CIRCULAR 85 MAY 1942

See back of book for 1950 revision

The Planting and Maintenance of Lawns

By

D. G. STURKIE, *Associate Agronomist*
H. S. FISHER, *Extension Landscape Gardener*

A Zoysia matrella grass lawn. Note the growth of the grass under the trees.

AGRICULTURAL EXPERIMENT STATION
OF THE
ALABAMA POLYTECHNIC INSTITUTE

M. J. FUNCHESS, *Director*
AUBURN

Contents

The Planting and Maintenance of Lawns

A LAWN provides the most desirable setting or base for landscape development and offers many practical benefits. It prevents the washing away of soil and reduces the amount of dirt getting into the building in form of dust and mud. A lawn provides a cooler and more comfortable setting for a building since it reduces the glare and absorbs and reflects less of the heat of the sun's rays than does bare ground.

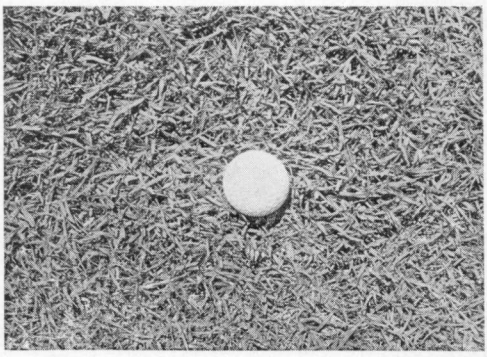
Most everyone desires a beautiful lawn around the home, but too few expend the effort and care necessary to develop one. In Alabama, it is more difficult to establish lawns than in sections farther north since certain growing conditions are not as favorable and the grasses that will grow are not always satisfactory for lawn purposes. Despite these handicaps, some good lawns can be found in all sections of the State. Unfortunately these lawns are in the minority but the fact that some exist indicates that more good lawns can be developed.

SELECTION OF GRASSES AND GROUND COVERS

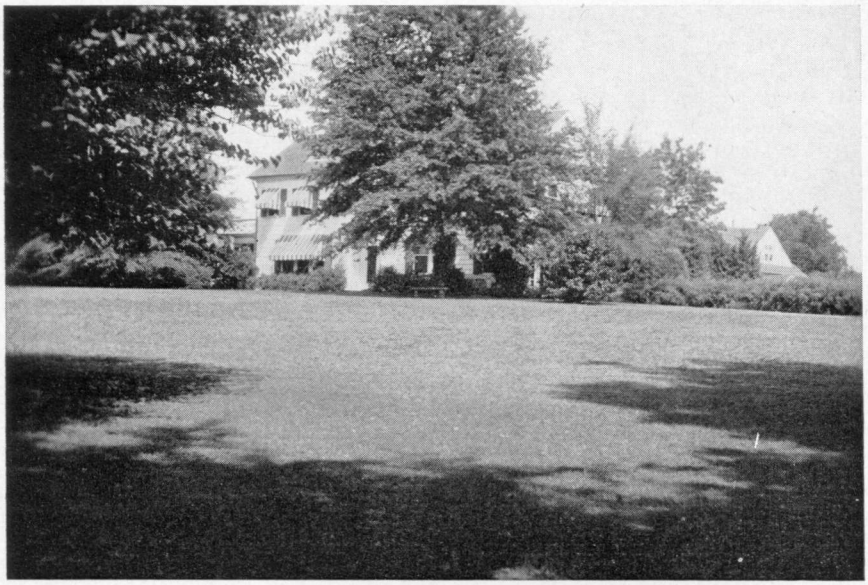
The following plants are used for lawns in various places in the State: (1) common Bermuda, (2) fine-leaved Bermuda, (3) Kentucky bluegrass, (4) St. Augustine, (5) centipede, (6) carpet grass, (7) Zoysia matrella grass, and (8) ground cover plants. Other grasses are used with varying degrees of success. In the northern part of the State mixtures of grasses often prove satisfactory.

Summer Grasses

Common Bermuda grass (Cynodon dactylon) is the most common lawn grass used throughout the State. Some objections to this grass are: it dies down in winter, gets weedy easily, turns brown in hot dry weather, does not thrive in shade, and it will, if not controlled, spread to cultivated areas. Among the things in favor of common Ber-



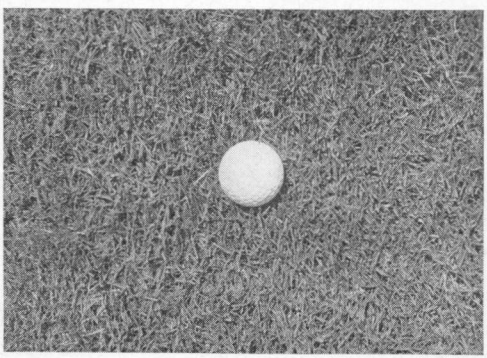
Close-up of sod of common Bermuda grass.



A Bermuda grass lawn. This grass does not grow in the shade.

muda are its hardiness, general availability, and rapidity in becoming established. Common Bermuda can be started by sod, sprigs, and seed.

