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## July 1965

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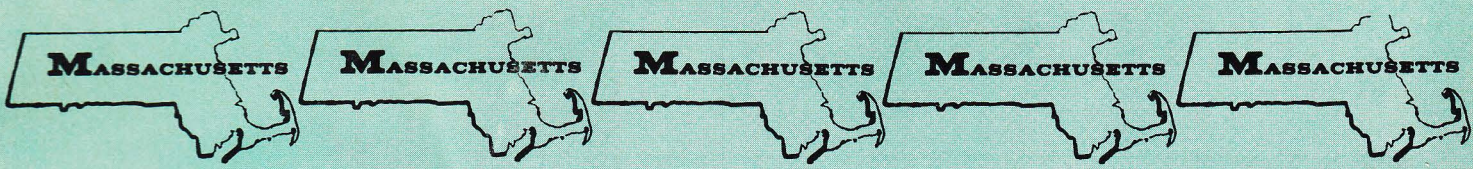
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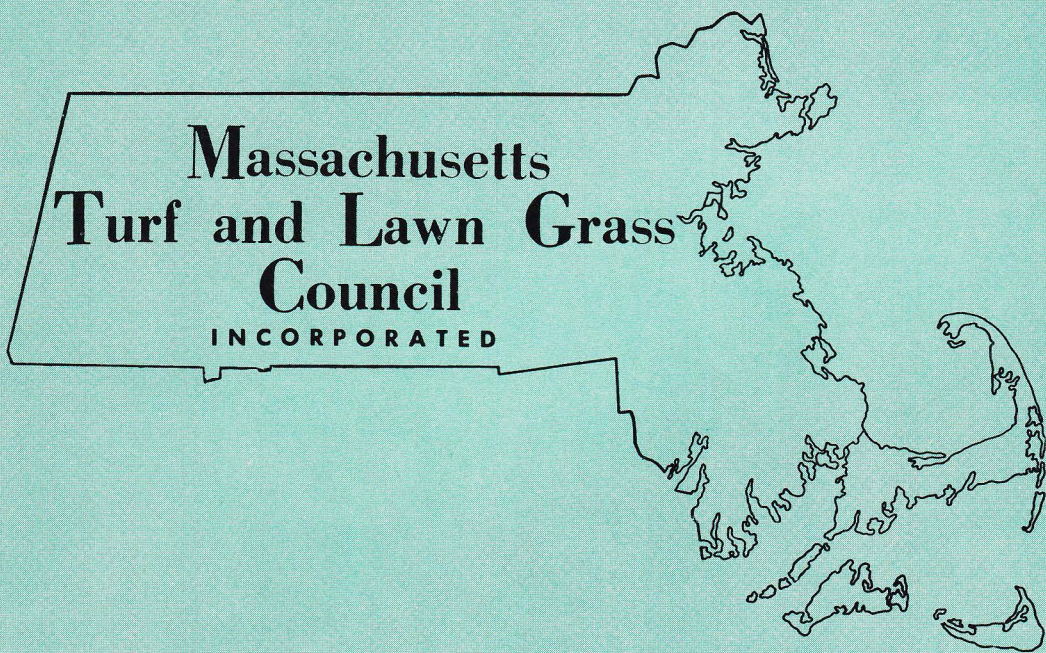
George R. Smith, Robert W. Schery, Malcolm McKenzie, E. H. Wheeler, Henry W. Land Sr., Roy Goss, and C. W. Lobenstein



July 1965



# Turf Bulletin



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## TURF BULLETIN

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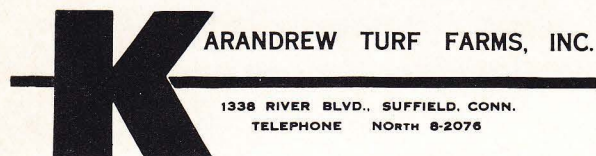
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# Turf Management In The Maritimes

by

GEORGE R. SMITH

## *Drainage — Soil Texture*

Soil drainage is of first importance in the development of a sound turf management program. Since soil texture is related so intimately with soil drainage, it is important that we understand what is really meant by the term 'soil texture'. Soil texture is determined after all the stones and gravel are removed. The remaining soil contains particles which are referred to as sand, silt, and clay. The coarse sand particles range in size from 1/25th to 1/30th of an inch in diameter. The medium sand particles range in diameter from 1/50th to 1/100th of an inch. The fine sand particles range from 1/100th to 1/250th of an inch in diameter. The very fine sand particles range from 1/250th to 1/500th of an inch in diameter. The silt particles range from 1/500th to 1/5,000th of an inch in diameter, and the clay particles have a diameter of less than 1/5,000th of an inch.

Sandy soils contain an average of seventy-five per cent or more of the various types of sands with less than twenty per cent clay. The loam soils contain approximately fifty per cent sand and fifty per cent silt and clay, with the clay content less than thirty per cent of the silt-clay total. Soils are classed as clay loams when they contain twenty to thirty per cent of clay particles and as clay when the clay content is thirty per cent or more. Grass such as Kentucky Blue, Fescues, Brown Top, and the Bents will grow on a wide range of texture, but sandy loams or loams are to be preferred for fairways.

In the construction of greens it seems exceedingly important that the textures be in the sandy loam class. I have observed during the past number of years that many of the greens which were constructed several years ago were built with soils which contained too large a quantity of silt and clay and the grasses growing on them suffer because of inadequate drainage and because of lack of aeration due to serious compaction. If you are involved in the reconstruction of an old green, be sure you have the materials analyzed to determine the exact texture. If the material is too heavy, you can then add the proper amounts of light sandy material to bring the texture to the desired level. The same principle holds true if you are designing an entirely new green structure. Be sure to check the texture of the soil which is on the site and then carry out thorough mixing after you have determined what quantity of light material must be incorporated with the soil from your property.

## *Precipitation*

The mean average precipitation in the Maritime Provinces amounts to 41.2 inches per annum. In certain areas we have annual precipitation of 48 inches per annum and in some areas and in certain seasons the precipitation is considerably less than 40 inches. The soils which occur in the Maritimes are highly leached and are generally very sour and are relatively low in plant food. This statement

holds true whether the soils are light sandy soils or heavy clay loams. We must, therefore, apply adequate amounts of lime for the growth of natural grass species and also apply well-balanced fertility to arrive at the best results.

## *Organic Matter Content*

When you are constructing a new green, you should also determine the organic matter content with a view to incorporating some material like peat with the soil. Peat materials have the ability to hold large quantities of moisture and valuable material is built up in the soil when peat decomposes. Here again the question of thorough mixing cannot be overemphasized.

Active organic matter builds up quite rapidly in well-drained soils providing proper amounts of limestone and plant food are used. Most of the grasses grow best when the pH is in the vicinity of 6, and contrary to what some people think, this holds true for the Bent grasses as well as grasses such as Kentucky Blue, Brown Top, and the Fescues. Active organic matter is built up in our well managed fairways by the decomposition of the grasses which fall behind the mowers and this build-up is probably not quite as rapid on the average green because of the fact that most of the grass is removed after clipping. The incorporation of adequate amounts of peat in new greens construction is therefore exceedingly important.

## *Plant Nutrients*

In the course of preparation of this paper I referred to a number of analyses which were received from the majority of our golf courses in the year 1954, and comparing these results with the results in 1963, I found that a tremendous improvement has occurred. The results in 1954 showed that there was still a very large area in a number of golf courses in Nova Scotia where the pH was running in the vicinity of 5. The nitrogen levels ranged from low on some courses to reasonably high on others. The available phosphoric acid was generally quite high in all the samples received in 1954, but in the case of potash the results were practically all very low in 1954.

The results in 1963 showed that approximately ninety-eight per cent of the soils analyzed from golf clubs had a pH in the vicinity of 6. There was still quite a variation in the available nitrogen content, but this is to be expected because the nitrogen levels vary from day to day depending upon climatic and soil conditions. In 1963 the available phosphoric acid was reasonably high in all the samples tested and in the case of available potash approximately seventy-five per cent of the soils were showing a reasonable high level of this important material. Great credit is due the golf course superintendents and to the members of the golf club executives for this great improvement.

May I now review a few of the things that we all pretty well agree on in so far as Turf Management is concerned.

(Continued on Next Page)



## MARITIMES (Continued)

*Liming Fairways and Tees*

Approximately five hundred pounds of lime is required per acre per annum to account for cropping and leaching losses. This means that we should be applying one ton of ground limestone per acre to our fairways and greens every two years. I know that the majority of our superintendents are making an earnest attempt to follow this practice, but I also know of one or two clubs where no lime has been applied during the past three years.

*Liming Greens*

I believe the pH of a green should be maintained at a level of approximately 6. In a few cases where you have not applied lime for three years, why don't you plan to check these soils to determine their present pH level?

*Plant Food*

I still hold to the idea that our fairways and tees should be given an annual application of a well-balanced fertilizer such as 6-12-12 or 10-10-10 at the rate of five hundred pounds per acre. The average nine-hole course will require approximately \$550. in the budget to pay for this fertilizer.

*Fertilizing Greens*

I have revised my ideas slightly concerning the fertilization of greens in this area and would suggest a program as follows:

April — Apply a 6-12-12 or 10-10-10 fertilizer at the rate of twenty pounds for each one thousand square feet of soil.

May — Apply a 6-12-12 or 10-10-10 fertilizer at the rate of fifteen to twenty pounds for each one thousand square feet of soil.

June — Apply a 12-6-6 or a 10-6-4 organic base fertilizer at the rate of eight to ten pounds for each one thousand square feet of soil.

July — Apply a high nitrogenous fertilizer. In some years this can be 12-6-6 or a 10-6-4, but in other years a straight nitrogenous fertilizer should be used at the rate of two to four pounds for each one thousand square feet of soil.

August — Apply a 12-6-6 or 10-6-4 at the rate of eight pounds for each one thousand square feet of soil.

September — Apply a 0-20-20 fertilizer at the rate of fifteen pounds for each one thousand square feet of soil.

*Compost Top Dressing*

"Based on comparatively recent experiments, it is now possible to produce a 100 per cent weed-free compost.

For the past twenty-five years, workers at the Rhode Island Experimental Station have carried on research work with steam, electricity, various chemicals, and nitrogenous fertilizers for soil sterilization in order to determine their efficiency and economy in destroying weed seeds in soil and in compost.

In the past, some workers in the field believed that high temperatures were necessary to kill weed seeds; however, experiments have shown that seeds were satisfactorily

destroyed by certain organic and inorganic nitrogenous fertilizers which do not generate high temperatures. For example, little or no increase in temperature resulted from the use of such inorganic nitrogenous fertilizers as granular calcium cyanamide, or with a mixture of ammonium sulfate and limestone.

