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Lawn Management

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LAWN MANAGEMENT

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As every lawn presents an individual problem, this leaflet includes a series of lawn management facts based upon experiments, observations, and experience. The reader must select the facts as applied to his own problem and act accordingly.

Turf grasses are aggressive and grow in successful competition with other vegetation, if given an equal chance. Turf failures should never be charged against the grass, if the variety is a real turf grass. Man selects the environment, plants the seed he desires, feeds the grass as he wishes, and abuses it as the occasion demands.

Grass is a living plant—its health is directly dependent upon food and environmental conditions. While the limits of tolerance in most of the factors governing its health are wide, like the human being, it is affected physically and by disease when these factors are abnormal.

It must be understood that the use of "cure-alls" may obtain immediate relief, but their continued use may bring about disastrous results. Also, there are the factors of man's technique and equipment that must be considered when attempting to "improve the lawn."

Man alone is responsible for a large majority of turf failures, because he fails to work with nature.

Eight factors of nearly equal importance enter into the construction and maintenance of fine turf areas. They are: 1. *The foundation.* 2. *The sub soil.* 3. *The top soil.* 4. *Surface grade.* 5. *Seed selection.* 6. *Seeding.* 7. *Fertilizing.* 8. *Use and maintenance practices.*

THE FOUNDATION

THE foundation is that structure below the sub soil. Usually it has to be accepted as found, be it rock, hard pan, clay, sand, gravel, or the old dump. The greater its distance below the top soil, the less the influence on the grass. Drainage and stability are its important influences on the lawn's condition.

Gravel, coarse sand, and hard pan, if it is sloping, removes the surplus free water from the sub-soil.

Sand, depending upon the fineness of grains, tends to absorb the free water and after the downward flow has ceased, will return some of it to the sub-soil by capillarity.

Clay and level hard pan absorb the water very slowly causing the sub-soil to become water logged. This is particularly harmful if the sub-soil is not deep enough to hold all the water. Such a condition may occur in the spring of the year or following long rainy periods, heavy showers, and by overwatering. Much of the so called "winter kill" is caused by such a condition occurring in the late spring.

Rock either rapidly diverts the water to subterranean channels or collects and holds it in an impervious basin. The former means complete loss of water and the latter excessively wet soil, with standing water at times and drowned turf roots.

Soluble plant foods can be lost with the water and in the case of coarse gravel and certain rock foundations, even foods in suspension can be lost.

If possible, the foundation of a lawn should be uniform. Otherwise, there will be an unequal distribution of soil moisture and fertility, and uneven heaving and settling. The influence of this unequalness is present in the lawn throughout the year and becomes especially obvious when the rainfall is abnormal.

Tree stumps and carelessly dumped large rocks are not stable. These will cause depressions to occur in the lawn surface.

THE SUB SOIL

The sub-soil is that infertile earth between the top-soil and the foundation. It is the regulator of the water flow from the top-soil to the foundation, and as such is fully as important as the top-soil.

The ideal sub-soil should be of such physical condition that it will absorb quickly a large portion of the surplus water from the top soil and return much of it by capillarity. The depth should be sufficient to retain enough water to supply the grass plant during the normal dry periods between showers.

The depth of sub-soil must vary with the physical character of the foundation within the lawn area, and unless this variation is made or corrected, the lawn will be uneven in growth, especially during the summer months. Over gravel, 14 to 16 inches of sub-soil is necessary, while much less is necessary over fine pressed sand. Clay requires at least 8 inches of fine gravelly sub-soil or 16 inches of heavier type of sub-soil. Rock should have 16 to 18 inches of a light clay sub-soil or 6 inches of clay.

Building debris does not make good sub soil or foundation as it is not uniform in its physical characteristics, and will permit rapid flow of water in one area and retard it in another. Small planks, tin cans, and boards stop the upward rise of capillary water and often account for individual browned spots in a lawn. Hard coal ashes, 6 inches deep over a sand foundation, make an excellent sub-soil.