The seed should be planted in March or April at the rate of about ¼ lb. per 100 square feet. For best results hulled seed should be used. Studies at Auburn show that there is little possibility of success in establishing a lawn if seed are planted at any time other than in early spring or during a prolonged period of rains, unless an ample supply of water is available for regular and thorough watering. If the soil is kept moist by frequent watering the seed may be planted any time from April to August. September or October planting is too late for the grass to become established sufficiently to live over the winter.



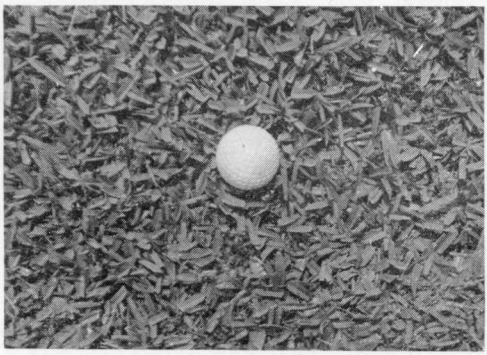
Close-up of sod of fine-leaved Bermuda grass (Cynodon transvaalensis).

Fine-leaved Bermuda grass (Cynodon transvaalensis) sometimes called African Bermuda grass, was introduced

from Transvaal (South Africa). It grows only 2 or 3 inches high, has very fine leaves, produces a dense sod, spreads very rapidly, and will form a sod as quickly as common Bermuda grass. Fine-leaved Bermuda grass has the same weaknesses as common Bermuda and, in addition, does not seem to be as tolerant to adverse conditions. The principal advantage of this grass over common Bermuda is that it is much finer-leaved. It must be established by sod and sprigs since seed of this plant are not available.

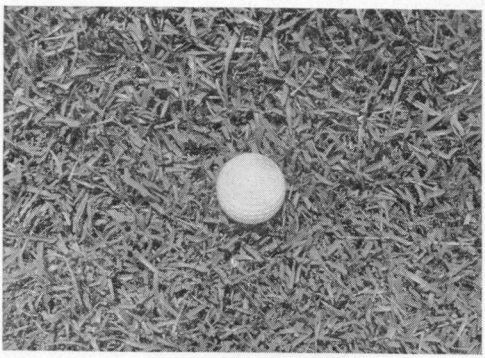
Kentucky bluegrass (Poa pratensis).—(See winter grasses Page 9).

St. Augustine grass (Stenotaphrum secundatum) is suited to shaded and open lawns in the southern part of the State, but it is not winter-hardy and should not be grown farther north than Montgomery. It is a broad - leaved grass, generally light-green or yellow-green in color, forms a comparatively dense sod, and usually crowds out other grasses and weeds. St. Augustine grass grows best on a moist sandy soil but will thrive on soils that are too dry for carpet grass. This grass is usually established by sod or sprigs since seed are rarely available. In setting sod or sprigs care should be taken not to cover the plants with soil. St. Augustine grass is subject to attack by chinch bugs.

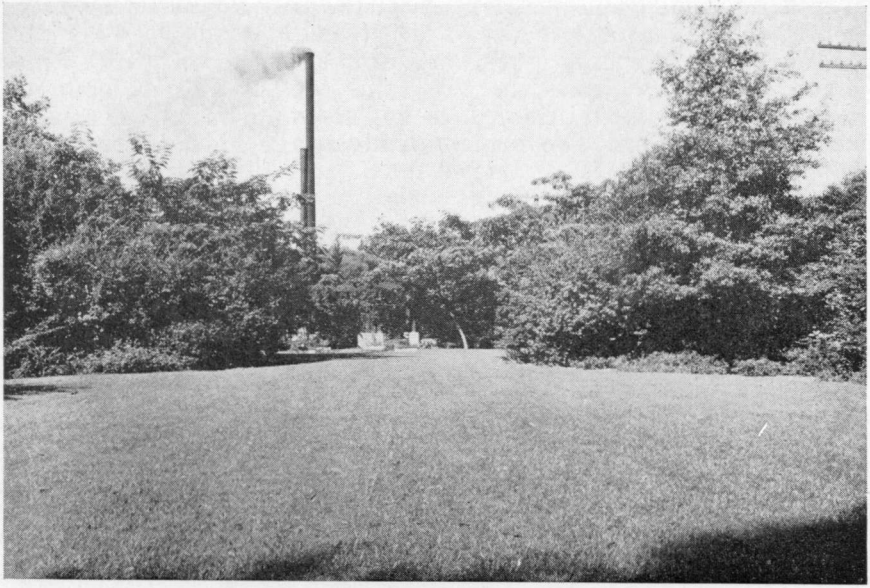


Close-up of sod of St. Augustine grass. Note the coarse leaves.

Centipede grass (Eremochloa ophiuroides) was introduced by the United States Department of Agriculture from China. It is a creeping plant with a medium-width leaf, of a light-green color and produces a dense sod that crowds out most other plants. This grass grows to a height of 3



Close-up of sod of centipede grass. Note the dense sod.