A practical method of preparing sterilized compost based on previous experiments, and used for the past ten years at the Rhode Island Agricultural Experiment Station, has been to mix thoroughly 13 pounds of granular calcium cyanamide, hereafter referred to as Cyanamid, containing 20 per cent nitrogen and the equivalent of 70 per cent hydrated lime, with each cubic yard of compost that has been screened through ¼-inch mesh. Rates below 13 pounds did not give complete control of weed seeds, while rates above cause burning of putting-green turf when the treated compost was applied as a top-dressing.

Good compost-pile management has been considered a basic requirement for good compost top-dressing and calls for construction of piles a few years prior to their use; however, raw compost can be sterilized with comparable results. One typical method of compost pile construction which has been used by the Rhode Island Agricultural Experiment Station is to prepare the pile in layers as follows: two parts loamy topsoil; one part clean, coarse, sharp sand; one part decomposed organic matter composed of either grass clippings or market garden refuse, or both.

When the pile is completed the top is dished-in to allow rain and melting snow to penetrate the surface to help hasten further decomposition of the organic matter.

After the pile is thoroughly weathered and decomposed it is screened through a rotary drum-type compost mixer made of ¼-inch mesh galvanized wire screen to break up clods, and to remove any undesirable materials such as stones and undecayed vegetative materials. Then, each cubic yard of screened material is thoroughly mixed with 13 pounds of Cyanamid in the same manner as cement is mixed by hand.

Another method is to put a layer of screened compost into a dump cart box of one cubic yard capacity. Then, sprinkle each layer with a proportionate amount of Cyanamid. If six layers of material are used, sprinkle a little more than two pounds of Cyanamid on each layer; likewise, if three layers are used, apply a little more than four pounds of Cyanamid to each layer, but not in excess of 13 pounds per cubic yard. Following this procedure the contents are again screened to thoroughly mix the Cyanamid and compost. A Royer or other commercial type compost mixer will also do an acceptable job of mixing.

Following the process of screening and mixing, the compost is placed in a wooden bin or other type shelter, where the sterilization process begins. This holding period should be initiated well in advance of cold weather so that a sufficient amount of heat is retained within the compost mixture to activate the breakdown of the Cyanamid.

Ordinarily, it takes four to six weeks for the Cyanamid to kill all weed seeds. Generally no water is added to the compost-Cyanamid mixture unless it is extremely dry. Ordinarily, a moisture content of 12 to 20 per cent within

(Continued on Page 8)



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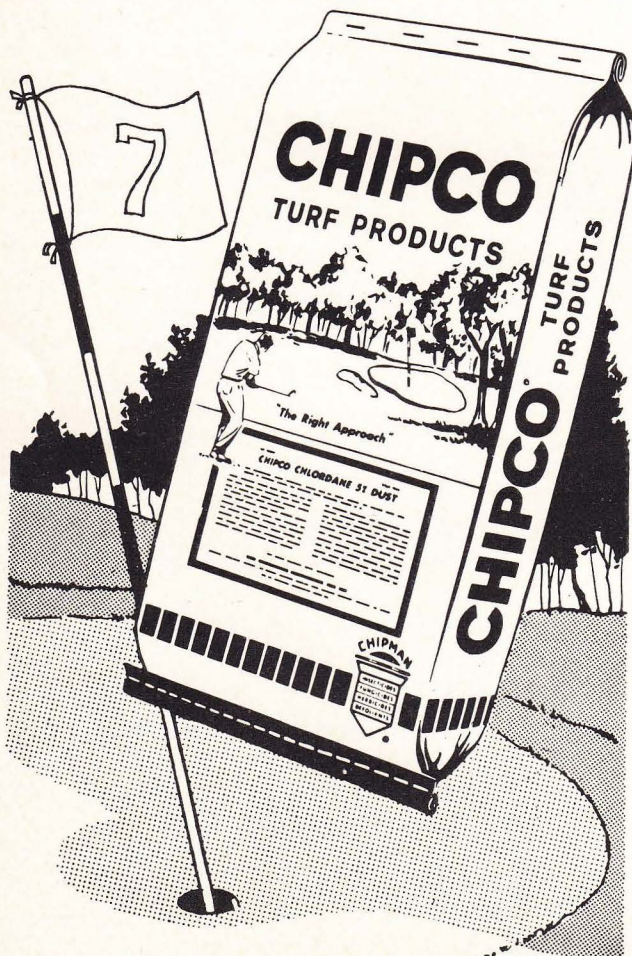
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## FOUND: The Light Switch for Plant Growth

*ARS Scientists Isolate, Identify Pigment That Triggers Growth Processes*

■ The “light switch” on phytochrome, the protein molecule that regulates many plant-growth processes, has been isolated and identified by ARS scientists at Beltsville, Md.

Beltsville scientists have been leaders in investigations of phytochrome, which they discovered—and named in 1959.

Their early studies showed that phytochrome, acting in response to light, governs flowering, stem elongation, germination, pigmentation, and many other growth processes (AGR. RES., May–June 1953, p. 3; July 1953, p. 14; June 1954, p. 8; July 1955, p. 12; May 1956, p. 16; December 1956, p. 10; July 1959, p. 14; November 1959, p. 3; April 1960, p. 15; July 1961, p. 10; and September 1964, p. 8).

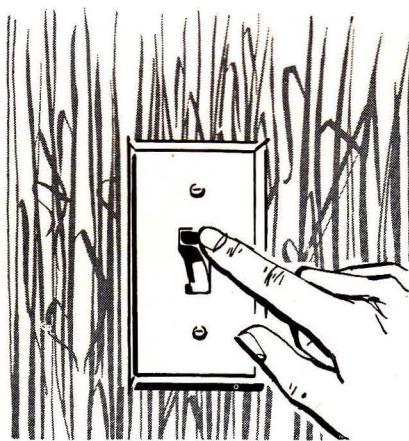
Phytochrome exists in two forms—one active, the other inactive—and both are reversible by exposure to two kinds of light. When phytochrome is inactive, exposure to red light converts it to the active form; when it is active, exposure to far-red light converts it to the inactive form.

The switch that activates or inactivates phytochrome is chromophore, a light-absorbing (photoreceptive) bile pigment that constitutes an important 1 percent of the phytochrome molecule. It is this chromophore that has been isolated and identified by H. W. Siegelman and S. B. Hendricks.

Hendricks predicted more than a decade ago that the chromophore is a bile pigment, so the recent verifica-

tion came as no surprise. Proof of the pigment's nature, however, is highly significant to scientists investigating plant and animal life.

The scientists isolated chromophore from phytochrome of oats—the first indication that bile pigments exist in higher forms of plant life (seed plants). In algae, bile pigments have an active role in photosynthesis, and in mammals in eliminating waste. Finding the growth-regulating function verifies that the different bile pigments, apparently closely related,



have vital and distinctly different functions in algae, seed plants, and mammals—and that their function depends on the kind of protein molecule to which they are attached.

Identification of the chromophore is one of the major achievements in about 15 years of intensive phytochrome research at Beltsville. Accomplishments during that time have brought worldwide recognition and honors to several ARS scientists.

After recognizing that some photo-receptive substance governs many aspects of plant growth, and developing a method to determine the activity of the substance, the scientists knew that three main steps lay ahead: (1) isolating phytochrome, (2) identifying it, and (3) determining its biological action.

When moderate purification of the phytochrome molecule had been achieved early in 1964, Siegelman and Hendricks concentrated on isolating the chromophore.

Although the chromophore is only about 1 percent of the entire phytochrome molecule, which in turn is about one-millionth of the plant, it is so important that its identification clears the way for investigations of how phytochrome functions.

The researchers know that phytochrome in its active state serves as an enzyme, and they can assume that substances (substrates) are present that the phytochrome uses to make other substances.

These substances made by phytochrome might be termed biochemical messages that are sent from the enzymatic action site to the growth site—to the terminal buds of the stems to control flowering, to the seed embryo to control germination, to the fruit skin to control pigmentation.

The task, now, is to learn what the substances are that phytochrome uses and makes, and how these interrelated systems function as the phytochrome responds to light—and “dictates” plant-growth processes. ☆



MARITIMES (*Continued*)

the mixture of compost is sufficient to carry out the sterilization process for handling, and for spreading on turf.

*Suggestions for Top-Dressing Putting-Green Turf  
With Cyanamized Compost*

Once the sterilization process has been completed, the compost may be applied to putting greens and other fine turf grass areas such as bowling greens and tennis courts. The optimum time for this operation is during the moderately cool seasons of late spring and early fall, at which time most turf grasses are exhibiting their most vigorous growth. Because of this fact, it is also the best time to help mend thin turf, and heal scars caused by diseases or other injuries. To this end 'cyanamized compost', weed-free, is of immeasurable value as a turf tonic.

The suggested rates of application of cyanamized compost are  $\frac{1}{4}$  cubic yard per 100 square feet on creeping bent and  $\frac{1}{5}$  cubic yard per 1000 square feet on velvet bent turf.

If the turf is matted, it should be brushed, raked, combed and mowed prior to composting. If, on the other hand, the soil is compacted, spiking, aerifying or verti-cutting should precede the operation of composting. When the compost is spread on the turf it should be worked down between the grass blades with the back of a wooden rake or other pushboard and also with a steel door mat used as a drag. Finally, the entire treated area should be watered lightly.

It is further suggested that the cyanamized compost be applied when the turf foliage is dry and closely cut as the material will adhere to wet grass leaves and has a tendency to cause injury similar to a fertilizer burn.

It should also be pointed out that top-dressing with any material alone, such as peat, humus, muck or sand may produce an undesirable layer that will greatly interfere with root development and moisture movement. It is advisable to avoid any method or material in composting that would cause layering.

Further studies are underway at the Rhode Island Agricultural Experiment Station to determine if top-dressing fine turf with compost made of loam and sand is more beneficial without the addition of the organic matter to the mixture. Tests to date indicate that organic matter may not be necessary in compost top-dressing in view of the vast amounts of roots produced year after year by the bent grasses. This root accumulation contributes to the organic matter and to the consequent accumulation of thatch and dead roots in the soil which tend to produce sod-bound conditions that require special maintenance.

The main benefits derived from cyanamized compost are twofold: (a) The weed seeds are destroyed, and (b) The turf takes on a pleasant dark green appearance.

The improvement in color of the turf is due largely to the addition of nitrogen carried by the small amount of Cyanamid used in each cubic yard of compost. The combination is both practical and economical from the golf superintendents' standpoint because sterilized compost, and

fertilizer high in nitrogen, and lime are spread in the top-dressing in one easy operation. This saves much time, labor, and money, combining three operations into one.

Other benefits derived from compost top-dressing are:

1. The smoothing up of playing surfaces.
2. The addition of new soil which contains trace elements not found in commercial fertilizers.
3. The aforementioned tonic effect on weak or injured turf areas, and it has been noted that many cases of so-called 'chlorosis' have been cured, at least temporarily, by an application of compost-top-dressing.

