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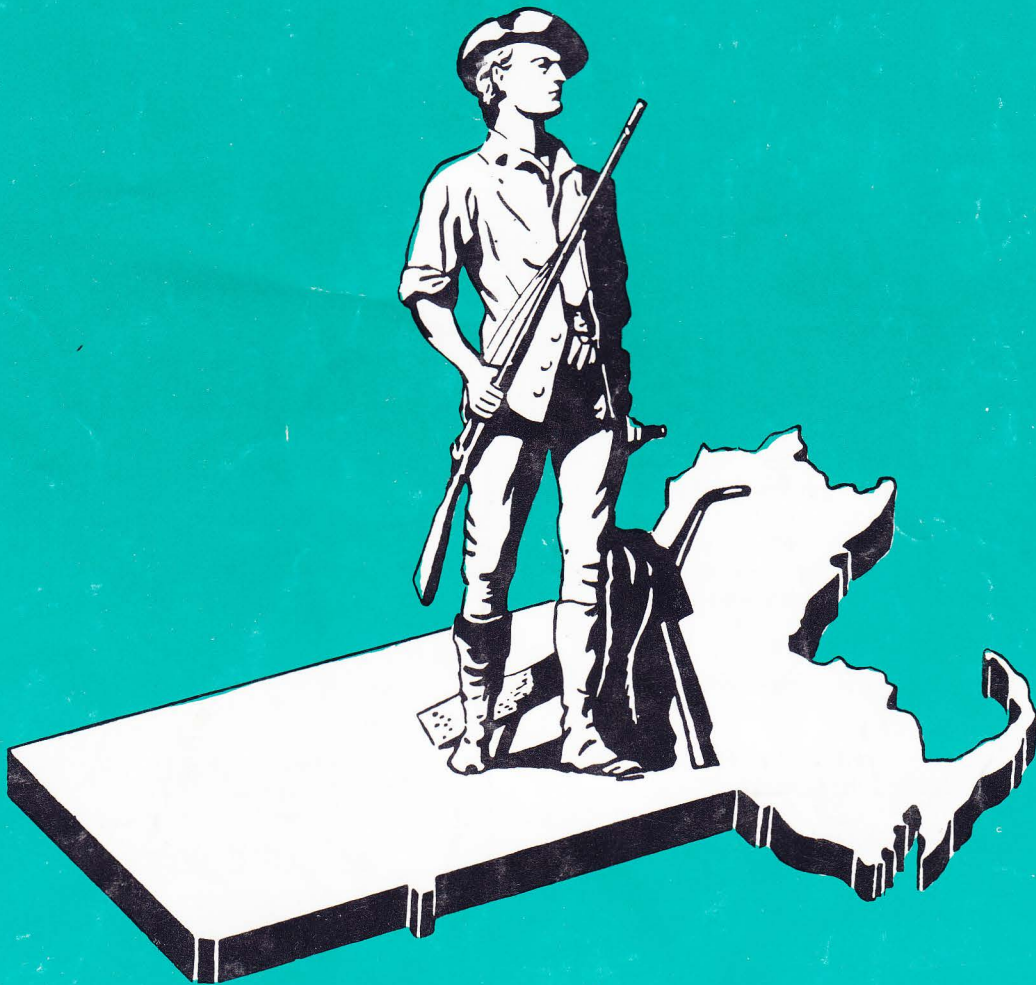
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Evangel Bredakis, John Zak, Robert W. Schery, Geoffrey S. Cornish, William G. Robinson, and D. A. Williams

#2 May 15, 1966

TURF BULLETIN

MASSACHUSETTS TURF
AND LAWN GRASS COUNCIL
I N C O R P O R A T E D



SPRING 1966

BETTER TURF THROUGH RESEARCH AND EDUCATION

Editor

Joseph A. Keohane, UMass

Secretary-Treasurer & Advisor

Dr. Joseph Troll, UMass

RFD #2, Hadley, Mass.

TURF BULLETIN

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More detailed information on the subjects discussed here can often be found in bulletins and circulars or may be had through correspondence.

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Massachusetts Pesticide Review

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"There should be no right to pollute."

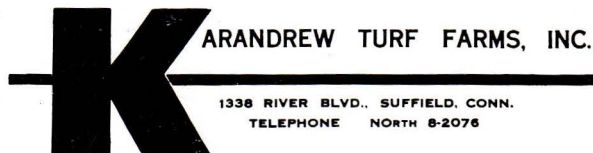
"Unnecessary use of pesticides should be avoided whenever possible. Pesticide use is necessary under many circumstances, but is almost invariably accompanied by undesirable side effects, and often by hazards."

This report of over 300 pages is available from Superintendent of Documents, Government Printing Office, Washington, D. C. 20402. Price \$1.25.

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(Continued on Page 20)



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Turf Along Massachusetts Highways

by

EVANGEL BREDAKIS AND JOHN ZAK
 Department of Plant and Soil Science
 University of Massachusetts



Parkway highways are the new look of the Interstate System — beautiful as well as useful. Lawngrasses such as the Kentucky bluegrasses and red fescues fill a new role along roadsides because of low growth and fine texture.

INTRODUCTION:

A comprehensive study was made by University of Massachusetts research workers in order to develop uniform recommendations for the establishment of turf on roadside areas in the Commonwealth of Massachusetts.

Recommendations are based on the results of exhaustive on-the-site evaluations.

Site selection will have been predetermined by existing or proposed highway routes present in the state, and in most instances, will be beyond the control or scope of the turf planner. Therefore, the areas to be turfed will, by necessity, have contours, shoulders, slopes, drainage ditches or whatever is already in place. In most cases, it is probable that no grading changes can be made.

SEEDING:

Mother nature has already invented the most opportune time for seeding and seed germination, i.e., late summer or early fall. However, given the proper environment, moisture and food resources, seedings can be made successfully at other times. Ordinarily, seeds will germinate best during the period from August 20 to October 1 in the cool Northeast region; while the second best time for seeding is early spring — approximately from the last thawing period up to about May 15.

Usually, the late summer seedings have been found to be most successful, because the necessary vigor and environment are present, thus insuring rapid germination. Once a thick stand of turf has been established, the desirable grasses will tend to crowd out or hamper the development of weeds or other undesirable grasses. Timing of planting is,

therefore, of the utmost importance as borne out by the experiments.

Under abnormal conditions (either as the result of emergency conditions or the completion of roadside areas during times other than late summer or early spring), the use of mulches would then be necessary in order to protect the seed from desiccation or washout. Mulching, however, is not always successful in producing good results because of extreme weather conditions. For example, if mulching were done and the precipitation was below average for that part of the season, then it is likely that only small percentages of germination would take place.

SEED MIXTURES:

1. For Grass Plots.

Species	% by Wt. of Mixture	% Purity	% Germination
Red Fescue	65	98	85
Kentucky Bluegrass	30	85	80
Domestic Ryegrass	5	98	90

2. For Slopes and Shoulders.

Species	% by Wt. of Mixture	% Purity	% Germination
K-31 Tall Fescue	40	98	85
Red Fescue	44	98	85
Domestic Ryegrass	10	98	90
Red Top	5	92	90
White Clover or Ladino	1	98	85

RATE:

The rate should be 70 to 100 lbs. depending on soil type, slope exposure and time of seeding. Heavier rates should be used for Type III soils, southern slopes and summer seeding.

(Continued on Next Page)

HIGHWAY (Continued)**SOIL PREPARATION:**

Soils are classified as:

- (a) Type I, heavy soils which contain a high percentage of clay.
- (b) Type II, medium soils, which contain an average percentage of clay.
- (c) Type III, light soils, which contain only 5% to 10% clay.

Normally, Type II and Type III are found in this state. However, intermediate types may be found, such as light, but gravelly, or heavy with a slightly medium texture. In order to stay within normal limits, only the aforementioned types will be considered with sufficient discrepancy for overlapping.

All soils should be made friable and receptive to seeding by means of thorough disking, raking and levelling. The soil must not contain large boulders or other debris that might hamper future growth or maintenance of the turf area. Wherever possible, the use of Type I soils for seedbed should be discouraged, and only Type II or Type III recommended with Type III as the most preferable.

USE OF LIME AND FERTILIZER:

A soil analysis is a prerequisite for judging the nutrient requirements necessary for a healthy turf. The results of the analysis will serve as a guide for the amounts of lime and fertilizer that may have to be applied. Equally important, in the cool season areas of the Northeast, is the fundamental requirement for super-phosphate applications to the seedbed prior to liming, fertilizing or seeding. Normally, 100 to 150 lbs. of P_2O_5 per acre are necessary. Since super-phosphate is essential to the development of a good root system and moves into the root system at a very slow rate, it is recommended, therefore, that this fertilizer be added in the initial stage of soil preparation. The phosphate should be mixed into the area that lies two to four inches below the surface. Phosphate is needed in our acid soils and, added in this way, will act as a reservoir supply.

Enough lime should be worked into the soil to raise the pH level to about 6.5. The lime must be worked into the upper two inches of the soil for proper distribution. Preferably, about two tons of dolomitic limestone per acre will raise the pH on Type II soils about one point on the pH scale. Type III soils will require much lighter applications, while Type I soils will require heavier rates.

A complete fertilizer containing Nitrogen, Phosphorus, and Potassium should be used at the rate of 50 lbs. of each per acre. This application is equivalent to over 400 lbs. of 12-12-12 analysis fertilizer per acre. Our research work has shown that the sources of Nitrogen should be in the form of equal portions of an organic and inorganic source.

The fertilizer can be applied either at the time of seeding or just before the actual sowing. Lime and phosphate, previously added, should be done one to two weeks prior to adding the fertilizer or seeds.

SEEDING METHOD:

When practical, all seeding distribution should be made first in one direction with one-half the required rate. Then use the remaining one-half portion to be distributed at right angles to the first sowing.

- a. The cultipacker method of seeding is the most practical and least expensive for large areas. Seed and fertilizer can be placed on turf in one operation.



Evangel Bredakis, one of the authors, checking on his field trial plots.

- b. The hydraulic system is a method where the seed and fertilizer are applied in the form of a slurry. Where no mulch is applied with this operation, the seeds must be firmed and covered by use of a chain harrow, drag harrow, or brush drag. Oftentimes, a section of wire mesh fencing dragged by a light tractor will suffice. If mulch is applied, then no dragging or firming is necessary.

It should be noted that our trials have shown that the cultipacker method has produced superior percentages of germination over the hydraulic method.

COMPACTION:

To avoid compaction of seedbed areas or areas being prepared for seeding, heavy equipment must not be allowed on the area.

MULCHING:

In case of adverse weather conditions, or because of the angle of slope, it will be necessary to cover newly-seeded areas with a mulch. Natural or synthetic mulches may be used. When hay is used, a type that is free from noxious weeds or objectionable material is recommended at 2 to 3 tons per acre. Prior to distribution, the hay should be chopped, which will make for ease of distribution, give better coverage, and prevent winds from removing large quantities. In the case of wood chips, the mulch coverage should be approximately to a depth of a one-half inch.

MAINTENANCE:

For areas that will have normal maintenance, the turf should be cut as soon as the blades have grown to a height that can be trimmed by machinery. This operation should be repeated as often as is necessary to insure deep-rooted and vigorous plants. For other areas such as slopes, shoulders or where normal maintenance is impractical or not desirable, the grass should be allowed its natural habits of growth with only one or two cuttings per year. The latter practice may help reduce roadside fire hazards. However, where climax vegetation is desired, the areas should not be mowed.

Once germination has taken place and the plants appear to have taken hold, an application of Nitrogen for maintained areas is necessary. Nitrogen, at the rate of 50 lbs. per acre, should be applied in early spring, and the late summer of the following year.

