Growing Beautiful Lawns
Michigan State University Extension Service
James Tyson
Issued April 1941
16 pages

Extension Bulletin 224 April 1941

GROWING BEAUTIFUL LAWNS

JAMES TYSON

MICHIGAN STATE COLLEGE

EXTENSION DIVISION

EAST LANSING

Cooperative Extension Work in Agriculture and Home Economics,
Extension Service, Michigan State College and the U. S.
Department of Agriculture Cooperating.

CONTENTS

GROWING BEAUTIFUL LAWNS

By James Tyson

A well kept lawn is the most effective setting for a home or a large building and is an essential feature of parks, cemeteries, recreation areas and playgrounds.

Proper grading to "set-off" the buildings and to establish a suitable subsoil condition for the grass is the first step in the development of the lawn. Next comes the selection of a good lawn soil which is essential in the production of a lawn because the grass, through its roots, absorbs the water and mineral nutients needed for growth from the soil. A good lawn soil, therefore, is one which is capable of supplying optimum amounts of mineral nutrients and water to the grass plants at all times during the growing season. Grass roots can perform their function of absorbing water and mineral nutrients most efficiently when the soil contains an available supply of free oxygen, and when the reaction of the soil (the degree of acidity or alkalinity) is within the range of tolerance of the grass plants. Oxygen must be present in the soil air to be available to the grass roots; therefore, the physical nature of the soil must be such as to provide small pores for the retention of needed water and large channels to allow the excess water to drain away freely and fresh air to enter the soil. The choice of a grass or grass mixture adapted to the conditions of shade and moisture supply is next in order.

Finally, but of most importance, is the supplying of adequate plant food and water, accompanied by regular mowing at a suitable height. Carbon dioxide is absorbed through the openings (stomata) in the leaves of the grass plants. It is combined with water in the leaves, through the action of sunlight and chlorophyll (the green coloring matter), to form simple carbohydrates. These serve as a basis for the formation of more complex carbohydrates, proteins, and other compounds which form the leaves, stems, roots, and other essential parts of plants. Inasmuch as the leaves are the factories which produce the ingredients to induce new growth, close clipping of lawns which removes too large a proportion of the leaves weakens the grass by drawing on the root reserves to make new leaves.

A beautiful lawn can be made and maintained by anyone who will study the growth requirements of grass and apply a few, simple, fundamental principles of lawn management. Considerable time and energy are required, but the work is enjoyable and the result is pleasing to the owner and his neighbors.

MAKING A NEW LAWN

Grading

The first step in building a new lawn is to shape the soil to form the desired contours and landscape features. The most satisfactory grades slope gently away from the buildings in all directions. *Terraces and steep slopes*

should be avoided for it is difficult to establish and keep grass on them. Water tends to run off the steep slopes, rather than soak into the soil, and it is difficult to mow, rake, roll, and fertilize such areas. *A gently curving slope gives a more pleasing landscape effect and simplifies the problem of lawn maintenance.* Wherever the grading operations require the moving of enough soil to cause the surface soil to be covered with subsoil, it is advisable to remove the surface soil, establish the grade in the subsoil, and replace the surface soil. The surface soil on a lot where a new building is to be constructed should be scraped to the rear of the lot, in a place where it will not be disturbed until the building is finished and the subsoil has been graded to give the desired contours. Clayey and clay loam subsoils should be shaped so there are no pockets in which water may accumulate and cause a water-logged condition in the surface soil.

Drainage

In addition to the shaping of the subsoil it may be necessary to install a tile drainage system in very heavy soils to insure good drainage. Tile lines should be installed after the grades have been established in the subsoil but before the layer of surface soil is put in place. However, if needed, they may be installed after the lawn is established. Use regular 4-inch agricultural tile, placed at a depth of 18 to 24 inches below the surface in lines approximately 15 feet apart. Run the laterals into a main which should be either 6- or 8-inch tile, depending upon the size of the lawn being drained. This line must have an outlet, which is usually a storm sewer in the cities or an open ditch in the rural districts. The pattern of the tile lines will be controlled by the shape of the lot, and the size, shape, and location of buildings. The tile lines must have a "fall" of at least one-tenth foot per 100 feet of line; an even greater "fall" would be more desirable, so as to remove the surplus water as quickly as possible.