*Weed Killers*

The only comment that I would like to offer is that a weed killing program be carried out every year on the fairways and that at least two applications be applied to the greens.

*Herbicides and Fungicides*

I believe it is essential to have good equipment available to do this job effectively and it is my belief that if the proper materials are used at the proper time and sufficiently often during the season, most of the diseases which affect grass in this area can be controlled.

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## Tips For Home Lawns In August -- Making New Ones, Caring For Old

Make a new lawn in August. Mid-August is the best time to establish a new lawn. Seeds of permanent grasses in the wild germinate at this time; most grass seeds germinate best if the nights are cool and the days warm, conditions which prevail in August throughout most of the country; new grass does not have to compete with most of the common weeds, whose seeds do not like cool nights and so do not sprout. First step in starting a new lawn is soil preparation. Remove large rocks and other rubbish from the area. Spread on a lawn fertilizer (10-6-4 or similar analysis) at the rate of 40 pounds per 1,000 square feet. Peat moss, well-rotted manure or other forms of organic matter will also improve soil. Work in fertilizer to a depth of 4 to 6 inches. A rotary tiller will do this well and easily. Next, level the lawn and rake it smooth. Sow your seed. Be sure to use seed with a high percentage of permanent grasses. Sow according to directions on package; do not sow too heavily. Rake lightly in order to cover seed, and roll the area to firm the earth around the seeds and promote quick germination. Water often enough and generously enough to keep the soil and seeds from drying out. Mow new lawns high, as soon as the mower can get a "bite", and maintain at 2 to 2½ inches.



# August Is The Month For Home And Community Lawn Projects

by DR. ROBERT W. SCHERY \*

Community lawns mirror a town, reflecting local pride. The lawns around the churches, hospital and school, those in public squares, traffic circles, along roadsides are ever on display. The townspeople use these lawns constantly and enjoy the sight of the cool green carpet every day. Visitors, too, use and enjoy these lawns, for they surround the most frequently visited community sites, border the most frequently seen parts of the community.

Yet in many towns the community lawns are not cool, green, well-kept carpets, but sparse patches of ill-kept turf which do not reflect the townspeople's pride in the appearance of their town.

IT'S NOT THAT NO ONE CARES about civic adventures in lawn care. It's just that the community lawns are seldom anyone's major responsibility. The school grounds are mowed inexpertly by the janitor, whose main responsibility is the school building. Very likely he has no training in lawn tending and no inclination to add lawn fertilization to his tasks. Most churches seem haphazardly tended outdoors, the church members forgetting that a little sprucing would buoy the whole decorative theme.

But you, the Turfmen who read *Turf Bulletin*, are civic minded about your gardening. If your community lawns are not the velvety carpets which they could be, you are disturbed. Both your neighborliness, nurtured in gardening discussions over the back fence with your neighbors, and your pride in a gardening job well done, as evidenced by your gardens and lawns, are troubled by the lackluster condition of the community lawns. You want to do something about the lawns.

But community lawns can't be cared for in the same way or with the same intensity as a private lawn. Funds are inadequate; people just don't have time. Realizing this, you are stumped. You remark to your neighbor: "Sure," the lawns around the school and the Civil War monument look bad, but how can we improve their looks? We don't have time to care for them as we do our own lawns."

MAINTENANCE OF COMMUNITY LAWNS is really not difficult or prohibitively time consuming. The first step in such a program is the mustering of a group of citizens who will take responsibility for directing the program. Your local garden club and other civic groups can become nucleus of this community project. (In many towns, of course, projects of this sort have already been initiated by garden clubs or other civic groups.)

When you have formed your committee and enlisted volunteers to help with the work, investigate the condition of the community lawns.

Most community lawns have at least a scattering of good grasses worthy of preservation and encouragement. Thus the problem becomes one of upgrading such a lawn and, afterwards, of maintaining it in a good condition without costly skilled help.

TWO STEPS ARE ESPECIALLY IMPORTANT anywhere in the blue-grass belt at this season: bolster seeding and fertilization.

A bolster seeding need not be heavy and thus is not expensive. Blue-grass based mixtures generally average two million seeds to the pound; at the usual price for good packaged seed this averages out to be something on the order of five one-hundred-thousandths of a cent per seed. One blue-grass seed is capable of forming a plant which in a year's time will spread to encompass an area the size of a saucer. Where is there a better bargain for improving the appearance of your community?

It is extremely difficult to distribute seed lightly and uniformly; some extra seed makes inexpensive insurance. Good wheeled spreaders can scatter as little as 1 pound per 1000 square feet quite accurately. (Spreaders can be rented or borrowed.) If the seed is to be sown by hand, it may be advisable to bulk it to at least double volume by thoroughly mixing it with some inert material of similar weight and texture such as corn meal, sifted dry soil or sand, pulverized corn cobs and vermiculite. This will provide sufficient volume for easy handling without wasting seed.

BEFORE SOWING be certain that debris has been raked off the lawn surface. The tiny seeds must reach soil in order to anchor permanent roots. Perched on the top of old leaves, the seedlings will not become established. (The seed will sprout if sufficiently watered even though it does not reach the soil.) Any scuffing of the soil surface—for instance, with a sharp-tined rake—will help catch and hold seed and should certainly be done. However, be careful that you do not damage or pull up the good grass.

WHAT KIND OF GRASS? Community lawns should be sown in reasonably attractive turf grasses, yet ones able to go-it-alone much of the time. Extremes in grass are well avoided: at one extreme, those requiring high-level care such as bent-grass in the North and top strains of Bermuda in the South; at the other extreme, the coarse, unkempt "hay grasses," which so often produce impermanent grass and are usually an ingredient of cheap lawn-seed mixtures. Kentucky blue-grass and red fescue are better for cooler humid climates, perhaps centipede and common Bermuda for southern locations.

That these species can withstand adversity is shown by roadsides in the blue-grass country; abused by traffic, singed with summer drought, they rebound a brilliant green at first rains and cool weather of autumn. Fine fescues persist year after year on improverished soils in full shade. Southern Bermuda scorched brown by drought recovers to complete verdancy in a matter of weeks. Through the years these basic grasses have proven themselves companions to man on lawns receiving little or no care.

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AUGUST (Continued from Page 9)

WEED KILLERS should not be used at seeding. In northern states, where seeding is best accomplished by the end of August, there may no longer be time enough to kill the weeds then wait the necessary two or three weeks for safety before sowing. In middle latitudes, where seeding in early September still gives sufficient time for good autumn establishment of blue-grass, 2,4-D to eliminate broadleaved weeds or DSMA to brown back crab-grass may still be permissible.

With 2,4-D the weeds will simply curl where the bolster seeding can strike root. It crab-grass is thick, as it is especially apt to be in the Ohio Valley belt, it may be necessary to work the seed down through the crab-grass remains. In this climate zone dead crab-grass might well be left in place as a mulch; at Busch Stadium in St. Louis it was noted that a bluegrass overseeding became established much more quickly under the protective mulch of dead crab-grass than on bare soil.

YOU NEED NOT BE SO CAUTIOUS when applying fertilizer. As a matter of fact, seed can be sown mixed with granular fertilizers. A wheeled spreader is again recommended; with this time-saving machine, seeding and feeding can each be done more precisely. Fertilizer will not harm dormant seed. Before this seed sprouts, sufficient water will have been applied either through sprinkling or rainfall to have washed the seed coat free of any damaging fertilizer salts. The fertilizer will then be in the soil ready to spark rapid seedling growth. It may be of interest that at the Better Lawn and Turf Institute test grounds, generously fertilized sods produced double the number of blue-grass shoots and about double the weight of stems with roots as sods not fertilized.

Over most of the blue-grass belt it is hard to imagine overfertilization in autumn. Ten to 20 lbs. of the older soluble or organic fertilizers per 1,000 square feet is recommended. Apply double this rate of the newer slow-acting types based largely upon ureaform nitrogen. The better fertilizers for lawns are high in nitrogen, since grass feeds largely on this leaf-making ingredient. A nitrogen-phosphorus-potassium proportionment of 3-1-1 or 3-2-1, such as a 20-10-5 formulation, should be chosen. Most lawns benefit from a complete fertilizer, but if in the past heavy phosphate and potash applications have been made or if a soil test shows a high amount of these present, a nitrogenous material alone may be used. There are several brands of fertilizer today designed specifically for turf grass. These should be chosen in preference to those fertilizers commonly used for agricultural crops or for garden flower and fruit, rather than leaf, production.

THE TWO STEPS — seeding and feeding — are "musts" in any refurbishing of a poor, community lawn. Both may be handled as community projects. A crowd of volunteers directed by someone who has had some experience in lawn care can complete both of these projects in a short time. If everyone brings a rake, and a spreader or two is rented or borrowed, the only expense will be for grass seed and fertilizer. And it can almost be guaranteed that everyone will have fun.

If time, budget and enthusiasm permit, there are additional practices which encourage quick sprouting and good establishment. One of these is a light mulch on thin turf or bare patches to protect the seeds from drying out. A thin scattering of sphagnum moss might serve or a sifting of compost which is free of weeds. Another is frequent light sprinkling, so that the soil surface remains humid until the seedlings show green and are an inch or so high.

MOWERS should be checked for sharpness and adjustment, so that they will not tear new seedlings loose. It is probably most convenient to continue mowing at the usual mowing height, which for Kentucky blue-grass over most of its range is preferably at least 2 inches. Intensively managed lawns or those in cooler, more northerly climates can withstand a closer clipping height than those in, say, Tennessee, where 3 inches might be preferable.

Cresses, dandelions and chickweeds may have volunteered by next spring. As spring warms, 2,4-D or 2,4,5-TP would be a good cure for these bad actors. By late spring crab-grass might be a threat. Some crab-grass herbicides are applied to the soil in order to catch crab-grass as it sprouts; others are used after the seedlings show. If fertilizer is applied generously in autumn and again in early spring, blue-grass should be sufficiently thick to discourage much weed competition. A tight turf mowed reasonably tall intimidates crab-grass; note how crab-grass never grows in the shade, whether of tree, house or thick turf.

There may be pathway or hard use problems on community lawns. No grass can stand up to excessive wear, and the only help is to intensify maintenance where bare areas threaten. Pathways should be discouraged by shrub barriers or by installation of walkways at short cuts. Benches can probably be moved from place to place to lessen continuous trampling. Should the soil become thoroughly compacted, it might be necessary to loosen it by spiking or by hiring a lawn service with aerifying equipment.

IN SUMMARY, choose good seed, stressing not cost per pound but quality. It is more economical to sow "expensive" mixtures high in blue-grass and red fescue, than chaffy cheap mixtures of impermanent ryegrass or clumping tall fescues.