Unless the sub-soil is reasonably uniform in its water-holding capacity and compensates for inequalities in the foundation, there will be a variation in the color, health, and vegetation of the lawn as it ages and in periods of poor growing weather, even though the top soil is uniform.

TOP SOIL

TOP soil should be evaluated: (1) by its ability to absorb rain or sprinkled water, retain a reasonable amount, and pass the surplus through to the sub soil; (2) by its ability to retain plant food; (3) by its inability to become packed and tight, thus excluding air which is essential for healthy grass roots, and causing too great a surface run-off of water; (4) by the amount and type of organic matter; (5) by its freedom from infestation with weed seed. Ideal top soil is friable sandy loam, reasonably well supplied with plant food, has good water retention qualities, and at least 5% organic matter. Physical condition is more important than fertility.

The depth of the top soil need not be more than 4 or 5 inches if it is over a suitable sub soil. And it should be remembered when selecting top soil that, while a deficiency in plant food may be easily supplied by fertilizers, it is difficult to change the physical texture of the soil once the grass has started to grow. Although the heavy and darker top soils appear to be better for turf growing, they are very liable to become packed and form an impervious roof over the root zone. Clayey soils can be improved physically by the addition of sharp sand, peats, (especially American peats) or manures. Sandy soils are benefited by the addition of clayey soil, peats, manures, or other organic matter. It requires much more sand to show effective improvement to a clayey soil than it does clay or organic matter to improve a sandy soil. At least 2 inches of sand should be spread over a clayey soil before being mixed with the clay by thorough harrowing.

The value of a soil rests on thoroughness in mixing as much as it does by material used.

Dark top soils usually indicate the presence of organic matter which in turn indicates a greater soil bacterial activity. However, dark soil that makes a good stiff mud pie when sun or oven dried is not preferred to a light colored soil that makes only a fair pie. Soil that makes a sun-baked mud pie that breaks into a few pieces when struck a light quick blow is much less desirable than one that crumbles easily. Fertilizers to feed the grass can be supplied to soils of low fertility, and the resultant increase in the growth of grass will add to the organic matter and friability of the soil.

To repeat, the friability of the top soil is more important than the fertility. When regrading a lawn, never place top soil over existing turf without first thoroughly harrowing, spading or plowing under the sod.

Harrow or thoroughly loosen the surface of the sub soil before placing the top soil. Best results will be obtained if a 2 or 3 inch layer of top soil is spread over the loosened sub soil and the two mixed by harrowing, by the common garden soil pulverizer, or spading. The remainder of the soil is spread to the correct grade lines. Manures, stable or poultry, are always beneficial and if available, should be mixed into the top soil during this operation.

PREPARATION OF THE SEED BED

THE seed bed is the top two inches of the top soil. Its physical fitness is far more important than its fertility. Large areas should be disc harrowed at least in two directions at right angles to each other, rolled with a medium weight roller, and smooth-harrowed to pulverize the soil. On small areas, a graden pulverizer set to work to a depth of four and one half inches will usually suffice. Much benefit will be gained if the surface is rolled after pulverizing and the soil loosened by deep hand raking. Very small areas and sections located where a garden pulverizer is not available must be entirely hand worked. The loosened top soil should be rough raked with an iron rake to remove debris and large stones and to pulverize the soil, then carefully raked to finish grade.

Preparation of the seed bed calls for the following: 1. Any depressions occurring after the rolling should be filled with imported soil, and

not with soil raked from the rim of the depression. 2. Any humps that appear should be brought to grade by removing soil and not by rolling or tamping it to grade. 3. The surface $1\frac{1}{2}$ inches, preferably 2 inches, should be free from debris and stones that will be caught by the wood type of rake. It should also be finely pulverized.