In sandy soils, drainage is generally good, unless they are underlain with clay or hardpan or unless they are in a swampy location. In fact, drainage may be so good there will not be enough water left for the grass. This situation can be improved by adding sufficient good topsoil to provide a water storage capacity large enough to supply the requirements of the grass, and still retain the good drainage condition.

Lawn Soil

Texture: *Dark colored sandy loam and loam soils* are ideal surface soils for lawns, since they possess the capacity to retain large quantities of water and plant food, while allowing surplus water to drain away readily. These are soils which contain 40 to 65 per cent sand, much of which is coarse-textured, less than 20 per cent clay, and from 10 to 15 per cent organic matter. Dark-colored soils usually are well supplied with organic matter for it is this substance which imparts the dark color to the soil. Mucks and peats may be distinguished from dark-colored loams and sandy loams by their light weight when they are dry. *Mucks and peats are not suitable surface soils for lawns although they are useful for mixing with soils to supply organic matter.*

Organic Matter

Organic matter is a very important constituent in the surface soil for lawns. This material can be supplied to those surface soils which lack it, by mixing well-rotted barnyard manure, artificial manure, peat, muck, and green

plant material into the soil. Rye, buckwheat, cowpeas, oats and peas, and other crop plants may be grown for green manure and plowed under when still green and succulent. This system is used principally for large acreages, such as parks, cemeteries, golf course fairways, airports, and roadsides where the time element is not important.

On small lawns, or even on fairly large estates, where a grass cover is desired as soon as possible, the use of well-rotted barnyard manure, peat, or muck is more practical. Peats and mucks need to be shredded and screened, if there is any coarse, woody or fibrous material present, to prepare them for mixing with the lawn soil. They should be mixed in the proportion of one part by volume of peat or muck to two or three parts of mineral soil—for example, use one bushel of peat or muck with two or three bushels of soil, or one cubic yard of muck or peat with two or three cubic yards of mineral soil. Peat and muck may be purchased under various trade names, or they may be obtained from local deposits. *Wherever organic materials are added to the surface soil of a lawn, the two should be mixed until the organic matter is evenly distributed throughout the surface layer of mineral soil.*

Improving Unsatisfactory Soils

Heavy clay, clay loam, or silt loam soils are usually undesirable for lawns because surplus water drains away too slowly. This condition results in insufficient air for the grass roots and hence unhealthy grass. Furthermore, such soils will remain wet and soft in the spring, delaying spring care of the lawn. Lawns on these heavy soils tend to become uneven instead of maintaining a smooth surface. Sandy soils, on the other hand, allow water to percolate through them too freely, retain little moisture for the plants, and hence the grass suffers from drouth. They act much like sieves, rather than having sponge-like qualities. The faults of either clay or sandy soils may be corrected by adding to the particular soil sufficient quantities of soil with the opposite characteristics. Very good lawn soils may be prepared by mixing the following proportions of sandy, clay, and organic soils:

(a) 1 bushel clay soil, 1 bushel muck or peat, and 2 bushels of sandy soil.
(b) 1 bushel clay loam, 1 bushel muck or peat, and 1 bushel of sandy soil.

Thickness of Surface Soil Needed

After the subsoil grade has been established, the lawn should be covered with a layer of the loam topsoil as described. The thickness of surface soil required for the lawn depends upon the type of subsoil; the following table should be used as a guide:

Nature of Subsoil or Subgrade	Thickness of Surface Soil Required
Sandy loam or loam	4 to 6 inches
Silt loam	6 to 8 inches
Clay subsoil	8 to 10 inches
Sandy subsoil	10 to 12 inches

Initial expense often influences people to use less topsoil than the amount indicated in the table, but reduction of maintenance costs and increased lawn beauty will more than offset the extra initial costs of the full topsoil.

Clay Layers Damage Lawns

In sandy areas, where it is difficult to obtain good topsoil, it is a common practice to cover the sand with a layer of 4 to 6 inches of clay. Wherever a heavy clay subsoil is used for this purpose it usually prevents the free downward movement of excess water and the lawn is damaged by a poor drainage condition. A better plan is to mix a 3-inch layer of clay soil with the top 6 to 8 inches of sandy soil. On large areas the mixing may be accomplished by repeated plowing and harrowing when the clay soil is in a friable condition, but for the average-sized lawn a small power mixer would be needed. Hand-mixing is so laborious that few people would do a thorough job. Usually the process of getting clay and mixing it with the sand is just as expensive as to use all good topsoil over the sandy soil.