FERTILIZE THE LAWN without fail. And be generous. A combination of good seed and plenty of plant food is the best assurance for a thick turf next spring. Autumn is nature's best grass-starting season and will take care of other vital details.

Maintenance of good-looking community lawns is not difficult. Because community lawns mirror a town, reflecting local pride, and because they are used and enjoyed by both townspeople and visitors, they should be well-kept, green and pleasing to the eye. So call out the volunteers! Muster the rakes, seed and spreaders! August is the month for community lawn projects.

*\*Better Lawn & Turf Institute  
Publicity and Research Director*



# ELMS

By MALCOLM A. MCKENZIE  
 Director of Shade Tree Laboratories  
 University of Massachusetts

## Practical and Aesthetic

Trees on your property can transform a house into a home. Trees in your community can change distraction to distinction, uproar to tranquility, and parching heat to refreshing shade.

To discriminating visitors, attractive scenery made possible by elm trees is an essential component in recreational areas. To permanent residents, elms are often the common denominator of all generations. For visitors and residents alike, the elms represent the foresight of an older generation, the privilege of the present generation and the heritage of a rising generation. Few other assets in Berkshire County contribute so much to so many variations of the landscape as elm trees. People are attracted to the Berkshires by the elm scenes, whether elm conscious or interested in panoramas essentially framed by elms. And a measure of prosperity for the Berkshires comes with the guests. This courteous prosperity is not a compulsion but a compliment that could be lost through carelessness. Let us appreciate and protect the natural attraction given by the elms as a present and continuing glory rather than a reflection of retrospect, as a prize lost by default. The Dutch elm disease threatens the elms of Berkshire County. Our Commonwealth needs their stature and serenity.

## PRESERVE OUR HERITAGE OF ELMS

Ten elms graced the scene of a well known New England colonial church and academy. Disease and decay compelled removal of original trees. Replacement trees have been started, but at least one generation of townspeople will miss the charm of a once attractive pastoral landscape in western Massachusetts.

Elms on Main Street in Williamstown have withstood the advance of the Dutch elm disease, but they could be lost by neglect. Their contribution merits special vigilance by the town. Trees, like sturdy citizens in all towns, contribute character to the community. At the same time they also contribute as an important part of taxable property. Trees in your town can make the difference between mediocrity and superiority. When the number of shade trees cut in a community exceeds the number of trees planted, the community faces a disaster of considerable significance.

## THE DUTCH ELM DISEASE

The Dutch Elm Disease caused by the fungus, *Ceratostomella ulmi*, and spread by bark beetles, menaces our Massachusetts elms.

Widespread in Europe since its discovery in 1919.

Known in the United States since 1930, following the importation of fungus and carrier-bettle infested elm logs from Europe — 1929 to 1934.

First known in Massachusetts — 1941.

Symptoms of the disease include: wilting, curling, yellowing, and early falling of leaves; brown streaking of infected wood.

Trees may die suddenly or gradually.

A Wood-Staining Fungus living in the water-conducting channels causes the disease.

Death of trees results from a toxin produced by the fungus and gummosis in the water-conducting vessels.

The smaller European and native elm bark beetles serve as carriers of the fungus.

The beetles engrave breeding galleries in weakened trees and later the young emerge to feed on tender green twigs.

Other means of spread include direct contact between diseased and healthy trees, i.e. natural grafts of roots.

Trees affected with Dutch Elm Disease may appear similar to elms afflicted with other troubles.

Therefore, laboratory study of wood showing streaking is necessary to prove whether disease fungus is present.

## INSTRUCTIONS FOR SENDING SPECIMENS FROM TREES SUSPECTED OF DUTCH ELM DISEASE FOR LABORATORY TESTS

1. Collect at least 3 branch-sections from different parts of the tree showing disease symptoms.
2. Take each branch-section from a *recently* wilted or *recently* killed branch.
3. Collect branch-sections that show some dark streaking, spotting, or other discoloration of the wood.
4. Be sure specimens are not less than 6 inches in length and at least 1/2 inch in diameter. Avoid sending specimens of much larger dimensions.
5. Be sure to include your name and address and exact location of tree.
6. Wrap and label specimens securely and send to: Shade Tree Laboratories, University of Massachusetts, Amherst, Mass.

## DON'TS

- Do not send dead twigs from the ground.
- Do not send leaves without twigs.
- Do not send rotten or crumbly bark.

## DISEASE CONTROL

The General Court of the Commonwealth of Massachusetts has enacted numerous statutes for the control of Dutch elm disease. The duties and powers of State and Town agencies, and especially the financial obligations of Towns, and the law enforcement responsibilities of the Massachusetts Department of Natural Resources, have

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## ELMS (Continued from Page 11)

been defined. Local Moth Superintendents may be consulted regarding control laws.

The spread of the disease has been effectively checked in certain places, notably Alford and Williamstown, by the activity of local committees working with the Local Moth Superintendent and the Department of Natural Resources.

The disease control program in Berkshire County has been materially aided by appropriations by the County Commissioners. This pioneer work by the County Commissioners and the Berkshire County Dutch Elm Disease Control Committee set a pattern which was later followed in other counties, and is a valuable means of restricting spread of the disease. The State Department of Natural Resources has prepared a report and a film, both of which furnish valuable help in disease control operations by Town Committees and Local Moth Superintendents.

## LURKING DANGER . . .

## IMPENDING AND OBSCURE

Wood from broken elm limbs should not be distributed in neighborhood backyards as fuel wood, but should be disposed of promptly by burning. The following are other serious hazards in the spread of Dutch elm disease: elm limbs scarred, broken or left as "hangers" from wind and ice-storms; extra limb weight from rain and snow-storms; elms weakened by fungus and insect pests; elms damaged by lightning, electric current, utility operations, escaping gas, traffic accidents, all types of construction, etc.

All dying elms, including freshly cut elm wood, are especially attractive as breeding material for elm bark beetles, which spread the disease fungus into beetle-breeding galleries of dead elms as well as into feeding scars on twigs of healthy elms.

Control of Dutch Elm Disease is seriously handicapped by improper elm wood disposal, or by delays in cleanup and sanitation work.

## EVERYONE CAN HELP

1. From October 1 to April 1, cut and burn all dead elm trees and elm branches which have died since the previous May, regardless of the cause, within 1000 feet of healthy elms you wish to protect. Under no circumstances allow elm wood of any kind to accumulate in woodpiles.

2. Follow latest spray schedule for control of elm bark beetle carriers of the Dutch elm disease fungus, and also employ any other treatment known to control the disease.

3. From late April to early July apply elm spray as needed to control insect and fungus pests that attack leaves, especially the elm leaf beetle. The leaf beetle, which commonly spends the winter in attics of nearby houses, causes serious injury to elm foliage. This injury is often confused with the Dutch elm disease. However, the leaf beetle is not known to be a carrier of the Dutch elm disease fungus, but damages elm as an independent pest.

4. Participate in systematic scouting for Dutch elm disease especially during July. Send carefully selected samples from suspected trees for laboratory tests, as previously indicated.

5. During summer months remove and burn diseased and dead elm material promptly before bark beetles have

opportunity to breed. A delay of a month at this season may be an important factor in disease spread.

6. As a substitute for (5), if bark is removed and burned from dead elms, control of bark beetles may be aided, provided removal of bark is thorough.

7. If dead or dying elms, or cut elm wood, discovered during summer cannot be burned or debarked immediately, the bark may be sprayed as the least desirable alternative in control. Latest information on sprays should be followed.

8. Try saving a diseased tree by immediate removal of affected parts, especially in early summer, when a very small limited infection is found.

9. In all contracts involving elm trees (road construction, housing projects, utility construction, line clearance) require the burning or other satisfactory disposal of all elm wood removed.

10. Keep elms as healthy as possible by appropriate use of fertilizer and water according to local needs.

## Apples Cause Flowering

*. . . in common houseplant that rarely blooms*

Homemakers can turn a popular green houseplant, the bromeliad, into a bright-colored floral display — with a ripe apple and a plastic bag — says ARS horticulturist H. M. Cathey.

Simply put the plant in the bag, add the apple, close and tie the bag, and leave it alone for 4 days. Then remove the bag and the apple and take care of the plant as usual. In 1 to 6 months, depending on the species, the plant will produce beautifully colored blooms and fruits.

Bromeliads are pineapple plants (family, Bromeliaceae), which are quite popular for indoor use. As houseplants, they rarely flower but are easily recognized by their cup-like crown formed by fleshy leaves surrounding the stem tip. There are many species, but homemakers usually know and buy them simply as bromeliads.

Cathey is a member of a Beltsville, Md., team working with plant-growth regulating compounds to tailor ornamentals to meet the desires of consumers. After scientists in Hawaii had used B-hydroxyethyl hydrazine to make field-grown pineapples bloom and form fruit, Cathey used this chemical on greenhouse bromeliads.

Knowing that ripe apples give off ethylene gas, which has a chemical structure similar to that of B-hydroxyethyl hydrazine, he decided to test the apple as a natural source of growth regulator that could be used by homemakers themselves.

He tried it—and it worked. The bromeliads bloomed and formed fruits in 1 to 6 months. A treated bromeliad produces a large cluster of small flowers that vary in color even with species. Cathey is working with several species, including billbergia, aechmea, and viresia, that produce blooms and fruits in a wide range of colors — orange, blue, lavender, yellow, green.

Ethylene gas has had a bad effect on carnations, roses, and some other cut flowers. So don't keep them in the refrigerator with apples.



# Hastening A Reduction In Japanese Beetle Populations With Milky Disease

## A Project For Garden Clubs And Other Community Groups

E. H. WHEELER, *Professor of Entomology*  
*Department of Entomology and Plant Pathology*  
*University of Massachusetts*  
*Amherst, Mass.*

Here is a way for garden clubs and other groups to perform a community service. It is inexpensive, will require little time, and can be as extensive or as limited as the particular group desires. It may be completed in one year or carried out over several seasons.

**ITS GOAL:** The ultimate reduction in numbers of Japanese beetle adults on our trees, shrubs, flowers and crop plants and of Japanese beetle grubs feeding on the roots of our lawn grasses.

**THE PROBLEM:** The Japanese beetle is now known to almost all areas in Massachusetts. This insect cannot be eradicated. Unlike the case of the gypsy moth and possibly mosquitoes, no federal, state or community governmental agency can be expected to carry out an *effective* control program.

Much has been done through research into chemical and biological or natural control methods. Parasites and diseases have been discovered and methods found for their distribution throughout infested areas.

Individuals, or those responsible for public property within communities, are in the best position to make use of chemicals to protect against this pest. They can do it more effectively and at less cost than could any state or federal agency given such a responsibility.

Civic-minded groups are in the best position to bring about the distribution of milky disease, one of the most effective of the natural enemies of the Japanese beetle.

