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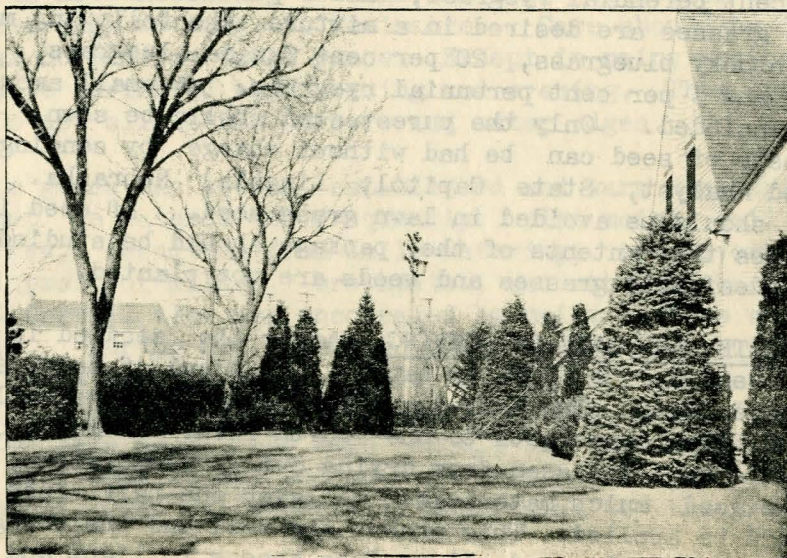
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METHODS OF LAWN IMPROVEMENT



PREPARATION OF THE GROUND FOR SEEDING. It is usually not necessary to plow or spade up the soil to any great depth, unless it has been packed by trampling. The surface inch or two should be fine and loose enough so that the seed may be covered easily, but the soil underneath should be firm and well packed.

If the land has been weedy, it is important to cultivate the soil for six weeks or more before seeding, so that the weed seeds may germinate and be killed. This is important for both spring and fall seeding. If spring seeding is planned, the ground should be cultivated during the fall. For fall seeding, tillage should begin about July 1. If available moisture is low, it may be advisable to water frequently to encourage weed seeds to germinate, so that the seedlings can be killed.

Prepared by M. D. Weldon, R. A. Olson, N. S. Hanson and J. E. Livingston, Departments of Agronomy and Plant Pathology and the Agricultural Extension Service.

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126

Unless the soil is quite fertile, manure should be applied and worked into the soil several weeks before seeding. Two or three tons of manure is enough for a lot 50 x 125 feet. Care should be taken to obtain manure that is free from noxious weed seeds such as bindweed and hoary cress.

WHAT TO SEED. Pure Kentucky bluegrass should be seeded alone, or two to three per cent of white clover may be seeded with the bluegrass satisfactorily. Where a simple mixture is desired, 93 per cent Kentucky bluegrass, 5 per cent perennial ryegrass, and 2 per cent white clover can be used. If more grasses are desired in a mixture, the following may be used: 65 per cent Kentucky bluegrass, 20 per cent Canada bluegrass, 10 per cent fancy redtop, and 5 per cent perennial ryegrass. A small amount of white clover may be included. Only the purest seed should be sown. Purity and germination tests of seed can be had without charge by sending samples to the State Seed Analyst, State Capitol, Lincoln, Nebraska. Timothy or orchard grass should be avoided in lawn grass seed. If seed is purchased in small packages the contents of the package should be studied with great care so that undesirable grasses and weeds are not planted.

METHOD, DEPTH, AND RATE OF SEEDING. After the seedbed is thoroughly prepared, the seed may be sown by hand. One pound of seed should cover about 1000 square feet. The seed should be raked into the soil so that it will be covered from one-eighth to one-fourth inch. A mulch of some kind may be applied to keep the seed from drying out. Clean straw, sawdust, or peat-moss make good mulch materials. A layer one-half inch or less in thickness should be applied. This shades the soil and the young seedlings, keeps them moist and cool, and allows free access to light and air. Peat-moss is less unsightly than straw or sawdust, and is fairly effective if it is applied uniformly and not too heavily. Where more than about one-fourth inch of peat-moss is applied, the result is frequently a spotted stand of grass. Manure of any kind is not recommended as a mulch, unless it is dried, screened, free from weed seeds, and used sparingly.

