1982

Summer 1982

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TURF BULLETIN

MASSACHUSETTS TURF
AND LAWN GRASS COUNCIL
INCORPORATED

FEATURED IN THIS ISSUE:

1981 Field Trial Results
Living with the Gypsy Moth
Managing Annual Bluegrass

SUMMER 1982

BETTER TURF THROUGH RESEARCH AND EDUCATION

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Vol. 19, No. 2 **Summer 1982**

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

The Editor wishes to thank Loretta J. Cassel for her research and technical assistance in the construction of this bulletin.

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Registration of Isofenphos

To: Golf Course and Other Turf Managers in Massachusetts
Re: Registration of isofenphos (Oftanol*, Scotts Insecticide 4*)

On 28 April, a sub-committee of the Pesticide Regulatore Board conducted a second hearing concerning a possible state label for isofenphos. At an earlier meeting (19 March) two companies had submitted proposals for state labels for the material -Mobay for Oftanol* and O.M. Scott for Insecticide 4*. Both requests were denied at that time, primarily because the sub-committee was concerned about the use of isofenphos on home lawns. The sub-committee voted in March to require a statement requiring watering in and a "For Restricted Use Only" statement on the label. Neither company was willing to accept the "restricted use" statement, because such a statement could conceivably jeopardize efforts for a future federal registration. O.M. Scott subsequently submitted a second request for Insecticide 4*, "for use on golf course turf only", by certified pesticide applicators. This proposal was approved at the 28 April meeting.

Therefore, Scott's Insecticide 4* which is a 2% granular formulation of isofenphos (same active ingredient as Oftanol*) has been cleared for use on golf course turf (but *only* golf course turf) in Massachusetts. Each user must have a copy of the state label in his possession when applying the material, but Jeff Carlson of the Pesticide Regulatory Board assured me that the bags marked "for use in Massachusetts" would in fact have the necessary label on them.

The Scotts representatives said they would try to make Insecticide 4* available as soon as possible, but logistically, they probably will not be able to supply every interested course until early July.

Incidentally, the Scotts label does specify that the material is to be watered in. This was one reason the sub-committee was willing to accept the Scotts formulation. (Watering in may or may not improve the efficacy of the material, but it reduces the likelihood of harm to non-target organisms.) Therefore, to be in compliance with the law, *the user must water in the material* immediately after application.

Meanwhile, Mobay's Oftanol* was not cleared for use in Massachusetts for 1982. Once again, even if the material has been purchased legally in another state and has been watered in, *any use of Mobay's Oftanol* in Massachusetts is in violation of the law.*

So, for those of you who wish to apply isofenphos to your golf courses, Scotts Insecticide 4* is the only formulation which will be legal in Massachusetts in 1982. We are still hoping that Mobay will be able to clear the paperwork for a federal registration for 1983.

Good luck in the current season!

*Trade name

Sincerely,

Pat Vittum

Patricia J. Vittum
Extension Entomologist

Managing Annual Bluegrass

By J. M. Vargas, Jr.
Department of Botany & Plant Pathology, Michigan State University

More and more people over the past several years have come to realize that annual bluegrass is only another turfgrass species. It has its good points and its bad points, just as all the other species do. One of its good points is its ability to provide an adequate putting surface at 1/8th inch height of cut or an excellent fairway at 5/8th inch height of cut. It provides an upright lie for the golf ball in the fairway and allows the fairways to be maintained in a softer condition during the summer months. It does have its share of disease problems, as do the other turfgrass species (Table 1). Annual bluegrass has an advantage that other species do not have in that if it is lost due to mechanical damage, disease, or insects, it will replace itself from the viable seed which is in the thatch or soil layer. From a conceptual point of view, the advantage Kentucky bluegrass, creeping bentgrass and the new perennial ryegrasses have had over annual bluegrass is that they only die once. If annual bluegrass is mismanaged, it dies, but it will regerminate and replaces itself. Soon, annual bluegrass becomes the problem instead of mismanagement. More importantly, what is overlooked is the fact that the Kentucky bluegrass, creeping bentgrass, and perennial ryegrass also disappeared through mismanagement practices. However, the fact that they only die once, somehow makes them more desirable.

Table 1. Important Turfgrass Diseases on the 4 Major Cool Season Turfgrasses

Kentucky Bluegrass	Creeping Bentgrass	Annual Bluegrass	Perennial Ryegrass
Melting out	Dollar spot	Dollar spot	Brown blight
Fusarium blight	Brown patch	Brown patch	Brown patch
Stripe smut	Pythium blight	Pythium blight	Pythium blight
Nigrospora patch	Leaf spot	Leaf spot	Anthracnose
Yellow patch		Anthracnose	Red Thread Rust
Fusarium patch	Typhula blight	Fusarium patch	Typhula blight
	Fusarium patch	Typhula blight	

Each turf species, and in some cases each turfgrass cultivar, has its own particular ecological requirement. Kentucky bluegrass should: 1) be maintained at 1-1 1/8" mowing height, 2) receive between 1 to 4 pounds of actual nitrogen per 1000 square feet per season and 3) receive minimal supplemental irrigation. Creeping bentgrass should receive no more than 1 1/2 pounds of actual nitrogen per 1000 square feet per season and should also receive minimal amounts of supplemental irrigation. Annual bluegrass is a nitrogen lover and it should receive 3 to 4 pounds of actual nitrogen per 1000 square feet per season. It can be mowed as low as 1/8 inch and it should be irrigated frequently. Trying to maintain Kentucky bluegrass at 3/4 of an inch will only result in a quick invasion by annual bluegrass. Likewise, over irrigating the Kentucky bluegrass fairways to make them a little softer during the summer period will result in the invasion, and the eventual takeover of the fairways by annual bluegrass. Creeping bentgrass has approximately the same mowing requirements as annual bluegrass. Like annual bluegrass it also can tolerate frequent irrigation. However, unlike annual bluegrass, creeping bentgrass will also do well on minimal irrigation, which gives it a competitive advantage over the annual bluegrass. The other key to maintaining creeping bentgrass is to keep the nitrogen level on the low side. Granted, the creeping bentgrass will not have the dark green color normally associated with it and you will not be removing the same amount of clippings you have in the past. However, you will be a lot more successful in maintaining a creeping bentgrass stand (Table 2).

Table 2. Requirements for Competitive Survival of Cool Season Turfgrass

	Kentucky bluegrass	Creeping bentgrass	Annual bluegrass
Mowing height	1"-2"	1/8"-3/4"	1/8"-3/4"
Irrigation	infrequent	infrequent	frequent
Nitrogen fertility requirement	1-4 lbs	1 1/2 lbs	3-4 lbs

The question you should ask yourself is: "Am I being paid by the amount of clippings I produce or is my job to maintain an excellent putting surface?" If the answer to the question is an excellent putting surface, the one thing that will detract from an excellent putting surface is thatch and graininess. Excess nitrogen is a great contributor to thatch and graininess. Following a low nitrogen management regime not only favors creeping bentgrass over annual bluegrass, but makes it easier to maintain a quality putting surface. The cultural management requirements for each species is given in Table 2.