**WHAT IS MILKY DISEASE:** This is a disease of Japanese beetle grubs. It is given the name "milky" because of the "milkiness" of the blood of the grubs as the disease begins to take effect.

The disease in the grubs is caused by a bacterium. Spores of this organism remain dormant in the soil for years, apparently unaffected by extremes of temperature, moisture or chemical action.

When grubs of the Japanese beetle, or some other susceptible species, take in some of these spores along with the grass roots and dirt upon which they are feeding, the disease organism enters upon an active stage and increases in abundance so as to completely fill the blood cavity of the insect.

Japanese beetle grubs which become diseased in this way do not mature into the adult beetle stage. They die before this change occurs, thus liberating millions or even billions of spores of the milky disease organism into the soil in which they were living. It is estimated that 10 full-grown grubs that die from this disease release into the soil as many spores as are contained in a pound of standard spore powder.

As the years go by and more and more grubs become diseased and die, the soil in which they have been living becomes so highly infective that later generations of grubs have little chance of survival.

Thus it can be seen that the inoculation of milky disease spores into the soil of grassy areas can increase the incidence of disease amongst the grub population. This incidence may become greater with each passing year. Thus, we can say that milky disease can bring about an ultimate reduction in the numbers of Japanese beetles within an area.

**CAN GROUPS OBTAIN MILKY DISEASE FOR DISTRIBUTION:** Milky disease spores are being produced under license for the U. S. Department of Agriculture by at least one firm at present. Healthy grubs are dug, injected individually with the disease organism, incubated until they show full disease development, ground up and mixed with chalk and talc in such a proportion as to provide one hundred million spores of the disease organism per gram of finished spore powder.

This milky disease spore powder is available in half-pound packages and possibly in larger quantities where extensive distribution is anticipated.

For further information concerning availability of milky disease spore powder through retail channels or directly from the manufacturer, clubs or individuals should contact Mr. Howard A. Chittick, Fairfax Biological Laboratory, Clinton Corners, New York.

**IS THE MILKY DISEASE ORGANISM HARMFUL TO OTHER LIVING THINGS:** This organism has been studied since early in the 1930's. It has been found to be disease producing in the Japanese beetle grubs and in a few other undesirable soil-inhabiting insects. It does not cause disease in any higher form of life, including domestic animals, pets, birds and man. It has no deleterious effect upon earthworms, beneficial insects or plants.

**HOW IS THE SPORE POWDER DISTRIBUTED:** The most effective way to use milky disease spore powder is to place small quantities of the material at intervals over a grub-infested area. One teaspoonful every four or five feet in rows four or five feet apart is an excellent procedure. On large infested areas it might be more desirable to put the spots ten feet apart in rows ten feet apart. It really makes no difference so long as the spore powder is placed in heaps amounting to about a good teaspoonful *on grub-infested turf*.

It is not necessary to place the powder into the soil. Simply place it in a heap on the grass and let natural agen-

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**BEETLES** (*Continued from Page 13*)

cies work it down. Of course, it does absolutely no harm to actually lift a small piece of turf and place the milky disease underneath it.

Broadcasting the milky disease spore powder uniformly over an area to be inoculated is not recommended. This is known to be less effective in establishing the disease rapidly within the grub population.

**WHAT FACTORS DETERMINE HOW RAPIDLY THE INCIDENCE OF DISEASE AMONGST THE POPULATION WILL DEVELOP:** There are many factors, but two are of outstanding importance. First, the number of grubs present in the soil in the inoculated area. The more grubs there are to become diseased and therefore to die and to release spores which will infect subsequent generations of grubs, the more rapid will be the build-up of milky disease within the soil.

Second in importance is soil temperature. For rapid multiplication of the bacterium within the body of infected grubs, soil temperature above 70°F. are necessary. This limits somewhat the period of time within each season during which milky disease can increase rapidly in the New England area as contrasted to areas in New Jersey, Pennsylvania and farther south. This means that build-up of the disease organism occurs more slowly here than it does in more southern areas.

**DOES MILKY DISEASE SPREAD NATURALLY FROM THE ORIGINAL AREAS WHERE IT WAS PLACED:** Milky disease does spread from the original point of inoculation. The most important agency in this spread is bird life. Birds of many kinds feed upon grubs of the Japanese beetle. In an area that has been inoculated with milky disease spore powder, some of the grubs taken in by the birds as food are diseased and contain spores of the disease organism. These spores pass through the bird and are distributed with its droppings, thus spreading the milky disease organism far and wide from the original point of inoculation.

Rain, soil moisture, movements of soil insects, and the movements of diseased grubs themselves contribute to its spread between the original spots where heaps of spore powder were placed.

**IS THE DISTRIBUTION OF MILKY DISEASE POWDER A SUBSTITUTE FOR GRUB-PROOFING OF GRASSY AREAS WITH CHEMICALS:** These two methods supplement one another. Chemicals such as chlordane or dieldrin are highly recommended where one has a lawn or a portion of a lawn which is essential to the beauty of the surroundings and which should be protected from the activities of Japanese beetle grubs. One treatment, if applied properly, should protect that grassy area for from five to seven years. This one treatment should protect it from all kinds of soil-inhibiting grubs.

Milky disease spore powder is to be placed on unshaded grassy areas infested by grubs but which are not so essential to the beauty of the surroundings or which will never be treated with chemicals for one reason or another. Some damage by grubs may be tolerated for two or three years but meanwhile the milky disease organism is building up in the soil. Eventually, that area will be fully protected

against further noticeable damage. Unfortunately, we can not say that it will be equally well protected against the ravages of some other insect pests of lawns since milky disease does not affect all kinds of insects equally well.

Chemicals, then, are for immediate protection of grassy areas from the ravages of Japanese beetle grubs and other insects that damage grasses. And chemicals will continue to be used, of course, against the adult stage as the beetles attack our many plants.

Milky disease will be used where complete protection of the grass is not so essential; where some damage can be tolerated. In this sort of a situation, where grubs will be allowed to exist, we have our best chance for a rapid build-up of the milky disease organism in the soil. Gradually it will become more and more difficult for a beetle grub to survive in that soil because of the presence of the disease organism.

*The mixing of chemical treatments and spore powder treatments is not advocated since grubs must be present in order to give the milky disease organism a chance to increase in numbers.* Of course, chemically treated areas do become inoculated with milky disease organisms as birds carrying spores fly over those treated areas.

**HOW SOON MIGHT WE EXPECT TO SEE THE EFFECTS OF AN INOCULATION:** There will be no immediate effects. Control by utilizing milky disease spore powder is a long-term process in which results can be expected in from five to ten years.

The rapidity with which the milky disease builds up will depend upon how much of the grassy acreage within and around a particular community is treated. The more acreage that is treated originally, the more rapid one would expect the disease to build up and its effect on reducing the population of both grubs and beetles to become apparent. However, even a very small acreage within a community will have its ultimate effect and clubs or individuals should never be discouraged because they feel they have to limit their activities to the inoculation of what may appear to be very small areas.

It should be emphasized over and over again that clubs undertaking this project are working towards the ultimate reduction in Japanese beetle populations, not for an immediate change.

**ARE WE SURE THE MILKY DISEASE ORGANISM WILL EXIST IN MASSACHUSETTS:** Several years ago, the U. S. Department of Agriculture placed some experimental plots of milky disease in the Springfield area. Following that, a considerable amount of the material was distributed through local agencies or by individual home owners.

Grubs have been dug from many areas in and around Springfield and individuals diseased with milky disease organism have been found among them.

We do not have accurate figures as to the degree of reduction being brought about in this area, but in studies made in the area around Perryville, Maryland, reductions of from 80 to 90 percent have been noted. Populations of grubs equalling 20 or more to the square foot, in August or September soon after egg laying and grub hatching, have been reduced by milky disease to populations of one, two or



**BEETLES (Continued)**

three grubs per square foot by the time they are ready to change into beetles the following June.

This cannot happen in one year here in Massachusetts; it can happen in a five to ten year period.

**HOW COULD GARDEN CLUBS CARRY OUT THIS PROJECT:** Clubs might operate in two ways. First, they might decide, as a club, to spend a certain amount towards the purchase of milky disease spore powder and then proceed to distribute this on suitable locations throughout the community.

Second, they might wish to do the above and in addition carry on a campaign which would encourage individual home owners to treat non-essential grassy areas with spore powder which they purchased as individuals, either through the garden club or through normal retail channels.

**IS ANY LABOR OR EQUIPMENT REQUIRED:** The material needs are very slight, just a teaspoon and the milky disease spore powder.

The only labor necessary would be in choosing the sites to be inoculated and then the actual process of placing the teaspoonful of powder at the desired intervals on those sites. The main thing that is needed is the spirit and desire to do the job for the betterment of the community in the years to come. Clubs or other groups must not expect any immediate reward in the form of great reductions in the number of Japanese beetles during the next two or three seasons.

**HOW MUCH MUST A CLUB DO TO MAKE IT WORTHWHILE:** It is doing something worthwhile if a club feels it can distribute but one-half pound of the milky disease spore powder. A goal of something like a pound for each square mile of community area is excellent. Cemeteries, parks, playgrounds, golf courses and the like are excellent places to make inoculations, providing that it is done on those areas *where no chemical treatments have been or will be made*. Two or three pounds of the spore powder placed on well selected sites in the grassy "roughs" of golf courses would provide an excellent chance for the disease to build up and to become distributed throughout a wide area.

Those charged with distributing the milky disease spore powder should learn enough about the Japanese beetle and its egg laying habits so they know the type of site selected by the female beetles for egg laying and thus know the places where grubs are likely to be found in fair numbers. If such places are not to be treated chemically, they are ideal for milky disease inoculation.

**MUST THE INOCULATIONS BE DONE AT ANY PARTICULAR TIME OF THE YEAR:** The distribution of milk disease spore powder can take place any time of the year and under any conditions except when the ground is frozen or when it is windy. Distribution just before a rain would be ideal, but is not essential.

County Agricultural agents may be contacted and in most cases will be in a position to discuss the Japanese beetle problem and milky disease before committees or groups of leaders in the project. They should be able to help in the selection of sites if that becomes necessary. The county offices will be kept up-to-date and supplied with information from the office of the Extension Entomologist at the University of Massachusetts in Amherst.