A centipede grass lawn. This grass is especially valuable for planting on the borders of flower beds.

or 4 inches and does not have to be mowed often to maintain a good appearance. Centipede grass will tolerate more shade than Bermuda grass but it cannot stand dense shade. In general, it will thrive in practically all of Alabama and under more adverse conditions than Bermuda grass, growing well on dry sandy areas and on banks and field that are difficult to maintain in other grasses.

On very fertile soils or when large amounts of nitrogen are applied, centipede grass grows thick and dense for one year but during the second year, practically all of it will die. The exact reason for this is not known. This grass is especially well-suited for lawns if ordinary care is given or on poor dry soils. Centipede is one of the most desirable grasses for use on school lawns which are not played on too much.

Centipede grass begins growth earlier in the spring than does Bermuda grass but it is about as susceptible to frost. It is more drouth-resistant than Bermuda and if mixed with other grasses will crowd them out in a few years.

Since there are no large amounts of centipede grass seed available, it is usually propagated by sod and sprigs. Care should be taken not to cover the grass with soil.

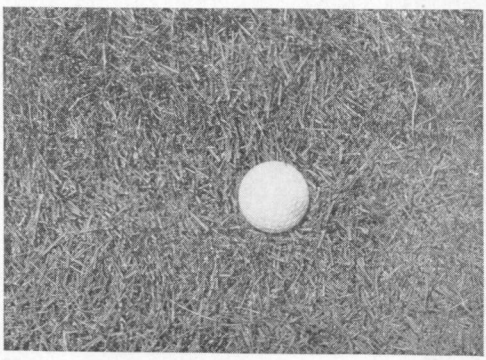
Carpet grass (Axonopus compressus) is used for lawns on moist sandy soils in the southern part of the State, and can be grown with some success under suitable soil conditions in the central and northern parts of the State. This grass, like St. Augustine, is broad-leaved and creeping in its habits of growth,

A carpet grass lawn. Note how this grass will grow in limited shade near the pine tree.

and usually light-green in color. It grows well in the shade if the soil is moist.

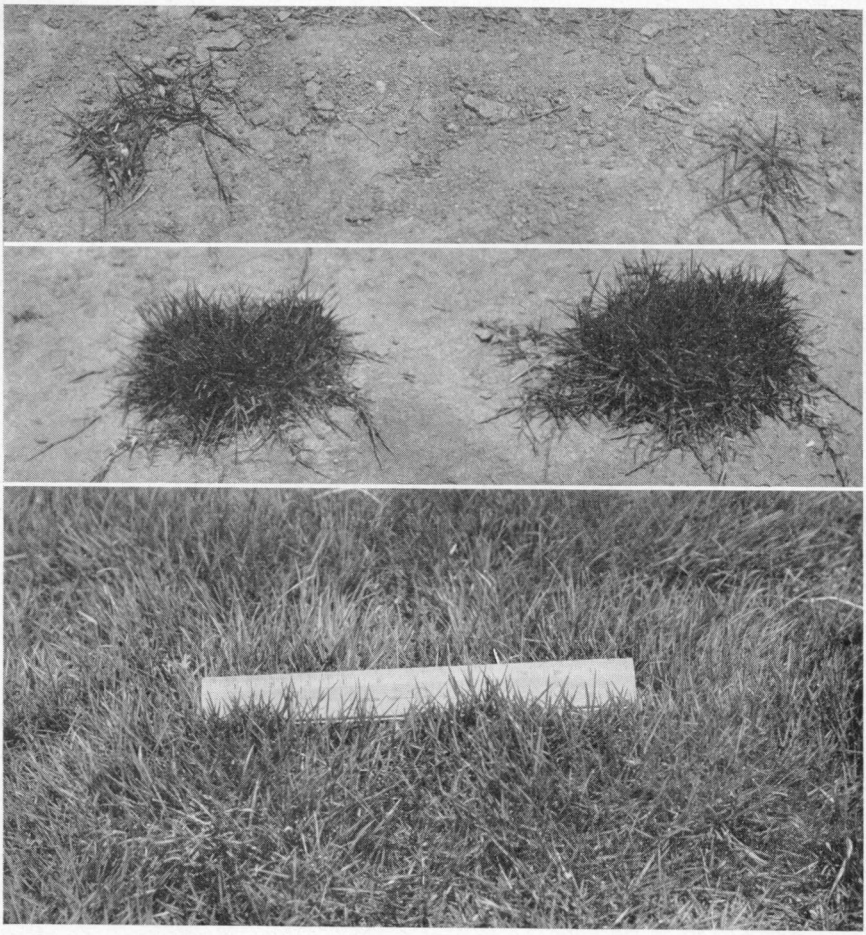
Carpet grass produces an abundance of seed stems that are 8 to 10 inches in height and have two-or three-branched panicles that somewhat resemble those of crab grass. St. Augustine, by comparison, has few seed stems which are flattened unbranched spikes. Seed stems of carpet grass are difficult to cut by mowing; therefore, a lawn of this grass usually has a somewhat rough or "ragged" appearance.

