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Monsanto

VERSATILE EFFECTIVE

COOL-SEASON FERTILIZATION

from page 38

leased at a slower rate. Slow-release N sources are more expensive even though quick-release sources may be applied more frequently.

The turfgrass manager should evaluate several sources to determine what type of results fit the budget. Almost any fertilizer, used properly, can provide good results. More expensive fertilizers do not necessarily provide better results.

Cool-season turfgrasses exhibit their maximum growth rate in the spring and fall. Growth slows over the summer because of higher air and soil temperatures. The typical fertilization program on lawns, parks and other turf areas is adjusted to provide more nutrients in the fall and spring than in the summer. A complicating factor on the golf course is that more rounds of golf are played during the summer than in any other season. The superintendent must watch his greens and tees to make sure that there is some turfgrass growth over the summer to ensure recovery from wear.

Fairways are less critical because the traffic is spread out more. Summer fertilization can be done by either applying small amounts of a soluble fertilizer on a frequent basis or by using a slow-release fertilizer. The total amount of nitrogen applied to the putting greens will partially depend on the number of rounds played and the emphasis on putting green speed.

As rounds increase, the amount of nitrogen applied must be increased. Where putting green speed is important, use frequent applications of top dressing along with a moderate N level, moderate mowing height and moderate irrigation practices to increase speed. Fast greens are difficult to maintain where the amount of play is heavy and the N level has been reduced.

Superintendents in the Chicago area have observed that Penneagle creeping bentgrass greens require a higher level of nitrogen than Penncross or Toronto greens to provide good quality. They are going in the opposite direction with their Penneagle bentgrass fairways. Good results, that is less competition from annual bluegrass, have been observed on these fairways using lower levels of nitrogen.

Some golf course superintendents apply a small amount of urea to the greens when they apply a fungicide. If the urea is being applied with a contact fungicide, and irrigation is withheld to allow the fungicide to work, then some of the N will be lost by ammonia volatilization resulting in an inefficient application.

Apply the urea when a systemic fungicide is being applied and watered in or apply the urea by itself and water it in. Many superintendents are reluctant to use a liquid fertilizer on their putting greens.

Several liquid fertilizer products being used by the lawn care industry have a place on the golf course. They can be applied with a sprayer at a higher N rate than urea without fear of burning the turf. Fall fertilization, both in the early fall to speed recovery of the turf from summer stress and in the late fall to promote color retention into the winter and early spring greenup, is extremely important on all turfgrass areas. Research conducted at Ohio State University has shown that late fall fertilization promotes root growth in an indirect way.

Turf fertilized in the late fall has a reduced need for early spring nitrogen fertilization. Nitrogen fertilization in the early spring can decrease root growth. Also, because there is generally a flush of growth during the spring due to increased moisture, the first fertilization should occur in late spring.

Recent research conducted at the University of Illinois evaluated late fall applications of IBDU, sulfur-coated urea and urea for their effect on spring color. With sulfur-coated urea and urea, a November application resulted in superior spring color compared to where these same fertilizers were applied in September. With IBDU, a September application resulted in turfgrass color equivalent to where the IBDU was applied in November. Better results for the year were found where IBDU was applied in June and September than in June and November.

Although the greatest plant response is caused by nitrogen fertilization, the other elements are certainly important in the overall health of the plant.

NITROGEN GUIDE FOR COOL-SEASON GOLF TURF

	Aug.	Sept.	Oct.	Nov.	Apr.	May	June	July
	---------- lbs nitrogen/1000 ft² ----------							
Greens								
Creeping bent		1.0	0-1.0	1.0	0-0.5	0.5-1.0	0.5-1.0	0-0.5
Fairways								
Creeping bent		1.0		1.0		0.5-1.0	0.5-1.0	
Kentucky blue		1.0		1.0		0.5-1.0	0.5-1.0	
Perennial rye		1.0		1.0		0.5-1.0	0.5-1.0	
Tees								
Creeping bent	0.5	1.0		1.0		0.5-1.0	0.5-1.0	0.5
Kentucky blue	0.5	1.0		1.0		0.5-1.0	0.5-1.0	0.5
Perennial rye	0.5	1.0		1.0		0.5-1.0	0.5-1.0	0.5

Use low end of ranges for courses with moderate play, high end for courses with heavy play. Use higher N on Penneagle greens. Use low end of range if fairway clippings are returned or to combat annual bluegrass. Maintain good fertility on perennial ryegrass fairways to help reduce the severity of red thread. Tee program should be adjusted based on number of rounds and size of tees.

The other elements

A basic recommendation regarding the use of nitrogen, phosphorus (P) and potassium (K) is to apply these elements in a 3:1:2 (N:P:K) ratio. This recommendation is based on the fact that turfgrass tissue contains N, P and K in approximately this same ratio.

However, consider the points listed below when planning the rest of your fertilization program.

1. Potassium fertilization. There is a trend to apply higher levels of potassium to turfgrasses. This means applying an amount of potassium equal to or greater than the amount of nitrogen applied. Research reported by Bob Shearman, Ph.D. and Jim Beard, Ph.D., in 1975 indicated that increased levels of potassium resulted in improved wear tolerance of Toronto creeping bentgrass.