**CHARACTERISTICS OF A SUITABLE SITE  
FOR MILKY DISEASE SPORE POWDER  
DISTRIBUTION:**

- A. Permanent turf or lawn area: cultivated or heavily mulched areas are not suitable since no or very few grubs are found in them.
  1. Unshaded most of day; sunny slopes are perfect.
  2. Grass mowed regularly or kept relatively short, at least during July and August so as to be attractive to beetles for egg laying.
  3. Will not and has not been grub-proofed with chemicals.
  4. Neither exceptionally dry nor wet for extended periods.
- B. Is already infested with grubs of Japanese beetle as shown by their presence in grass roots. This is most easily determined by lifting a square foot section of turf, shaking the root free of soil and then examining the soil for grubs. Usually, from mid-July until mid-September, the grubs are small or almost absent and therefore hard to find. However, the presence of adult beetles in the vicinity during the summertime is almost certain to result in eggs being laid in nearby suitable grassy area.
- C. Of sufficient size to require as few as half-dozen teaspoonful of spore powder at 5 ft. intervals to cover the site or large enough to require from 1/2 to a full pound of the spore powder distributed at 5 ft. intervals or possibly 10 ft. intervals. It really makes no difference. One pound of spore dust spotted at 5 ft. intervals is enough to treat about 1/8 acre. If spotted at 10 ft. intervals the same amount is enough for 1/2 acre. Even a single eighth acre plot inoculated in each square mile is very much worthwhile. But, of course, milky disease build-up and spread in the general region will be more rapid if larger areas are inoculated or a larger number of small plots are established.

**HOW MUCH MUST BE DONE BY A COMMUNITY TO ESTABLISH MILKY DISEASE IN THE JAPANESE BEETLE GRUB POPULATION?** Here are a few suggestions to guide garden clubs and others working towards the establishment of Milky Disease.

But remember! *Any distribution* of Milky Disease Spore Dust, from 1/2 pound up, just so long as it is on a suitable site, *is very much worthwhile*.

Experience has shown the amounts given below to be quite reasonable and satisfactory. It is doubtful that greater expenditures, for more widespread distribution, are warranted. But of course, additional amounts can do no harm.

Do enough to be sure some grubs become diseased — then *let Nature carry on!*

**HOW MUCH SPORE DUST IS REQUIRED TO TREAT AN AREA OF TURF:** One pound, spotted as teaspoonfuls at 5 foot intervals, is enough to treat about 1/8 acre. At 10 foot intervals 1 pound is enough for about 1/2 acre. The size of a treated plot actually makes no

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BEETLES (*Continued*)

difference. However, it is obvious that the larger the plot treated, the sooner the milky disease organisms will become well established and the greater its opportunity for rapid build-up.

Where grubs and beetles are very abundant, it actually requires less spore dust to bring about the establishment of the disease and a rapid build-up of disease organisms in the soil. Use relatively more spore dust where grubs and beetles are less numerous as yet.

REASONABLE GOALS FOR  
SPORE DUST DISTRIBUTION  
WITHIN A COMMUNITY:

- A. For extensive parks, golf courses, pastures or other large lawns or closely clipped grass areas: Plan for about 1 pound of spore dust for each 5 to 10 acres. On golf courses, treat the open, grassy "roughs". They will never be grub-proofed with chemicals.
- B. For similar turf areas of less than 5 acres: Use from 1/2 to 1 pound of spore dust placed on the most suitable locations for grub infestation.
- C. For residential areas consisting of small lawns: Use from 1/2 to 1 pound of spore dust for each block. Choose unshaded areas in back and side lawns which will not be chemically treated.

SUITABLE SITES FOR SPORE DUST PLOTS: Permanent turf or lawn — not cultivated gardens.

1. Always closely clipped or cut over at least once during July.
2. Unshaded most of the day.
3. Not chemically grub-proofed within last 5-6 years and not likely to be so treated.
4. If beetles have not yet become very abundant, choose a plot of sunny lawn near some vine or other plant where beetles have been feeding.
5. Large enough for a full pound spotted at 10 ft. intervals, or so small as to need only a few spots every 5 ft., and anything in between.

## Suggestions For The Care Of Power Sprayers

During the winter months sprayers should be overhauled in order that they may be in good working condition when the spraying season arrives. Some of the items which should be checked over are listed below:

1. Sprayers should be overhauled annually.
2. Valves, plungers, bearings, gears, drive chains, etc., should be examined and worn or broken parts replaced.
3. Check pump.  
Replace valve seats and balls if worn and pitted.  
Replace pump cylinders if badly worn.  
When taking pump apart mark bearing caps so that they may be replaced in same position as they were originally.  
Repack plunger if necessary.
4. Check pressure regulator.  
Check valve seat and ball.  
Check setting of stem below the ball. There should be 1/16" clearance when pressure is off.  
Replace packing around stem.  
Oil spring, adjustment nuts and all moving parts.
5. Check Engine.  
Remove carbon, grind valves, adjust tappets, take up bearings, clean or replace spark plugs. Have magneto checked by authorized service station if necessary. If piston rings are badly worn, replace or have cylinders re honed if oversized rings are needed.
6. Replace pipes which have become very rusty on the inside.
7. Make sure that strainers are in good condition.
8. Be sure that drive belts and chains are in proper alignment.
9. Grease agitator bearings with water pump grease.
10. Check spray nozzles to make sure that they are in proper working order.
11. Be sure that hose is properly rinsed out with clear water, drained and coiled. Store in dry location away from artificial heat and sunlight.
12. Grease or paint all metal parts that are likely to rust.
13. Order extra parts such as nozzles, discs, etc., which may be needed during the spraying season.

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# Stump Removal Made Easy

By HENRY W. LAND, SR. AND ROY GOSS

A stump is one of the most ornery critters that was ever created as an obstacle to man. As the saying goes, most stumps are just about as useless as a flat tire. Stump removal on a large scale is time-consuming, laborious and expensive.

The usual methods for removing stumps are either blasting or by the use of powerful machinery, and lastly just plain old digging them out by hand or burning them.

Any of these methods are difficult to say the least. In the case of large stumps which are quite often found in turfgrass areas such as golf courses and parks, the use of blasting equipment is naturally prohibitive due to the proximity of buildings and residential areas. Some of these stumps just can't be handled either by our usual heavy equipment. Therefore, we must resort to other means of removing the stumps.

We would like, therefore, to pass on to you an easy method of removing stumps with a minimum of effort and expense to the operator. It has been known for many years that potassium nitrate (Chile saltpeter) will make an excellent fuse when a fabric is dipped in a solution of potassium nitrate. This fuse will burn without a flame and will burn when wet or submerged in soil or almost under any conditions. Potassium nitrate produces its own oxygen and is the reason for its burning without the presence of ample air.

For the reasons described above, then, stumps will burn very deeply and roots will burn to the very extremities when treated with potassium nitrate. Here then is the recipe for the stump burning. In the fall of the year or early winter drill holes one and a quarter to one and three-quarters

inches in diameter to approximately fourteen to eighteen inches deep in the stump. The larger the stump the more hole. For example if the stump is forty-two inches in diameter, probably five holes should be drilled in the stump. Fill these holes to the entire depth with potassium nitrate (granular material). Fill these holes with water, that is, pour water over the potassium nitrate to form a solution. Cut some pegs or use other forms of stoppers for these holes and drive them in securely and let them set. In late spring remove these plugs and fill the holes with diesel oil. Ignite the deisel oil and stand back and let the stumps burn. They will generally smoulder for many days and will burn generally to the extremities of the roots and quite often the only thing remaining would be an empty outside shell.

The reason for the complete removal of stumps by this method is that the potassium nitrate solution will move through the vascular system of the plant down into the roots and once the tissue is ignited will follow the potassium nitrate down and do a complete job of burning. It isn't often that the stumps go out but if they should, reignite and start over again.

It is always better to try this type of burning on new stumps, that is those that have been recently cut since the water conducting system in the plant is still intact and this material will flow down it freely.

Try this system sometime and see if you don't think it is easier and less expensive than others that you have tried.

*Northwest Turf Grass Topics*

## **VELSICOL TURF CHEMICALS**

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# Selecting Fertilizers

*Prepared by Soil and Water Conservation  
Research Division  
Agricultural Research Service*

Soil in its natural state rarely is fertile enough for best growth of plants. Usually it is necessary to supplement the earth's store of plant nutrients before we can obtain the most vigorous lawn, the most abundant flowers, or the greatest yield of tasty and nutritious vegetables. The easiest way to furnish these added nutrients is through application of mixed fertilizers.

## FERTILIZER RECOMMENDATIONS

What fertilizer should you use? And how much should you apply? These questions are best answered by specialists at your State agricultural experiment station. These specialists will test a sample of your soil and recommend a program of liming and fertilizing for your plants.

Some States perform this service free of charge for State residents; others charge a small fee. For information regarding soil tests—how much they cost, how to take samples, and where to send them—consult your county agricultural agent. His office generally is located at the county seat.

## MANAGING YOUR SOIL

Fertilizer application is only one step in effective soil management. For best growth of lawns, vegetables, and

ornamentals, you should also provide the proper soil acidity, soil structure, and soil moisture.

You can adjust soil acidity by applying liming or acidifying materials. You can improve or maintain soil structure by working the soil properly and by incorporating organic matter into the soil. You can control soil moisture by improving drainage, by irrigating, and, where practical, by applying mulches.

For information on these essential steps, consult your county agricultural agent or refer to State extension or USDA publications dealing with the crops or ornamentals that you wish to grow.

Publications of your State extension service and the U.S. Department of Agriculture also are sources of information regarding kinds and amounts of fertilizer to use. Fertilizer manufacturers, too, generally supply guides for the use of their products.

Even after you have obtained recommendations for a program of fertilizer application, you may have difficulty in selecting a fertilizer from the many kinds that are available.

## FERTILIZER MATERIALS

Garden-supply stores offer for sale a wide variety of materials for fertilizing lawns and gardens. Some of these products are considerably more expensive than others.

*(Continued on Page 21)*

# FOR

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- insecticides
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# Green Grass And Grass Roots

C. W. LOBENSTEIN

*Presented December, 1964, University of Illinois*

The growing of healthy green grass is the common goal of our respective jobs which brings us together at meetings. The users of our products expect the production of an adequately thick ground cover at all times in spite of the many hurdles of disease, weather, and soils problems and at the same time desire the product to be green. Many times GREEN is NOT GREEN ENOUGH and we may find ourselves yielding to pressures to make it greener. This is fine—we all desire to produce a product that gains maximum customer satisfaction.

All who have examined critically the question of "How green is good" recognize it is not a new problem. In any series of turfgrass literature this matter is discussed repeatedly. As recently as 1960 in these proceedings, Dr. Eliot C. Roberts discussed the relationship between foliage and root production and again pointed out that yield, as foliage production, and dark green color were, in themselves, poor indicators of quality turfgrass.

Anyone seriously concerned with turfgrass management recognizes as obvious, the fact that grass, like most other plants, cannot be grown without an adequate root system. Examples of problems observed during the past season illustrate the point that many apparently do not yet recognize this point or overlook it in the pressures of the growing season. Thus some of the factors affecting foliage and root development are perhaps worthy of review and re-emphasis.