Carpet grass can be started from sod, sprigs, and seed. Seed sowed at the rate of ¼ lb. per 100 square feet will usually give satisfactory results. These seed may be planted in the fall, winter, or in early spring.



Close-up of sod of Zoysia matrella. Note the fine leaves and dense sod.

Zoysia (Zoysia matrella 13521) commonly called Zoysia, was introduced from the Orient by the U.S. Department of Agriculture. It is probably the best grass



Zoysia plants. Upper, two months after planting with small sprigs. Middle, two months after planting with 2-inch blocks of sod. Lower, sod 18 months after setting. Right, sprigs; left, 2-inch blocks of sod. Note both have covered the ground equally well.

that has been found for Alabama provided the lawn is well cared for. So far as is known it is suited for use in all parts of the State.

Zoysia grass has a fine leaf, is dark-green in color, produces a dense sod which feels like a rug, and does not get as weedy as does Bermuda grass. It is one of the earliest grasses to begin growth in the spring and one of the last to die in the fall, remaining green much longer than Bermuda grass (9 to 10 months of the year in Central Alabama). Zoysia grows only 3 or 4 inches tall, does not have to be mowed often, and will grow very satisfactorily either under trees or in direct sunlight. It has stood

a more dense shade than any other grass tested at the Alabama Experiment Station.

The two major faults to be found with Zoysia are that it grows very slowly and there is no source of seed at present. It requires about two years to establish a good lawn using two-inch square pieces of sod spaced twelve inches apart. Under the same conditions Bermuda grass would produce one in two months. A lawn of Zoysia needs to be well fertilized and watered for best results. The soil should not be allowed to become too acid. Studies at Auburn have shown that when the soil becomes as acid as pH 4.5 the grass died.

CAUTION: This is not the same grass as the one sold under the name of Korean lawn grass (Zoysia japonica), the seed of which is available.

Winter Lawn Plants

The appearance of a Bermuda grass lawn in winter can be decidedly improved by planting a winter grass in the Bermuda sod. The plants discussed below are often used for this purpose as well as for planting alone for lawns.

Kentucky bluegrass (Poa pratensis) is an evergreen grass but tends to die out in Central and South Alabama. It has a dark-green color and small leaves, is not as harmful to Bermuda grass as is Italian rye and is, therefore, more desirable for winter lawns on areas that are well kept and are in a good state

A Kentucky bluegrass lawn in Auburn, Alabama. Note how well this grass thrives in the shade when the soil is properly treated.

of fertility. Bluegrass grows especially well in the shade, and thrives on moist alkaline soils that are rich in phosphate. An application of basic slag at the rate of 5 to 10 pounds and a 6-8-4 fertilizer at the rate of 2 pounds per 100 square feet should be made at the time of seeding bluegrass.

Close-up of sod of Kentucky bluegrass. Note the fine leaves and dense sod.

For winter lawns the seed should be sowed in October or November. They may be sowed in January or February when a winter lawn is not desired. The rate of seeding should be ⅛ to ¼ pound of seed per 100 square feet. Even under growing conditions favorable for this grass, it may be necessary to re-seed the lawn from time to time.

Italian ryegrass (Lolium multiflorum) is an annual grass that grows in the winter and dies during the summer and is especially well-suited to shade. Italian ryegrass should be sowed in October or November at the rate of ½ lb. of seed per 100 square feet. The seed may be worked lightly into the soil though this is not essential. On established lawns it is best not to disturb the existing sod in planting Italian ryegrass; a light raking of the lawn to settle the seed to the ground, together with rolling and watering, will result in quicker and better germination.

Italian ryegrass is not recommended on lawns established in grasses other than Bermuda grass. There is some objection to the use of Italian rye grass on permanent Bermuda grass lawns due to the fact that it damages the permanent lawn. If regular mowing is carried on throughout the winter and spring and the general fertilizing schedule is started in the spring immediately after the ryegrass has died, damage to the permanent lawn is reduced.

Close-up of sod of Italian ryegrass.

White Dutch clover (Trifolium repens) is sometimes planted for a winter lawn and also in a mixture with other plants. White

clover requires a nearly neutral soil and should have applications of phosphate for best results. An application of 5 to 10 pounds of basic slag per 100 square feet at the time the seed are sowed will usually supply sufficient lime and phosphate. About 1/10 lb. of seed per 100 square feet should be sowed in September or October; the seed should be inoculated.

Ground Cover Plants

Vines and other low-growing plants can often be used to good advantage as ground covers on areas where it is difficult to establish and maintain a satisfactory lawn. Steep banks, terraces, and densely shaded areas under trees can often be more satisfactorily maintained in a ground cover than in a grass. There are a number of plants suitable for use as ground covers. However, for supplementing lawn grasses in Alabama, English ivy, common periwinkle, Ophiopogon or Japanese snakebeard, and partridgeberry are probably the most desirable.

English ivy (Hedera helix) is a very satisfactory vine for use around trees and on banks. It thrives best in areas that are at least partially shaded. Under some conditions it may be necessary to prune and thin English ivy to prevent it from becoming too high and matted.