Do all raking up the grade, especially on terraces. Raking down the slope pulls much of the top soil to the lower areas where it is not needed, leaving the upper areas thin soiled to dry out quickly and produce thin weedy turf. If peaty material is mixed into the soil on the shoulder of the terrace, or the depth of top soil increased, much maintenance trouble will be avoided.

If the top soil is known to be very acid, from 40 to 50 pounds of ground limestone should be mixed into each 1000 square feet of the soil by one of the harrowings or rakings. If the top soil is only medium acid, mix 30 pounds of superphosphate into each 1000 square feet and plan to apply lime to the surface within a year.

If the top soil contains a reasonable amount of organic matter as indicated by the brownness of color, and the average soil does, the use of nitrogenous fertilizers before seeding is not advised. Certainly not one having readily available nitrogen. A better root system will be formed without the pre-seeding nitrogenous fertilizer, and a well developed and well placed root system means better turf at a lowered cost of maintenance.

If top soil is purchased, insist that it be free from crab grass seed, or mix 15 pounds of calcium cyanamid into each cubic yard and let it remain in a pile for several weeks. If this is impractical, a satisfactory control of crab grass, spotted spurge and similar weeds can be obtained if the following suggestions are carefully followed: On the finish graded soil, apply 10 to 15 pounds of calcium cyanamid evenly over 1000 square feet. Rake into the top $1\frac{1}{2}$ inches, also evenly. Let the area remain fallow for 10 days. Loosen the top one inch, no deeper, by careful raking, and sow the seed. Technique of operation is the key factor. This use of cyanamid does furnish a high nitrogen pre-seeding fertilizer, but the assurance of a reduced crab grass liability may outweigh the value of a better root system. If the lawn area is prepared in the late spring and dust is not a factor, reasonable weed control can be obtained by the following: Let the weeds start, and every two weeks shallow cultivate and rake the surface. This will destroy the young weeds and exhaust the weed seeds. Do not deep cultivate as it may bring more weed seeds to the surface.

THE SURFACE GRADE

THE grading of a lawn is usually influenced by fixed grade points, such as the elevation of the house, the highway, neighbor's property and trees. A surface slope of at least 6 inches in 100 feet is a minimum safe grade. A network of taut string lines connecting all fixed points and checked with a string level will assure surface drainage and give a preview of the lawn surface. As loosened soil will settle, the grade of the new lawn should be $1\frac{1}{2}$ inches above the desired finish grade.

There should be one or more natural or artificial outlets for the surface water and all areas should drain toward these outlets. There should be no absolutely level surfaces or pockets. Poor surface drainage becomes

a chronic disability for the lawn. Before changing the grade about established trees, one should consult a recognized forester or landscape maintenance specialist.

SEED SELECTION

THE Massachusetts seed law requires each package of lawn grass seed to be marked with a label having certain valuable information. Know what you're buying.

The highest priced seed mixtures sold by reputable seed houses can be relied upon as being the best possible blending of varieties for general use and within the market price range. Low priced mixtures should be avoided. A saving of a few dollars for seed will inevitably lead to either an increasingly unsatisfactory lawn or an abnormally high maintenance cost for satisfaction.

Note the varieties of grasses listed:

Basic grasses are Kentucky bluegrass, Colonial Bent, Seaside bent, Chewing's fescue, and Creeping red fescue.

Nurse grasses are rye grasses in variety, and occasionally red top and timothy are used as a nurse.

Special purpose grasses are rough stalked meadow and occasionally Canada bluegrass.

Clover is not a grass and does not belong in a lawn seed mixture. However, if it is really desired, 5% of white clover seed is the maximum amount to use.

Note that the percentages of varieties listed are by weight, not by number of seeds. This is a bit misleading as the number of seeds in one pound of grass seed varies greatly with the variety. Using one pound of Kentucky bluegrass seed or 100 as a basis, the following is an approximate proportion: Colonial bent 300, red top and seaside bent 200, Chewing's fescue 20, rye grass 15.