As you saw in Table 1, each species has its own set of disease problems. If these problems are not taken care of, the turf will be severely thinned or, in many cases, destroyed by these diseases. In the case of Kentucky bluegrass and creeping bentgrass, the dead areas most likely will be filled in by annual bluegrass, broadleaf weeds, or other weedy grasses. In the case of annual bluegrass, the annual bluegrass will undoubtedly replace itself in the fall or spring. However, the objective of a good superintendent in to maintain disease free turf whether it be on the greens, or the tees, or, on the higher budget

courses, on the fairways. To do this, one needs to focus his cultural management efforts on turfgrass maintenance during the most stressful time of year. For the northern United States, this is the period between July 1 and August 31. God grows the grass until July 1 and he takes over again on August 31. During the other two months it is the golf course superintendents responsibility. This is what he has been hired for and what he should aim his cultural program at. Too often fertilizing, verticutting, and coring are done when it is convenient to do them. However, these practices should be done at the time that they will make the turf the healthiest as it goes into the July 1 to August 31 stress period.

Figure 1. Nitrogen Fertility Schedule for Annual Bluegrass

	June 1	July 1	Aug. 1	Sept. 1	Oct.	Nov. 15
(lbs/1000 sq ft)						
Option I	1/2	1/2	1/2	1		1
Option II	1 1/2			1		1
(Anthracnose)						
(Dollar Spot)						
Brown Patch						
Fusarium Patch						
Typhula Blight						

A good cultural program consists of heavy deep verticutting in the early spring, following the breaking of dormancy and the initiation of new growth. A heavy, deep verticutting in early May will remove some of the mature plants, the result being the production of new juvenile plants which should be better able to survive the heat stress period. This should be followed by a double coring of the fairways between the 1st and 3rd week in June, depending upon your tournament schedule. These two corings should provide enough coring holes for vigorous deep root growth to make the annual bluegrass plants healthier and more vigorous going into the summer stress period. Finally, a good nitrogen program with emphasis on summer and fall nitrogen applications should be followed (Figure 1). The summer nitrogen will help reduce the severity of diseases such an Anthracnose and Dollarspot. The September application should help the plants recover from the summer stress period and begin to build up carbohydrates to get them through the remainder of the fall. The September application should be made early enough so the turf has a chance to harden-off before winter sets in. The late fall application should be made after vertical growth has ceased. At this point, the roots will remain alive for a 2 to 3 week period during which time they will be capable of taking the nitrogen up, storing it, giving the plants the nutrition they need to begin growth in the spring. Spring nitrogen application often causes a flush of growth which usually results in excess top growth at the expense of root growth and, therefore, a less healthy plant going into the summer stress period.

Figure 2. Fungicide Schedule for Annual Bluegrass

	June		July		August		Sept.
	7	10	1	10	1	10	1
Fungicides:	S		NS	S	NS	S	NS
Diseases:			Anthracnose				
	Dollar Spot						
			Brown Patch				

S - Systemic Fungicide NS - Non-Systemic Fungicide

Now that we have done everything we possibly can to culturally encourage annual bluegrass growth, it is time to take care of the pests of annual bluegrass. Figure 2 has a fungicide schedule for maintaining healthy annual bluegrass fairways or greens. Table 3 has a list of fungicides which are effective against these diseases. However, not all the fungicides listed are labelled for all the diseases and they should be used only as labelled. If you are still skeptical or if your golf club refuses to give you the money to treat either your fairway or greens, I suggest the following: in the case of the fairways, take one fairway from tee to green and treat ½ of it with the fungicide program. I know from past experience that once the membership sees the difference in the turf quality, you will have no problem obtaining the funds for this program for all 18 holes the following year. If it is only the greens you are concerned with, you can accomplish the same result by treating ½ the greens with the program recommended here and the other ½ with your old program. Again you will not have any trouble the following season getting the extra money to treat all 18 greens.

Table 3. Fungicide Schedule for Annual Bluegrass Turfs

June 7	Acti dione (TGF, RZ) Daconil 2787 Chipco 26019-(S)
July 1	Daconil 2787
July 10	Tersan 1991-(S) Fungo 50-(S) Cleary's 3336-(S) Pro turf Fert. + DSB-(S) Pro turf Fungicide 7-(S) Bayleton-(S)
August 1	Daconil 2787
August 10	Tersan 1991-(S) Fungo 50-(S) Pro turf Fungicide 7-(S) Cleary's 3336-(S) Pro turf Fert. + DSB-(S) Bayleton-(S)
September 1	Daconil 2787 Acti dione (TGF, RZ) Chipco 26019-(S)

Annual bluegrass does have one other major pest, the Black Ataenius beetle. There are many effective insecticides which can be used to control this problem. You should consult your local entomologist for further details.

I leave you with one final thought. The man who ceases to try anything new, who closes his mind to new ideas, is already dead although his heart may still beat. The golf course superintendent who closes his mind to new ideas, who is unwilling to try anything new is a superintendent in name only. To approach the greens committee with some new ideas on how to maintain healthy annual bluegrass, to improve the quality of their golf course is to be an alive, vibrant thinking superintendent. If, after demonstrating to them how they can have better, healthier turf, they are not willing to support you, then shame on them. But if you do not ask them for the money or if you are not even willing to try a new program on a small test area, then shame on you. Remember, when the fairways are green and the greens are healthy, the membership will show up to play golf. They will come into the clubhouse in a good mood and will be far more likely to stay for dinner and drinks. They will also be far more likely to tip the locker room boys and the help in the grill room and dining room. But if the fairways are thin and dead and if the greens are bare, they will stay home or find another golf course to play on. When they do show up, after a round on 'dead dirt', they will either go home, or if they stay they will be in such a bad mood that they will take out their frustration on the hired help in the clubhouse. It is not only the superintendent who benefits from a healthy golf course, but all of the other personnel as well.

I wish you all the best of luck in the upcoming year.

Helminthosporium Leaf Spot Fungicide Control Trial — 1981

By Dr. Joseph Troll

The trial site consisted of a mixture of common Kentucky bluegrass and red fescue located on the University of Masachusetts South Deerfield Turfgrass Research Station. Plot size was 5 ft. by 5 ft., with 3 replications. Chemicals were applied May 5 and 18, June 4 and 16, with a 3-gallon sprayer. The test site received a total of 1 lb. n/1000 sq. ft. by late June. The area was not irrigated. It was mowed twice weekly at 1½ in. Results are shown in table 1.

It appears that there was a greater incidence of leaf spot about May 14 and again a possible increase in early June. However, most fungicides used in the trial controlled the disease. Fungicide 26109, applied at the lower rate of 1 oz./1000 sq. ft. resulted in the most effective residual control. Nitrogen (urea) appeared to enhance the disease infection.

Table 1. Treatments, rates of application, and degree of leaf spot infection - 1981.