Good Seed Makes Good Sod

by

DR. ROBERT W. SCHERY, *Director*
The Lawn Institute



“Growing pains” currently beset the sod industry in many parts of the country. These relate more to business practicalities than to technical know-how, but nonetheless sod quality is highly erratic.* Fortunately, the makings of high-quality sod are at hand, in the high-quality domestic lawn seed now available. Particularly important are the select bluegrasses, of which Merion is one of the more popular sod varieties. Often Merion is blended with other bluegrasses, and bluegrasses with fine fescues such as Pennlawn, Chewings and Illahee. Some bentgrass is seeded for sod, but for golf greens vegetative planting from stolons is not unusual, and is the standard means of sod propagation in the South (as with select bermudas, zoysias, St. Augustine).

Those contemplating entering the sod business will do well to read the thorough-going resume of professional sod growing in the winter issue of *The Farm Quarterly* (1). It becomes apparent that a happy combination of interest, technical skill, capital resources, business sense, and marketing know-how are essential for those who will be permanently a part of this rising new industry. How far the industry will progress depends upon many factors, not the least of which is national economic affluence (sodding, as contrasted to home seeding, is a luxury of considerably more cost). But quality, too, must match that attainable so easily by home seeding. Perhaps 10% of the new lawns are sodded today, but of that 10% probably less than half with cultivated sod (i.e. sod horticulturally grown for lawns).

* In time demands of the market place will cause shake-out of itinerant, less responsible producers. Meanwhile, sod buyers should be made more alert to quality features and advantages. Some states, notably Florida and New Jersey, now certify sod. A consumer unsure of his source, can ask for this attestation of quality.

Contributing to current chaos is the offering of old pasture sod in many areas. Pasture sod for home lawns is nothing new. In fact, until recent years this was nearly 100% of the business in the North. Anyone with a truck and a sod-lifting machine could become a sodsman, by offering farmers at the outskirts of metropolitan areas relatively few dollars per acre for the privilege of lifting the pasture. To be sure, some of the more responsible operators contract for fields months ahead, spray them for weeds and keep the bluegrass mowed consistently lawn-like. Even so, it is no wonder that “bargain” sod offered at roadside stands, and for contract mass sodding of speculative housing, shows up full of coarse grasses, weed seeds, even insect and disease pests. Such sod is sure to be a long-range source of frustration. Much better that the homeowner sow his lawn with the reliably clean seed available at every garden store these days.

Economics make the poor-sod situation hard to counter. A new house seems to need an “instant lawn” for fast turnover. Until buyers demand a quality lawn (and are willing to pay a bit more it), there is no incentive for the speculative builder to abandon bargain sod. Further complicating the situation, FHA loan requirements for “established cover” — even if weedy sod — are an invitation to inexpensive sodding at a stage when few buyers are likely to worry much about sod quality, with so many more important closing arrangements to be tended.

Economic realities also tend to keep sod growing quite localized; hauling so heavy a horticultural product as sod is seldom feasible for any great distance. Sod farms spring up around the periphery of large metropolitan areas, and while insulated from distant competition, are by the same token provincial in their marketing customs and standards. In some markets consumers are quite willing, even anxious,
(Continued on Page 7)

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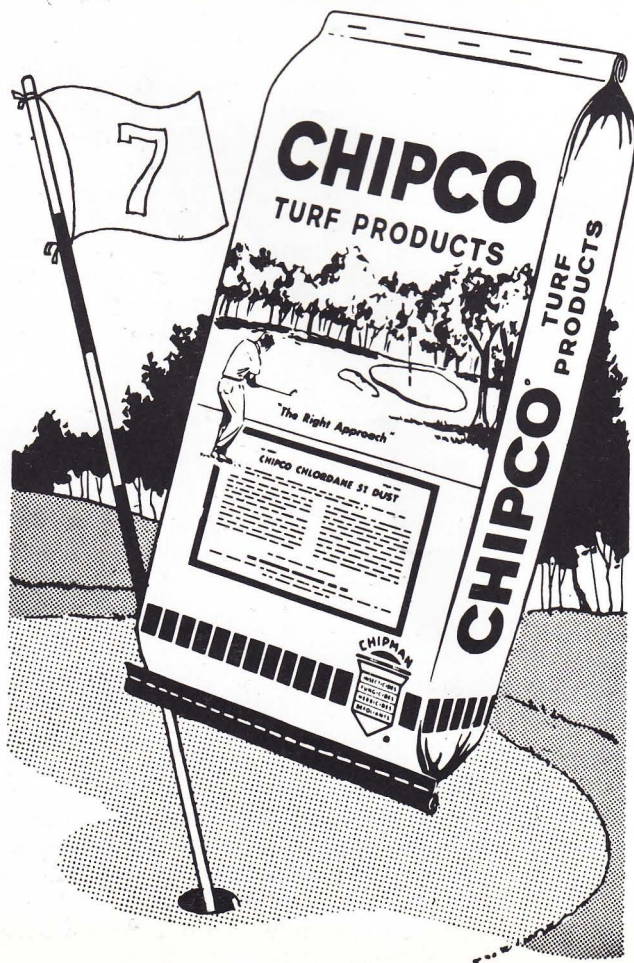
"PM-2, 4-D" — Weed control including Silver-crab.

"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)



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GOOD SEED (Continued)

to pay a fair price for quality product. A hundred miles away it may be difficult for a careful grower to find a market among homeowners accustomed to pasture sod prices.

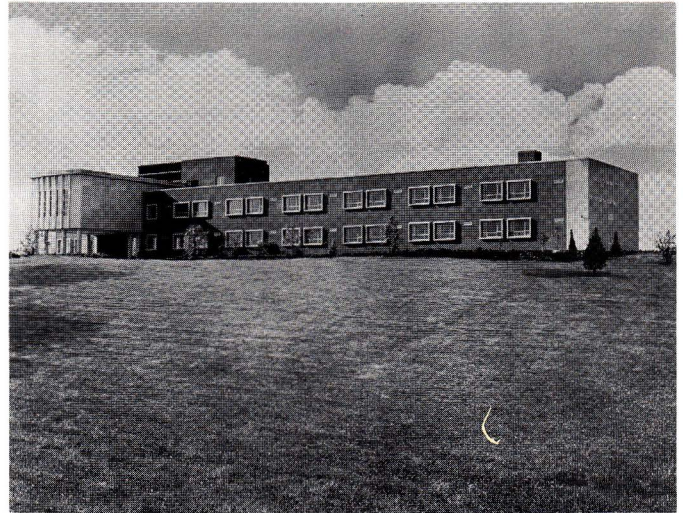
Most consumers know little about turfgrasses, or have any inkling about subtle features of sod. Coarse weeds or patches of grass with contrasting texture would be noted, but not weed seed, insect pests or deviations in botanical composition, etc. While the speculative housing market will probably always lean towards inexpensive sod of dubious quality, certainly the landscape trade, the established homeowner, and the man contracting for building his own home will want a better product. Reputable landscaping firms should be in a position to recommend sources of quality sod, and are a good place for the sod industry to begin its educational efforts.

From the purchaser's standpoint, the sod should be of the variety or blend of grasses specified. Over much of the Northeast, the Merion variety of Kentucky bluegrass has become the glamour sod, even in areas where it may not be so well adapted as other bluegrasses, or where the homeowner is in no position to give the attention that Merion requires (such as extra fertility, occasional thatch removal, and so on). For the average lawn which cannot receive the attention that Merion requires, a blend of good bluegrasses, perhaps with some fine fescue, might be suggested instead.

Reports indicate that bluegrass grown on mineral soil "takes" more readily than sod grown on muck soil (which growers prefer, because of lighter shipping weight and easier sod establishment). This is not a critical factor, but does have some bearing on performance. For one thing, bringing in even a thin layer of muck to lay atop a newly cultivated mineral soil is like starting the new lawn out with a modicum of thatch. It is generally recognized, too, that thin ($\frac{3}{4}$ inch) sod will root more quickly in its new habitat than thicker sod, but that it must be tended to prevent drying out.

Sod is a perishable product, and should not be stored for great lengths of time, especially in warm weather. Take a critical look at rolled sod left in a storage area, or unwatered on the garden store display lot. Responsible growers prefer that no more than 24 hours elapse between lifting and laying of sod if at all possible. Many harvest sod late in the day, haul it to the planting site early the following morning. Fortunately, Kentucky bluegrass is very recuperative; even if there is some damage during marketing, recovery from the crowns and rhizomes occurs when the sod is planted and properly cared for. Soil preparation for the laying of sod should be no less assiduous than for seeding a lawn, involving suitable grade and drainage, soil cultivation, fertilizing and liming as needed.

It goes almost without saying that good sod should be free of serious weed infestation — either of live weeds or seed carried in the sod. Be especially concerned with coarse perennial grasses, for which there is no satisfactory selective control by herbicides. Good sod should also be without disease. Cultivated sod almost always is, for disease seldom attacks young grass; most cultivated sod is marketed within 18 months from seeding. Nor is young sod likely to have accumulated thatch. Sod from reliable sources will not carry grubs, nematodes or other hidden hazards.



Progressive businesses realize the morale and public relations value of spruced up surroundings.

The "perfect" sod would be that grown on sterilized soil, from absolutely clean seed. In some cases the sod grower does sterilize the soil. But this adds to the cost, and is not widely practiced. Ordinarily, it is sufficient to have cultivated the soil (with interim fallows) to reduce weed possibilities (1). Highest quality seed is sowed, up to 100 lbs. per acre (depending upon density required). For quick turnover, heavier seeding rates more than justify their cost, even though light seedings eventually fill to a good sod. Most bluegrass sod must be considered a two-year crop so far as field time is concerned, and thus per acre profit halved to accurately compare it with other crops such as corn or beans which might be grown on the same land.

First-class, level farm land is preferred for sod growing, in some close-in locations worth \$1000 or more per acre. Operations are increasingly with labor-saving equipment, ever more expensive and complex. Irrigation is essential for good sprouting and rapid maturation, in itself a capital investment of about \$500 per acre. Frequent and ample fertilization to match the soil must be undertaken. Unless all steps in growing are carefully carried out, there will be added expense (and perhaps imperfect product) when it comes to lifting of the sod.

Thus it may seem surprising that it costs as much to cut, load and haul the sod as it does to grow it. Automated devices for lifting sod are currently under development and test, but much hand labor is still involved. Palletized moving of sod with fork lifts or straddling trailers has already been adopted by the bigger, more automated operations. Here, too, no little capitalization is needed; an 18 inch sod-cutting machine is of itself a \$1300 investment. Cultivated sod of good quality just cannot be delivered, even in large wholesale lots, for the 25¢ per yard at which some old field sod is offered.

With so many cost considerations involved in producing and marketing sod, a dollar or two more for an "acre's worth" of exceptionally good seed is certainly inconsequential. In fact, the more expensive seed will likely make up its difference in cost many times over, by reducing other production costs and hazards. It just doesn't make sense to plant anything but top quality seed. What then are the criteria in selecting seed for quality sod? Not all factors

(Continued on Page 8)

GOOD SEED (Continued)

are equally important, and some may be of no consequence at all.

First of all, the grower (and consumer) will want assurance that the grass is of the genetic identity claimed. If Park Kentucky bluegrass is specified, Newport or something else should not turn up instead. For varieties which are certifiable, certification is one means of checking. Other seed, such as common or natural Kentucky bluegrass from the Midwest, is not certifiable, though it can be of equally high quality. Certification is basically an attestation by state authorities that the seed is truly of the identity claimed. Beyond that the purchaser must buy from reliable source to be certain that other quality considerations are met.