Common periwinkle (Vinca minor) is a hardy trailing evergreen plant which has blue flowers and dark-green foliage. However, there are a number of varieties of Vinca minor having various colored flowers and foliage. The common periwinkle will usually be most satisfactory since it forms a dense mat and tends to shade out weeds and grasses. Periwinkle does not develop as dense and heavy a mat as English ivy and, therefore, does not harbor snakes. It grows best under moist half-shaded conditions, but will grow satisfactorily under dry conditions and in dense shade. It is propagated by division or cuttings and can be planted practically the year-round in this State. For summer plantings water must be available.

Ophiopogon or Japanese snakebeard (Ophiopogon japonicus) is a member of the lily family and is a perennial, bearing violet-purple to white flowers. This is a good plant for use under trees and will grow in poor soil and tolerate drouth. It is propagated by division and should be set close enough to cover the entire area since it spreads little. Although at the present it is used principally in the southern part of the State, it will probably grow throughout the State. Ophiopogon does not require clipping; however, some people prefer to cut it back at least once a year.

Partridgeberry (Mitchella repens) is a native plant desirable for use as a ground cover under trees and on moist fertile soils in other shaded areas. The evergreen leaves are small, glossy and almost round. Partridgeberry produces pinkish-white

flowers in the spring, followed by scarlet fruit in the fall and winter. These berries are often borne in pairs. The partridgeberry is propagated by division and can be collected from the banks of streams and shaded woods throughout the State.

Grasses for Special Purposes

Grasses such as centipede, St. Augustine, and Zoysia that form dense sod and tend to crowd out other grasses and weeds are desirable for use on walks in garden areas, for sodding center panels in gardens, and, also, as buffer strips between established lawns of Bermuda grass and flower beds, vegetable gardens, and fields. These grasses can be removed easily from such areas when they spread into them and do not become a pest as does Bermuda grass. These grasses, when planted in buffer strips 1 foot or more in width, help prevent the Bermuda grass from spreading into cultivated areas.

PREPARATION OF THE AREA FOR A LAWN

Draining and Grading.—Before grading and leveling the area, all trash, bricks, boards, stone, and similar material should be hauled away. If such material is buried in the area during the grading operation, the grass will turn brown and often die over such places. The area should then be drained, graded, and leveled. If the soil is poorly drained, it is desirable to put in tile drains. Lines of 4-inch tile, 25 feet apart, laid 2.5 feet deep, with a fall of 3 inches for every 50 feet, will take care of the average drainage problem. The use of tile drains in this State is rarely necessary if the area is graded and leveled in such a manner as to provide proper surface drainage.

Before grading the area, the topsoil should be removed to a depth of 4 to 6 inches and saved for spreading over the area after the grading is done. If the topsoil is of poor quality, it should be replaced with rich soil. The subsoil should be brought to the desired grade and roughly leveled before the topsoil is replaced.

Grading and leveling should be done in such a manner as to allow the water to run away from the house. Six inches to 1 foot of fall for each 100 feet will be sufficient for proper surface drainage. It is not necessary to grade the area to a flat or uniform surface since a rolling effect is usually more desirable. Do not leave depressions or pockets that will hold water since water standing on the lawn for a period of time will damage the grass.

Preparation of the Soil.—Deep and thorough preparation of the soil is necessary to establish a good lawn. Unless the soil is plowed or spaded deeply, the roots of the plants will be unable to develop properly. The soil for a lawn should be as well prepared as a good vegetable garden area before the grass is planted.

Fertilizing.—Lawns are comparatively permanent plantings. For this reason the soil should not only be plowed or spaded deeply, but should also be enriched by the addition of fertilizers.

For most lawns, an application of 5 to 10 pounds of basic slag and 5 to 10 pounds of 6-8-4 fertilizer to 100 square feet will give good results. In addition, well-rotted manure may be added at the rate of 40 to 50 pounds per 100 square feet or cottonseed meal at the rate of 2 to 4 pounds per 100 square feet may be included. Phosphorus and potash should be applied and worked thoroughly into the soil at the time the lawn is being prepared.

A good procedure for applying fertilizers at the time the area is being prepared is to broadcast about one half of the amount to be used over the area before plowing or spading, then to work the remainder into the surface of the soil by disking or by hand if the area is small. This method permits a better distribution of the fertilizers throughout the soil in which the grass roots are to grow and, yet, concentrates the major portion in the upper layer where most of the roots will be found.

Concentrated commercial nitrogen fertilizers tend to burn grasses when they come in direct contact with them. Because of this fact, when lawns are to be established by sodding or sprigging, the area should be watered or should have a good rain on it before the grass is set if heavy rates of nitrogen fertilizers have been used.