Treatment	Rate/ 1000 ft^2	Av. degree infection[1]					
		5/5	5/14	5/26	6/1	6/10	6/23
IBDU + CGA 64251	.8 lb + 8 g[3]	1.6[2]	4.0	2.3	3.0	1.0	2.3
Daconil 2787 (4.17E)	1.5 oz	0.3	2.0	1.6	0.6	0.6	1.6
Daconil 2787 (4.17E)	3.0 oz	0.3	0.0	1.3	1.0	0.6	1.0
Acti-dione TGF	0.34 oz	1.6	0.3	0.6	1.3	0.6	2.1
Acti-dione TGF	0.68 oz	0.3	1.3	1.6	1.3	0.6	1.6
Acti-dione TGF + Daconil (75W)	0.34 + 0.93 oz	1.6	3.0	1.6	1.6	1.3	1.3
CGA 64251 EC	12 g(ai)	1.6	0.3	1.6	0.0	0.3	0.0
Daconil (75W)	1.84 oz	0.3	0.0	2.0	2.0	0.3	1.6
26109	1.0 oz	0.3	1.0	0.3	0.0	0.6	0.0
26109	1.5 oz	1.6	1.6	1.3	0.3	0.3	0.0
Urea	0.25 lb	2.0	2.6	3.0	3.0	1.3	2.0
Daconil 90DG	1.67 oz	2.0	0.3	1.3	1.3	0.3	1.0
LSR	3.0 oz	1.6	2.0	0.6	1.6	1.3	2.0
Antibiotic	——	1.6	4.0	3.0	2.3	0.6	1.[illegible]
Check	——	0.3	2.6	1.6	2.0	1.3	1.[illegible]

[1] Ratings were based on an average of 3 replications

[2] Rating: 1 = very light infection, 2 light infection, 3 medium infection, 4 severe infection.

[3] Applied every 4 weeks.

[4] Applied twice, 30 days apart.

Cultivar Trials — 1981

By Mickey Spokas and Dr. Joseph Troll
University of Massachusetts

In recent years, plant breeders have introduced numerous cultivars which exhibit differences in leaf color and texture, shoot density, disease resistance, and cultural requirements. Knowledge of how these cultivars perform under varying environmental conditions and maintenance practices will allow turf specialists to make informed selections, specific to their needs.

Kentucky Bluegrass Trial

The third Kentucky bluegrass cultivar trial at the University's research plots was begun in 1978 and concluded in 1981. Two areas were each planted to forty-four cultivars in 5×6 ft. plots, with each cultivar represented three times. These two sets of turf plots were maintained at different heights of cut, one at ¾ inch, the other at 1½ inch. Mowing was done twice weekly. All plots were fertilized at the rate of four lbs. of nitrogen/1000 sq. ft./year. Disease controls were applied as needed.

Spring turf quality was affected in 1981 by the incidence of Helminthosporium leaf spot (tables 1 and 2). Cultivars with moderate to severe infections were Aquila, Scenic, Birka, Fylking, Arista, Kenblue, Park, and S-21. During the course of the year, at close mowing height (¾ inch), Banff, Plush, Touchdown, and Princeton exhibited high quality. When maintained at 1½ inch, Banff, Touchdown, Trenton, Majestic, Princeton, and Ram I were found to have performed well.

During the previous years of this study, Kentucky bluegrass cultivars which performed well were as follows: 1980 - Baron, Banff, Bonnieblue, I-13, Haga, Nugget, P-164, Parade, Princeton, Rugby, Sydsport, Touchdown, and Trenton; 1979 - Banff, Bonnieblue, Columbia, Fylking, Haga, P-164, Majestic, Merion, Nugget, Parade, Princeton, Ram I, Rugby, Sydsport, Touchdown, Trenton, and Windsor. It can be seen that consistent high quality over the three year period was exhibited by Banff, Princeton, Touchdown, and Trenton.

Fine Fescue Trial

The fine fescue variety trial plots were seeded September 23, 1978, following plot size and replication procedures described for the Kentucky bluegrass trial. Heights of cut for the fine fescue subplots were 1½ inch and 2½ inches. Fertilization was at the rate of two lbs. of nitrogen/1000 sq. ft./year.

When maintained at the 1½ inch mowing height, superior cultivars were Longfellow and ST (table 3). At the 2½ height of cut, outstanding cultivars were Walding, Balmoral, Mom FOD 11, and Menuet. Scaldis rated high early in the year, but dropped off somewhat in August. In general, the 2½ inch mowing treatment subplots exhibited better color and density in June and July, but were found to be in poor condition in August. In contrast, the subplots mowed at 1½ inch rated poor in June and July, but were found to be superior overall in August.

1979 rating results on these varieties found Walding, Scaldis, Longfellow, and ST to be those which exhibited the best color and density throughout the year. The results in 1980 were similar with the inclusion of Biljart and the exclusion of ST. During the course of this three-year study, cultivars which have shown consistent high quality are Walding, Scaldis, Longfellow, and ST.

Perennial Ryegrass Trial

The perennial ryegrass variety trial was originally planted on September 20, 1979, but due to winterkill, most plots were replanted on May 16, 1980. Forty-two cultivars were planted in 4×6 ft. plots, with each cultivar represented three times. The plots are mowed at 1½ inch twice weekly. Fertilization is at the rate of three lbs. of nitrogen/1000 sq. ft./year. Pest control is applied as needed.

During the 1980 season, cultivars which were found to have performed well were K5-684, R-40, Elka, Belle (MP-1), and Manhattan (table 5). In the spring of 1981, moderate to severe winterkill was observed on Barry, Diplomat, Yorktown, CT-112, Dasher, and ZW 42-80. The cultivars exhibiting superior quality during 1981 were K5-684, K5-88, Delray (K5-90), and Blazer (table 4).

The Kentucky bluegrass and fine fescue trials have been concluded and the results are summarized here. The perennial ryegrass trial will be continued, with any further results published in a future issue of the Turf Bulletin. Since no single species or cultivar is able to adapt to the varied soil, climatic, and cultural practices of New England, it should be stressed that the quality ratings given in this article are the results of the maintenance practices outlined and are not to be considered as a recommendation for one cultivar over another.

Table 1. Performance of Kentucky bluegrass cultivars maintained at 3/4 - 1981.

Cultivar	Helminthosporium leaf spot[1]	Quality[2] 5/21	6/10	7/9	8/6
A-20		5.7	6.7	5.7	5.3
A-20-6		6.7	8.0	5.7	6.3
A-29-10	1	6.7	7.3	6.0	6.0
A-34	1	7.0	8.3	5.0	6.0
Adelphi		6.7	7.3	7.0	6.7
Aquila	2	5.7	6.0	5.0	6.0
Arista	3	4.7	5.7	5.3	6.7
Ba74-501		7.0	6.0	6.3	5.3
Banff		6.7	7.0	7.3	7.0
Baron	1	6.3	7.7	6.7	6.3
Birka	1	5.7	7.3	5.7	6.3
Bonnieblue		7.0	7.7	5.3	6.0
Bristol		7.3	7.0	5.3	6.0
Brunswick	1	7.0	8.0	6.3	6.3
Cheri		7.0	7.7	6.0	6.3
Columbia		5.7	6.7	5.7	5.7
Fylking	1	6.0	6.7	6.0	6.7
Glade		7.7	7.3	5.3	6.7
Haga		7.0	7.3	5.3	6.7
Holiday		7.3	8.3	6.7	6.3
I-13		7.7	7.3	4.7	5.7
IS-28	3	3.7	4.0	3.7	5.3
Kenblue		6.7	6.3	5.0	5.0
Majestic	1	6.7	7.3	6.3	5.3
Merit	1	7.0	6.7	6.0	5.7
Merion	1	6.0	5.3	4.0	4.3
Newport		7.3	8.0	5.3	6.0
Nugget		7.0	7.3	5.7	6.3
P-164	1	6.7	8.0	5.3	6.0
Parade	3	3.3	5.3	3.3	5.0
Park	1	6.0	7.7	6.7	7.0
Plush		7.7	8.7	7.0	5.7
Princeton		7.3	8.0	6.3	7.0
Ram I		7.7	8.0	5.7	6.0
Rugby	3	5.0	4.0	3.3	5.7
S-21	2	5.0	5.0	3.7	6.3
Scenic		6.3	7.0	6.3	7.0
Sydsport		7.7	8.3	7.0	6.3
Touchdown		7.3	7.1	5.7	6.3
Trenton		6.3	6.0	5.7	6.7
Troy	1	5.3	5.7	5.0	5.3
Vantage		7.0	8.0	6.3	6.0
Victa		7.7	6.3	6.0	5.7
Windsor	1	5.7	7.3	5.0	5.7

[1] Helminthosporium infection ratings were made on a scale of 1 to 3; 1 slight, 2 moderate, 3 severe.