Mowing is necessary in production of good usable turf but may be a necessary evil as far as the grass is concerned. The fact that clipping practices, especially at the heights often required, reduces foliage and root growth is a cardinal principle in turfgrass growth. Maintenance of high nitrogen levels and optimum moisture conditions stimulate shoot growth much more rapidly than root growth especially when new leaves are removed as rapidly as they are produced. This is the second principle. If root development is further placed at a disadvantage by poor aeration through compacted or poorly drained rootzone structure, the effects of the two previous facts are aggravated. The poor growth of roots is transferred to poorer shoot growth. Additional nitrogen or additional water in an effort to get quick results only makes matters worse. With a good structured, well aerated rootzone, troubles may still arise from problems of pH or failure of the turf user to appreciate the limitations of air and soil temperatures beyond which the turfgrass cannot be forced without serious injury.

Development of slow release nitrogen fertilizer compounds in recent years have been a most useful and welcome addition to the tool kit of turfgrass management. The ability to provide a more continuous feeding in place of the very stimulative soluble materials should lead to better turf health. At the same time, many still use moderate amounts of the quick solubles or even spray-on applications to get that "quick-kick" to keep the color up and the user happy, without full knowledge and awareness of the interacting

factors regulating foliage and root growth, all three forms can still cause serious trouble.

As an example, up to June, the greens on a small course in Southern Illinois started the season in excellent shape. Upon subsequent show of poor color, a urea-formaldehyde application was made, the only fertilizer application since early spring. The greens responded—colorwise! During the summer nearly all greens went out from 20 to 90 percent in spite of verticutting, skipping, daily watering, and more U-F. When the damage had been done it was discovered that the greens had received 16 pounds of calcium arsenate per 1,000 in a split application the preceding fall and spring, some potash but no phosphate of record. No soil test had been made but a fairly good guess could be made as to the trouble, especially in view of the arsenical used on typically low phosphate soils of Southern Illinois.

The point of concern here is that even with the exclusive use of slow release nitrogen materials, trouble can surely arise if all factors are not considered. With the typical reduction of the working depth of the grass roots accompanying high temperatures, coupled with depletion or complexing of the phosphate reserves in the surface zones of soil, addition of even slow release nitrogen to get growth and color can backfire just as surely as the more quick soluble forms.

Two home lawns in Carbondale illustrate a similar violation of the cardinal principles of growing a durable turf. They were established with the best of seed with adequate surface fertilization including limestone but no incorporation sufficiently deep into the rootzone of the slowly soluble limestone or phosphates. The results—? By following recommended applications of a complete fertilizer with a high ratio of slow release nitrogen including regular month applications, beautiful lawns were produced—as long as the rains came and before that section of the city ran out of water. Then, with the dry summer and an anti-watering ordinance, disaster struck. Other lawns in the neighborhood, with moderate to little fertilization and particularly lower nitrogen levels, survived. Not as green of course, but they survived. The luxuriant foliage had been produced at the expense of a root system adequate to carry through; moreover, the thatch developed by this program had encouraged the roots to develop even shallower in the tight soil. Small wonder the turf expired when the thatch dried out.

In a long-term fertility experiment on bluegrass at Dixon Springs in cooperation with the University of Illinois, Department of Horticulture, we again observed the breakdown of greenness of color as a measure of turf quality. This experiment was set up on low phosphate soils of very desirable structure but received supplemental irrigation only once during the summer. In the various combinations used, plots receiving high nitrogen rates in monthly increments

*(Continued on Next Page)*



## Establishing And Keeping Athletic Field Grasses

**SOIL AND SEEDBED.** One can only touch upon the athletic field foundation, but certainly the soil should be the best obtainable. This doesn't necessarily mean hauling in topsoil. But it does mean phosphatic fertilizer mixed to the depth of the root zone (phosphorous is fixed by the soil, leaches down from the top only slowly), tillage to loosen soil compaction, and incorporation of organic additions (compost, peat, or other humus) if needed. About 5% organic content makes sandy soils more retentive, clay soils looser.

Small amounts of sand mixed into heavy soils is relatively useless, since the sand will simply bind in the clay as does aggregate in concrete. It's better to utilize funds for fertilizer (which will promote grass roots, thereby contributing organic material) or for organics directly.

In regions of acid soils, where a soil test shows low pH, agricultural lime should be mixed into the seedbed, at rates of about 100 pounds to the 1000 square foot.

Original construction should provide good drainage. On low lying fields, tile might be needed. In most cases crowning the field a foot or two so that surface drainage is gradual away from the center, will be sufficient to prevent waterlogging.

Any new seeding should be mulched. Loose straw a few straws deep will suffice. Mulch holds humidity about the seed, hastening sprouting, at the same time that it protects soil against wash. Obviously the time of seeding should match the kind of grass, autumn being the best for northern locations, spring for southern.

**WATERING.** Seldom is rainfall adequate to foster quickest sprouting and most rapid establishment of the seedlings. Thus, frequent but light watering is good regimen on new seedings. As the grass roots grow deeper, frequency of watering can be lessened.

Sandy soils hold less water and drain faster than heavier ones; they should be watered more frequently. Likewise sands lose their fertility more quickly, and should be fertilized frequently at light rates. Clays normally require slow but prolonged irrigation, hold both water and fertility over a longer period of time.

There's a difference of opinion on need for watering athletic fields once the turf is established. In its first year, grass will be incapable of enduring much drought, and should be watered any time wilting starts. But once the turf is fully established, good grass can endure protracted drought.

Fields not in play during summer very likely can survive drought-induced dormancy without harm. But rain or watering must commence a few weeks ahead of the season for play. Both bluegrass and fescue in the North, and bermuda and bahia in the South, are quite drought tolerant.

Persistent irrigation may waterlog the deeper soil, causing shallow rooting. Moreover, continuously wet soil, subjected to athletic field use, may compact and become impervious. And persistent watering encourages unwanted shal-

low rooted species (bentgrass, annual bluegrass, *Poa trivialis*, to say nothing of weeds like crabgrass). One of the

(Continued on Page 22)

### GREEN GRASS (Continued)

always rated highest from the viewpoint of color regardless of whether P and K were high or at the minimum level. When drought stress took its toll the high nitrogen plots lost the most grass and by the end of the season were the lowest in measured shoot density.

In review, the basic principles of maintaining good foliage and root balance are summarized by many papers and talks in previous turfgrass meetings as follows: maintain clipping heights as high as possible with the dictates of the grass and its use, diseased leaves cannot support adequate root growth nor use of the turf, phosphorus and slowly soluble nutrients must be adequate throughout the rootzones, other essential nutrients should be supplied in proper balance and quantities, pH and water factors should be regulated with common sense, roots cannot grow without air, and nitrogen levels be as low as possible without causing the grass to completely lose its vigor to recover when climatic and disease factors become more favorable. Even though the slow release materials may provide a much more desirable means of supplying nitrogen to grow GREEN grass, they do not provide a means of escaping the pitfalls of grass being permitted to grow TOO GREEN for its own good.

## CLEARY PRODUCTS FOR BETTER TURF

**"CLEARY'S MCPP"** — For selective weed control in Bentgrass Greens, kills knotweed, chickweed, clover.

**"PMAS"** — Crabgrass & Disease Control.

**"SPOTRETE"** — 75% Thiuram Fungicide.

**"CADDY"** — Liquid Cadmium Fungicide.

**"PM-2, 4-D"** — Weed control including Silver-crab.

**"ALL-WET"** — For hard to wet areas.

**"METHAR"** — DSMA in liquid or powder form for crabgrass control.

**"SUPER METHAR"** — The "AMA" type liquid for crabgrass control.

**"THIMER"** — A combination of mercury and thiuram for crabgrass and disease control. (Wettable powder)



## SELECTING FERTILIZERS (Continued from Page 18)

They vary in price because of—

- Nutrient content. Products containing a high percentage of plant nutrients cost more per pound than those containing a small percentage of nutrients.
- Ingredients. Products containing slowly available forms of nitrogen cost more per pound than those containing quickly available forms.
- Form. Pelleted, or granular fertilizers, and soluble fertilizer concentrates cost more than powdered fertilizers.
- Added materials. Products containing added trace elements or pesticides cost more than plain fertilizers.
- Package size. Fertilizer in a small container costs more per pound than the same product in a larger container.

Are the expensive products worth the extra price? After considering their advantages over the less expensive fertilizers, you may decide that they are. Or you may decide that the least expensive fertilizer is satisfactory for your needs.

### Nutrient Content

Manufacturers of mixed fertilizers are required by law to state on the container the guaranteed content of primary nutrients. These primary nutrients are nitrogen, phosphoric oxide, and potash.

The primary nutrient content of a fertilizer mixture is indicated by its *grade*—a series of three numbers separated by *dashes*. The numbers show the percentage of nitrogen, phosphoric oxide, and potash, in that order, contained in the mixture. For example, a mixture with the grade 5-10-5 contains 5 percent of available nitrogen, 10 percent of available phosphoric oxide, and 5 percent of available potash.

Because nitrogen, phosphorus, and potassium are likely to be deficient in the soil. When you buy a fertilizer, therefore, you generally buy it for its content of these materials.

The relative proportions of primary nutrients in a fertilizer mixture determine the suitability of the mixture for specific soils and plants. Lawn fertilizers, for example, usually are highest in their proportion of nitrogen. Fertilizers for use on vegetables may be highest in their proportion of phosphoric oxide. It usually is wasteful, and may even be harmful, to use the wrong type of fertilizer. Follow recommendations closely.

Specialty fertilizers—manufactured in grades usually suitable for use on a specific kind of plant—are available for most garden applications. These specialty fertilizers include products for lawns, tomatoes, and azaleas and other acid-soil plants. Usually they are satisfactory for use according to directions on their labels, but they usually cost more than ordinary farm fertilizers of the same grades.

Fertilizers of several grades may contain the same proportions of primary nutrients. For example, 5-10-5 and 6-12-6 are both composed of one part of nitrogen, two parts of phosphoric oxide, and one part of potash, though 6-12-6 contains the higher percentage of these nutrients.

Fertilizers having the same proportions of primary nutrients generally can be used interchangeably. It usually

is only necessary to alter the rate of application so the desired amounts of primary nutrients are applied to the area being fertilized.

Frequently the price per pound of the nutrients in fertilized mixtures containing a high percentage of nutrients may be lower than the price per pound of nutrients in fertilizer mixtures containing a lower percentage. For example, 1 pound of 10-20-10 contains the same amount of nutrients as 2 pounds of 5-10-5, yet an 80-pound bag of 10-20-10 may cost only one-third more than an 80-pound bag of 5-10-5.

For greatest economy, buy fertilizer for its weight of nutrients, not for its total weight.

### Ingredients

Nitrogen is the most expensive component of a fertilizer mixture. Slowly available forms of nitrogen—urea-form and other organic sources—are more expensive than quickly available forms. Therefore, the more nitrogen a mixture contains—especially slowly available forms of nitrogen—the more expensive the mixture is.