Purity of seed is more important than its germination.

The date of purity test is important. Good seed, if properly stored, does not lose its vitality too fast, but if kept in a warm location its vitality decreases rapidly.

SUGGESTED SEED FORMULAS FOR HOME MIXING

Percentages in weight. Rate of seeding is pounds of mixture per 1000 square feet.

A. Average lawn conditions and soil.

Kentucky bluegrass	65%	Colonial bent	15%
Rye grass	20%	Rate: Max. 4 lbs. Min. 3 lbs.	

B. North shaded lawn. Good soil.

Kentucky bluegrass	50%	Rough stalked meadow	30%
Rye grass	20%	Rate: Max. 4½ lbs. Min. 4 lbs.	

C. Under trees

Chewing's fescue	70%	Rough stalked meadow	20%
Kentucky bluegrass	10%	Rate: Max. 6 lbs. Min. 4½ lbs.	

D. On sandy soils.

Chewing's fescue	80%	Colonial bent	10%
		Rate: Max. 6 lbs. Min. 4¼ lbs.	

Under the low and dense shade trees, particularly beech and Norway maple, it is better to plant a ground cover of myrtle, pachysandra or similar shade enduring plant.

Under high limbed pines, use equal parts of Chewing's and Sheep's fescue. This sod will be somewhat bumpy but will be dense and clean. Rate: Maximum 8 lbs. Minimum 6 lbs.

SEEDING

FALL, between late August and September 20, is by far the best time of year to seed a lawn. Other times follow in this order of preference: 2. October 20 to freeze up. 3. On wet snow in February or early March. 4. On the "honey combed" soil in late March. Fall is Nature's seeding time.

Spring seeding means waiting until the soil is dry enough to work. Then weed seeds and weeds have a big advantage over grass seed and the young grass plant. If the grading and shrub planting of the new lawn is finished in the spring, much will be gained by either sowing a temporary lawn (equal parts red top and timothy at 3 pounds per 1000 square feet) or a cover crop. Spring rye, soy bean or buck wheat, each at $2\frac{1}{2}$ pounds per 1000 square feet are good cover crops.

The temporary lawn or cover crop should be turned under or thoroughly harrowed into the soil before mid-August and a permanent lawn sown about September 1.

Sow lawn grass seed broadcast by hand or with a mechanical distributor. If sown by hand, an even distribution will be obtained by dividing the seed into four equal parts by bulk. Sow one part north and south, one east and west, and one on each of the two diagonals.

With a mechanical distributor it is best to divide the seed into two parts and sow each part at right angles to the other. After sowing, the seed should be lightly covered by brushing with a brush drag, made of twigs, or carefully raked in with a wooden lawn rake. Care should be taken not to cover the seed more than $\frac{1}{4}$ of an inch. Do not try to grade the area while raking in the seed. It makes the seed very unevenly distributed and the presence of 15% of the seeds on the surface after raking or brushing should cause no worry.

Areas under trees should be seeded only in the fall.

After raking the seed in, roll the area with a light-weight roller. A water ballast roller without water or a wooden roller is advised, but roll it whatever the weight of the roller. The soil should be dry, otherwise the roller will pick up the seed and soft soil. Leaves must be kept raked from the seeded area. All newly seeded areas should be protected from drying winds during the winter and if on a southern exposure, open shade is desirable to prevent too early starting of the grass. One sharp freezing of young grass plants is very harmful and two or three in quick succession is usually fatal.

Newly seeded areas should be kept moist by sprinkling, but avoid overwatering and puddling, especially if the soil is "heavy." Many new seedings have been spoiled by permitting the soil to dry out after the grass seeds have started to "swell" or because of a caked condition of the

soil. The time between sprinklings and the amount of water applied should be increased as the plants grow.

Young grass plants should be clipped only with a sharp mower or scythe. Make the first clipping when the grass is $\frac{1}{2}$ inch short of "lopping over" and clip not more than 1 inch of the blade, preferably less. The clippings can be left on the areas as they are beneficial.