[2] Quality ratings were made on a scale of 1 to 9, with 9 representing ideal turf.

Table 2. Performance of Kentucky bluegrass cultivars maintained at 1 1/2 - 1981.

Cultivar	Helminthosporium leaf spot[1]	Quality[2] 5/21	6/10	7/9	8/6
A-20		4.3	5.7	5.7	6.3
A-20-6		6.0	7.0	6.0	6.0
A-29-10		6.0	7.0	5.7	5.3
A-34	1	5.0	6.7	6.3	6.3
Adelphi		5.0	6.3	7.0	5.7
Aquila		5.0	6.3	6.3	6.0
Arista	3	3.3	4.7	6.3	6.3
Ba74-501		5.7	6.3	6.3	5.3
Banff		6.0	8.3	7.0	6.0
Baron		6.3	6.0	6.7	5.0
Birka	2	5.0	6.0	5.7	6.0
Bonnieblue		6.0	8.0	6.0	6.0
Bristol		6.0	7.3	5.0	6.0
Brunswick		5.3	6.3	6.0	6.0
Cheri		5.7	6.7	6.3	5.7
Columbia	2	4.3	4.7	7.0	6.7
Fylking	1	3.7	5.0	6.0	6.3
Glade		6.0	6.7	6.0	5.0
Haga		5.7	6.7	6.0	6.0
Holiday		6.0	7.0	7.0	6.0
I-13		6.0	6.3	6.0	7.0
IS-28	2	3.7	4.0	6.0	5.7
Kenblue		6.0	7.7	7.0	6.7
Majestic		6.0	6.7	7.3	6.7
Merit		6.3	6.3	6.0	7.0
Merion	1	4.0	4.3	5.0	6.7
Newport		5.7	7.7	6.3	6.7
Nugget		6.0	8.0	6.3	6.0
P-164		6.3	7.0	5.7	6.0
Parade	2	3.7	4.7	5.7	6.3
Park		5.0	6.3	7.3	6.0
Plush		7.0	7.7	7.7	6.7
Princeton		3.0	7.0	7.0	6.7
Ram I		6.0	6.7	6.0	6.7
Rugby	2	3.7	4.7	5.0	6.0
S-21		4.7	5.7	6.0	6.0
Scenic		5.0	7.0	6.3	6.3
Sydsport		6.7	7.7	7.7	7.7
Touchdown		6.7	7.0	6.0	7.0
Trenton		5.3	6.3	7.0	6.3
Troy		5.7	5.0	6.7	6.3
Vantage		4.7	7.0	7.3	6.0
Victa		5.3	7.0	7.3	6.3
Windsor	1	5.7	7.3	6.0	6.7

[1] Helminthosporium infection rated on a scale of 1 to 3: 1 slight moderate, 3 severe.

[2] Quality ratings were made on a scale of 1 to 9, with 9 representing ideal turf.

Table 3. Performance of fine fescue varieties maintained at two cutting heights - 1981.

Variety	Height of cut	Quality[1]		
		6/23	7/9	8/6
Flana	1.5	3.3	5.0	4.3
	2.5	4.3	4.3	2.7
Waldina	1.5	4.3	4.0	4.7
	2.5	4.7	5.7	2.7
Dawson	1.5	3.0	3.7	5.0
	2.5	4.3	4.3	3.7
Silvana	1.5	4.3	3.3	4.7
	2.5	4.3	5.3	2.7
Scaldis	1.5	3.7	4.7	4.7
	2.5	4.7	4.7	2.7
Scarlet	1.5	4.3	4.3	4.0
	2.5	4.3	4.7	3.0
Balmoral	1.5	3.7	3.3	5.0
	2.5	5.7	3.3	2.0
Mom FRR 25	1.5	3.3	2.0	3.3
	2.5	3.3	4.0	3.7
Mom FRR 33	1.5	2.3	2.0	4.0
	2.5	3.0	4.3	2.0
Mom FRR 4211	1.5	3.7	4.0	5.0
	2.5	4.3	5.0	3.0
Moncorde	1.5	3.0	3.0	4.0
	2.5	3.3	4.7	2.3
Mom FRC 61	1.5	2.7	2.7	4.3
	2.5	3.7	5.3	2.7
Mom FRC 62	1.5	4.0	3.3	3.7
	2.5	3.0	3.7	2.7
Mom FRC 10	1.5	3.0	3.3	4.3
	2.5	3.7	4.0	2.0
Mom FRC 12	1.5	3.7	3.7	4.0
	2.5	3.3	4.0	2.0
Mom FOD 11	1.5	4.3	4.0	2.0
	2.5	5.0	5.0	3.0
Ensylva	1.5	2.7	2.3	4.0
	2.5	2.7	5.0	2.7
Checker	1.5	3.0	3.3	3.3
	2.5	4.0	4.3	2.3
Highlight	1.5	3.0	3.0	3.3
	2.5	4.0	4.0	2.0
FL 1	1.5	4.0	4.0	5.0
	2.5	4.7	6.3	2.3
Jamestown	1.5	3.3	3.3	3.7
	2.5	3.3	3.3	2.3
Syn W	1.5	3.0	4.0	4.0
	2.5	3.7	3.7	2.7
Biljart	1.5	3.7	4.7	4.3
	2.5	4.7	5.7	2.3
Kensington	1.5	3.3	3.3	4.7
	2.5	3.0	4.0	2.7
ZW 42-68 Bingo	1.5	4.3	3.3	5.0
	2.5	3.3	4.7	2.7
ZW 42-69 Lobster	1.5	4.0	4.3	4.0
	2.5	3.3	4.3	2.0
Satin	1.5	3.0	3.3	4.3
	2.5	4.0	5.0	3.7
K4-21	1.5	2.7	2.0	4.0
	2.5	3.3	4.7	2.7
K5-29	1.5	2.3	2.7	3.7
	2.5	3.7	4.7	2.0
Longfellow	1.5	4.7	3.7	4.3
	2.5	4.3	5.7	2.7
ST	1.5	5.3	5.7	5.3
	2.5	4.0	6.0	2.7
A-74-50	1.5	3.0	2.7	4.0
	2.5	3.3	4.3	1.7
Menuet	1.5	3.7	3.3	3.7
	2.5	5.3	6.3	3.0
Banner	1.5	4.3	4.0	3.3
	2.5	3.7	4.7	1.3
Koket	1.5	3.0	3.3	4.0
	2.5	3.7	4.7	1.3

[1] Quality ratings were made on a scale of 1 to 9, with 9 representing ideal turf.

Table 4. Performance of perennial ryegrass cultivars - 1981.