Foremost among these would be avoidance of competing and discordant species in the purchased seed. Thus seed purchased for sod (or for direct sowing to lawns, for that matter) should contain no weeds which might become a pest in the turf. It should also have little or no "crop" — certainly none of those crop species which might become a nuisance. Weeds are specified by state law, and the official ones may or may not be important in turf (many of them are agricultural pests only). A few bedstraw or dodder seeds in mowed sod would be of no consequence, for example, but a few quackgrass seed very well might imperil the whole field! Good lawn seed seldom contains troublesome weeds (2), and never that blackguard, crabgrass. Crop is the designation given other contaminating seed that is not officially a weed. Some kinds of crop, too, are of little consequence — such as a bit of Canada bluegrass in Kentucky bluegrass, or a little Kentucky bluegrass in Merion Kentucky bluegrass. But other crop can be serious — things like timothy, orchardgrass or tall fescue in bluegrass or fine fescue. These perennial grasses cannot be eliminated selectively with herbicides once introduced in the new sod. Unless crop content is spelled out, and proves to be of harmless types, the sod grower is well advised to willingly pay premium prices for crop-free seed.

Beyond the assurance of genetic quality and freedom from weed or crop contamination, other standards are not too important. These factors can be considered from a dollar-and-cents viewpoint. A few percentage points difference in "purity" (percent of good seed in total weight) is of little concern, but lower purity should be compensated for by lower cost. The remaining percentage not accounted for by purity should, of course, be inert (such as chaff, dust, etc.), not crop or weeds. In other words, there is no real reason to insist upon "99% pure" seed, say, if the same seed is more readily available at a favorable price with only 95 or even 90% purity (again, provided the remainder is inert, not live seeds). Germination, another standard for seed sale, can be looked at much the same way. Insistence on unrealistically high germination percentages is seldom worth the added cost. There will be rather little difference in field performance between two lots of seed germinating respective 92% and 87%. If the latter is of equal quality otherwise, and is discounted more than 5%, it may be the better buy!

It would take much more space than is available here to review the sod industry fully. The references already cited, plus the "Sod Producers Special" issue of Golf Course Reporter (3), should give a pretty good overall view. I have particularly not dwelt on

cultural technique, feeling that these are familiar to TURF BULLETIN subscribers, and in any event not much different than for establishing and maintaining lawns.

- (1) Straub, Chas. "Sod Is For The Pro's." *The Farm Quarterly*, 20, No. 4: 62-ff. Winter, 1956-66 (Cincinnati).
- (2) Schery, Robt. W. "Lawn Seed And Lawn Weeds." *Seed World*, 97, No. 9: 6-off. December 10, 1965.
- (3) Several presentations in *The Golf Course Reporter*, 33, No. 2. February 1965 (issue largely devoted to the sod industry).

CRABGRASS CONTROL

ELWYN E. DEAL, *Extension Turf Specialist*

Did you ever wonder why the chemical you used for pre-emergence control of crabgrass worked some years and not in others? Consider these factors in trying to explain it: time of application, accuracy of application (rate and distribution), rainfall immediately after application, spring and summer rainfall, and traffic on the treated area.

We will assume that the chemical was applied properly before the crabgrass germinated in the spring. Most of them have little or no effect on seedlings — they **must** be on before the seed starts to germinate. But, as careful as you may have been, the battle against crabgrass is only partially finished. Quite often, it is events that follow the application which determine how effective the treatment is. Consider now the factors that were listed previously.

Rainfall or irrigation immediately after application is usually not as important with granular formulations as with sprays (liquids and wettable powders). Information as to the importance of formulation varies from different sections of the country. Some say formulation is not important. However, there is some evidence from several states along the Eastern Seaboard that granular materials are more dependable.

It is extremely important that **all** of the chemical reaches the area where the crabgrass seeds are located. Granules are more likely to fall through the foliage to the soil surface than sprays unless large amounts of water are used at the time of or soon after the application. If part of the chemical is deactivated by light, high temperatures or other such factors before it reaches the soil, you may end up with only half or two-thirds as much active chemical as was applied originally. In such a case, of course, the results would not be satisfactory.

Spray applications have certain advantages, especially for large areas such as golf course fairways, large parks and sod fields. Wettable powders and emulsifiable concentrates are usually much less expensive than granules per pound of active ingredient. With some of the spray rigs now available to cover widths of 10 to 40 feet, large acreages can be sprayed in short periods of time. Granular formulations are probably better for small areas such as lawns because of ease of application.

If you plan to use spray applications of pre-emergence crabgrass control chemicals, it is good insurance to water the chemical in soon after it is applied unless you have a good rain. Watering in is especially important with such chemicals as bensulide or R-4461 (Betasan or Pre-San-TM) and siduron (Tupersan-TM) which are more light sensitive than certain others. And, of course, it never hurts to water in the granular materials, although it is not as important with these as with sprays.

Renovation And Rebuilding

by

GEOFFREY S. CORNISH AND WILLIAM G. ROBINSON
Golf Course Architects*

The Eastern Director of the U.S.G.A. Green Section, A. M. Radko in "Renovation vs. Rebuilding" published in U.S.G.A. Journal and Turf Management, April 1959, defines his title words as follows:

Renovation "means renewing or improving the turf surfaces, implied is the fact that we must correct existing deficiencies, change over turfgrass surface and then set up the required program of maintenance and management to insure that the turf-grasses will do what is expected of them."

Rebuilding — "we mean changing the design of some part of the golf course through construction."

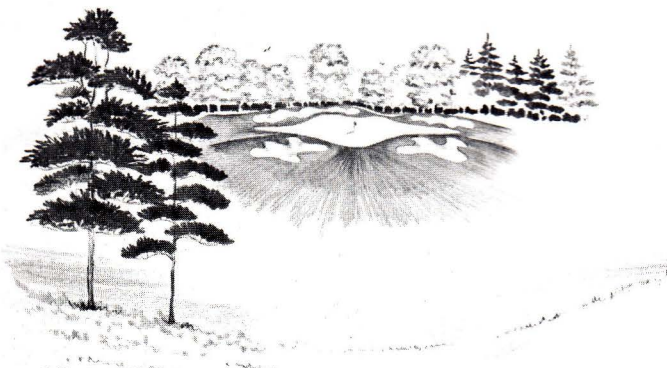
In line with Mr. Radko's definition our observations are that the problems making renovation necessary are agronomic, while those forcing rebuilding are both agronomic and design in nature.

Redesign is required when it is desired to —

- (a) Heighten playing interest
- (b) Increase eye appeal
- (c) Remove or modify features costly or impossible to maintain
- (d) Increase safety

Many old established clubs throughout the Nation are engaged in or are contemplating re-design to be followed by rebuilding. Factors most often considered are:

1. **LENGTH:** It is true that many short hitters and high handicap golfers get more pleasure from a round on a short rather than a long course.



The new 5th green at Meadowbrook Country Club, Reading, Massachusetts. Superintendent Bert Clark is rebuilding one or two holes each year. By 1970 Meadowbrook will be an entirely new course.



The new 7th green and pond at Avon Country Club, Avon, Connecticut. Superintendent Joe Bidwell is far advanced on his club's program of rebuilding Avon.

But we find they receive far more pride and satisfaction from their rounds if the course also possesses "championship" qualities such as length, even though they do not use it. A *regulation* course should be built for all types of golfers. We find it is a tragic error to build it for one type of player only. Many established clubs are rebuilding to make their courses true tests for the low handicap man and yet not be too difficult for the high.

2. **BALANCED LENGTH:** Occasionally a regulation course calls for the use of fewer clubs than a well designed par 3. This is because there is not sufficient variation in lengths of par 3's, 4's and 5's. For example, with all short par 4's the course can be largely mastered by a low handicap golfer with the driver and short irons.

3. **HAZARDS:** Today these are placed strategically in contrast to "penal" placement. Again the objective is to keep the course relatively easy for the high handicap man who is willing to use longer but safer routes, and at the same time award the low handicap man who takes chances and succeeds. At one time the objective was to punish every bad shot.

4. **GREENS:** In the Northeast the average area of new putting surfaces appears to be levelling off at 7,000 to 10,000 square feet. This is larger than the postage stamps of older layouts, but smaller than the monsters built in the late 1950's and early 1960's.

5. **TEES:** Tend to be large and long to permit flexibility in placement of tee markers.

6. **PONDS:** Ponds are being constructed on many courses to heighten playing interest, to add beauty and to function as reservoirs.

(Continued on Page 10)

7. **TREES:** Clubs are finding tree planting programs to be most worthwhile.

8. **SIDEHILL LIES, STEEP CLIMBS, STEEP BANKS AND MOUNDS** are being removed.

9. **PRACTICE AREAS:** More adequate practice areas are being added at many clubs.

10. Modifications for electric cars are frequently required.

RENOVATION

Several factors to be considered in both renovation and rebuilding are:

1. Outside New England the trend is to bentgrass tees mowed with putting greensmowers. In New England, Merion tees are still popular but must be kept thinned to provide the teeing surface the golfer wants.

2. Bentgrass fairways cut close are more popular with the golfer than Merion fairways, although the latter are far more impressive in appearance and more trouble free.

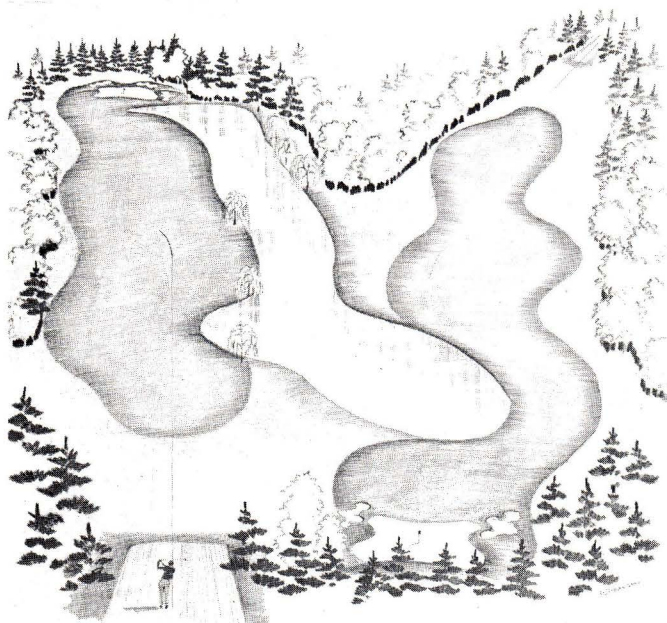
3. At many Mid West clubs the approaches as well as collars are mowed with putting greensmowers.

4. Because of the prolonged drought we are apt to overlook tile drainage for fairways. In recent years miles of tile in New England have been useless. But this is surely not a permanent condition.

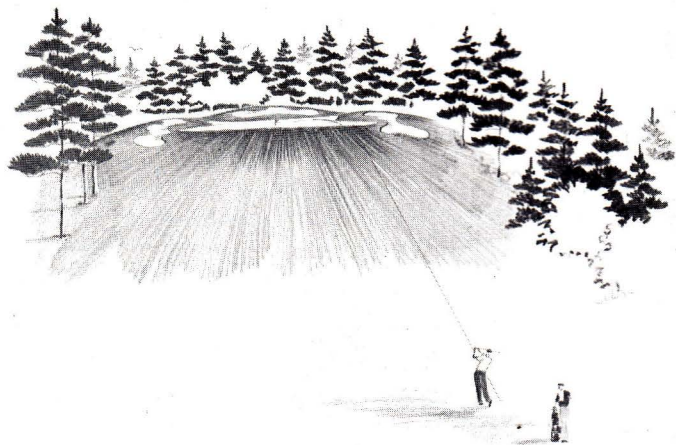
5. A blessing of the drought is that everyone is turning to fairway irrigation. Fairway irrigation can be compared to air conditioning in public buildings. The public expects air conditioning while golfers expect fairway irrigation.