It is strongly advised that the lawn area be fully prepared for seed in the fall regardless of the time the job is finished. If it is impossible to sow the seed before the ground freezes, seed on the snow or honey combed soil.

TURF FERTILIZER FACTS

OF the basic grasses, Kentucky blue is the least tolerant to acid soil conditions, Chewing's fescue next, and Colonial bent the most tolerant.

Kentucky blue requires the greatest quantity of food, Colonial bent a medium amount and Chewing's fescue the least.

The continued use of either acid or alkaline reacting fertilizers is inadvisable. The best growth by all grasses will be obtained if the soil is kept only moderately acid at a pH of 6.0 to 6.5.

Nurse grasses should not be considered in the fertilizer program.

Neutral fertilizers have no effect upon the acidity or alkalinity of the soil.

Grass plants must have a complete fertilizer, that is, one having nitrogen, phosphorus, and potash, the more important elements frequently deficient in soil.

Nitrogen stimulates leaf growth. The grass plant being periodically clipped must be continuously producing new leaf. It is the most used element.

Phosphorus in abundance encourages clover, but is particularly necessary for the development of the grass roots.

Potash is usually well supplied in the soil, and is important in developing the stem, maturing the plant, and aids in resistance to diseases.

Grass leaves contain the food taken from the soil and will return a large portion in the correct ratio if not removed from the lawn after being clipped.

Fertilizer formulas are written as a series of three figures. The first figure states the percentage of nitrogen guaranteed, the second figure the percentage of phosphorus, and the third the percentage of potash. A descending ratio is desired except for run-down lawns. Then a 5-8-7 or similar ratio garden fertilizer should be used for the first two applications. Rate: 10 to 12 pounds per 1000 square feet.

All fertilizers sold in Massachusetts must be labeled as to their guaranteed nitrogen, phosphorus, and potash. Example, "Rush 'Em up Green" brand 10-6-4, interpreted means that this brand guarantees in each 100 pounds of fertilizer, 10 pounds of nitrogen, 6 pounds of phosphoric acid, and 4 pounds of potash. Such a brand would be considered as high grade.

The different forms of nitrogen commonly found in fertilizer should be understood.

Ammonia and nitrate nitrogen are readily soluble in water and are quickly available to the plant. They are stimulants, caustic, have a short period of effectiveness, and can be easily leached from the soil. Ammonia and urea tend to make the soil acid. Stimulants are for prompt effect and depend only upon soil moisture for their availability. All inorganic fertilizers should be washed into the soil by rain or immediate sprinkling if applied heavier than 3 pounds per 1000 square feet.

Organic nitrogen is the form of nitrogen found in vegetable or animal matter. It is slowly available, non-caustic, and has a long period of effectiveness. It does not appreciably change the soil acidity and is particularly desirable for light and gravelly soils. Organic fertilizers must decay before their fertility becomes available. They are, therefore, dependent upon a reasonably warm temperature in the soil and moisture.

Mixed lawn fertilizers should contain a large proportion of organic nitrogen, 50% or more.

No more than one pound of nitrogen to 1000 square feet of turf should be applied at one time. Thus, a 10-6-4 mixture should not be applied heavier than 10 pounds to 1000 square feet, and 8-6-2 at 12½ pounds etc.

Bean meals and manures can be considered as complete and well balanced fertilizers having all the nitrogen in organic form. They can be safely applied at 16 to 20 pounds to 1000 square feet. Dried and pulverized poultry manure can be used at the rate of 20 to 30 pounds.

Fertilizers applied in the spring will help the grass to crowd out summer weeds. Fertilizers applied in the summer cause abnormal growth and strain upon the plants. Fall fertilizer, (September 1-10) prepares the turf for the winter and results in an early and aggressive growth in the spring.