Cultivar	Winterkill[1]	Quality[2]			
		5/27	6/23	7/10	8/7
Barry	2	3.7	3.3	3.7	3.3
Diplomat	2	3.3	4.0	4.3	4.3
Yorktown	2	4.3	3.3	4.0	3.7
Yorktown II		4.0	4.3	4.7	4.7
K5-684		5.3	4.7	5.0	5.0
Eton	1	5.0	4.0	4.3	3.7
K5-88		4.7	3.7	5.3	4.3
K5-683	1	3.7	2.7	3.7	4.0
NK-200		3.0	4.7	3.7	3.3
Goalie (K5-92)		4.3	3.0	3.7	4.0
Svea (K4-102)		3.7	3.0	4.0	3.3
Delray (K5-90)	1	5.3	4.0	4.7	4.3
CT-112	2	4.0	3.3	4.3	4.0
Derby	1	2.3	2.7	4.0	3.3
Paramount		4.3	3.0	2.7	2.7
Mom LP-20		5.3	4.3	4.0	4.7
Mom LP-617		3.0	2.7	2.7	3.7
RFK	1	4.7	3.7	4.3	4.3
Princess		4.3	3.7	3.7	4.0
Loretta		5.3	5.0	4.7	4.3
Caravelle	1	3.3	2.3	2.3	3.0
Sprinter		4.7	5.3	4.3	4.0
Score		3.0	3.3	3.3	3.3
ZW 42-80	3	3.3	3.7	4.0	3.7
Springfield	1	4.3	3.7	4.0	3.3
Pelo		4.7	3.3	4.0	3.0
Arno		4.0	3.7	4.3	4.3
R-36		3.0	3.0	3.7	4.0
FRR-1		4.0	4.0	4.7	4.3
R-40		5.3	4.7	5.7	5.0
Belle (MP-1)		5.0	4.0	5.0	4.7
Manhattan		3.3	4.0	4.3	4.3
Pennfine		4.0	3.3	5.0	4.7
Norlea		4.7	3.3	4.3	3.3
Citation		3.3	3.3	4.3	3.3
Acclaim		4.0	3.3	4.0	4.3
Blazer		4.7	5.3	5.0	4.0
Dasher	2	3.3	3.3	4.0	3.3
Manhattan & Pennfine	1	3.7	3.3	5.3	4.3
Fiesta		3.7	3.3	4.0	3.7
Elka	1	3.3	4.0	4.0	4.0
Derby & Manhattan		4.7	4.3	4.7	4.3

[1] Winter kill was rated on a scale of 1 to 3, with 1 mild, 2 moderate, 3 severe.

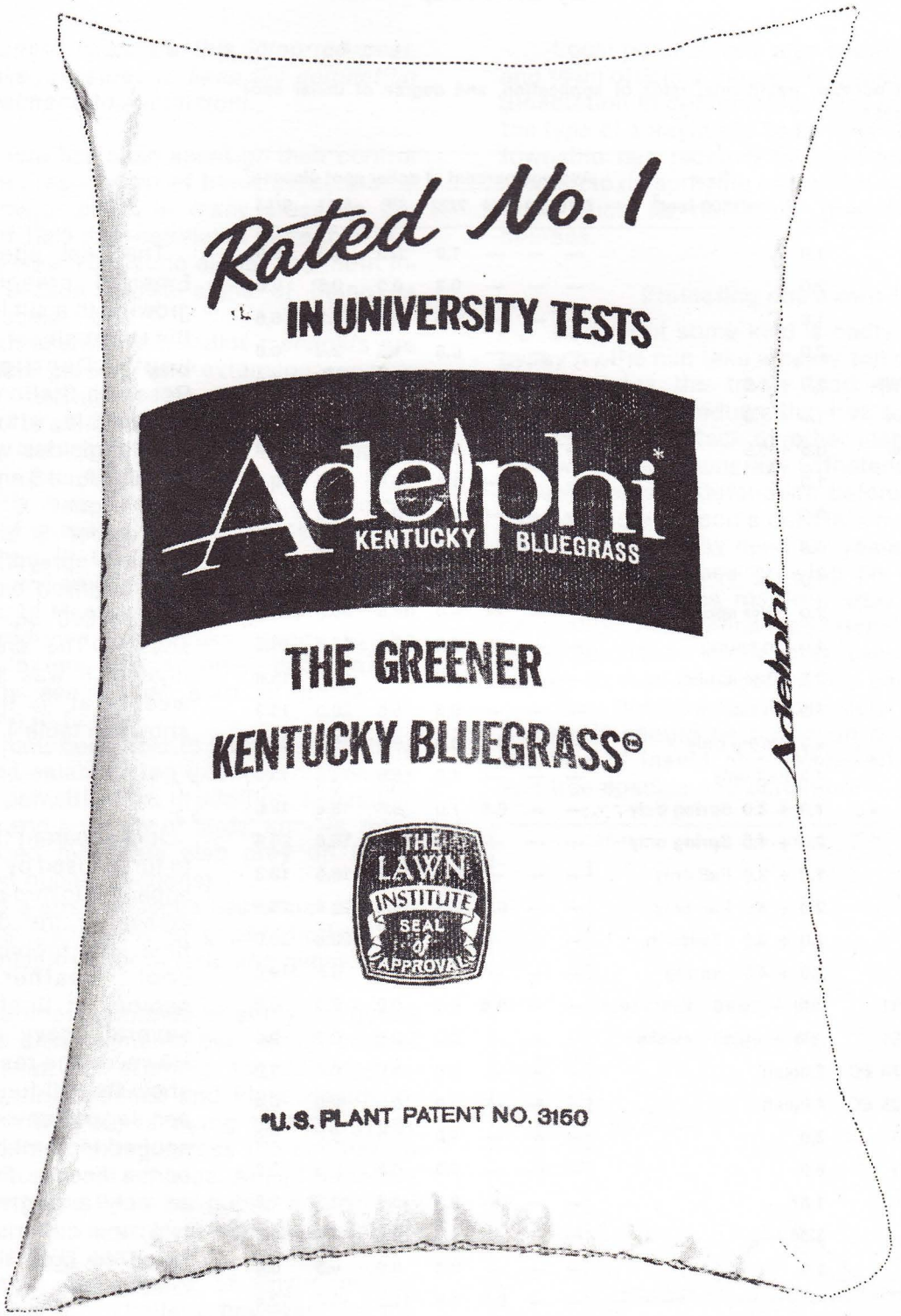
[2] Quality ratings were made on a scale of 1 to 9, with 9 representing ideal turf.

Table 5. Performance of perennial ryegrass cultivars - 1980.