Grasses for Lawns

There are many firms supplying good grass seeds. Although the exact formulæ of the mixtures may vary, the firms use the same varieties of seeds in their mixtures for the same purpose. *Ready-prepared grass seed mixtures distributed by responsible seedsmen and purchased from reliable dealers are recommended for all small lawns.* Special mixtures may be obtained for open, sunny lawns and others for shady lawns. It is required by law in Michigan for seedsmen to label packages of grass seed with the analysis of the particular mixture.

One precaution should be taken in buying grass seeds for general lawn purposes, and that is **not** to buy mixtures which contain bent grass seeds, either creeping or colonial bents, for Michigan conditions although many reliable seedsmen add a small percentage of these to their "best" mixtures.

Creeping and colonial bent grasses are being very widely used for lawns because they produce a shorter statured, thicker, and more velvety turf than do the usual lawn grasses. However, their greater susceptibility to the fungous diseases commonly called brownpatch, dollar-spot, and snowmold; the necessity of more intensive care and management, including more frequent mowing at a much lower height; more frequent fertilization; more watering, and frequent topdressing with soil lead us to discourage any, but those growers who are willing to study the care of these grasses, or who have the means to keep a gardener who understands their care, from planting them in their lawns. It is true that the better strains of creeping bent and colonial bent, when properly maintained, make very beautiful lawns but, likewise, properly maintained Kentucky bluegrass and Chewing's New Zealand fescue make beautiful lawns. The management of bent grass lawns is discussed in Michigan Agricultural Experiment Station Circular Bulletin 156, "Management of Bent Grass Lawns."

Common Lawn Grasses Recommended

Good lawns may be obtained by planting Kentucky bluegrass, Chewing's New Zealand fescue, or rough bluegrass individually — that is, without the usual nurse grass, such as redtop or domestic ryegrass. However the average lawn builder will get more satisfactory results if he uses one of the mixtures with some nurse grass or white clover present.

Table 1. Seed Mixtures for Different Locations

Soil Conditions	Grass Seed Mixtures	Rate of Seeding (Lb. per 1000 Sq. Ft.)
Open, sunny, fertile, well-drained loam	Kentucky bluegrass 90% redtop 5%—white clover 5% Kentucky bluegrass 85% domestic ryegrass 15% Kentucky bluegrass 80% domestic ryegrass 10%—white clover 10% Kentucky bluegrass 90% white clover 10%	
Shady, fertile, well-drained loam	Chewing's New Zealand fescue 50% rough bluegrass (*Poa trivialis*) 40% redtop or domestic ryegrass 10%	1½
Sandy soil, shady or sunny	Chewing's New Zealand fescue 85% domestic ryegrass 15% Chewing's New Zealand fescue 80% domestic ryegrass 10% white clover 10%	1½
Wet, poorly drained soils	Canadian bluegrass 50% rough bluegrass 30% redtop 20%	1

The proportions of different grass seeds in any mixture may be varied rather widely without materially affecting the resulting turf, for the soil conditions will largely determine the grass which will predominate. However, not more than 15 per cent domestic ryegrass or white clover should be used in the mixtures. Redtop which is so commonly used as a nurse grass in lawn seed mixtures is very susceptible to injury from brownpatch and snowmold, the same as are the bent grasses. Snowmold may kill large areas of a newly seeded redtop turf in the winter, and brownpatch affects newly seeded turf in the summer months.

Seedbed Preparation

To Lime or Not to Lime the New Lawn

Lime should be applied when building a new lawn only when tests for acidity have indicated the soil to be very strongly acid in reaction. These tests may be made by the individual lawn owner by means of the Soiltex reaction kit which may be purchased through the local county agricultural agent or the Soils Department, Michigan State College, East Lansing, Michigan; or he may send samples of soil to either of the above-named agencies for testing. If the soil, when tested with a Soiltex kit, shows a reaction of pH 5.5 or less, broadcast pulverized limestone, ground limestone, or agricultural meal, at the rate of 100 pounds per 1,000 square feet of lawn area and mix it thoroughly with the topsoil when preparing the seedbed. *Hydrated lime may be used but because it reacts with sulphate of ammonium in fertilizer to produce ammonia gas, which has a severe burning effect on grass, it should be applied not less than two weeks before seed sowing or a fertilizer application.*

Broadcast Fertilizer on the Lawn before Seeding

Broadcast 10 to 15 pounds of 10-6-4* fertilizer per 1,000 square feet of lawn and mix thoroughly with the surface soil by raking, as the preparation of the seedbed is being completed. (This quantity of fertilizer is approximately 400 to 600 pounds to the acre.)

