surface of grass. To accomplish this end, the land to be resodded should be leveled and graded well in advance. Imbedding the sods level with the surface of the ground, either in holes dug by hand or in carefully plowed furrows, is important if it is desired to use the resultant area for golf or lawn purposes. If the sods are set too deep, loose soil washes over them and retards the spread of the grass. If the sods are not set deep enough, the soil may erode from around them leaving the ultimate surface rather bumpy and unlevel. High winds also contribute towards a roughened condition of a transplanted area by blowing soil particles from around the sods and depositing dust in the grass. While care in transplanting is helpful in obtaining a smooth surface of grass, proper treatment after transplanting may serve to correct a rough surface condition caused by careless transplanting or wind and water erosion.

Methods of resodding large areas.—Resodding large areas is considered to be a practical possibility from a study of all the results obtained at this station.

Pieces of sod, varying in surface area from 2 to 17 inches square, and cut to a depth of 1 or 2 inches, have been successfully transplanted by merely dropping them on freshly and deeply cultivated land and pressing them level with the surface of the ground with a heavily weighted surface packer. This eliminates the tedious labor involved in digging holes or plowing furrows and setting the sods out by hand.

This time-saving method of transplanting, which has been rather well tested and found to be both practical and successful, may be put into practice in several ways. One suggestion is to cut the sods at a depth of 1 to 2 inches, using a 12-inch sod cutter equipped with erect dividing blades so as to cut three strips 4 inches wide at one operation. Cutting the strips into sods of a convenient length, 4 to 12 inches, may then be accomplished with rapidity, using a sharp spade. The sods are then loaded on a wagon or truck and hauled to the field, which has been disked or plowed to a depth of 4 inches and leveled.

A three-man crew can unload the sods in a comparatively short time. One man drives the truck or wagon and two men unload the sods. If the sods are thrown to the ground, they must be handled with reasonable care to prevent them from landing grass side down. To eliminate this possibility and save time, the sods may be unloaded in sheet-iron chutes fastened to the wagon and dragging on the

ground far enough in the rear to prevent the sods from overturning as they slide off the incline. In this manner the sods are rapidly transferred from the wagon to the surface of the cultivated land, where they are pressed into the ground with a heavily weighted packer. If the nature of the soil is such as to cause some difficulty in packing the sods level with the surface of the ground, shovel attachments may be fastened to the bottom of the sheet-iron chutes, thus providing a furrow for the sods.

The unloading operation may be further facilitated by using a manure spreader with the reel removed and platforms fastened to the sides of the rear end for the unloading men to stand on. The driver can then operate the apron-moving lever and keep the men supplied with sods at the rear, so that there need be no delay in unloading. Such work should be started on the higher elevations, so that, if it is not completed at once, seed washing down from the higher land will assist in resodding the lower areas.

Broadcasting the turf.—Broadcasting small pieces of buffalo grass turf on recently cultivated land and packing afterwards has been successful only under favorable rainfall conditions at this station.

In 1930 a manure spreader was successfully used in broadcasting the sods. At first the sods were cut into small pieces the same as for broadcasting by hand, loaded on the manure spreader, and scattered with the machine. This distributed the sods rather evenly over the freshly cultivated ground but shook most of the soil off the roots, causing the grass to dry out rapidly. To overcome this difficulty and eliminate the task of chopping the sods into small pieces, shallow strips of sod in sizes as large in surface area as could be handled conveniently with a shovel were used. The spreader reel not only unloaded the sods satisfactorily but broke them up into rather small pieces without shaking so much soil off the roots, and scattered them rather evenly over the ground. The manure spreader in full gear was passed over the ground twice, leaving an even covering of small sods on the cultivate soil, which was firmly packed immediately after broadcasting.

This work was followed immediately by favorable rains, which caused most of the pieces of grass to renew growth satisfactorily. The spread of the grass was just as fast as that of 4-inch cubes transplanted 3 feet apart, and the final surface was smoother than that of the sods set out by hand.

Successful reestablishment of the grass also resulted from similar work conducted in 1931. However, the broadcasting operations in 1932 and 1933 were followed by periods of dry, windy weather, from which none of the grass survived, indicating that broadcasting is not a safe practice for all conditions.

Treatment After Transplanting or Broadcasting

Packing the land with a heavily weighted surface packer after the sods are set out or broadcast is altogether essential in securing a rapid start of the grass and assuring a smooth surface. Irrigating resodded areas is seldom necessary but may be helpful when the water is sparingly and judiciously applied. Too much water is decidedly detrimental to the growth, as it encourages the competitive development of weeds and less desirable grasses, but a few light and timely applications will be helpful in starting the grass. When

set out on low, poorly drained areas, the grass soon succumbs to an excess of water and is replaced by the less desirable taller grasses.

Buffalo grass spreads almost entirely by surface runners, which should not be disturbed by hoeing or cultivating after the sods are set out. It is well to clip at intervals throughout the season to control other growth and admit sunlight essential to the spread of the grass. Clipping will not wholly destroy but will reduce competing growth and leave a stubble over the land sufficient to minimize the roughening effects of erosion and soil blowing. A mowing machine or a high-cut lawn mower, cutting at a height of 2 inches, will cut the taller grasses without unduly injuring the prostrate buffalo grass. Observations indicate that persistent and repeated close clippings of buffalo grass with an ordinary lawn mower weakens the grass and encourages the inroads of weeds.

The uneven surfaces caused by wind and water erosion or careless transplanting may be leveled by topdressing after the grass has become fully established on such areas as lawns, golf courses, or football fields, where a smooth surface is desired. Depressions in the turf may be filled by periodic applications of a fine layer of soil, being careful not to cover the leaves entirely.

QUESTIONS AND ANSWERS

All questions sent to the Green Section will be answered in a letter to the writer as promptly as possible. The more interesting of these questions, with concise answers, will appear in this column. If your experience leads you to disagree with any answer here given it is your privilege and duty to write to the Green Section. While most of the answers are of general application, it must be borne in mind that each recommendation is intended specifically for the locality designated at the end of the question.

Use of peat in preparing sandy soil for putting green purposes.—How valuable is peat in preparing a sandy soil in the construction of putting greens? In what amount should it be used on a soil that is almost pure sand? (New Jersey)

ANSWER.—Peat would be very desirable in supplying organic matter in preparing a top soil for your putting greens. For best results about 20 cubic yards of peat would be required for a green of 6,000 square feet. The peat should be disked in and thoroughly mixed with the top 4 inches of soil.

How can we get rid of annual bluegrass? (Ontario)

ANSWER.—It is practically impossible to get rid of annual bluegrass (*Poa annua*) in putting greens, by ordinary methods, once it has been allowed to go to seed in the greens. It will produce seed even when kept closely cut. When it first appears in a green as scattered individual plants it can be removed by hand weeding. If it has developed into more or less solid patches, these may be removed with a hole cutter or a turf plugger. When, however, it is fairly well dispersed through a green it is necessary to remove all the sod and replant the green, weeding out any annual bluegrass afterwards as fast as it appears. Much can be done to prevent the grass from get-