TIME OF SEEDING. Fall seeding is preferable to spring seeding because the competition of annual weeds is eliminated, and the grass gets a better start the next spring before hot weather begins. August 20 to September 10 is usually best, although seeding as late as October 1 is occasionally successful.

In the case of spring seeding, it is important to seed early. Seeding in March or early April will permit the bluegrass to become well established before the summer annual weeds such as crabgrass (water grass) and foxtail start to grow.

RESEEDING AN OLD LAWN. The dead trash should be raked off and the soil raked vigorously so that there is enough loose soil to cover the seed properly. If the ground is hard or full of weed seed, it may be necessary to spade it up to a depth of five or six inches. If this is the case, the rough surface should be watered and smoothed with a rake until the weed seeds have germinated and have been killed and the seedbed is firm and clean.

Previous spotted grass growth may have been due to buried brick, stones, concrete, or other foreign materials in the poor spots. The soil should be checked in such areas before reseeding. If materials of this nature are found, they should be removed, or the areas should be filled in so that there is at least two feet of good soil above the deposit.

WHEN AND HOW TO WATER. After the seed is planted, the soil should be kept continually moist until the new grass has made a growth of one or two inches. It is not necessary to soak the soil with each watering, but an occasional thorough wetting is desirable. Care should be taken to water slowly so that no erosion takes place. Except in rainy weather newly seeded lawns should be sprinkled both morning and evening. This operation is very important. Do not slight the corners and outer edges.

After the grass has become established and warm weather comes on, the lawn should not be watered too frequently. The moist soil and humid air around the grass, resulting from daily watering, are favorable conditions for the development of mildew, brownpatch, and other diseases of the grass. Crabgrass and foxtail also are encouraged by moist surface soil, especially in hot weather. During hot weather, heavy watering should be done in the evening at intervals of a week or two to keep the subsoil moist and the surface soil moderately dry. From early spring until June 15, and from September 1 to late fall, the lawn should be thoroughly watered. Two or three inches per week is not too much. This encourages the bluegrass to root more deeply, and is especially beneficial to the trees and shrubs.

MOWING THE LAWN. It is desirable to raise the cutter bar of the lawn mower to a height of at least two inches. If the grass is growing rapidly it should be cut frequently so that no more than one inch of grass is removed per cutting, but in hot, dry weather little or no cutting should be done, even though the grass should grow to a height of three or four inches. As soon as the weather cools and rains begin in the fall, the lawn can again be mowed and kept smooth and green during the fall and early spring. Following this suggestion will help in controlling crabgrass, dandelions, and other weeds. Crabgrass takes root at every joint. If the bluegrass covers the ground so thoroughly that the crabgrass stems cannot touch the soil, they cannot take root and spread so easily.

THE CLIPPINGS. Where the clippings are plentiful they should be removed by raking or with a grass catcher on the mower. If the clippings are short, this is not necessary, but too much trash or dead grass keeps the grass from making a dense sod. The fertility removed can be supplied more effectively in the form of commercial fertilizers or well-rotted manure.

FERTILIZERS. Suitable fertilizers aid in obtaining stands, promoting vigorous grass growth and controlling weeds. Well-rotted barnyard manure is effective for this purpose when applied at the rate of 100 to 200 pounds per square rod, but this material is not always desirable because it is likely to contain troublesome weed seeds. Suitable commercial fertilizers eliminate this risk. A light application of about one-fourth pound of ammonium nitrate (or other 'nitrate' nitrogen fertilizer) per square rod every week

during the period of frequent watering will aid in obtaining a good stand and rapid early growth. This is most readily accomplished by dissolving the fertilizer in water and sprinkling the solution over the area, following up with a light watering to carry the fertilizer into the soil.