Special Fertilizer for White Clover Lawns

If a lawn seed mixture containing white clover seed is used, the fertilizer used should be one which contains no nitrogen. Phosphate and potash fertilizers applied to soils in which the available supply is low stimulate the growth of the white clover, while applications of available nitrogen stimulate the more aggressive grasses, retarding the growth of the clover by competition. The analysis of the fertilizer used depends upon the kind of soil on which the clover is grown as shown in the Table 2.

Table 2

Soil	Fertilizer* Analysis	Rate in Pounds per 1000 Sq. Ft.
Muck soils—Sandy soil	0– 8–24	20
Sandy loam	0–20–20 0–12–12	15 20
Heavy sandy loam—Loam—Silt loam	0–20–10 0–14– 6	15 20
Clay loam—Clayey soil	0–20– 0	15

*See footnote at bottom of page for explanation of figures used to denote fertilizer analysis.

Fitting the Soil

Alternately rake and roll the lawn surface until a firm seedbed is produced. This condition may be ascertained by observing one's footmarks when he walks on the soil. The feet should not sink into the soil appreciably when the seedbed is sufficiently firmed. The final preparation before broadcasting the seed is to rake the surface very lightly with a steel rake. The teeth of the rake should not penetrate the soil to a depth of more than one-fourth inch.

Large areas may be prepared for seeding by plowing and harrowing with disk, spring-tooth, and spike-tooth harrows until the soil is well-pulverized and a smooth seedbed is prepared. Then go over the area with a cultipacker for the final preparation. Cultipacking should be done at right angles to all slopes so the small trenches will tend to prevent washing.

*The first figure in the fertilizer analysis represents the per cent of available nitrogen, the second the per cent of available phosphoric acid, and the third the per cent of water soluble potash. Thus a 10-6-4 fertilizer contains 10% available nitrogen, 6% available phosphoric acid and 4% available potash. Michigan law requires the analysis to be printed on each package of fertilizer offered for sale.

Seeding the Lawn

The best time to seed lawns in general is from August 15 to September 1 in southern Michigan and from August 10 to 25 in the Upper Peninsula. Where facilities are available for watering, however, good results may be obtained with seedings made at any time during the growing season.

It is a good plan to mix the seed for each measured section of the lawn with enough dry screened soil to make sufficient bulk for even distribution when it is broadcast. It is suggested that the seed be divided into three portions. The first portion is broadcast while the operator is walking in a north-south direction, the second portion while he moves in an east-west direction, and the third while he walks northeast-southwest. This plan leads to even distribution of the seed (Fig. 1). Rake the lawn lightly after the seed has been sown and roll it once with a heavy roller to firm the soil around the seed.

When seeding large acreages where a firm seedbed has been prepared by alternately harrowing and cultipacking, the seed may be broadcast immediately after the last cultipacking. A uniform seeding is easily obtained through the use of one of the wheel-barrow type grass seed distributors. It is unnecessary to cover the seed by harrowing or any other mechanical process. With

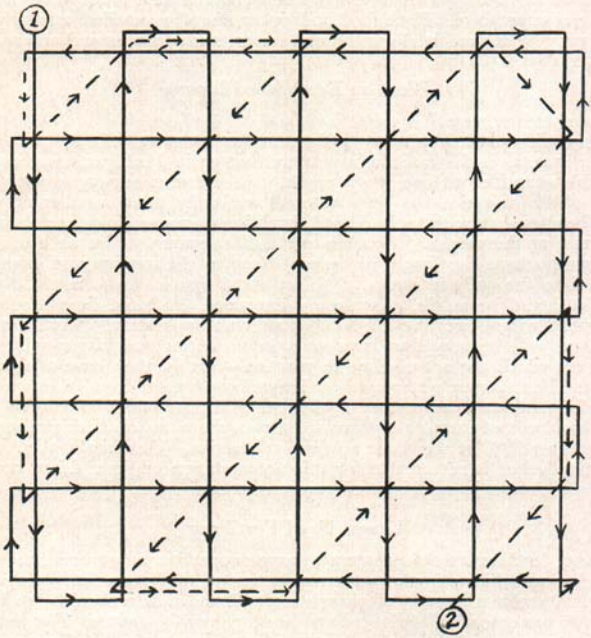

Fig. 1. Suggested method for sowing seed to insure even distribution of seed.

the first rain, enough soil will be washed from the ridges into the trenches to cover the seed to about the right depth.