An ideal fertilizer program calls for three applications: one about April 15 to 20, a second May 15 to 20, and a third September 5 to 10. If only one can be given, there is a slight preference for the September dates.

The May application should be omitted if the lawn is known to be infested with crab grass.

On new lawns seeded before September 1, apply fertilizer at half rate about October 10-15; otherwise wait until spring. Areas affected by tree roots should be fertilized in the early fall only.

Raw poultry manure in which 10-15 pounds of superphosphate has been mixed into each cubic yard makes an excellent turf fertilizer that can be applied in the very late fall and pulverized by the first mowing in spring.

Since 1942, the supply of lawn fertilizers has been limited to castor bean pomace, milorganite, dried poultry manure and commercial brands. The better lawn fertilizers have a descending plant food ratio. A very satisfactory substitute for the truly good lawn fertilizers is the tobacco 6-3-6 grade.

LIME

Lime is not a fertilizer, but a correction for acidity. It also improves the physical condition of clayey soils and aids in creating a favorable medium for the necessary soil bacteria action.

On soils not alkaline or on which acid reacting fertilizers are used, ground limestone should be applied at the rate of 40 pounds to 1000 square feet every second season. The late fall is the best time to apply lime. Do not apply any fertilizers within 10 days of the lime application.

CLIPPING

A thick well-fed lawn may be clipped closer and more often than one that is thin and underfed. The frequency with which a lawn is mowed should be governed by the length of the grass and the prospective weather rather than by the day of the week.

Lawn turf should be mowed often enough to prevent mats of cut grass showing 36 hours after cutting. If they appear, these mats should be brushed into the lawn area or gathered and thrown away. All other clippings should remain on the turf. The mulch and fertilizer value of clippings has been demonstrated many times.

Set the mower to clip not lower than $1\frac{1}{4}$ inches, preferably $1\frac{1}{2}$ inches and clip when the grass is not more than $2\frac{1}{4}$ to $2\frac{1}{2}$ inches tall. Such a standard height of cut can be constant for the growing season.

If the lawn is not fall fertilized, raise the height of cut $\frac{1}{2}$ inch from September 1.

On established lawns, the first mowing in the spring should be at the minimum height desired for the season. Do not delay the first mowing until the grass is 4 to 5 inches tall.

Newly seeded lawns should be permitted to grow to the lopping over height and the first clipping should be with a *sharp* mower. set $\frac{1}{2}$ inch higher than the desired minimum.

Under trees and in shaded areas, skip every other clipping of the lawn.

It is much better for the grass to clip it very early in the morning than in the late afternoon and early evening. Especially if it is not fertilized or the clippings removed.

Avoid re-clipping areas.

WATERING

FIFTEEN to 30 minute sprinklings with the hose are harmful to a lawn as is a light rain. A thorough soaking once in 6 or 8 days is more beneficial and more economical. Short sprinklings draw the grass roots near the surface where they are very susceptible to wear, drought, freezing, sun and wind drying. Apply water slowly at first and, if possible, no faster than the soil will absorb it. Grass is not injured by watering while the sun is shining.

Bent lawns should not be watered in the late afternoon or early evening if the day has been hot.

Early morning is the best time to water the lawn. Over watering will do much more harm than under watering or no watering at all.

SPRING AND FALL CULTURE

COMBING the lawn in the spring with a rounded wire rake, or wooden lawn rake is desirable, but using a wire or rattan broom should be avoided. If the lawn area is rough, the raking should be postponed until after rolling. Spring rolling is very important as it will press the

grass crowns, that have been lifted by frost action, back into the soil. This rolling should be done when the soil is friable but not wet. Much injury will be done if the ground is wet when rolled. Use as light weight a roller as possible to accomplish the smoothing. No rolling is preferred to very heavy rolling, and unless the soil is very sandy, roll only once. Burning a lawn is harmful to the turf.

Turf growing under trees should be kept free from leaves during the fall, winter, and spring in order to permit sunlight and rain to work upon the grass and soil.