On most Nebraska lawns nitrogen is the primary limiting factor as far as fertility is concerned. Little or no phosphorus and potassium are required, with the one exception that some phosphorus supplement may be needed in a few sections to obtain luxuriant clover growth. Where nitrogenous fertilizers are used, those containing 30 to 40 per cent nitrogen should be applied at the rate of about one pound per square rod; those containing 16 to 20 per cent nitrogen, 2 to 3 pounds per square rod; those containing 8 to 12 per cent nitrogen, 3 to 5 pounds per square rod; and those containing 4 to 8 per cent nitrogen, 5 to 8 pounds per square rod. This application should be made early in the spring as growth commences. An additional late fall application may prove beneficial. These suggested applications to established lawns should not be made when the grass is moist from dew or rain, as burning of the leaves may result. The lawn should be sprinkled lightly after fertilizer application to wash the fertilizer particles from the grass and into the soil.

A poor soil physical structure can retard grass growth as much as a low state of fertility. Where the soil has been packed by trampling or other means, it is desirable to spade up such areas in the fall, leave them rough over winter, and work organic materials such as well-rotted leaf mold and manure into the soil when preparing the ground for seeding in the spring.

CHLOROSIS. Iron deficiency, resulting in yellow chlorotic plants, has been noted on lawns of central and western Nebraska for several years. This condition exists primarily on the more alkaline soils of the valleys.

Chlorosis of this type (not to be confused with nitrogen deficiency) can be corrected by the application of 4 to 8 ounces of ferrous sulfate (copperas) per square rod. This treatment should be made preferably in the spring, and the lawn should be thoroughly watered after application.

Due to the small quantity of material involved, it is desirable to dissolve the ferrous sulfate in water and sprinkle the solution over the lawn in order to obtain uniform distribution. One and one-half pounds dissolved in a gallon of water is sufficient for an area of four square rods.

Iron sulfate solution produces a conspicuous yellowish-brown rusty stain on concrete and cloth which is very difficult to remove. Accordingly, care should be exercised when spraying to avoid sidewalks, curbstones, and clothing.

WEED CONTROL. Proper methods of weed control are extremely important in maintaining a neat, successfully growing lawn. Weeds as well as the lawn grass respond readily to fertilization and watering. Consequently the weeds must be removed by special means. The weeds found most commonly in lawns in Nebraska are as follows:

Perennials:

Dandelion
Plantain
Mouse-eared chickweed

Bindweed
Sheep sorrel
Nimblewill

Annuals or Winter Annuals:

Shepherd's purse
Annual peppergrass
Henbit
Common chickweed
Kochia
Yellow trefoil

Lady's sorrel
Downy brome grass
Crabgrass (water grass)
Barnyard grass (water grass)
Yellow and Green foxtail
Windmill grass

Of the weeds listed above, the dandelion in the spring and the crabgrass in the summer and fall are the most serious pests in most lawns.

Pulling and spudding scattered plants that are just getting established is the most effective means of eliminating any of these species. However, after heavy stands of weeds have become established, the pulling and spudding method is relatively ineffective unless followed with unusual persistence.