Care of New Seeding During Early Stages of Growth

The most important step in caring for a newly seeded lawn is to make certain the surface layer of soil in which the seed is imbedded always contains enough moisture to keep the little seedlings alive after the seeds germinate. Water the lawn, using a fine spray to avoid washing the soil, as often as is necessary to keep the surface moist. It may be necessary to sprinkle the new seeding two or three times daily.

After the grass attains a height of approximately one inch the lawn may be watered as described under *"maintenance of established turf"*, page 12. Begin mowing the lawn as soon as the grass has reached a height of 3 inches. A sharp mower is essential for mowing any lawn, and especially for new seedings. The cutter-bar should be set to cut at a height of 2 inches and the grass maintained at this height.

Care of Established Lawn

If a lawn is to give lasting satisfaction and continue to improve, it must receive constant care. Plant food and water must be supplied regularly, the grass must be mowed intelligently, and leaves, sticks, stones and other debris removed.

Lime on Established Lawns

As stated on page 7, lawn soils should not be limed unless they are very strongly acid (pH 5.5 or below). The constant watering of lawns with water rich in lime, as is the case with most well water in Michigan, supplies considerable quantities of lime. As a result, it is seldom necessary to apply lime to an old lawn which has been watered artificially for a number of years.

When tests show the soil to need lime, finely ground limestone should be broadcast at the rate of 50 pounds per 1,000 square feet on an established turf inasmuch as the lime will be held close to the surface and cannot be mixed into the soil mechanically. If hydrated lime is to be used 30 to 35 pounds should be ample. As already explained, hydrated lime should not be applied within two weeks before or after an application of fertilizer.

There will be very few lawn soils in the cities and larger villages of Michigan which are not alkaline in reaction—that is, they have a high-lime content. The average water used for irrigation purposes from lakes, streams, or wells, contains a large amount of lime. Soil tests which have been made upon hundreds of samples of lawn soils from the cities of Michigan indicate that at least 99% of them are alkaline in reaction. The lime applied in the irrigation water is responsible for this accumulation of lime. Lime need be applied to lawns in Michigan only in exceptional cases.

Lawns Need Fertilizer

Lawn fertilizers should contain a large proportion of nitrogen, the plant food element which stimulates the production of the green, leafy portion of plants. A medium amount of phosphoric acid and potash should also be included to promote a well-balanced and healthy growth of grass. *The fertilizer which is recommended for all general turf growing has a 10-6-4 analysis.**

*See footnote, page 8.

Fertilizing the Open, Sunny Lawn

An early spring application of 10 pounds per 1,000 square feet of lawn of the 10-6-4 fertilizer is recommended. This should be put on as early in the spring, after the snow disappears, as it is possible for one to walk on the ground without leaving footprints. In the southern half of the Lower Peninsula this is usually about April 1. For locations farther north, it will be approximately one week later for each 100 miles. The corresponding date in the Upper Peninsula, exclusive of Menominee County, is the first week in May.

A second fertilizer application, using the same amount, should be made about 6 to 8 weeks after the early spring treatment. This treatment should be broadcast between May 15 and June 1 in the vicinity of Lansing and not later than June 15 in the Upper Peninsula.

To insure a vigorous growth in the fall, a third application of the same amount and kind of fertilizer should be made about September 1, regardless of geographical location in the state. This is one of the seasons during which grass grows to best advantage and a vigorous growth at this time aids greatly in controlling weeds the following season.

Fertilizing Shady Lawns

Whenever there are shade trees and shrubs in the lawn or around the edges, the tree, shrub, and grass roots must of necessity get their available nutrients and water from the surface soil to a large extent. This competition of roots for the vital necessities of plant life is largely responsible for the difficult problem of producing a good lawn and must, therefore, be modified to assist the grass to obtain its share if a good turf is to be secured.

The system of fertilizing a shady lawn is a simple one, but it requires the periodic application of small amounts of available plant foods in the form of fertilizers during the entire growing season. The first fertilizer treatment in the early spring is exactly the same as for open sunny lawns—10 pounds of 10-6-4 fertilizer per 1,000 square feet about April 1 at Lansing, and at corresponding dates farther south or north. Thus, the entire lawn maybe fertilized in one operation at this season. Beginning May 1, however, *apply 4 pounds of 10-6-4 per 1,000 square feet every two weeks until September 1* to the shady lawn.