Cultivar	Quality[1]				
	6/5	7/8	8/5	9/4	10/14
Barry	6.3	6.0	5.3	3.7	6.0
Diplomat	5.3	6.0	5.0	4.7	5.3
Yorktown	5.0	6.0	5.0	5.0	6.0
Yorktown II	5.3	5.3	5.7	5.3	7.0
K5-684	5.7	7.0	5.7	5.7	6.3
Eton	5.0	5.7	4.3	3.7	5.0
K5-88	2.7	4.7	4.3	3.7	5.7
K5-683	5.0	5.7	4.7	5.0	6.3
NK-200	6.0	5.7	4.7	3.0	4.3
Goalie (K5-92)	3.7	4.7	5.0	3.7	5.0
Svea (K4-102)	5.0	5.0	4.3	3.7	4.3
Delray (K5-90)	5.3	5.7	4.7	4.7	5.3
CT-112	3.7	5.0	4.7	5.0	6.0
Derby	3.7	4.7	4.7	5.0	5.0
Paramount	4.7	4.3	3.0	3.0	4.3
Mom LP-20	5.7	5.7	4.7	4.0	5.3
Mom LP-617	5.3	6.3	5.7	5.0	5.0
RFK	5.0	5.3	5.0	4.7	6.0
Princess	4.7	5.3	4.3	4.0	5.3
Loretta	5.3	5.3	4.7	5.3	7.0
Caravelle	3.3	3.7	4.7	3.7	4.0
Sprinter	4.7	5.3	5.0	3.3	4.0
Score	5.0	4.7	4.3	3.7	4.7
ZW 42-80	4.7	5.7	4.7	3.3	4.7
Springfield	4.7	5.3	5.0	3.3	4.3
Pelo	6.0	6.7	5.3	3.3	4.0
Arno	5.7	6.3	5.0	3.7	4.7
R-36	4.0	6.3	5.3	5.7	7.0
FRR-1	4.7	5.3	5.3	5.0	6.7
R-40	5.3	6.7	5.7	6.3	7.0
Belle (MP-1)	5.0	6.0	5.0	6.0	6.7
Manhattan	5.7	6.7	6.0	4.3	6.3
Pennfine	4.3	6.0	4.7	4.7	6.3
Norlea	4.3	5.0	4.7	3.0	4.0
Citation	3.7	5.7	4.7	4.7	7.0
Acclaim	4.3	5.3	4.7	3.7	5.3
Blazer	5.3	5.3	5.7	4.7	6.3
Dasher	5.0	5.3	5.3	5.3	6.7
Manhattan & Pennfine	5.0	6.7	5.3	5.0	6.0
Fiesta	5.3	5.7	5.3	6.7	7.3
Elka	6.3	6.7	5.7	5.0	6.7
Derby & Manhattan	5.3	6.7	5.3	5.3	6.3

[1] Quality ratings were made on a scale of 1 to 9, with 9 representing ideal turf.

Incomparable



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Dollar Spot (*Sclerotina Homeocarpa* Sp.) Fungicide Control Trial — 1981

By Dr. Joseph Troll

Table 1. Treatment number, treatments, rates of application, and degree of dollar spot disease - 1981.

	Fungicide	Rate oz/1000 feet[2]	Average percent of dollar spot disease[1] 5/16	6/4	7/9	7/22	8/5	8/11	9/13
1.	TGF	1.0	—	—	—	1.0	0.3	0.3	0.0
2.	TGF	2.0	—	—	—	0.3	0.0	0.6	0.0
3.	Dac 2787 (75W)	1.0	—	—	—	0.6	2.6	8.3	6.6
4.	Dac 2787 (75W)	2.0	—	—	—	0.6	1.3	2.6	0.0
5.	TGF + Dac (75W)	1.0 + 1.0	—	—	—	0.0	1.0	1.0	0.3
6.	1991 + Bayleton	1.0 + 1.0	—	—	—	4.0	0.0	0.0	0.0
7.	1991 + Bayleton	0.5 + 0.5	—	—	0.6	1.0	0.0	1.0	0.0
8.	1991	1.0	—	—	—	1.0	0.0	2.3	0.0
9.	1991	0.5	—	—	—	0.6	0.6	0.6	0.0
10.	Bayleton	0.5	—	—	—	0.0	0.0	0.3	0.0
11.	Bayleton	1.0	—	—	—	0.3	0.0	0.3	0.0
12.	26019	2.0 One applic.	—	—	—	4.0	10.6	20.0	26.0
13.	26019	4.0 in spring	—	—	—	0.0	0.0	14.3	16.6
14.	26019	2.0 One applic.	—	—	—	0.3	2.3	10.0	15.6
15.	26019	4.0 in fall	—	—	—	0.3	5.0	20.0	16.3
16.	LSR	4.0 Spring only	—	—	0.3	3.3	9.6	18.3	26.3
17.	LSR	4.0 Fall only	—	—	—	1.6	6.6	14.0	19.3
18.	26019 + LSR	1.0 + 3.0 Spring only	—	—	0.6	7.0	8.3	15.0	16.0
19.	26019 + LSR	2.0 + 4.0 Spring only	—	—	—	5.0	10.0	16.6	20.6
20.	26019 + LSR	1.0 + 3.0 Fall only	—	—	—	4.3	11.6	16.6	13.3
21.	26019 + LSR	2.0 + 4.0 Fall only	—	—	0.6	3.3	10.3	23.6	26.6
22.	26019 + LSR	1.0 + 3.0 Twice in	—	—	—	4.6	3.0	20.6	30.0
23.	26019 + LSR	2.0 + 4.0 spring	—	—	—	1.0	9.3	9.6	19.0
24.	IBDU + CG64251	.8lb + 8g(ai) Every four	—	—	0.6	0.3	0.0	0.3	0.0
25.	IBDU + CG64251	.8lb + 8g(ai) weeks	—	—	—	0.0	0.0	0.3	0.0
26.	CG64251 – 1.125 EC	2.0g(ai)	—	—	—	0.6	0.6	0.0	0.0
27.	CG64251 – 1.125 EC	4.0g(ai)	—	—	—	0.0	0.0	0.0	0.0
28.	Dac 2787 (4.17E)	3.0	—	—	—	1.0	0.0	2.0	0.0
29.	Dac 2787 (4.17E)	6.0	—	—	—	0.3	0.6	0.3	0.0
30.	DAC DG90	1.67	—	—	—	0.3	0.6	2.3	1.6
31.	DAC DG90	3.34	—	—	—	0.3	0.0	0.0	0.0
32.	26019	1.0	—	—	—	0.0	0.0	0.3	0.0
33.	Antibiotic		—	—	0.3	4.6	12.3	19.0	12.6
34.	Check		—	—	—	3.6	8.0	15.0	19.3

[1] Percent disease was based on average of 3 replications

The trial site consisted of Emerald creeping bentgrass growing in a silt loam located on the University of Massachusetts South Deerfield Turfgrass Research Station. Plot size was 5 ft. by 5 ft., with 3 replications. The fungicides were applied on May 21, June 5 and 19, July 2 and 16, August 6 and 20, and September 3 and 13, with a 3-gallon sprayer. The test si was fertilized with a total o lbs. N/1000 sq. ft. during the season. The area was not irrigated. It was mowed 3 times weekly at 1/4 in. Results are shown in table 1.

It is apparent that the damage to turf caused by the fungus first appeared in mid-summer. The increase of the disease at that time was probably due to the cool weather, increasing number of light rainfalls, and several heavy morning fogs. However, the results of this test show that all fungicides applied *per se* and several which were applied in combination controlled the disease. Plots that received only a single application or two applications of chemicals failed to hold the infection check.

Living with the Gypsy Moth

By David F. Karnosky and Clive G. Jones

Tree owners cannot eliminate this imported pest, but they can take measures to keep the defoliation of valuable specimens to a minimum.

Although more has been spent on their control than on any other insect pest of trees, gypsy moths have become major pests in many areas; in the epidemic year of 1980 they defoliated more than two million acres in New York state alone. The moth infestation this season shows signs of being as bad—worse in some areas.

Worried gardeners and woodlot managers are flooding botanical gardens and extension services with pleas for information on control methods. Although control is still a far from perfect art, a variety of available measures can help a tree owner minimize gypsy moth damage.