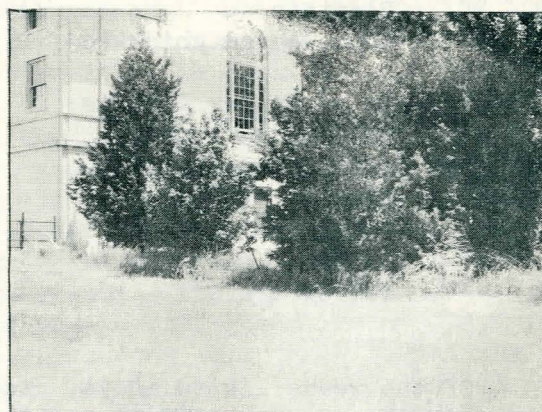
Since 1945 many experiments have been conducted with the chemical 2,4-D to determine its effectiveness for lawn weed control. In experiments in Nebraska and other states, the 2,4-D treatments have proven effective for the eradication of the perennial weeds including dandelion, plantain, mouse-eared chickweed, and the annual weeds including kochia, yellow trefoil, shepherd's purse, annual peppergrass, henbit, and common chickweed. Progressive control has been effected on the perennials, bindweed and sheep sorrel. The following weeds have proven resistant to 2,4-D, and can be neither eradicated nor controlled by the chemical under most conditions: Nimblewill, crabgrass, barnyard grass, the foxtails, windmill grass, downy brome grass, and lady's sorrel. All of these species except the last are weedy grasses.

HOW TO USE 2,4-D. The 2,4-D formulations which are being sold on the market come in liquid, powder, or tablet form to be mixed with water and applied as a spray. Some 2,4-D dusts are also available which are dusted on the weeds without mixing with water. The amine salts and esters which come in liquid form have given the most successful kills of lawn weeds most consistently. The powders have been satisfactory where 24 hours or more passed before the first rain.

An average size lawn may be treated with a knapsack sprayer. After filling the sprayer with clean water (usually 3 gallons) the 2,4-D chemical can be mixed according to directions on the 2,4-D label. In lieu of directions the chemical can be measured out with a teaspoon on the basis of $1\frac{1}{2}$ teaspoonfuls per gallon of water of a 40 per cent 2,4-D liquid or 2 teaspoonfuls per gallon of a 70 per cent 2,4-D powder. The chemical should be thoroughly mixed in the water before starting spraying.



(a) Lawn showing infestation before and at time of treatment with 2,4-D. April, 1946



(b) The same lawn as shown in (a) one year later. April, 1947

The 2,4-D solution may be sprayed over the entire lawn, weeds and grass alike, without injury to the grass. If the lawn contains white clover, the spray should be directed mainly at the weeds in order to prevent damage to the clover. If the clover is too thick, it may also be reduced in stand by spraying the entire lawn.

TIME TO SPRAY. Good kills of lawn weeds have resulted from treatment with 2,4-D at any time during the growing season. The best results have been from spring and fall treatments. The poorest results have been from treatments during hot and dry conditions in midsummer. Most rapid killing occurred during temperatures from 60° to 80° F. Slower but good kills have also resulted during higher and lower temperatures.

NOTE OF CAUTION. If the sprayer is to be used for spraying fungicides or insecticides on garden plants after 2,4-D, care should be exercised in giving it a thorough cleaning. This can be done by filling the sprayer with water and mixing eight teaspoonfuls of household ammonia per gallon and leaving the sprayer for several hours.

Crabgrass and other weedy grasses are often referred to as water grass since they begin growth about the time hot weather begins and lawns need to be watered. The control of these weeds can be accomplished by proper lawn management as follows:

1. Encourage active growth of grass by seeding, fertilization, and watering in early spring and late fall.
2. During active growth of grass in the spring the lawn should be clipped at regular intervals leaving the clippings to cover the ground between grass plants. When a heavy sod is established, the clippings can be removed.

3. During the hot and dry season the lawn should be left unclipped or at least 3 to 4 inches tall. In this way the soil temperature is kept low and the lawn grass is encouraged to compete effectively with the weedy grasses.
4. During the hot and dry season, heavy watering once per week is sufficient. This should be done in the late afternoon or evening. The water will thus be stored in the subsoil from which the lawn grass feeds. The surface soil will be kept relatively dry, thereby making conditions unfavorable for the weedy grasses.

Weed control can be accomplished most readily by good lawn management.