PLANTING WITH SOD

Time of Planting.—Lawn grasses may be established by sodding or sprigging at any time during the growing season if moisture conditions are suitable or if water is available. The fall season has many points in its favor. Lawn grasses started during this season make considerable root growth before and during the winter; they receive the benefits of fall and winter rains; and in the early spring they are ready for immediate growth. The growth of the grass in the fall and in the spring prepares it to stand the hot dry weather during the summer. During the spring and summer months the lawn is used more than in the fall and winter seasons. This is another factor in favor of having the lawn established before spring or summer, since well-established lawns permit rougher use than those recently planted. However, lawn grasses established by sprigging and sodding in the early spring grow satisfactory if they have sufficient time (about 2 months) to become well-established before hot weather. The principal controlling factor in regard to the time of starting lawns by sprigs and sod is the moisture condition of the soil.

Amount of Grass Required for Sprigging Lawn Areas.—Exact figures cannot be given for all work of this type due to the variation in quality of grass available, different methods of handling the sod, and other factors. However, the following rates will give a basis for estimating the amount of grass needed

for various sizes of lawn areas. Sod is measured by the bushel or by the square yard. One bushel of stolons or plants will be required to set 400 square feet of area, using 2-inch squares of grass spaced 12 inches apart. One square yard of sod will be required for each 324 square feet, using 2-inch squares of grass set 12 inches apart. If small sprigs of grass are used, 1 square yard of sod will set 3000 to 4000 square feet of Zoysia or Bermuda grass, or 1000 square feet of centipede or St. Augustine grass, when spaced 12 inches apart in squares.

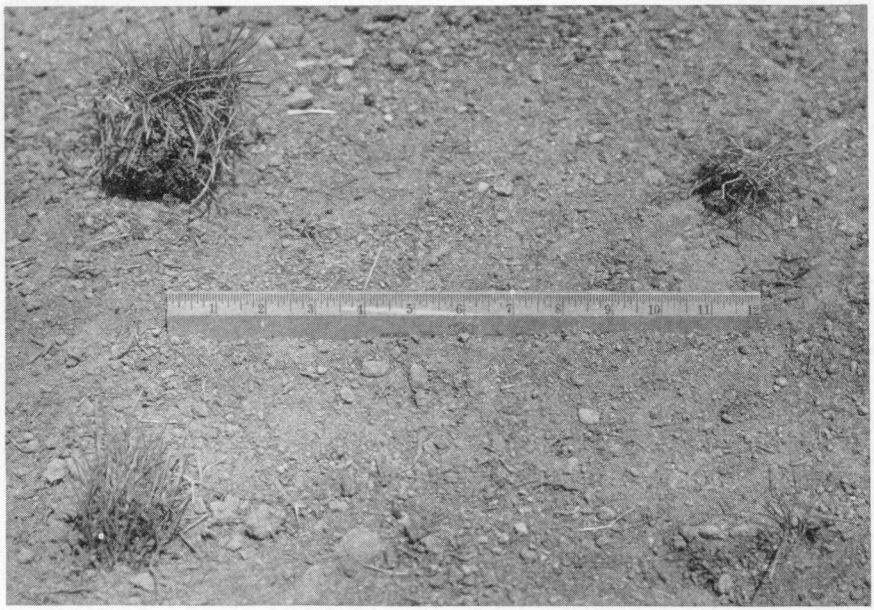
Sodding Solid.—Solid blocks of sod can be used very effectively in establishing lawns. When sufficient grass is available, blocks about 1 foot wide and as long as can be handled conveniently may be placed on the area after the soil is carefully prepared and fertilized. The sod should be rolled to settle the

Sodding an area solid with blocks of Bermuda grass sod. On the right the blocks of sod may be seen while on the left the area has been sodded by placing the blocks in place.

blocks into place. Such a treatment is often advisable on banks and terrace slopes, though it may not be practical to treat the entire lawn area in this manner. If it is not practical to cover the entire bank or terrace slope with blocks of sod, the blocks should be cut about 6 inches wide and set in solid rows across the slope. Thick blocks of sod should be dug, thus leaving as much soil as possible on the roots.

Sprigging.—Planting sprigs of grass in rows about 1 foot apart and spaced about the same distance apart in the rows is

a practical and effective method for establishing grass. Also, it can be planted in solid rows about 1 foot apart and the grass will, by this procedure, cover the entire area quickly. When this method is used on sloping areas, the rows should be run across the slope.



Upper left, 2-inch block of Zoysia sod. Upper right small sprig of Zoysia. Lower left 2-inch square piece of sod properly set. Lower right, sprig properly set. Note the leaves must not be covered.

The sprigs of Bermuda grass may be placed in a furrow and completely covered. Sprigs of Zoysia, centipede, St. Augustine, and carpet grass should always be carefully set leaving the tip-ends exposed since these grasses are killed when they are completely covered with soil. The sprigs should be firmly set and the area rolled and watered. A good rolling is very helpful in getting grass established and in eliminating ridges and high places in the lawn.

Sprigging Followed by Seeding.—When a lawn is started with sprigs, seed of some other plant may be sowed to give a quick sod to prevent the soil from washing while the sprigs are becoming established. If sprigging is done in the fall, Italian ryegrass, Kentucky bluegrass, or white Dutch clover may be used. If sprigging is done in the spring, common lespedeza may be used. This sometimes results in killing the grass set by sprigs. If Zoysia is treated in this manner the pieces of sod used for sprigging should be at least 2 inches square. Tests at Auburn

An area that was strip sodded with Bermuda grass. Note the rows run on the contour to check washing.

have usually resulted in a failure with Zoysia when small sprigs were used in this manner but if 2-inch pieces of sod were used the Zoysia always succeeded.