MASTER PLANS

Clubs are preparing master plans showing all future major changes that require rebuilding. Renovation is generally not included in the master plan.



The new 15th and 16th holes recently opened for play at Weston Country Club. These were built under direction of Superintendent Phil Cassidy.



The new 8th green at Woodland Country Club. Superintendent Norman Mucciarone has almost completely rebuilt Woodland on a long range program starting in 1959.

Several points relative to master plans are as follows:

1. Once the plan is completed, the work itself is passed over several years and executed under direction of the course superintendent.

2. Many clubs enter the completed plan in their bylaws and no future major rebuilding changes are allowed except in accordance with it.

3. Preparation of the master plan involves the chairman and his committee together with professional and superintendent.

4. The role of the golf course architect is to sift ideas brought out by these men, bring in fresh ideas and finally to produce the plan.

5. The master plan should include finished plans, working drawings and specifications together with tree planting program.

6. Sketches of the new features and a colored rendering of the proposed new course are also important to keep the general membership informed.

7. Discussion in all phases of planning produces the inspired master plan.

Superintendents in New England, perhaps more than elsewhere, have been active in rebuilding their established courses as well as in building new layouts. Accompanying sketches show reconstructed features at four clubs where the superintendents have been in charge of rebuilding programs which will eventually result in entirely new courses.

* Golf projects by Geoffrey S. Cornish and William G. Robinson, Golf Architects of Amherst, Massachusetts, are at present under construction in all the New England States, New York, New Jersey, Pennsylvania, Ohio, West Virginia and British Columbia.

Grass In Soil And Water Conservation

by D. A. WILLIAMS, Administrator
Soil Conservation Service

As far back as records go into civilization's dawn, grass has been a solid base for agriculture. Through the centuries it has provided most of the forage for livestock feed and cereals for man's own food.

In the United States in the past generation grass has gained new eminence as a tool in soil and water conservation. Today it occupies a dual role of production and protection in American agriculture.

The withering drought and the financial depression of the 1930's triggered an agricultural revolution that brought forth a new national program to halt soil erosion and protect renewable natural resources. With it new grassland science emerged, and new grasses and legumes for forage grow on nearly half the land area of the United States. A return of about 17 billion dollars annually comes from the livestock and poultry that eat grasses, grains, hay, and silage.

On the farms of America before 1930, grass was often looked upon as a resource of minor value. In the South and in the Great Plains, farmers grew mostly clean-tilled row crops and small grains. In most of the country, improved pastures occupied a position of minor importance.

Even where grass was seeded for hay or pasture, farmers seldom thought of using fertilizer or providing special care such as they did for cultivated crops or orchards. Legumes, such as alfalfa and the clovers, too often were planted on the poorer land and given further attention.

In the absence of improved varieties of grasses and legumes, or of knowledge about their management and potential productivity, farmers understandably paid little attention to grass so long as good land was plentiful for cultivated crops. It was after they became aware of widespread damage from erosion that they became interested in these plants for soil conservation and as primary income-producing crops.

The drought of the early 1930's (coupled with the effects of a declining soil fertility) parched crops and grasslands in all areas of the Nation except the humid East. Winter and spring winds swept across the bared lands of the Great Plains, whipping soil into the air. These "black blizzards" imparted to the national consciousness a new sense of urgency about the menace of soil erosion.

In Congress the pleas of Dr. Hugh H. Bennett already had awakened interest in the problem. In 1929, through the Buchanan amendment, Congress provided \$160,000 for the first soil erosion experiment stations to be established by the Secretary of Agriculture.

Experimental Basis for a Program

In record time, 10 erosion experiment stations were set up across the country and were busy studying the causes and effects of erosion. This was the beginning of scientific soil and water conservation based on technical knowledge derived from experimental research.

Soon, largely through the work of these stations, a vast amount of convincing information was acquired and given to the public. More than 200,000

quantitative measurements were made of soil and water losses under different conditions of land use. It was then that grass came into its own in the United States, for scores of the experiments proved that the dense cover on the surface and the fibrous root systems in the soil produced by grasses and legumes are of superior effectiveness both in preventing erosion and maintaining productivity of farmland.

Measurements beginning 1931 showed how grass protects soil against erosion from runoff.

At the station at Guthrie, Okla., for example, it was found that more than 10 times as much water ran off an 8-percent slope planted to cotton as from land of similar type covered with bermudagrass. It, likewise, was found that the amount of soil washed was nearly 500 times as great on the cotton land as on the bermudagrass. Research results at the Clarinda, Iowa, station showed that more than five times as much water ran off a sloping cornfield as from the same kind of land in alfalfa, and the soil loss was about 180 times as great on the cornfield. Experiments at Zanesville, Ohio, revealed that runoff was more than three times, and soil loss about twice, as much from an unimproved pasture as from a pasture that had been limed, fertilized, planted to a good grass mixture and properly managed. When summed up they proved that, on the average, a covering of grass or other dense-growing vegetation is 313 times more effective in retaining soil and 6 times more effective in retaining rainfall than clean-tilled crops on the same kind of land.

In all such experiments erosion damage was found to be consistently heavier on land planted to a clean-tilled crop year after year than on land under a good rotation containing grasses and legumes. They also proved that yields of cash crops depend greatly on grass. Results in the Corn Belt revealed that the yield of corn following clover was more than 2½ times as great as for continuous corn. It was here and in similar findings that the ideal expressed in such words as larger yields from fewer acres was born.

The experiment stations found too that grasses and legumes could be managed after the plants are dead so as to reduce losses of soil and water. Straw, stubble, and stalks left on or near the surface served to increase greatly the absorption of water by the soil. Proper ways of handling such residues were studied intensively in all stations and proved extremely valuable. In South Carolina, a mulch-disk method that kept much of a cover crop of rye and vetch on the surface reduced soil loss 46 percent and water loss about 50 percent, as compared with losses where the cover crop was turned under. Early results at the stations indicated that mulch tillage causes greater improvement in soil structure and more rapid increase in soil organic matter and nitrogen in the first 5 inches of soil than tillage without mulch.

Grasses for pastures, and for range forage throughout the vast West, were subjected to intensive experimentation and trial over the years at many locations, both by the Soil Conservation Serv-

(Continued on Page 12)

CONSERVATION (Continued)

ice (SCS) and other agencies of the U. S. Department of Agriculture (USDA) and the States. The plants themselves, and their adaptations to soils and climate, were the primary concern, for many pastures and ranges were sadly depleted of grass cover and some had no value at all for the country's tremendous livestock industry.

Finding the best grasses and other forage plants, locating them for good production and palatability, and then testing each one for its productivity and effect on livestock's well being came next at most stations. Findings such as these from a cooperative study at the Central Plains Range Experiment Station, requiring years, had values never available before:

Yearling Herefords gained an average of 252 pounds on short-grass range stocked with 40 head per section for a 6-months season. On comparable range, overstocked at 60 head per section, the average gain was only 174 pounds. Comparable profit in 1946 was \$1,807 per section for the range stocked at grazing capacity and \$1,345 for the overgrazed, even though the latter produced slightly more beef. The heavy stocking resulted also in cumulative soil and forage deterioration (Chapline 1948).

After the erosion experiment stations had been functioning only 4 years, in June 1933, Congress appropriated money through the National Industrial Recovery Act for erosion-control work as a means of unemployment relief. On September 19, 1933, the Soil Erosion Service was established as a temporary agency of the U. S. Department of the Interior. This resulted in the setting up of 41 soil and water conservation projects in the Nation. Civilian Conservation Corps camps provided bases and staffs as well as the manpower for the testing of new technology in conservation on a voluntary basis by farmers and ranchers.

The Charge to an Agency

On March 23, 1935, the Soil Erosion Service was transferred from the Department of Interior to the Department of Agriculture. It became the Soil Con-



Foundation seed stock at a plant-materials center.

servation Service, charged by Congress in Public Law 46 "to conduct surveys, investigations and research relating to the character of soil erosion and the preventive measures needed . . . To Carry out preventive measures, including . . . engineering operations, methods of cultivation, the growing of vegetation and changes in the use of land . . ."

The assignment was in an uncharted field. Erosion, its character and causes, its prevention and cure, was largely unexplored. But the search began, a painstaking, relentless, world-wide search for techniques and materials that would halt the progress of erosion. It was a time of trial and error, of examination and comparison, of frustration but refusal to accept defeat — and it was a time of occasional and heartening success.

Leading in the effort were the technical forces of SCS and the other agencies of USDA, the agricultural colleges and the experiment stations, solidly reinforced by the millions of American farmers and ranchers whose own experience pointed the way to realistic solutions to many of the problems.

Out of this came the concept of the complete coordinated soil and water conservation plan designed specifically for a given farm or ranch to combine all needed practices for maximum effectiveness. Such a plan provided for the treatment of each parcel of agricultural land according to its need for treatment and for the use of each parcel within its capability for continuing agricultural service.

Such an integrated plan was a sharp departure from the single-practice approach to soil problems that had been used by agricultural workers up to that time. The basic conservation plan, making use of combinations of practices fitted to differences in soil, continues to this day as the fundamental principle of conservation planning for farms and ranches, watersheds, and other project areas.

Tools for the Job

Inevitably the search for the tools with which to accomplish the protection and repair of land led to grass, trees, and shrubs. Among these, grass was in the forefront.

Fortunately, research on forages, their establishment and management, and plant breeding for improved varieties had begun very early in USDA and the State experiment stations. Soil conservationists, therefore, had a valuable backlog of information when they started using these plants to meet the special requirements of soil and water conservation.

A first step in providing seed of a large number of improved range, pasture, and hay plants was the setting up of nurseries for this purpose by the Bureau of Plant Industry in 1933. Much of the work of these nurseries was devoted to the testing of grasses. In 1935, they were transferred to SCS.

In the Great Plains the need for the nurseries to collect and grow grass seed was urgent. Nurseries were first established in this region at Mandan, N. Dak., and Manhattan, Kans.

In other areas of the Nation seed-increase work was scarcely less important. Nurseries were established early at Albuquerque, N. Mex.; Americus, Ga.; Beltsville, Md.; Big Flats, N. Y.; Elsberry, Mo.; Pullman, Wash.; San Antonio, Tex.; Zanesville, Ohio; Tucson, Ariz.; Pleasanton, Calif.; and Thorsby, Ala. Others were added later; at one time there were 24 of these nurseries.

(Continued on Page 18)

Chemicals To Kill Waterweeds



Waterlilies have floating leaves but their roots are in the pond bottom.

Many chemicals are now available for the control of waterweeds. When used carefully at rates recommended they seldom cause any great loss of fish. The chemicals most practical for control of weeds in or near agricultural waters are discussed in the following sections.

Sodium Arsenite

Sodium arsenite will kill almost any plant, but it is recognized as a severe treatment because it will also kill people, livestock, and wildlife. It kills filamentous algae, waterlettuce, and the tiny duckweeds, but it does not kill water-hyacinths. Sodium arsenite is only effective in impounded waters; it is not effective in canals or streams.

Sodium arsenite is sold in liquid form as Atlas A, Penite-8, and Triox. Use 3 gallons of Atlas A, 1½ gallons of Penite-8, or 2 gallons of Triox per acre-foot of average pond water. This is a concentration of about 4 p.p.m. In soft (acid) waters, one-half this amount usually makes a satisfactory kill. Hard water (alkaline) may require double that amount.

Fill an ordinary garden sprinkler can half full with liquid arsenite and the rest with water; stir and then sprinkle the contents over the weed beds.

If your pond is more than half filled with weeds, treat only one-third to one-half of it at a time, waiting a week between each application. This will avoid killing fish by oxygen deficiency caused by the decay of a large mass of dead weeds.