Gypsy moth outbreaks do occur in Europe, where the insect is native, but the problem is less severe there than in the U.S., probably because natural controls and smaller forests tend to keep the insect in check. In Massachusetts, where the moth was first introduced, outbreaks seem to be diminishing in extent and severity, and we are almost certainly seeing the start of processes already operating in Europe.

Scientists have been able to identify, introduce into the U.S. and establish ten exotic parasites: six wasps and four parasitic flies. In addition, two native ground beetles and a variety of birds, shrews, mice and medium-sized mammals also prey on larvae (caterpillars) and pupae (cocoons).

A virus and a streptococcus bacterium are two known microbial pathogens of gypsy moths. The virus can be a major factor in reducing gypsy moth populations.

While researchers continue to study the gypsy moth, there are disagreements over which control strategies are best. For example, the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) is trying to stop gypsy moth eggs from hitchhiking across the country on campers and recreational vehicles. APHIS therefore sprays the insecticide Sevin on public and private campgrounds in Pennsylvania, a state in which infestation is especially heavy.

Pennsylvania's Department of Environmental Resources (DER) officials believe, however, that the spread of gypsy moths cannot be stopped, consider campground spraying ineffective, and advocate natural controls such as insect predators or spraying with milder insecticides.

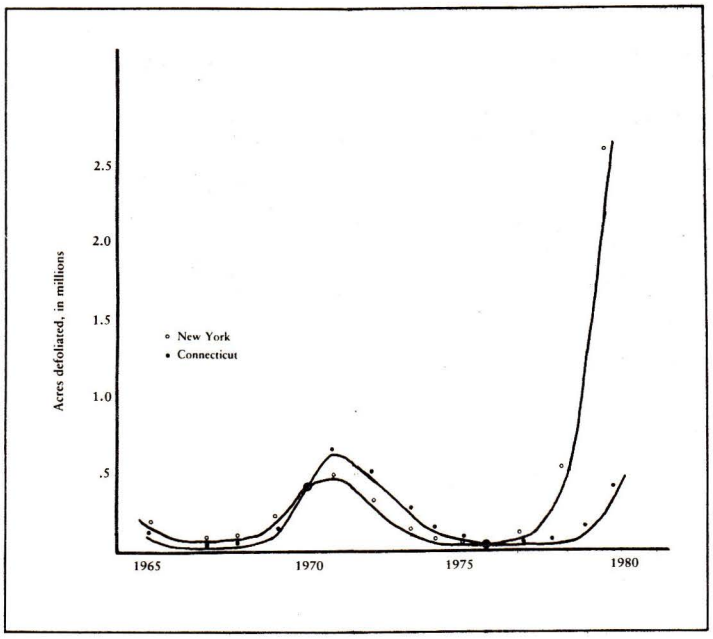
Local politics have also come into play. County and town officials frequently disagree as to who has jurisdiction in determining areas to be sprayed, and the type of spraying to be allowed. One Connecticut township has recently enacted an ordinance banning all toxic spraying except for commercial operations such as nurseries, greenhouses and golf courses.

Protecting one's own trees

Control of some kind is badly needed because gypsy moths can take a heavy toll on trees. Defoliation depletes the tree's food reserves; repeated defoliation can reduce the tree's vigor, leaving it susceptible to attack by other insects or diseases. Hardwood trees generally withstand two to five successive years of defoliation before dying, although even a single season's defoliation can stress a tree so badly that it may need ten years to recover fully.

Hardwood trees growing on poor sites or in adverse conditions may die after only one year's defoliation. Evergreens also often die after one complete defoliation since they cannot replace their foliage as readily as hardwoods can.

The homeowner's decision to use control measures should be based on his particular combination of insect abundance, site characteristics and tree species and condition.



The gypsy moth's population rises and falls in cycles in the Northeast. At population peaks millions of acres will defoliated.

• Gypsy moth abundance. If your property is surrounded by woodlands in which gypsy moth populations are high, you will almost certainly suffer tree damage. If you see hundreds of egg masses per acre, or a large number on a few individual trees, such as oaks, you can expect severe damage.

If the insect has not yet reached your area or if there was no previous major defoliation of trees that gypsy moths prefer, you may not need a control program this year.

• Site characteristics. Well-drained, exposed slopes or hilltops, especially those downwind of an existing outbreak, are more likely to be defoliated than moist, lowland sites with deep litter.

• Tree species. You are more likely to have a problem if your property has a preponderance of species gypsy moths prefer: alder, apple, aspen, hawthorn, larch linden, oaks, willow, and gray, paper and river birches. Because oaks are so abundant in the Northeast, these are the trees most frequently defoliated.

The least preferred species are ash, balsam fir, black locust, butternut, catalpa, Eastern red cedar, holly, mountain ash, red spruce, Scotch pine, sumac and tulip tree. Other trees come somewhere in between.

• Tree condition. Trees that have been recently defoliated may need special attention. Because a single defoliation of an evergreen can often kill, you might want to control infestations near valuable specimens.

• Size of property. If you have a great deal of acreage, you might have only two options: a large scale spraying, or nothing at all.

Control measures in combination

While large areas of infestation will be sprayed this year by various government agencies, the homeowner and small woodlot manager can protect individual trees by using an integrated control program, that is, a variety of measures used together.

A direct way to control the insects is to get rid of their egg masses, scraping them off into a container with a knife, paint scraper or stiff brush. Destroy the eggs by burning, burying or soaking them in soapy water before flushing them down the toilet. Do not paint egg masses with creosote or similar materials—it can damage your trees. Egg masses can be removed from September through mid—March.

If the gypsy moth population is not too large, you can significantly reduce the local population by removing egg masses. If the population densities are high, however, there will probably be enormous numbers of egg masses high up in the trees, hard to reach. So you have to be realistic about how many egg masses you can remove.

Profile of an insect pest

The gypsy moth, *Lymantria dispar,* is an Old World native, and its egg masses were brought to Boston around 1869 by an entomologist searching for a hardy silk moth. Unfortunately a few of the larvae escaped and became established on the local vegetation. Lacking any natural pedators, the moth population grew rapidly and in the 1880s severely defoliated trees.

Despite the present strict quarantine regulations and spray programs, the gypsy moth has steadily spread. While the insect, blown by the wind, can travel only short distances each year by itself, vehicles have carried it far from the Northeast to the Carolinas, Kentucky, Missouri, Ohio, Virginia, Wisconsin, Michigan and even California.

Gyspy moth eggs hatch in late April or early May about the time trees begin to leaf out. The tiny larvae climb trees and when they reach the outer branches they begin feeding. If food is limited, they drop on silken threads which carry them a few feet or as much as several miles. This is the means by which the insect naturally expands its range.

As the larvae become larger, they devour all green material on their host plants. Feeding habits change as the larvae mature. They generally feed at night, but in epidemic areas, they may feed around the clock.

The larvae of two tent caterpillar species are often mistaken for gypsy moth larvae. While both of these can cause serious local defoliation, they are less widespread than the gypsy moth.