The lawn should be cleaned of debris by raking each fall. If the season is late, mowing should continue into October. In Massachusetts the week of September 25 is the usual time for the last mowing. Lawns need no winter protection from cold, and will very likely be severely injured if covered with hay, straw, or similar material.

Lawns are frequently injured from exposure to drying winds during the winter. A snow fence or light covering with brush will hold the snow and prevent such injury.

The white circular patches that appear on the lawn in the spring are caused by the snow mold fungus. Brush these spots with a stiff broom to destroy the fungi and cause the grass to stand erect and permit air and sunlight to the soil and grass crowns. Snow mold seldom kills the grass, but if not brushed, it seriously weakens it for later growth.

If there are low spots in the lawn that cannot be graded out, punch one or more two inch holes in the low part late each fall. The holes should be at least 4 feet deep, if gravel is not reached, and they should remain open during the winter and spring.

Any turf area having 40% or more basic grasses should be given an opportunity to be improved by fertilization and correct cultural treatment. Too many lawns that could easily be restored by feeding have been dug up, reseeded (in the spring) without correcting fundamental faults, and treated as carelessly as before.

The lawn should be cleared of debris by raking each fall. If the season is late, mowing should continue in October as the grass should not be lopping over as it enters the winter.

It is wasteful to sow grass seed on a fairly well established lawn. Fertilize instead. Bare areas should be deeply raked and seeded. Thin areas loosened by deep forking (not turning over) and seeded.

All frequently walked on parts of the lawn should be deep forked early each spring. Insert a spade fork to full depth of the tine, and pry down on the handle to crack and loosen the soil.

ANIMAL AND INSECT PESTS

Ants—Where the infestation is by small colonies scattered thickly over the lawn, chlordane 50% wettable powder, 4 ounces in 100 gallons of water sprayed over 1000 square feet is suggested. For spot treatment, $\frac{1}{8}$ teaspoonful of the powder placed in each ant hill and then thoroughly watered in will effect a kill. A second application in three weeks may be necessary.

If large colonies or "ant hills" appear, punch small holes, varying in depth from 6 inches to the bottom of the colony throughout the infested area and well around the edges. These holes should be from 6 to 9 inches

apart. Into each hole pour about 2 tablespoonfuls of carbon bisulphide and immediately seal the hole with moist earth.

Caution—Do not have fire or smoke a pipe, cigar, or cigarette near carbon bisulphide and do not spill it upon the grass or any vegetation.

Chinch bug—This is a very small winged insect that doesn't fly but crawls on the soil and in the grass crowns. The color varies from yellow to red, to black with whitish wings. To see the pest, one must get down on the knees and pry into the grass. The Chinch bug destroys the grass by sucking the juices, and the injury first appears as dulled greening of the grass followed by browning. It is often mistaken for drouth. There is no regular shape to the injured area and thousands of the insects will be found at the edge, especially in the green zone. Control with chlordane, 5 lbs. of 5% dust applied with a duster or mixed with sand or a suitable carrier and spread over 1000 square feet. Sabadilla dust, 10% at 2½ pounds per 1000 square feet, is also very effective. D.D.T. at ½ pound of actual D.D.T. per 1000 square feet will effect considerable control.

Grubs—Larvae of the Japanese beetle, June bug and Asiatic beetle destroy turf by eating the grass roots just below the surface of the soil. Injury appears as a well defined irregular shaped outline of injured turf that increases in size daily, or as numerous irregular browned patches.

Small deep holes dug by skunks and turf torn by crows and black-birds is the first warning that grubs are present in the lawn. Later the turf can be lifted in pelt like masses and the grubs exposed to view. The same control treatment is used for all species of grubs in the lawn. Rates given are for 1000 square feet.

Arsenate of lead—10 pounds. For immediate effect, apply with 50 gallons of water and force the solution into the soil. For protection apply and let the rain wash it in. Effective period of control 4 to 5 years.