After submersed weeds have been destroyed, their return must be avoided by keeping the pond water in a murky condition. This can be done effectively and economically only with adequate applications of fertilizer. Begin fertilization within 10 days after treatment with sodium arsenite. Repeat applications at 2-week intervals until the microscopic algae hides a white object from sight when held 12 inches beneath the surface.

CAUTION: Sodium arsenite is a dangerous caustic poison. Animals like its salty taste. It doesn't take much of it to kill a pet, a wild or domestic animal, or a person. Follow the cautions stated by the manufacturer. Better still, employ someone who has experience in the use of this chemical. Sodium ar-

senite kills fish if it is used in concentrations stronger than double the above recommendations. Even as recommended, it will kill some but not all of the insect nymphs and larva which are foods of pondfish.

Keep children and animals away from the chemical, the empty drums, and the spray equipment. Avoid skin contact with the liquid or spray; in case of skin contact, wash off immediately. Wash contaminated clothing with hot, soapy water before reuse. If you get a skin rash from contact with spray, bathe, apply milk of magnesia to affected skin, and allow to dry on. Apply milk of magnesia before going to bed at night and again in the morning for 2 to 3 days or until rash clears up. If rash continues, see a doctor.

If any of the chemical is accidentally swallowed, induce vomiting by giving a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Then give 2 tablespoons of epsom salts or milk of magnesia in water followed by several glasses of milk or water. Have victim lie down and keep quiet. Call a physician immediately.

Goggles should be worn while spraying. If any sodium arsenite is splashed in the eyes, flush eyes out thoroughly with water and bathe with boric-acid solution or boric-acid eyewash. See a doctor.

Don't use sodium arsenite in waters that soon afterward will be used for irrigation. Don't use sodium arsenite-treated water for bathing, for watering or animals, or for any other purpose for 2 weeks following treatment.

Keep livestock away from the treated pond until a heavy rain has washed away any sodium arsenite that may have drifted onto the bank or shore plants. Although domestic animals would probably not drink enough of the treated water to be injured, it is almost impossible to treat a pond thoroughly and not leave some of the poison on the shore plants. Stock may be attracted by the salty taste and eat enough of the treated plants to be poisoned.

Since rice plants are extremely sensitive to arsenic, do not use it in waters intended for rice culture.

Residual effects of sodium arsenite may remain in the bottom soil a long time. Repeated applications

reduce fish production. Therefore, you should kill the weeds once if necessary, then keep the fater fertilized throughout the growing season to prevent re-growth of the pond weeds.

2,4-D

2,4-D kills many kinds of broad-leaved plants but does not kill grass. Its principal use around agricultural waters is to kill brush, waterweeds, and marsh plants such as small willows, water-hyacinths, water-hemp, waterprimrose, lotus, pickerelweed, and similar plants with leaves that rise above the water surface. When 2,4-D is used in diesel oil or in crankcase oil, the mixture also restricts the growth of most grasses and sedges. 2,4-D does not harm fish, wildlife, or livestock and is not a fire hazard.

Three forms of 2,4-D are commonly available — esters, amine sales, and sodium salts (occasionally ammonium sales). The esters and amine salts of 2,4-D are usually sold as a liquid and the sodium salt as a powder. 2,4-D is also available in granular form.

To kill most waterweeds, marsh plants, grasses, sedges, and shrubs around ponds, mix 1 cup (8 ounces) of 40- or 50-percent esters of 2,4-D in 5 gallons of diesel oil or used crankcase oil. The oil has weed-killing properties and helps the 2,4-D to penetrate the plant leaves and stems.

The amount of spray needed varies with the rankness of plant growth and the type of spraying equipment. You may use any type of equipment that will give uniform coverage. You must wet the plants from top to bottom. With pressures of 25 to 35 pounds and low-volume nozzles, you can spray an acre with only 20 to 50 gallons. As much as 80 pounds of pressure may be used, but high pressures result in more vapor with consequent drift. For heavy cattail growths you may have to use as much as 200 gallons of spray per acre.

A single spraying seldom kills all the plants. You can spray again after 2 or 3 weeks if needed. Do not spray when plants are wet with dew or rain or when you expect rain within 3 or 4 hours after spraying.

To kill water-hyacinths, mix 1 quart of amine salts of 2,4-D (4 pounds active ingredient per gallon) in 100 gallons of water (the addition of a wetting agent such as household detergent will increase the effectiveness of the mixture). Use 50 to 100 gallons of spray to an acre of hyacinths. One application should kill 90 percent or more of the plants. Follow up with a second spraying in 2 to 3 weeks and repeat until the last hyacinth is dead. It will take 2 to 6 applications. Or you may prefer to remove the last few by hand.

To kill submersed weeds and rooted plants with floating leaves. A granular form of 2,4-D, containing 20 percent active ingredient, is effective on several pond weeds such as cowlily, waterlilies, watershield, parrotfeather, waterprimrose, hornwort, and bladderwort at rates of 100 to 150 pounds of granules per acre. This form of 2,4-D has not yet been thoroughly tested on all types of submersed weeds.

Granules of 2,4-D may be applied on submersed weeds in the fall and winter. Such treatments after July seldom affect the plants until the following spring when those sensitive to this chemical usually fail to appear.

In treating parrotfeather, or other waterweeds, the first application may miss a clump here and there. If so, place a second application on and around the area of plants that are recovering.

CAUTION: Fish kills have followed a few treatments with 2,4-D granules, but the exact cause is not known.

Tobacco, cotton, clovers, tomatoes, and many other valuable broad-leaved plants are extremely sensitive to 2,4-D sprays. Small amounts of spray vapor drift surprising distances from the area being treated and kill or damage sensitive plants. Because of this danger, spray only when there is little wind movement. Never store 2,4-D near fertilizers, seeds, or insecticides. Always keep container closed tightly.

Water treated with 2,4-D or 2,4,5-T should not be used for spraying or irrigating sensitive crops until tested. You can test it by spraying the water on young tomato plants. If the stems do not bend within 24 hours, the water is safe.

Since it is practically impossible to wash 2,4-D out of the spraying equipment, do not use this equipment for insecticides or fungicides.

Excessive amounts of diesel oil sprayed on pond waters give an unpleasant flavor to fish for about 4 weeks after the spraying.

2,4-D deteriorates in time. Use fresh-dated material.

2,4,5-T

2,4,5-T is especially suited for killing woody plants such as brambles, vines, and shrubs that are not killed easily with 2,4-D. 2,4,5-T does not harm fish, livestock, or wildlife. It is not flammable and will not corrode equipment. Use 1 cup (8 ounces) of 2,4,5-T in 5 gallons of diesel oil.

A spray of one-half cup (4 ounces) each of an ester form of 2,4-D and 2,4,5-T in 5 gallons of diesel oil is suitable for the edges of ponds where both herbaceous and woody plants grow. Plants must be wet from top to bottom.

Silvex

Silvex is a phenoxy compound related to 2,4-D and 2,4,5-T and is effective on spatterdock cowlily, waterlilies, frogbit, parrotfeather, bladderwort, spikerush, and other waterweeds. Silvex may be sprayed on emergent leaves or sprinkled into pond water. When sprinkled into the water, the rate is 3 or 4 parts per million. One manufacturer's product contains 1 pound of silvex per quart; thus 8 to 11 quarts of this product per acre-foot of pond water equals 3 or 4 p.p.m. Three pints per acre-foot (about 0.5 p.p.m.) has been effective on white water lilies, watershield, and cowlily.

Silvex appears to be the best chemical to control spikerush (especially *Eleocharis acicularis* and *E. baldwinii*) in pond waters. This plant grows along the shore as water recedes, then rapidly develops floating mats in the pond. Dalapon is used to control spikerush on the shore.

As a spray on emergent plants, 3 or 4 quarts of commercial silvex (totaling 3 or 4 pounds chemical ingredient) per acre is satisfactory. One quart of silvex in 5 to 10 gallons of water is effective for low-growing plants — 10 to 20 gallons for taller ones.

Silvex is not poisonous to livestock at the rates recommended by its manufacturers.

CAUTION: Silvex may give fish an unfavorable taste for several days after application.

Dalapon

Dalapon kills grasses and grasslike plants such as maidencane, cattails, cutgrass, mannagrass, and knotgrass but not broad-leaved plants. It is a powder to be mixed in water for spraying. Silvex, 2,4-D, or 2,4,5-T may be added to a dalapon solution when both

grasses and broad-leaved plants are to be killed. Mix the dalapon first, using not more than 8 pounds to each 10 gallons of water. Addition of a wetting agent, such as household detergent, increases the effectiveness of the mixture.

Manufacturers recommend different rate for different conditions. Usually for noncrop areas such as those around ponds, mix 1 pound of dalapon with 1 gallon of water and use 15 to 30 pounds per acre at each application. If necessary to get "coverage" of rank growth, 2 gallons of water may be used per pound. As with other sprays, wet the foliage thoroughly. A second or third application may be necessary.

Dalapon is not effective on marsh plants in water more than 6 inches deep because of dilution of the chemical. Lower the water level before treating with dalapon.

CAUTION: Do not allow spray drift to contact foliage or roots of lawn grass or similar blade-leaved plants that are to be left unharmed.

Dalapon causes skin irritation. Avoid contact with skin, eyes, and clothing. Wear rubber boots. In case of contact, remove clothing and wash skin with plenty of soap and water. For eyes, flush with water for at least 15 minutes and get medical attention. Wash clothing before reuse.

Flush spraying equipment immediately after use with plenty of water to avoid contaminating later sprays and possible corroding of equipment.

Irrigation water should not be contaminated with dalapon.

Ammate (Ammonium Sulfamate)

Ammate kills poison ivy, honeysuckle, persimmon, sassafras, wild cherry, and most kinds of trees and shrubs. It is a yellowish crystalline material that is very soluble in water. It is not combustible and is not poisonous to humans, livestock, wildlife, or fish. It is not volatile and is therefore safe to use near cotton, tomatoes, ornamental shrubs, or other broad-leaved plants that are sensitive to 2,4-D.

For shrubs or trees under 2 inches in diameter, spray the green leaves in late spring. A kill will be more likely if you spray the stems and trunk also. One pound of ammate in 1 gallon of water is the correct mixture for spraying. Addition of a wetting agent, such as household detergent, increases the effectiveness of the mixture.

For trees 2 to 6 inches in diameter, cut off the tree close to the ground, leaving a V-shaped notch in the stump. Apply 1 tablespoon of ammate crystals to kill the stump or moisten it thoroughly with a strong solution of ammate (4 to 6 pounds per gallon of water).

For larger trees, cut deep gashes every 4 to 6 inches around the trunk at the base of the tree. Put 1 tablespoon of crystals in each cut or saturate it with the solution of ammate (4 to 6 pounds per gallon).

CAUTION: Ammate causes iron to rust unless such equipment is washed thoroughly after using. Prepare the solution in a glass or earthen jar or a wooden bucket. Since the solution irritates the skin, avoid prolonged contact with it. Wash the hands and face frequently with water.

Copper Sulfate

Copper sulfate, as a weed-control chemical, is used chiefly to control microscopic algae and the single-filament algae. It also kills stonewort (*Chara*). It is not effective against leafy waterweeds, either

submersed or emergent. It is sold in powder, crystal, or liquid form. Copper sulfate is known also as "bluestone," and "blue vitreol."

Three pounds of powder or crystals per acre-foot of water (about 1 p.p.m.) is strong enough to kill algae and stonewort in most waters. This concentration kills snails but does not kill fish. In alkaline water stronger concentrations may be necessary. A little experimenting will help you decide the right amount for your pond.