Soluble Fertilizers—Many lawn owners are becoming interested in the use of fertilizers which are soluble in water, which can be applied through the hose by means of various types of proportioners which are made for this purpose when one is watering the lawn. Several types of these proportioners are on the market, which range in price from as low as $1 to as high as $50 each. There are a number of nitrogenous fertilizers such as ammonium sulphate, sodium nitrate, calcium nitrate, and urea which are completely soluble in water. Potassium phosphate is the only common phosphatic fertilizer which is completely soluble in water, and since it carries phosphate and potash in about the right proportion to each other it may be used as the source of both for this purpose. The main drawback to this material is its seemingly high cost, however, mixed with either ammonium sulphate or urea in the amounts required to be equal to the application of 10 pounds of 10-6-4 fertilizer per 1,000 square feet, the cost is not excessive. A mixture of either 5 pounds ammonium sulphate and 1¼ pounds potassium phosphate *or of* 2¼ pounds urea and 1¼ pounds potassium phosphate is equal to 10 pounds of 10-6-4 fertilizer.

These mixtures are completely soluble in water and may be substituted for the regular 10-6-4 fertilizer if it is desired to use the material in solution with a proportioner.

A few complete mixtures, composed of ammoniated phosphate and potash combinations, may be used in a large spray apparatus where the material is dissolved in a large tank of water. These materials include ammoniated phosphates, ammophos, ammophoska, nitrophoska and combinations of these and similar products with other soluble materials such as ammonium sulphate, urea, and muriate of potash. Ammoniated phosphate, ammophos, ammophoska, nitrophoska, and similar compounds are not completely soluble in water but leave a sludge which must be kept in suspension so as to flow evenly and not clog the sprayer. A mixture of 60 pounds of sulphate of ammonia and 40 pounds of nitrophoska (15-30-15) is equivalent to a fertilizer mixture having an analysis of 18-12-6. This may be used at the rate of 5 pounds per 1,000 square feet instead of 10 pounds of 10-6-4.

Warning—*Fertilizers may be broadcast on lawns in early April in southern Michigan and early May in the Upper Peninsula without fear of injury to the grass which will be dormant at that time. However, care must be exercised when making applications during any time of the growing season when the grass is green, because any fertilizer salt which clings to the green leaves will have a burning action.* If the grass is wet with dew or rain, or by sprinkling with the hose, the injury will be more severe than if the grass is dry. Broadcast fertilizers during the day when the grass is dry. The lawn should be divided into convenient areas of 500 feet or less, using walks and flower beds as boundaries. Divide the fertilizer into amounts fitted to each area. Broadcast the fertilizer on the first area as quickly and evenly as possible, and thoroughly water it into the soil immediately, before applying the fertilizer to the next area. If there are two workmen, one may broadcast the fertilizer and the second wash it into the soil.

Since the small bulk of fertilizer which is used may cause difficulty in getting even distribution, it is a good plan to mix the fertilizer with a considerable bulk of screened topsoil, sand, or muck. Usually about a half-bushel of soil to 10 pounds of fertilizer is a convenient amount to broadcast on 1,000 square feet. If a fertilizer distributor is used, it is needless to mix soil with the fertilizer, but care must be exercised not to miss strips or to overlap with the machine.

Watering the Lawn

Water, which is absorbed by plant roots from the soil, is required in unbelievably large quantities for the growth of grass. It is necessary that the soil contain sufficient water to supply the grass with enough to meet its requirements or otherwise the grass will wilt and turn brown. Likewise, grass roots, as is true of those of other land plants, need a constant supply of free oxygen if they are to function properly. Therefore, the soil must contain in its inter-particle spaces a suitable proportion of air and water to be furnished the plant as needed.

If the grass develops a large root system, its capacity to get needed water will be large and drouth resistance great, but if the root system is restricted its ability to obtain water will be small. Two moisture conditions tend to limit the depth of root development and these should be eliminated. First, grass roots cannot penetrate and live in a water-logged soil. For that reason, subsoil drainage should be adequate to remove excess water to a depth of

approximately 2 feet or more, so that the grass roots may develop downward as far as possible. Over-watering on fine-textured or clayey soils likewise should be avoided. *Second, there is a tendency for many persons in watering lawns to move the sprinklers frequently so as to cover the entire area of lawn every evening or every morning.* This results in producing a shallow moist layer on the surface and, if continued, the grass roots tend to develop in this layer and a very shallow-rooted turf, which is easily injured by adverse weather condition or insects, is produced.