DDT—6 pounds of 10% dust or 12 pounds of 5% dust or 1¼ pounds of 50% wettable powder in 25 gallons of water. Wash in for immediate effect. Protective period, 4 to 5 years.

There have been numerous reports of birds being killed from eating grubs having D.D.T. However, conclusive evidence is not available.

Chlordane—5 pounds of 5% dust or ¾ pound of 50% wettable powder in 40-50 gallons of water. Wash or force into soil. This material will effect the quickest control, but its period of effectiveness has not been definitely determined.

Angleworms—Unless the lawn soil is very clayey and is being used as a play ground, it is not advisable to remove the worms. At present, bi-chloride of mercury, a deadly poison, is the easiest to obtain. Three ounces in 50 gallons of water will bring the worms to the surface immediately. Before buying bi-chloride of mercury, inquire if any of the pre-war wormicides are again on the market—these should be used according to directions.

Moles—Moles do not eat grass roots, but are very annoying. Trapping is successful if the trigger does not press too hard on the runway. Cyanogas and commercial poisons are also successful if correctly used. Attach a hose to the exhaust pipe of an automobile, insert the free end in the center of the mole burrow, and let the automobile run for 20 minutes. Be sure there is a free passage for the gas each side of the insertion.

WEED PESTS

A well built lawn, fall seeded with the correct varieties of grass for the location, well fed, and given reasonably good cultural care, will not become weedy. An established lawn that is practically weed free will continue so if cultural practices are kept within the grasses limits of tolerance. Thick grass is the best known weedicide.

Many weed infested lawns can be made practically weed free by the practice of sound cultural methods.

Weeds in turf may be attributed to one or more of the following factors: Spring seeding, particularly late spring; original soil infested with weed seed, weed seed being blown or washed from adjacent areas (crab grass in particular), lawn grass seed used not containing a sufficient amount of basic grass; incorrect or no fertilizer; the dropping of mature seeds from weeds already in the lawn.

Before using chemical controls against the weeds, try to visualize what the lawn will look like with all the bare spots, determine why the weeds entered the lawn, and promise yourself not to repeat the errors and that you will correct the basic cause. Otherwise you will be disappointed.

Weedicides should be preceded and followed with fertilizer. The grass must be in a healthy state to withstand the shock of the chemicals, bents in particular.

All of the common lawn weeds that have broad flat leaves can be eliminated with the 2,4-D weed killers. There are too many preparations on the market to give exact rates of application. Follow directions carefully.

Drifting spray, even mist from the spray nozzles, will kill or severely injure garden vegetation and shrubbery. Care must be taken and if a wind is blowing, shields placed to protect desired vegetation. Any spray apparatus in which 2,4-D has been used should be washed many times with strong soapsuds before being used to spray for any other purpose.

Moss and Sorrel usually indicate an over acid soil. Two or three applications of ground limestone at 40 pounds per 1000 square feet supplemented by a fertilizer will stimulate the grass to crowd out the moss and sorrel.

Clover—Liberal fertilizing with sulphate of ammonia or high nitrogen supplying organic fertilizers will keep clover well under control. Ground limestone at 40 pounds per 1000 square feet should be applied every second year.

Witch or Quack Grass—On a newly made lawn, rake out that which can be easily obtained, but do not spend the effort to remove "every spear." Don't worry much about it in an established lawn—close and frequent clipping plus fertilizer will suppress it.

Crab Grass—Fertilize the lawn only in very early spring and after September 1. Note possible sources of seed and eliminate them. Seed is often carried in the spring surface drainage water. As soon as the blossom heads appear in late July, rake the lawn before clipping to cause the grass to stand erect and set the mower to cut very low. At the same time, keep the lawn well fed with frequent light applications of fertilizer. The commercial preparations for killing crab grass are successful if directions are followed very carefully and the technique of application good.

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