The crystals may be scattered by hand on the surface of small ponds or tied in a loosely woven bag and swished through the water behind a boat. Or the crystals or powder can be dissolved in water and sprinkled or sprayed on. The powder dissolves much more rapidly than the crystals and therefore is easier to mix as a spray.

In the recommended concentrations, copper sulfate may be used without harm in waters for livestock or irrigation.

If a heavy growth of algae is present, treat only one-third or one-half of the pond at a time at weekly intervals. This is to avoid depleting the oxygen when the mass of dead organic matter decomposes. You may treat an isolated mass of stonewort or algae without treating the whole pond.

In very soft water (less than 20 p.p.m. hardness) use only 1½ pounds of copper sulfate per acre-foot, as fish may be killed at the 3-pound rate. (Fish have been killed, however, in coastal pond waters having a high pH, when the smaller amount was used.)

Plastic garden sprinkling cans are convenient for applying copper sulfate. It corrodes galvanized cans and most spraying equipment. Even after normal washing they are often ruined.

CAUTION: Residual copper is toxic to many aquatic animals so that frequent and continued use kills a large part of the fish-food supply. Therefore, it is unwise to use copper sulfate regularly in fish-ponds.

Since copper sulfate kills algae, it should not be used when you are fertilizing to control weeds.

Aromatic Solvents

Aromatic solvents are derived from petroleum or coal tar and are commonly used as paint thinners. Certain of the aromatic solvents will control submersed waterweeds in irrigation and drainage ditches. They kill the stems and leaves but do not kill the roots and seeds. Thus the control is temporary. Aromatic solvents also kill fish, snails, crayfish, and mosquito larvae.

Aromatic solvents give economical weed control in ditches with flows of 1 to 70 cubic feet per second. In larger ditches, mechanical weed removal is usually less costly. Consult persons who are experienced and have the proper equipment for weed control in ditches.

Several chemical companies are marketing ready-to-use mixtures of aromatic solvents with suitable emulsifiers. These mixtures are applied through spray nozzles below the water surface at a pressure of 50 pounds or more per square inch. In western alkaline waters, a concentration of 740 p.p.m. applied for 30 minutes gives adequate control of submersed weeds for most of a season. This is 10 gallons of aromatic solvent applied for each cubic foot per second of flow in the canal.

In southeastern soft waters, applications of only

(Continued on Page 18)

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Banvel D is compatible with 2,4D. In combination these two herbicides give one application control of a broad range of problem weeds.

SOIL FUMIGATION

Velsicol
Pestmaster
Soil Fumigant-1

Soil Fumigant-1 contains methyl bromide with 2% chloropicrin. It will remove weeds, weed seeds and obnoxious grasses in an old golf green, or in the soil before new grass is planted.

PRE-EMERGENCE CRABGRASS CONTROL

Chlordane
Bandane

Chlordane provides exceptionally effective pre-emergence crabgrass control, and complete protection against damaging soil insects. Bandane is a newer pre-emergence control, notable for effective control plus safety to seeding grass and established turf. It also kills ants, grubs, and other insects.

TURF INSECT CONTROL

Chlordane
Heptachlor

Both Chlordane and Heptachlor kill most common insect pests of turf, plus many harmful or annoying insects that live on the surface of the soil.

**CONTACT YOUR DISTRIBUTOR NOW FOR THE COMPLETE
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FOR MORE INFORMATION WRITE



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DR. TROLL RECEIVES HONORARY LIFE MEMBERSHIP IN N.E.G.C.S.A. — Leon V. St. Pierre, on left, president of the New England Golf Course Superintendent's Association, presents lifetime honorary membership to the N.E.G.C.S.A. to Dr. Joseph Troll, Associate Professor, Department of Plant and Soil Science, University of Massachusetts, Amherst. Presented for his "unselfish contributions he has rendered to the Golf Course Superintendent's Association of New England."

WATERWEED (Continued)

80 p.p.m. (about 1 gallon of solvent for each cubic foot per second of flow) is sufficient for a first clean-out, followed by maintenance applications of only 20 p.p.m. at intervals of 6 to 9 months.

Treated water is distasteful but not harmful to cattle.

CAUTION: Use a respirator to avoid excessive breathing of the fumes which cause severe headache and asthma. Wash the hands and face thoroughly with soap and water. Prolonged or frequent contact with the skin causes burning and irritation.

Aromatic solvents are as flammable as gasoline and must be handled with equal care. Treated water should not be used for irrigating crops until the emulsion clears — 27 to 72 hours after treatment.

These solvents are toxic to fish.

CONSERVATION (Continued)

The immediate need was to obtain promising plants and to get preliminary information about their possible conservation uses and values by comparing them with common varieties. The plants tested came from both foreign and native sources. Numerous species now in common use were known 30 years ago, or less, only as native wild plants.

Any plant material that appeared to be promising in nursery rows was then studied in plots similar to small farm fields. Those considered to hold promise for soil and water conservation were tested further in outlying stations. These studies generally were in cooperation with State experiment stations, but some joint testing was done in soil conservation districts, with individual farmers, or with other agencies such as the U. S. Forest Service.

The final step was to make foundation seed stocks of the new or improved varieties available to farmers and commercial seed growers. From the first, SCS recognized that it was not the business of a Federal agency to compete with commercial producers but to serve as a source from which commercial production of tested and proved seeds could develop. As soil conservation districts spread over the country, farmer-district production of new conservation plants became an important source of seed.

Early in the development of this new interest in grass in conservation, research specialists, soil conservationists, farm-implement manufacturers, and farmers themselves, teamed up to provide growers with a variety of machines for handling the new-found crops: special grass-seed planters and fertilizer spreaders, mowers and rakes, hay balers and loaders, silage cutters and hay dryers. Improvements and innovations came periodically. These included precision drills, band-seeding attachments for fertilizer and grain drills, and heavy-duty drills for interplanting in sod.

Special hammermills and other equipment for cleaning native grass seed were developed, beginning with the 1930's. Grass seed cleaning and processing plants sprang up throughout the country. All the improved machines, each for a specific new need, have made the grass farmer's operations easier and more profitable.

Between 1944 and 1954, seed production of most of the grasses and legumes then in new demand increased to the point that farmers and ranchers for the first time could buy the seed they needed at reasonable prices.

The harvesting of native grass seed was a new

local business arising out of the soil conservation program. In 1950, more than 425 million pounds of grass and legume seed was harvested in soil conservation districts alone. For many farmers, growing grass seed on cultivated land became an enterprise more profitable than growing ordinary crops such as wheat, cotton, or corn.

An Area for Testing

In its early efforts to solve the problems of erosion control, SCS expended much of its time and resources on the critical areas of the Great Plains. The need for materials and techniques that would effectively prevent erosion and repair damaged land was acute in that region.

Some of the early efforts took place on land acquired by the Federal Government under Title III of the Bankhead-Jones Farm Tenant Act and termed "land-utilization projects." These were patchworks of submarginal farmlands that had been damaged by erosion. Many of the farms had been abandoned. They were administered first by the Bureau of Agricultural Economics, then transferred to the Soil Conservation Service in October 1938. On these projects SCS, in 1939, began a series of trials in the use of grasses that would arrest erosion and permit the damaged land to again serve in agriculture.

In these early years the effort was marked by a high percentage of failure. The experience, however, proved of tremendous value.

SCS established seed plots on many of the projects. The seed produced was used first to plant the rundown and damaged lands. Later the projects began to yield seed for use elsewhere.

Experience on the Land

Perhaps the most important single factor in the spreading of an appreciation of grass in conservation was the experience of land owners and operators themselves in soil conservation districts. The first such district was certified on August 4, 1937, as the Brown Creek Soil Conservation District in Anson County, N. C. Under the district approach, the farmers and ranchers of the Nation began working together, assuming responsibility for the solution of their soil and water problems and receiving technical help from the Federal Government through memorandums of understanding with the Secretary of Agriculture. The principle of applying combinations of needed soil and water conservation practices to a farm or ranch unit, including conservation cropping systems using grasses and legumes, became a focal point. The districts, with their local leadership, began exerting a strong influence on the development of useful grasses and legumes for agricultural use.

The Soil Conservation and Domestic Allotment Act of 1936 authorized payments to farmers to encourage adoption of certain soil conservation practices, including the seeding of unsuited cropland to adapted grasses. This encouragement has contributed to the speeding up of the stabilization of hazard-our land. It has also stimulated the use of grass to effect a more secure and efficient farm economy and to the recognition of grass as a crop of primary importance in the new agriculture.

Grass in Today's Agriculture

Grasses and legumes have established their place among the Nation's major crops, thanks to farmers' and ranchers' profitable experience in growing improved varieties developed and made available to meet local needs by State experiment stations, SCS

(Continued on Page 19)

CONSERVATION (Continued)

and other agricultural research and action agencies, and by commercial seed growers.

Today, after a quarter century of conservation farming and ranching, the results of grassland husbandry are reflected in the economy of individual operators and that of many communities and some entire regions.

Grasses and legumes have largely taken the place of cotton in many parts of the Southeast. Beef and dairy herds thrive on improved pastures that have supplanted cotton and corn in parts of the old South. In the Southwest and Great Plains, native grasses are protecting millions of acres of soil that once blew in duststorms and are bringing increased livestock returns to farmers and ranchers. Across the West and back through the Midwest and Northeast, expanded planting and profitable management of native and improved grasses and legumes follow the national pattern of higher hay yields and increased carrying capacities on pastures.

Most grassland farmers started by using grasses and legumes for erosion control. Then they found that these sod crops were not only soil savers but were also soil improvers and moneymakers as well. Ranchers who realized that grass was the base of their livestock production learned to know their plants and to care for them with the same attention they gave their animals. The new generation of conservation farmers and ranchers has come to manage grasses and legumes as primary crops on a par with the conventional row crops and small grains of yesterday.

The stature of grass husbandry in American agriculture today is reflected in the grass conservation practices being used throughout the country by cooperators in soil conservation districts.

SEED SELECTION

by DR. ROBERT W. SCHERY
Director, The Lawn Institute

Seeding the golf course may seem a singularly uncomplicated operation, compared to the delicacy in rates and timing needed for weed control, disease prevention and fertilization of the pampered greens. Yet, there are factors the superintendent may never have considered. Conceded, that every superintendent understands good seedbed preparation; still, the best in planting can be defeated if choice of seed is not wise.

For plantings where the soil has been sterilized, chiefly greens, the superintendent must be exceptionally careful about the seed he sows, or the sprigs and stolons he plants. If not, he may waste his sterilization investment.

Fairway plantings are less demanding, but even there careful scrutiny of seed quality is merited. The close clipping that tournament play now calls for increasingly focuses attention on bolster-seeding. Overseeding becomes a regular maintenance requirement, just as is the winterseeding of southern greens.

Dr. Daniel, Purdue University, points up the revival of interest in Kentucky bluegrass fairways, once considered impossible under low mowing. Now Daniel feels bluegrass has much to recommend it, provided modern maintenance precautions are taken. Among them he advises "repeated light overseedings at 10-40 lbs. for each acre." Seed purchase shares importance with other budgeted items.

With the spread of fairway irrigation (and close

mowing), many turfs have turned largely to *Poa annua*. These may need partial renovation, including introduction of low-growing species such as economical Highland bentgrass. Firestone Country Club, site of the All American Golf Classic, vertical-thinned its fairways, overseeding with Highland bent in the hope of having "something else" handy should the prevailing *Poa annua* find the going too rough during a muggy summer spell.

ABOUT SEED SPECS — The required label effectively covers familiar marketing standards such as germination — the ability of the seed to sprout — the importance of which is obvious. For example, what are the underlying inferences from the "purity" figures on the tag? A lower purity percentage might occasionally be a better buy (if the remaining percentage is merely inert). Even where purity is extremely high, a small unspecified residue can be hazardous if it includes live seeds of species that are weeds in fine turf. These don't necessarily have to be listed on the label (it varies with state law).