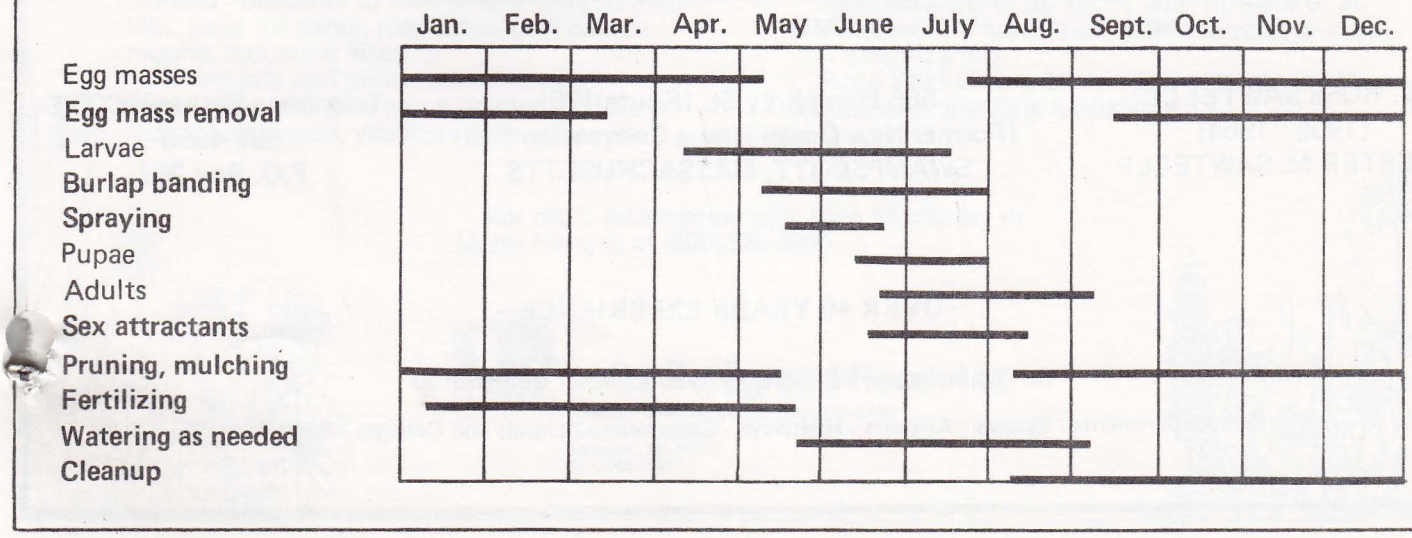
By late June or early July gypsy moths have completed their larval stages and seek a sheltered place to spin cocoons. Within about two weeks, the one-inch long adult moths emerge. The dark brown males appear several days earlier than the cream-colored females. The female moths, which have well developed wings but whose weight of eggs prevents them from flying, crawl to an elevated place and emit an attractant chemical (sex pheromone) which brings males from as far as a mile away. Shortly after mating the female deposits her eggs—on the undersides of branches, tree trunks, stone walls, fences, buildings, vehicles, or any shady protected place. Human refuse along the forest edge may provide additional egg sites, a partial explanation for the observation that the concentration of gypsy moths may be ten times as high around homes as in nearly woodlands.

Each female deposits up to a thousand eggs in a single mass, covering them with hairs; the eggs overwinter. Temperatures well below zero for a prolonged period do decrease their survival—although the exact effects of temperature, times and location are not fully understood.

Gypsy moth larvae are generalist feeders but prefer some trees over others. Oaks, preferred above all other trees, grow abundantly on the well-drained uplands slopes and hilltops favorable for gyspy moth population buildup.

Within areas in its established range, gypsy moth populations rise and fall in cycles, In New York State, for example, gypsy moths defoliated more than 416,000 acres of forest during 1971, a peak year. Then the population began to decline, and the insects defoliated only about 9,000 acres in 1975. During the past five years, the population has gradually increased again: 1980 was an epidemic year and almost 2.5 million acres were affected.

Gypsy moth life cycle and control



You can also entrap the larvae. In late May or early June, the nearly mature caterpillars move down the tree to rest in the shade, and a simple band around the tree at that time will catch a large number.

Take a one-or two-foot-wide strip of burlap or black polyethylene a little longer than the circumference of the tree. Tie this loosely with string around the tree at chest height (five feet) and fold the top half of the band over the string. Check the band daily and remove and destroy larvae. Later, larvae will form the cocoon stage under the flap and can be removed and destroyed.

A four to five inch band of a sticky material such as Tanglefoot applied to the outer top of the band may increase its effectiveness. However, such sticky materials should not touch the tree bark directly since they can injure the tree and leave unsightly marks.

Another strategy is to set out a synthetic version of the female gypsy moth sex attractant, which can be used to attract adult males to a sticky trap or to fill the air with enough attractant to disorient them and prevent mating. Hercon Gypsy Moth Trap, Hercon Luretrap and Hercon Disrupt Flakes are some products. (We do not endorse brands named in this article but merely mention them as being among those that are available.)

Sex attractants, which can be used between mid-June and mid-August, may be useful if the insect populations are small, but are of limited value at high insect densities. They are also costly, and their timing and distribution are critical.

When the gypsy moth population is very high or when conifers are starting to show signs of damage, spraying may be the only effective control. The spray *Bacillus thuringiensis* (BT) is a biological control, infecting the moths with a bacterial disease. Bug Time, Dipel, Thuricide are some brand names. Carbaryl (Sevin) is a broad-spectrum, short-acting chemical control. Both sprays are effective against the moths in their larval stages, May and June.

Sevin is toxic to most insects, including honeybees, and so it should not be used in the vicinity of beehives. Because it is toxic to other insects, it may also kill insect predators of the gypsy moth. Sevin can also kill aquatic animals, so it should not be sprayed over ponds, lakes or running water. BT should not be sprayed over open water either.

Neither spray offers absolute protection. Sevin is more effective, but given its greater potential drawbacks its use probably should be limited.

If you do spray, carefully follow label directions and spray at the right time. If you expect much defoliation, spray when the damage is first noticed, not after the trees have been defoliated. BT takes three to ten days to take effect, while Sevin acts more quickly. Both Sevin and BT remain active for only a short time so a second spraying may be necessary.

If you need to spray a large number of trees, you might want to consult a professional pesticide applicator, forester or arborist. Make sure the spray company is registered and licensed.

The vigorous-tree strategy

Some indirect methods of control involve keeping trees vigorous to reduce the effects of leaf loss. Newly planted ornamentals or established trees during drought periods will benefit from regular summer watering. Trees growing on poor soil and trees defoliated within the past few years may benefit from spring soil fertilizing. Pruning trees and removing dead and damaged branches in the fall and winter reduce the later moisture demand and improve vigor.

If you live where gypsy moth outbreaks have been frequent, you may want to remove susceptible species if they are not ornamentally important. Woodlot managers can selectively harvest susceptible species for lumber, pulpwood or firewood, which will also encourage growth of species gypsy moths don't much like.

You may want to try removing gypsy moth shelters—bark flaps, dead branches, tree stumps and refuse. You may want to encourage insect-eating birds by providing winter food and spring nesting sites and attract small mammal and insect predators by leaving a deep leaf litter under your trees.

We still do not fully understand the ecology of the gypsy moth. Even when we eventually do, and can design more effective long-term controls, we will never eliminate this pest. We have to live with the gypsy moth. Control measures are part of the compromise.

Dr. David Karnosky, forest geneticist at Cary Arboretum, Millbrook, N.Y., became interested in gypsy moth infestations as an outgrowth of his work on developing pest-tolerant trees for planting. Dr. Clive Jones studies insect-plant relationships as part of his work at Cary Arboretum on chemical ecology.

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