Care of Sod.—After sod is dug it should be kept moist and in the shade as much as possible until set.

PLANTING WITH SEED

When grass is to be started by seed, the soil should be carefully prepared and in a moist condition. (The rate of seeding is discussed under each plant). For lawns of average size broadcasting by hand is the most practical and efficient method of sowing the seed. In sowing grass seed, whether by hand or by machines, the quantity of seed should be divided into equal amounts. One half of the seed should be distributed in one direction and the remainder at right angles to the first application. After the seed have been sowed, the area should be raked very lightly and rolled with a light roller to aid in germination. Watering with a fine spray will help germination but care should be taken to prevent washing.

SODDING OLD BERMUDA GRASS LAWNS WITH NEW GRASS

It is sometimes desirable to sod a Bermuda grass lawn to another grass such as Zoysia or centipede without first killing out the Bermuda. Experiments conducted at Auburn show that

this may be done provided pieces of sod at least 2 inches square are used. When small sprigs are used tests with Zoysia have always failed, while some tests with centipede have proved successful. Holes should be dug in the lawn and the sod inserted and carefully packed with soil. The holes should be spaced about 12 inches apart.

CARE AND MAINTENANCE

Mowing.—After the lawn is established, the grass should be allowed to grow to a height of about 3 inches. After this it is desirable to mow the lawn regularly with the mower set high. It is not best to clip the grass low even after it is well-established. If the mower is set to a height of 1.5 to 2 inches, spreading and root development will not be retarded. Mowing should be started as early in the spring as necessary and should be continued until the grass stops growing in the fall. If mowing is done regularly, the clippings should be left on the lawn. The lawn may be brushed with a broom or rake to settle the clippings around the grass. Clippings have a mulching effect on the lawn and help keep the soil moist.

Watering.—It is often necessary to water lawns in this State to keep them attractive during the hot summer months. Proper preparation of the soil and correct practices in watering will reduce the frequency of waterings necessary to keep the grass in good condition.

The lawn should be watered in the late afternoon, at night, or very early in the morning. Watering during the hot part of the day wastes a high percentage of the water by evaporation and may scald the grass. It is much better to water the lawn thoroughly once or twice a week than to sprinkle it lightly every day. A light watering every day will cause the roots to develop near the surface of the ground where they are most subject to damage by drouth and cold. It will require 62 gallons of water per 100 square feet to apply 1 inch of water over the area. One inch of water will wet the soil 3 to 4 inches deep. With average city pressure, using the average hose without a nozzle, it will require about 15 minutes to wet 100 square feet 3 to 4 inches deep, or if a spray is used, it will require 30 to 60 minutes.

Fertilizing.—Probably more lawns are in poor condition due to a lack of proper fertilization than to any other one thing. A program of fertilizing the lawn, starting in the spring with an application of a fertilizer such as 6-8-4 at the rate of 1 pound per 100 square feet and repeating this application at intervals of 4 to 6 weeks will produce a good lawn. Cottonseed meal at the rate of 2 to 4 pounds or nitrate of soda at the rate of ½ pound per 100 square feet may be substituted for the 6-8-4 fertilizer for some of the applications.

In applying nitrate of soda, sulfate of ammonia, or other

sources of readily available nitrogen, or complete fertilizer such as 6-8-4, care should be taken to prevent burning the grass. This may be accomplished by watering the lawn to wash the fertilizer off the grass, or by applying the fertilizer while the grass is dry and raking or brushing the lawn so that the fertilizer will settle on the ground around the grass plants. There is no danger of burning the grass by the use of cottonseed meal or peanut meal.

CAUTION: Centipede grass lawns should not be fertilized with the nitrogen fertilizers as described above. (See page 6).

Kentucky bluegrass lawns should receive several applications of fertilizer containing phosphate. A mixed fertilizer, such as 6-8-4 is excellent for this purpose.

An application once or twice a year of about ¼-inch layer of good composted soil or good topsoil as a top-dressing for lawns is one of the best practices for maintaining a good sod. This soil should be uniformly distributed over the lawn and should be settled to the ground by watering or raking. On lawns of centipede, St. Augustine, and Zoysia grasses it is particularly important not to cover the plants.

Reworking Old Lawns.—Many old lawns that are in poor condition can be reestablished as good lawns by following the above practices in regard to mowing, watering, and fertilizing together with reseeding and sprigging or sodding sections where the grass has died. Where lawns are in too poor a condition to be reworked in this manner, the same general procedure should be followed as recommended for starting new lawns.

PESTS

The three most common pests of lawns are weeds, insects, and diseases.

Weeds are often one of the most difficult problems encountered in maintaining a lawn. When conditions are made favorable for sod-forming plants, most weeds are kept in check.

The weeds found on lawns in the South may be divided into two groups; namely, the winter weeds and the summer weeds.