A couple of winters ago imported rough bluegrass (*Poa trivialis*) winter-seeded to southern golf greens carried a bit of rosette crucifer seed, probably shepherd's-purse. Courses utilizing it had to lavish many man-hours of hand digging to eradicate the pockmarks (since herbicides could not be trusted on the delicate green grass). This was certainly an expensive seed purchase regardless of price.

Let's review some of the factors that make for good seed buy. Price of seed by the pound is really the least important. Far more meaningful to a golf course are the "headaches" to be avoided by choosing seed wisely.

CHOICE OF SPECIES — I can't tell the superintendent what variety to choose. Proper genetics are his to assess, in the light of local conditions, experience and preference. Some managers prefer one variety, some another. So long as the proper environment is maintained for the chosen variety, its performance will be excellent. If anyone, the superintendent is capable of maintaining proper grass environment. It's his profession. For the green he will have many vegetative strains to choose from, each with its subtle peculiarities. Typical are such true-to-type vegetative varieties as Toronto, Cohansey, Washington, Congressional, Old Orchard, Arlington, Pennlu, Evansville and Nimisilla, listed in the order of their rating by Dr. J. B. Beard, Michigan State University.

A convenient, economical alternative is seeded creeping bentgrass such as Penncross. Reports indicate Penncross to have performed remarkably well all across the country, though its vigor does entail a bit more attention to avoid thatch. Seaside, an old favorite creeping bentgrass from seed, is considered more disease-susceptible than is Penncross. There is also a velvet bent, Kingstown, now available as seed; and of course the recognized colonial bentgrasses (used mostly for fairways, but occasionally for bolstering greens), such as the work-horse Highland, and at higher prices, Astoria and Exeter.

For fairways and tees a number of seeded bluegrasses and fine fescues are standard, often preferred in combination. Kentucky bluegrass has no equal as a rhizoming sod-former. Fine fescues such as Chewings, Illahee and Pennlawn are included especially for dry soil in the shade and for sandy outcrops not well fertilized. Mowed tall, as in the roughs, Kentucky bluegrass-fine fescue seedings endure indefinitely

(Continued on Page 20)

SEED SELECTION (Continued)

with little attention. Merion Kentucky bluegrass has been much used for tees. Its relatively low growth and dense foliage equip it well for this use. Non-premium varieties are usually used for the voluminous fairway seedings, natural Kentucky bluegrass or a combination of proven varieties that include Arboretum, Delta, Park, Newport.

Other than for winter-seeding of greens, increasingly being done with northern "fine-textured" grasses (fine fescues, Kentucky bluegrasses, bentgrasses, various Poas), Southern golf turfs receive relatively less seeding. Improved Bermuda selections such as Tifdwarf and Tifgreen for the greens, Tifway for the fairways, must be vegetatively planted since they don't come true from seed. A good many golf courses do seed common Bermuda, and perhaps occasionally in the deep South bahia, carpet, centipede and zoysia. For discussion here, however, we must confine attention to species adapted to the northern two-thirds of the nation where seeding is usual.

WHAT TO GUARD AGAINST — Equally as important as what is wanted, is what is not. Here is a "rogue's gallery," of the grasses and weeds most pestiferous in turf, as determined by the Velsicol Chemical Co. survey and this writer's "The Lawn Book," Macmillan, 1961. Obviously, they vary widely with the climate and location and many others could be added to the list.

Of these turf rogues, any golf course superintendent realizes that many — almost all of the broad-leaf sort — are controllable these days with herbicides. It's a different matter with many grass-type weeds, which should be guarded against more carefully as inclusion in purchased seed.

HOW TO IDENTIFY QUALITY — A germination percentage is required by law on the seed label or tag; it is checked by official policing. The higher the germination, naturally the greater the value (by the same proportion). But it makes not a great deal of difference in getting a stand, whether the bluegrass you sow germinates say 80% or 90% (though the higher germinating seed should then receive at least a 10% price advantage). It is normal for germination to vary among species, and even between lots from one region and another. Except for a casual check to note value, one can pretty well take for granted adequacy of germination on seed reaching market through regular channels.

Purity is another common standard of sale. It signifies the weight of designated seed as a percentage of the total weight. The best lots of some seed types may run as high as 99% pure, the remaining 1% being a bit of dust or chaff termed "inert." With other seed 85% purity may be usual. Much depends upon the kind of seed, and even the year of harvest. There are instances where cleaning out the last bit of chaff would also eliminate good seed, and thus raise the price for no real benefit. But again, lesser purity should certainly be compensated for by proportionally lower price.

Varying according to state seed law, weed content must also be listed on the label. Some weeds especially pernicious in agriculture may be forbidden entirely. Others, less serious, must be grouped as "weeds" but don't have to be individually named. Naturally, for fine turf such as on the golf course, purchasing seed with any significant amount of troublesome weeds is questionable. But it well may be

that certain weeds bothersome on the farm are of no consequence in mowed-turf — things like *Galium*, dodder, etc. Nevertheless, it behooves a superintendent to specify essentially weed-free seed unless an analysis by a testing laboratory reveals exactly what the weeds are, and the superintendent sees that they are of no consequence.

So far, quality considerations are reasonably clear-cut. But there's a less obvious aspect worthy of checking on, too. This is the "crop" content. Most state seed laws allow up to 5% each of non-weed species to be carried without naming on the label, as crop. These can be coarse haygrasses, a blessing in the forage field, but the worst of pests in fine-textured turf. Typical examples are tall fescue, bromegrass, orchardgrass, timothy, ryegrass, redtop, etc. You will note on the Chart many of these are among the most troublesome fine-turf pests. The superintendent might specify that seed he purchases be essentially crop-free — at least unless the seller can show that crop contained is of harmless type (for example, Canada bluegrass in Kentucky bluegrass, or Kentucky bluegrass in Merion Kentucky bluegrass, offer no hazard; but tall fescue, timothy in redtop, certainly do). Perhaps the safest course is to buy from a quality supplier in whom you have confidence. In questionable cases, seed analysis by a commercial lab can pinpoint exactly what contaminants are carried from a sample.

LIKELIHOOD OF CONTAMINATION — The Lawn Institute recently tallied 1,707 lots of seed from the Seed Technology and Oregon State University laboratories, determining which contaminants of the familiar turf seeds tend to appear in what species, and with what frequency. It is of interest that never, in any lot of seed of any kind, were these weeds found: barnyard grass, crabgrass, dallisgrass, fox-tail, nimblewill, *Panicum*, sandbur, stinkgrass; black medic, bur clover, ground-ivy, knotweed, mallow, pennywort, puncture vine, purslane spurge. Thus the golf course superintendent can be reasonably certain that such familiar problems as crabgrass never arise from the seed he sows, but come solely from residues in the soil.

Some of the perennial grass weeds, such as quackgrass, are recognized as noxious almost everywhere. Sale is prohibited entirely, or restricted to low frequency with identification on the label. In some states, New York notably, *Poa annua* has been declared noxious, giving a chance for the superintendent who has sterilized his soil to procure seed free of *Poa annua* and know it.

PESTICIDE (Continued)

Continual changes in pesticide and additive registrations and tolerances make frequent revisions necessary. A recommendation made a few months ago may suggest an improper use today. It could result in legal action.

New and Revised Publications.

The House Fly, how to control it. Leaflet No. 390, USDA.

Clover Mite, a Household Pest. Publication No. 289, Cooperative Extension Service, University of Massachusetts.

Improper Storage Scores Again!

A 15-month-old boy, playing in a shed, found a container of weed-killer. It happened to be 55% sodium arsenite (41.9% arsenic trioxide). The boy died!
(Continued on Last Page)

250 Maryland Farms Cultivate Sod For Sale

COLLEGE PARK, MD. — Sod grass is big business in Maryland and it is a growing business, but it is not a business for everyone, according to Mr. Brian Finger, Montgomery County Extension agent.

Speaking to an overflow crowd in the University of Maryland Center of Adult Education, Mr. Finger said an acre of high quality cultivated sod can be marketed for nearly \$3,000, but this is by no means all profit. To begin with, the high cost of land in the metropolitan areas is a limiting factor, but even if land is available, the cash outlay to establish sod is considerable.

He considers the outlook for sod farming in the metropolitan Washington, D. C., area as bright, but he reminded landowners that capital needs can be quite high before quality sod is ready for market.

But the market is growing, he said. Single family type dwellings are being built at the rate of 17,000 a year and apartments are going up at the rate of 30,000 units yearly. In Montgomery County alone, he said, it is expected that 40 new schools will be built in the next four years; the totals for Prince George's County may be even higher, and along with most of the new schools go athletic fields. New communities, industrial installments and government agencies are moving to the suburbs, and parks and golf clubs are coming into being. All these are potential sod customers, he said. Maryland's 7,000 acres now in commercial sod production will have to increase to meet the demand.

Following up the idea of high quality sod, Joseph Newcomer, University of Maryland Extension agronomist, said many of the states bordering Maryland have already enacted sod laws. He said the Free State emphasis will be on a sod certification program.

Programs under consideration provide that certified sod will be grown from certified seed on a field that has been approved before planting and the sod will have to be inspected before it is sold. Maryland "Approved" sod, he said, will not have to be grown from certified seed, but to be classified as such it will have to be grown from seed approved by the inspectors.

He said he believes this program will assure Maryland producers a fair market for their crop and users will be assured of getting a quality product.

Gus Day, head of Maryland's State Board of Agriculture seed testing laboratory, urged all sod growers to insist on certified seed of varieties that are available, and also to read the label to make sure the seed meets the individual standards set by the user. "You should have some minimum specifications, and you should have them written down," he said. If seed is bought on specification, he added, payment can be made after a laboratory test shows the seed to be as advertised.

Edward F. Mayne, owner of Mayne Realty Company, Olney, Maryland, urged the group to adopt a uniform contract for sod sales. He said such a contract should include a description and location of the sod, the price, terms of payment, and the time of removal of the sod. This type of contract, he added, would protect both the producer and user of sod.

Careful seedbed preparation will pay dividends as long as sod is on a piece of ground, said Parker Shirling, manager of the Princeton Turf Farms near Centerville, Maryland.

He said rushing through the leveling operation could leave ridges in the soil that would cause problems every time the turf is mowed. Low spots may form lakes during wet seasons and cause problems of stuck equipment in addition to being unproductive areas.

He outlined his complete seedbed preparation program from deep plowing in the fall, through discing many times during the following spring and summer, to actual seeding in August. He said his practice of planting half the seed one way across the field and half at right angles gives a better stand and helps avoid missed areas.

Dr. Elwn Deal, University of Maryland turf specialist, said there is really no choice in the time to seed a turf plot in Maryland. Fall is the only safe season for seeding. If the plot lays fallow through spring and summer, it will produce sod as quickly as if it were seeded in the spring.

Maryland, he said, is just one the fringes of two different grass regions. It is almost too far south for good Kentucky bluegrass and fescue lawns, and almost too far north for good bermudagrass and zoysia lawns. He suggested a mixture of common Kentucky bluegrass and Merion Kentucky bluegrass as one that would meet most of the needs for lawns in the area.

Some of the newer chemicals can be used in conjunction with the old standby, 2,4-D, for controlling weeds in turf, according to Dr. John Meade, weed control specialist at the University. He said some of the newer herbicides are doing a good job of knocking out some of the species that have been resistant to 2,4-D, but some species are still hard to control.

Probably 80 per cent of the \$4 million spent for sod in the metropolitan Washington D. C., area last year was spent for poor quality turf, said Alton E. Rabbit, agronomist with the National Park Service, Department of Interior, Washington, D. C.