Before plants can utilize nitrogen from a fertilizer mixture, the nitrogen-source material must be soluble. The more expensive forms of nitrogen must break down into soluble forms—nitrates, or, in some cases, ammonia—before they can be used by plants. They break down slowly and release nitrogen to the plants over a long period of time. Less expensive forms of fertilizer nitrogen are already in available form; they can be used by plants immediately.

Fruits and vegetables properly fertilized with quickly available nitrogen are as healthful and tasty as those fertilized with slowly available forms. Because of their slow rate of breakdown, however, urea-form and other organic sources of nitrogen may be more convenient to use than the quickly available forms. One application of the slow-release forms of nitrogen may nourish the plants throughout the growing season, whereas several applications of quickly available forms may be necessary.

### Form

Most ordinary farm fertilizers are powdered materials. Fertilizer mixtures also are available in the form of granules, or pellets, and as concentrates that must be dissolved in water before application. The pelleted fertilizers and the concentrates are more expensive than the powdered materials. However, they may be more convenient for you to use.

Powdered fertilizers—most ordinary farm fertilizers—may be objectionable to use because they are too dusty, particularly on a windy day. They may become damp and may cake and fail to feed evenly through the fertilizer spreader. And they may stick to plant foliage, damaging the foliage.

Pelleted fertilizers are not as dusty and they do not cake as readily as powdered fertilizers. They flow readily through fertilizer spreaders, and they roll off the plant foliage, reducing danger of fertilizer burn.

(Continued on Next Page)



**SELECTING FERTILIZERS** (*Continued from Page 21*)

Fertilizer concentrates, mixed with water, can be applied by garden hose through use of a relatively inexpensive mixing device. Being liquid, these fertilizers are readily available to the plants; some nutrients are absorbed by the leaves of the plants. Because the materials are diluted considerably in application, there is little danger of damage to the foliage.

**Added Materials**

Fertilizer mixtures containing added materials—trace elements, insecticides, or weed killers—are offered for sale by many garden-supply stores. These added materials usually cost more when bought as components of combination products than they do when bought separately.

Combinations of materials may be more convenient to use than single materials—only one application is necessary—but they may be ineffective or even harmful; their misuse can kill desirable plants or make the soil unproductive. The best guide to the use of combination materials is this: Apply them only on the recommendation of your State agricultural experiment station.

*Trace Elements.*—Trace elements — more properly, micronutrients—are essential to the growth of plants but are needed only in very small amounts. Known micronutrients are iron, manganese, zinc, copper, molybdenum, boron, and chlorine. There may be others.

Do not apply trace elements routinely. Plants need tiny amounts of these elements, but an over-abundance of them may be toxic to plants. Apply trace elements only if they are recommended by your county agricultural agent or your State agricultural experiment station.

*Insecticides and Weed Killers.*—Fertilizer-insecticide combinations and fertilizer-weed killer combinations generally are designed for use on lawns. These combinations may be satisfactory to use if—

- The season for applying fertilizer and the season for applying the pesticide are the same.
- The nutrient content and the pesticide concentration of the combination are adjusted so that each component is applied at the proper rate.

Usually, fertilizers and pesticides are best applied separately.

**Package Size**

As with other products, fertilizers cost more per pound in small packages than they do in large packages. Packaging costs account for much of the expense of fertilizer merchandizing.

Paying the higher rate for small packages or fertilizer may be justified if you need only a small amount, if the ease of handling smaller packages is sufficiently advantageous, or if storage of large packages is a problem.

For greatest economy, determine the total amount of each kind of fertilizer that you need for one season, then buy this amount in the largest available packages.

**ATHLETIC FIELDS** (*Continued from Page 20*)

simplest procedures for eliminating these grass invaders is to weed them out by not watering.

**MOWING.** Close mowing on an athletic field is seldom needed. Even on lawns it's a mistaken belief that close

mowing contributes to attractiveness. The evenness of the cut, not the height, governs appearance. Athletic fields in the North should be mowed two inches tall, or even three inches in the more southerly portion of the bluegrass zone.

Greater leafage enhances energy reserves, results in deeper rooting, and the denser foliage lessens weed invasion.

**WEEDING AND PEST CONTROL.** Almost miraculous elimination of most broadleaf weeds is possible through the 2,4-D family of chemicals. A mixture of 2,4-D with 2,4,5-TP (Silvex) takes care of most, including clover. Very light rates suffice, around 2 pounds active ingredient per acre. Since formulations differ, follow exactly the instructions accompanying any product used.

Grass weeds are more difficult. Since their coarseness is less a problem on athletic fields than lawns, mostly they can be left to be outgrown by better grasses. If crabgrass and goosegrass are a special problem, these annuals can be killed with arsonate materials (DSMA, AMA). These, as well as some of the pernicious knotweeds and spurge (hard to kill with 2,4-D), show up chiefly where soils have become hard and compact.

Spiking or aerification of the compacted spots, along with generous fertilizations at appropriate season, may help hold the turfgrass. Some athletic grounds are routinely aerified (the punching of holes with powered equipment). This should be necessary only on compacted soils of poor structure.

**FERTILIZATION.** The time at which fertilizer is applied can have great influence. For bluegrass turfs, the main season for feeding would be autumn. This builds strength into the turf at a favored season and carries over into the following year. Fertilizer applied after the soil has cooled will be held, even though there's no very obvious grass response that late.

In the more northerly reaches of the bluegrass zone, fertilization is appropriate the year round. In middle latitudes, however, be careful about "soft" grass in hot weather, the result of a little too much nitrogen. Soft grass risks dying at the same time that summer weeds are encouraged by the extra fertility.

Total fertilizer needs during a year vary with the climate, soil, and grass. Three pounds of actual nitrogen (that is, 30 pounds of a fertilizer containing 10% nitrogen, such as a 10-6-4) is about minimum; and for heavy feeders (as bermuda varieties) in favorable climates as much as 6 or 8 pounds is suggested.

Fertilizer for turf should be high in nitrogen (the first figure of the analysis), this exceeding the phosphorus and potassium (the second and third figures) at least twice over. Where you know there's sufficient phosphorus and potassium in the soil, straight nitrogen—such as the ureaforms, urea, ammonium nitrate—can be used from time to time in place of complete fertilizer.

**OVERSEEDING.** The seasonal sowing of temporary grasses has been mentioned. It's also good insurance to bolster seed with the permanent grasses periodically, so that potential new plants are ever ready to fill voids.

A pound or two of bluegrass or bermuda mixtures per 1000 sq. ft., each autumn in the North, can be scattered and let "grind in" under normal play on the field.



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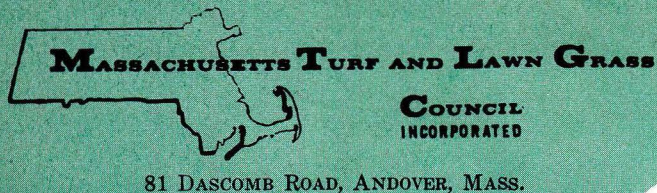
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## TURF BULLETIN

# TROLLING

Life among the robins takes on a leisurely quality. Those bright-breasted birds on the lawn have a quiet, unhurried manner, take frequent breaks for singing, and the songs fall gently on the languid air. Robins have different songs for different occasions, songs for evening, songs that precede a rain, and songs that follow a rain. They also have a small song they sing to themselves from within the green solitude of the old maple, a song so soft as to be nearly lost in the leafiness, but that also reaches the brief distance from the maple to the kitchen, there to be approved and appreciated. The robins are unafraid, and they take only as many running steps as are necessary to keep out of the way, and follow the lawn mower closely, gathering food. It is like passing the time of day with a friend to have a robin look up from whatever occupied his attention and acknowledge your presence with a clear chirp.

—Reporter, Diagonal, Iowa

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## NEW WAYS TO FERTILIZE TREES

Sprinkle an ounce of fertilizer, say 10-5-10, in the hole when you set out a tree or shrub and likely as not, you'll kill it. The salts in the fertilizer dehydrate the tender roots.

But there's no salt injury if you put the same ounce of fertilizer in an airtight plastic packet, then punch two or three pinholes in the packet and place it about 6" deep and 12" to the side of the tree or shrub. The packet becomes a "self-feeder." It gets the tree off to a quick start and keeps it well-fed for perhaps as long as five seasons.

University of Wisconsin scientists, who thought up the idea, say the packets work the way they do because what little air there is in the soil is always near—or right at—100% humidity. As each drop of the fertilizer-water mixture spills out, the moisture in the soil dilutes it to the strength that plants like.

"We see no reason why we can't develop a packet that will keep a tree or shrub well-fed for several years," says O. J. Attoe, who heads the team of Wisconsin scientists.

## PRINCIPAL LAKES OF U. S. DESCRIBED

A "WHO'S WHO" for all principal lakes of the United States of 10 square miles or more is now available to the public from the Department of the Interior.

They are listed in a 22-page Geological Survey publication and are described in non-technical language by Conrad D. Bue of Survey's Water Resources Division. A selected bibliography is provided.

The circular describes about 250 principal United States fresh-water lakes, located in 23 states. Nearly 100 are in Alaska. Another 100 are scattered throughout Minnesota, Wisconsin, Michigan, New York, and Maine.

The author, a hydraulic engineer, also tabulates the largest artificial reservoirs of 10 square miles or more (39) in each state. Largest is Garrison in North Dakota, with a surface area of 610 square miles, although Lake Mead, on the Colorado river in Arizona-Nevada, can store half again as much water as Garrison because of its great depth.

"Although the amount of water stored in natural lakes—even exclusive of the Great Lakes—is much greater than the amount stored in artificial reservoirs, their economic value, stemming from power, irrigation, flood control, navigation, and recreation, is surpassed by that of artificial reservoirs," Bue said.

Exclusive of the Great Lakes, 34 fresh-water lakes are known to have maximum depths of 250 feet or more. Twenty are in Alaska. Oregon's Crater Lake is the deepest (1,832 feet), and Minnesota's Lake of the Woods has the largest surface area (1,485 square miles), the report shows.

The Great Lakes are tabulated separately because of their size and described in effect as "inland seas." Lake Superior, largest and deepest, has a maximum depth of 1,302 feet and a surface area of 31,820 square miles.

The report also covers United States saline lakes, listing 27 principal salt lakes, most of them in the Great Basin area.

Largest is Great Salt Lake in Utah, saltier than the ocean, a "remnant" of ancient Lake Bonneville, which at its highest level covered an area of about 20,000 square miles. Present area of Great Salt Lake is about 1,000 square miles.

Geological Survey Circular No. 476, "Principal Lakes of the United States," may be obtained free from the Geological Survey, Department of the Interior, Washington 25, D.C.