Winter Weeds come up in the fall, grow through the winter and early spring, reproduce, and die. Some of the more common of these weeds are: chickweed, cranes-bill, evening primrose, cudweed, bur clover, Carolina clover, hop clover, henbit, plantain, and toadflax. All of these weeds may be controlled by hand-weeding if sufficient care is used in digging. They may also be controlled by treating the lawn with calcium cyanamid.

Calcium cyanamid is a common source of commercial nitrogen which has herbicidal properties, will kill weeds, and supply all the nitrogen needed by the lawn the following year. It should be broadcast uniformly over the area in January or early February at the rate of 5 pounds per 100 square feet.

CAUTION: Treatment with Cyanamid should be confined to Bermuda grass lawns, and should not be applied to bluegrass or other lawns. When applied to the soil, cyanamid will not injure shrubbery but it should not touch the foliage. It should not be used around vines or other plants that require an acid soil. Dogs with long hair should not be allowed to play on the lawn until after a rain has washed the cyanamid off the grass.

Wild Onion or Garlic is one of the worst lawn pests in the South and can be controlled by carefully digging up the entire plant, including the bulbs. It has been controlled in Bermuda grass by spraying with a mixture of 9 parts kerosene and 1 part creosote in late January or early February.

Summer Weeds.—The worst summer weeds are crab grass, Dallis grass, and crowfoot or goose grass. Dallis and crowfoot should be removed by hand-weeding. Crab grass can be controlled by hand-weeding or by treating with lead arsenate or calcium arsenate at the rate of 1 pound per 100 square feet of area. The arsenate should be applied in late February or early March and may be dusted on or mixed with soil and scattered over the lawn as a top-dressing.

CAUTION: Arsenates are very poisonous and livestock should not be allowed to eat the grass.

Insects and Other Pests.—Among the insects and other pests that sometimes damage lawns are: ants, chinch bugs, earthworms, moles, and white grubs.

Ants.—These insects often become a problem in the house and also cause trouble in the yard and garden by disfiguring lawns and transporting aphids to plants. Carbon disulphide forced into the openings of ant beds by the use of an oil can and the openings closed with moist soil will help to control these insects. Also, a good ant poison can be made as follows:

1 quart of water	125 grains of arsenate of soda
1 pound of sugar	25 grains of tartaric acid

Boil until the arsenate of soda has dissolved and add one tablespoon of honey. Place in pill boxes that have been waterproofed by dipping in hot paraffin. Make one or more holes in the top of the boxes with a nail and place the boxes containing the poison bait near ant runways.

Chinch Bug.—St. Augustine grass attacked by this insect turns brown in patches which have yellow edges. The insects will be found doing their damage in the grass that has turned yellow.

This insect can be controlled by the use of one per cent rotenone-bearing dusts carefully applied so as to actually come into contact with the pest. The applications must be repeated until all insects are killed.

Earthworms.—Under average conditions earthworms are considered beneficial but in some cases they are pests. They burrow in lawns and cast up mounds of soil which are unattractive and interfere with mowing. This trouble is also found on golf courses. Where such conditions exist apply 1 ounce of bichloride of mercury in 25 gallons of water per 500 square feet of lawn and water thoroughly to wash the material into the soil.

CAUTION: Bichloride of mercury is poisonous and should be carefully labelled and carefully handled. All containers used in this treatment should be thoroughly washed before being used for other purposes.

Moles may be controlled on small areas by the use of paradichlorobenzene or naphthalene (moth balls). About a teaspoonful of either material placed in the runways at 10 or 15 foot intervals will usually be effective in driving out the moles. The holes made in the runways in applying the material should be carefully repaired to prevent the fumes from escaping. The systematic use of mole traps may be effective.

White Grubs are the larvae of a number of species of beetles commonly called "June bugs". These grubs damage grass by eating the roots below the surface of the soil. Their presence is indicated by small irregular brownish patches in the lawn. When large numbers of the grubs infest a lawn all of the roots may be cut, killing large sections of the grass which becomes easy to pull or to rake out of the ground. White grubs can be controlled by dusting the lawn in February or March with lead arsenate or calcium arsenate at the rate of 1 pound per 100 square feet.

CAUTION: Arsenates are poisonous. (See page 19.)

Diseases.—Lawn grasses are sometimes injured by a disease known as brown patch. There are two kinds of brown patch. (1) Large brown patch which causes large areas of the grass leaves to die suddenly. The roots are not killed by this type and the grass usually will recover. (2) Small brown patch or dollar brown patch attacks small areas, about the size of a silver dollar completely killing the grass. Lawn grasses may turn brown due to reasons other than brown patch. However, if the brown spots appear suddenly, almost overnight, brown patch is probably the cause.

Both types of brown patch can be controlled by spraying with 1 ounce of bichloride of mercury in 10 gallons of water per 1000 square feet. Water the area carefully after using this material to thoroughly wash it into the soil.

CAUTION: Bichloride of mercury is poisonous. (See above.)

Brown patch can also be controlled by organic mercury compounds used as directed by the manufacturers.