He said there has been far too much cutting of pasture sod with poor grass species, weeds and "junk". He urged all sod buyers to purchase only on specification and from commercial producers of quality sod. "You cannot afford to buy cheap sod," he said, "because it will cost more to install it than good sod would cost."

Nothing wastes money as fast as an "on-again-off-again" promotion campaign, William H. Wilmot, manager of Summit Hall Turf Farm, Gaithersburg, Md., told the group.

He said Summit Hall spends nearly 15 per cent of its gross income on promoting the sale of sod. He listed as promotion such things as letterheads, uniformed workmen, clean trucks, direct mail campaigns, as well as paid advertising campaigns. Unless you sell your sod, all you end up with is a sea of green, he told the group.

The conference was sponsored by the University of Maryland Department of Agronomy and the Co-operative Extension Service. Program coordinators were Brian Finger and Dr. Elwyn Deal, turf specialist at the University.



■ APPLICATION by truck-mounted spray boom with two tips for broadcast work or one or two jets for selective spraying. Gauge pressure for spray boom is 50-60 psi.

GUIDELINES FOR A HERBICIDE PROGRAM

DETAILED instructions published by the Connecticut State Highway Department provide a ready reference for operating crews engaged in the use of herbicides for weed and brush control. Information on application dates, equipment, materials, operational details and special precautions for ten classifications of treatment are tabulated on a single large sheet that is convenient for use in the field. The program is the result of a combined effort by W. C. Greene, Engineer of Roadside Development; Ken Mattern, Assistant Head of Roadside Development; Richard Burgess, Senior Landscape Engineer; and E. F. Button, Staff Agronomist. Dr. Button furnished the information for this article.

Equipment

A small Bean pump which provides continuous by-pass agitation while spraying is used for all types of treatment. Application is made either by a truck-mounted sprayboom fitted with two OC-20 tips for broadcast patterns or a handboom with one or two T-jet 6504 tips for selective spraying. Gauge pressure is 50 to 60 psi for sprayboom application and 40 to 50 psi for hand-

booms. To calibrate spraying rates the by-pass pipe is placed in the same drum of water as the intake pipe; air is cleared from the nozzle line and pressure is adjusted to the indicated range with the outlet nozzle valve shut off. The nozzle is then operated for exactly one minute, catching all discharge in a pail. This quantity is measured to the nearest quarter pint, and if necessary the regulator is adjusted until the desired volume per minute is obtained.

Classification of Treatments

Weed Control in Medians: Median strips and other intensively mowed areas receive herbicide applications from late April through the middle of May. A broadcast type of spray is used to apply a mixture of 3 quarts of 2, 4-D amine and 50 pounds of 12-32-12 soluble fertilizer (or 25 pounds of urea) to 50 gallons of water. For spraying medians the sprayboom is mounted on the left side of the truck, which travels at 5 mph. A strip 10 feet wide is covered at an application rate of 3 gallons per minute.

Roadside Applications: Early herbicidal treatment for roadside weed elimination is scheduled for May.

A broadcast spray applies the same mixture of herbicide and fertilizer used for median strips. With the sprayboom mounted on the right side, the truck travels at 5 mph and covers a strip about 8 feet wide at a 3 gpm application rate.

Guard Rails and Signs: Seasonal removal of grass and weeds under rails and signs is carried on from April to the first frost. Treatment is with 10 lbs. of Radapon plus 2 quarts of 2,4-D amine plus 2 lbs. of Simazine mixed with 50 gallons of water. A handboom with a single tip is used to apply the solution to the base of sign and delineator posts until a 12-in. diameter area around each post has been thoroughly wetted. Care must be taken not to spray a larger area than indicated. Under guard rails at truck-mounted sprayboom is aimed to cover a uniform straight strip about two feet wide. Application rate is 2 gpm; truck speed is 5 mph.

Poison Ivy and Poison Sumac: For eradication of these weeds, selective spraying is used from June 1 through September 15. The solution is a mixture of 1 quart 2,4-D amine and 1 pint 2,4,5-T amine in 50 gallons of water. Handboom application is used to wet foliage of vines thoroughly.

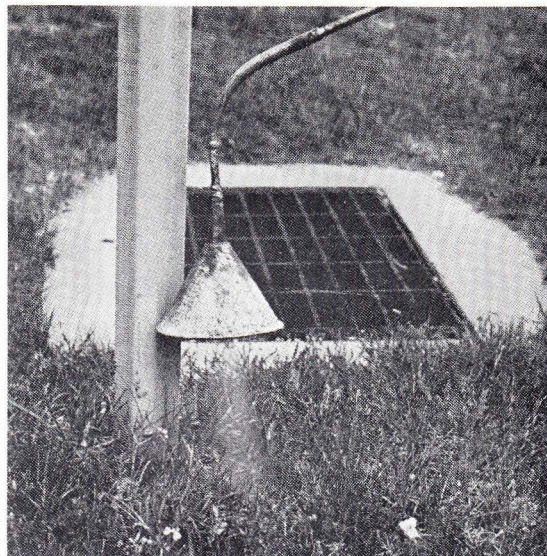
Ragweed: From early July through August, a broadcast application of 2 quarts 2,4-D amine plus 50 lbs. 12-32-12 soluble fertilizer (or 25 pounds of urea) in 50 gallons of water is used to control ragweed and other annual weeds. Spraybooms cover a 5 to 8-ft. strip at truck speeds of 8 to 10 mph. A 3 gpm spray rate is indicated. This broadcast spraying may be supplemented with selective handboom treatment if needed.

Brush Regrowth: Late summer treatment for control of brush regrowth is handled by selective spraying from August 15 to September 15. Depending on the type of growth, either broadcast or handboom equipment is used to apply a mixture of 2 quarts 2,4-D amine and 2 quarts 2,4,5-T amine in 50 gallons of water. For broadcast application the truck travels at 3 mph; 3 gpm are sprayed on a strip 8 ft. wide. Brush over three feet tall should not be sprayed.

Cut Brush: To prevent regrowth of cut brush, a selective basal bark spray is applied to stumps in the fall and winter. A single-tipped handboom is used to wet stumps thoroughly until solution runs down to the base of the stump. The herbicide solution is 1½ gallons of



■ **SELECTIVE** spraying is used for control of poison ivy and poison sumac, above. When soil sterilants are used, a bituminous cap is placed, right above. For selective weed and grass eradication a single tip is used.



2,4,5-T low volatile ester mixed in 48 gallons of No. 2 fuel oil or kerosene.

Soil Sterilants: Soil sterilants which are covered with bituminous caps may be applied under guard rails at any time when soil is not frozen and when it is not raining. For this treatment 7 lbs. Simazine or 10 lbs. Karmex (Telvar DW) is mixed with 50 gallons of water. The solution is applied at 2 gpm from a sprayboom to a straight strip 1½ feet wide which extends 6 ins. behind the rail. Truck speed is 4 to 5 mph. Special precautions must be taken when handling or spraying soil sterilants. Spillage on pavement or shoulder must be prevented and excessive applications which tend to run down slopes must be avoided. Mixing and spraying operations must be done in exact accordance with specifications.

A bituminous cap must be placed over the sterilized soil immediately after the sterilant is applied. MC-3 asphalt or other comparable bitumen is placed at the rate of 0.4 gal./sq. yd. to a 2-ft. wide strip, taking care that the cap overlaps both sides of the treated area and that the edges have uniform straight lines. White posts must be suitably protected during this application to

prevent them from being spattered with the bituminous material. [Many states do not use the bitumen cap; there is validity to the argument that it is not necessary.]

Difficult-to-Kill Species: Special treatments are used during the spring and summer to control weed species that are difficult to kill. For milkweed, 1 lb. amino triazole is mixed with 10 gallons of water and applied with a single-tipped handboom so as to wet the plant thoroughly. Spraying of grass and desirable vegetation must be avoided. The same mixture and application method is used on Canada thistle; spraying is done during the bud stage. For Japanese bamboo, a mixture of 1 gallon Baron in 4 gallons of water is applied early in the season by a handboom. Foliage, stems and ground at base of plant are soaked, with care being taken to avoid desirable plants.

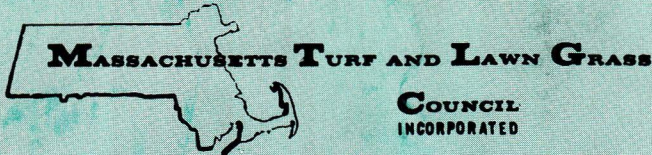
Shrub Beds: Selective weed and grass eradication in shrub beds may be done from May 15 to September 1. A handboom with a single tip and a funnel to prevent drift is

used for spot selective application of ¼ lb. amino triazole and 1 lb. Simazine in 50 gallons of water over each half acre. Particular care must be exercised to prevent spray material from hitting foliage of shrub plantings.

Precautions

A number of special features and precautions apply to all herbicidal spraying programs. One that is particularly emphasized is to avoid spraying roadsides adjacent to water supply reservoirs or within 50 feet of tributary streams. Other "don'ts" are: Do not apply any herbicide in windy periods. Do not apply 2,4-D or 2,4,5-T when temperature is 86°F or above. Do not permit pump pressures which will produce fine droplets causing drift away from spray areas. Do not allow any herbicide to hit foliage or stems of desirable vegetation, shrub plantings and the like. And finally, do not undertake a spray program until you thoroughly understand its objectives, and the nature of the material to be used. □□□

FROM



RFD #2, HADLEY, MASS. 01035



TURF BULLETIN

TROLLING

PESTICIDE (Continued)

Misinformation Hurts!

An endrin-apple pomace bait, purchased correctly under California permit, was delivered to an airstrip, unloaded and left *inside* a fenced area where cattle were grazing. Truck driver had been told cattle would not bother the bait. Score: 24 yearling Angus died.

Aldrin and Dieldrin Registration Changes:

Uses greatly curtailed on Field, Grain, Fiber, Forage and Vegetable crops.

Many uses on present and earlier labels are now illegal. Even some 1966 Pest Control Charts will have to be corrected.

There are, at present, no changes in seed treatments or on fruit.

More on Consumer Protection

I quote Dr. James L. Goddard, new Commissioner of the federal Food and Drug Administration: "25% of the consumer's dollar is spent for items produced by industries regulated by FDA . . ."

FDA is concerned with medicines, cosmetics, veterinary drugs, pesticides, foods and additives and a host of other items of which the purity, efficacy and safety are taken for granted by consumers.

Agricultural Research Service quarantine inspectors have to "keep on their toes" to protect our nation's resources against damaging foreign pests. According to a note in AGRICULTURAL RESEARCH, February, 1966, the following incident was one of several examples of the type of pests they are on the lookout for:

"Golf shoes were found playing host to a party of plant parasites upon their arrival at Dulles International Airport, near Washington, D. C. Soil adhering to the shoes yielded the grass cyst nematode that attacks lawns and pastures in foreign countries. Undetected, the pest could have started an infestation on some luxurious greens in this country."

Join Your Massachusetts Turf And Lawn Grass Council

For more information write:

Mass. Turf and Lawn Grass Council
Att.: Dr. Joseph Troll
RFD #2, Hadley, Mass., 01035
or

Contact either of the following:
George Moore, President MTLGC
1295 State St., Springfield, Mass.

Joseph A. Keohane, Rm. 202, Stockbridge Hall
Univ. Mass., Amherst

The Massachusetts Turf and Lawn Grass Council is a non-profit corporation. Its officers derive no benefits except the satisfaction of keeping Massachusetts and its neighbors first in turf. It was founded on the principle of "Better Turf Through Research and Education." We must support our University to accomplish this, and we can with a large and strong Turf Council.

Membership is not restricted to Massachusetts residents or turf professionals alone, all are welcome to take part. Write today.

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