The lawn should be watered when moisture is needed with a sprinkler which applies the water only as fast as it can be readily absorbed by the soil. There should be no free water remaining on the surface. The size of the sprinkler, its coverage, and quantity of water delivered must be governed by the size of the area to be watered, the water supply, and the individual soil conditions on the lawn. It is usually best to use a sprinkler with as large diameter coverage as possible, and let it operate longer in each location than to use a smaller sprinkler. It is a good rule to allow the sprinkler to remain operating in a given location until the soil is moistened to a depth of approximately 6 to 8 inches. This may be determined by taking samples with a small hollow tube which has had one side removed to facilitate observations and removal of the core of soil. The tubular steel shaft of a broken golf club can be made into a very handy sampling tool for this purpose.

After the soil has been given a thorough soaking, the time elapsed before water needs to be applied again depends largely upon the kind of soil, weather conditions, and trees. On a normal open, sunny lawn with good soil conditions watering once a week will usually be sufficient, and under extremely dry weather conditions, twice a week would always be plenty. However, on sandy soils, which have a low water-retaining capacity, and under trees it may be necessary to water at least every second day if a greensward is to be maintained. The practice in every case, though, should be to soak the soil slowly and thoroughly to a depth of about 6 to 8 inches each time.

Mowing the Lawn

Lawn grasses, such as Kentucky bluegrass, Chewing's New Zealand Rough meadow grass, and Canadian bluegrass should be maintained at a height of 1½ to 2 inches in open sunny areas and Chewing's New Zealand Fescue and Rough meadow grass, grown in shade, at 2 to 2½ inches; that is, the cutter-bar on the lawnmower should be set so the grass is mowed at those heights. Do not buy a lawnmower which cannot be adjusted to cut at those heights. The grass should be cut before it has made a growth not to exceed one inch above the height at which it is maintained. Allow the clippings to fall back upon the lawn. They accumulate around the crowns of the plants, acting as a mulch, and upon decay return plant foods and add organic matter to the soil. Properly mowed turf will resist the invasion of weeds.

Spring Cleaning of the Lawn

Spring cleaning of the lawn should be started by raking with a steel garden rake to remove sticks, stones, leaves, and other debris which has accumulated during the winter. This should be followed by rolling with a fairly heavy roller to smooth the surface and firm the soil around the grass roots.

It is customary with many people to top-dress their lawns in the spring with barnyard manure, muck, peat, leafmold, or soil. The use of barnyard

manure is not recommended because it is one of the worst sources of weed seeds. Topdressing with peat, muck, or leafmold has a tendency, if used liberally, to produce an organic layer at the surface of the lawn which may become a source of trouble in the future if used continuously.

The use of clean screened loam surface soil as a topdressing in the spring is recommended because it aids in producing a smooth surface and its continued use year after year will add considerably to the depth of the surface soil.

Winter Protection for the Lawn

Lawn grasses should not be covered with branches, leaves, or straw for winter protection. These practices often result in severe injury by smothering the grass. This is especially true in the case of the shade-tolerant grasses under trees. It is a good practice to remove all leaves and rubbish from the lawn before it is covered with snow. Although it is advisable to allow the grass to make some extra growth to aid in withstanding the severity of winter, the general lawn should not be allowed to attain a height of more than 3 or 4 inches and a lawn composed of rough bluegrass *(Poa trivialis)*, not to exceed 2½ inches.

Reseeding to Thicken Turf

The best time to sow additional seed to thicken a thin sod is in late summer or early fall, August 15 to September 1 in the southern half of the Lower Peninsula and August 10 to August 25 in the northern part of the Lower Peninsula and in the Upper Peninsula. Rake the lawn vigorously with a steel garden rake to remove dead grass and scar the surface of the soil. This procedure will provide sufficient loose soil to cover the seed adequately. After sowing the seed, using about one-fourth the quantity recommended for a full seeding, sprinkle thoroughly to settle the soil around the seed.

Michigan State College of Agriculture and Applied Science and U. S. Dept. of Agriculture co-operating, R. J. Baldwin, Director Extension Division. Printed and distributed under act of Congress, May 8, 1914.

4-41: 20M