DISEASES. There are several diseases that occur regularly in lawns and golf greens. One of the best known diseases is referred to as brown patch. This name is probably used somewhat erroneously since true brown patch, caused by fungus Rhizoctania solani, is primarily a disease of bent grass and seldom causes serious damage to bluegrass. When it does attack bluegrass it is usually seen in early morning following a heavy dew as a white cobwebby growth on the leaves of the grass. As a result of this growth the leaves, and occasionally the plant, may be killed causing the appearance of a brown more or less circular area of dead grass. A more common killing of bluegrass is caused by the fungus Helminthosporium vagans. This organism attacks the roots and crowns of the plant causing them to die and turn brown.

The control of these diseases depends first on having a good soil for the growth of bluegrass and maintaining proper cultural conditions, as already discussed. In addition, some control may be obtained by the application of chemical fungicides. Corrosive sublimate (mercuric chloride) applied at the rate of 3 ounces per thousand square feet is effective. A mixture of equal parts of corrosive sublimate and calomel applied at the rate of 2 ounces per thousand square feet of turf is equally effective. These mixtures should not be applied when temperatures are high as they may cause some browning of the grass. Mild fungicides such as Tersan, Special Semesan, Pfizer Solution, Cal-O-Chlor, etc., give good control of brown patch caused by Rhizoctonia under all but the most severe conditions. All of these treatments are more effective when applied early in the development of the disease. It may be necessary to repeat the treatments several times throughout the summer since it is not possible to rid the soil completely of these disease-producing organisms.

Frequently, in wet weather, another disease appears in the form of patches of bluish-gray mold on the grass. When this mold is rubbed between the fingers, it is found to be made up of a brown powdery mass. This mold is not parasitic, but it makes the grass unsightly and it may become so abundant that it smothers the grass. The moldy mass may be removed by brushing or sweeping. Applying sulfur dust or any good fungicide will usually stop its development.

GRUBS. Lawns are often damaged, usually in local spots, by grubs in the soil. The damage is characterized by areas of dead turf within which the dead grass plants may be lifted from the soil with ease. The grubs may be eradicated by application of one pound of lead arsenate per 100 square feet. Due to the small rate of application, it is desirable to mix the poison well with sand or soil. Spread the mixture uniformly over the infested area just prior to seeding, and wash the arsenate into the soil immediately by liberal watering to prevent poisoning of animals or poultry. This treatment will make the soil grub-proof for approximately five years.

Good lawn management practices are effective in preventing grub infestation. Grubs rarely damage a thick stand of grass which is cut no shorter than two inches.

WORMS. There are several diseases that occur regularly in lawns and golf greens. One of the most common is the brown patch. This name is properly used because it is characterized by irregular brown patches caused by fungus *Rhizoctonia solani*. It is usually a disease of the turf grass and seldom causes serious damage to the grass. When it does attack bluegrass it is usually seen in early morning following a heavy dew or a white frost. The leaves of the grass are a result of this growth. The fungus and occasionally the plant may be killed causing the appearance of a brown more or less circular area of dead grass. A more common killing of bluegrass is caused by the fungus *Helminthosporium*. This fungus attacks the roots and crowns of the plant causing them to die and turn brown.

The control of these diseases depends first on having a good soil for the growth of the grass and maintaining proper cultural conditions. As the grass becomes more dense, more disease may be obtained by the application of a fungicide. For example, a fungicide (mancozeb) is effective. A rate of 3 ounces per 100 square feet is effective. A mixture of equal parts of corrosive sublimate and calcium applied at the rate of 3 ounces per 100 square feet is also effective. These mixtures should not be applied when temperatures are high and they may cause scorching of the grass. Mild fungicides such as Tolan, Spectol, Benlate, etc., are also effective and should be applied. All of these treatments are more effective when applied early in the development of the disease. It may be necessary to repeat the treatment several times throughout the season since it is not possible to get the soil completely free of these disease-producing organisms.

Frequently, in wet weather, another disease appears in the form of patches of bluish-gray mold on the grass. This mold is caused by the fungus *Helminthosporium*. It is found in the soil and it may become so abundant that it smother the grass. The mold may be removed by brushing or sweeping. Fungicides will usually stop the development of the mold.