Currently, Shearman is studying the effect of potassium fertilization on both creeping bentgrass and Kentucky bluegrass on both heavy and light textured soils. He recommends a 1:1 ratio between nitrogen and potassium. You may want to try higher levels of potassium on an area that gets a lot of wear to judge the results.

Remember that potassium chloride (muriate of potash) can burn the turf if applied under the right conditions. Potassium sulfate (sulfate of potash) has a lower burn potential than potassium chloride.

2. Phosphorus fertilization. The trend with phosphorus applications on golf turf has been to apply as little as possible. This practice resulted

continued on page 43

Blue Chip Nitroform & CORE CULTIVATION

TURF MANAGEMENT REPORT NUMBER 1

Blue Chip® Nitroform® and Core Cultivation

Aerification by core cultivation followed by the application of Blue Chip® NITROFORM® offers an innovative approach to improving, renovating, and/or overseeding existing turf. This combination of cultural practices stimulates regrowth and vigorous, sustained development of the root system while reducing thatch to more manageable levels.

The leading cause of weakened turf is too heavy an accumulation of thatch, the layer of brown, dead residue from old roots and crown tissue immediately underlying the surface. A small cushion of thatch is desirable and natural. But when the accumulation exceeds 1/4 inch, it becomes a barrier to the percolation of water and nutrients. Excessive thatch results from too rapid growth accompanied by the accumulation of the thatch-forming tissues at rates faster than soil microorganisms can decompose them. Because water and nutrients are bound in the thatch, this area becomes the primary medium for the live roots—roots frequently so shallow that the turf is poorly equipped to withstand stress from drought, heat, cold, insects, and disease. The effects of compaction from heavy play and equipment are compounded in turf with excessive thatch since there is so little reserve of root system capable of generating new growth.

Turfgrass agronomists agree that the best means of reducing thatch is by core aerification (core cultivation). Hollow tines on the aerifying machines remove cores (plugs) of thatch and soil, leaving the subsurface accessible to water and air, and allowing the soil from the plugs to filter back in the holes and into the interface to mix with the remaining thatch. Moisture penetrates more readily, and live roots are encouraged to expand deeper through the soil profile.

Why NITROFORM® Following Core Cultivation?

NITROFORM provides slow-release organic nitrogen to sustain both plants and soil bacteria over many weeks of the growing season. Its 38 percent nitrogen is linked with carbon in low molecular-weight polymers of methylene ureas, over two-thirds of which is water insoluble. The degree of water-insolubility of the polymers determines the rate of nitrogen release. The more soluble components are less resistant to bacterial degradation (digestion), and release nitrogen over the first few weeks following application. The insoluble fractions continue to gently release nitrogen gradually during the growing season in sufficient quantity to support microbial activity and root formation without overstimulating vegetative growth. In the fall, as daily temperatures gradually decline, much of the nitrogen released from

NITROFORM nitrogen becomes stored in the roots. For turfgrass, this is healthy physiologically, and promotes early green-up the following spring.

Effect of NITROFORM® On Thatch

In a two-year study of nitrogen sources on lawn-care test plots at the University of Illinois, researchers observed that Kentucky bluegrass fertilized with NITROFORM (4 lbs. N per 1000 sq. ft. per year × 2 years) produced the least amount of thatch when compared with other nitrogen sources commonly used in professional lawn care. In fact, there was less thatch than measured in the no-nitrogen control. It is logical to assume the increased bacterial activity in NITROFORM-fertilized turf helped to keep the thatch in check. Other factors which may contribute to this phenomenon include the absence of rapid growth, commonly associated with thatch formation, and the fact that NITROFORM is only mildly acidic in its soil reaction. Strong acidic reactions of some fertilizers, e.g. ammonium sulfate, may discourage a favorable environment for beneficial soil microorganisms at the soil/turf interface.

NITROFORM is, in effect, a soil-activated fertilizer. It supplies food and energy (nitrogen and carbon) to soil bacteria. The bacteria, in-turn, gradually convert the nitrogen to forms available to plants. Applying NITROFORM following core aerification provides the opportunity to place it in direct contact with the soil. Not only is thatch reduced by mechanical coring, the NITROFORM will help sustain the bacteria responsible for decomposing accumulations of new thatch-forming tissues.

Application Rates For NITROFORM®

The rate to apply depends on the level of fertility the turf is currently under and the severity of its physiological condition. The minimum rate should be 3 lbs. 38-0-0 NITROFORM (1.14 lbs. N) per 1000 sq. ft. immediately following core cultivation. The following are guideline recommendations for typical turfgrass situations.

Lawns and commercial turf areas, athletic fields, fairways and tees:
3 to 5 lbs. NITROFORM 38-0-0 (1.14–1.9 lbs. N) per 1000 sq. ft. Use the higher rate when overseeding or when the turf requires extensive renovation.

Greens:
3 lbs. NITROFORM 38-0-0 per 1000 sq. ft. If greens are pale, or if the root system is shallow or restricted in the thatch layer, apply 5 lbs. NITROFORM 38-0-0 per 1000 sq. ft. NITROFORM can be applied at the time of top-dressing and swept into the aerifying holes. There may be some temporary color mottling which should smooth out in a few weeks, and is not harmful.

When to Core Aerify and Apply NITROFORM®

Whenever turf is stressed because of compaction and/or excessive thatch, core cultivation is appropriate. Aerifying during periods of hot weather should be avoided where irrigation is restricted or non-existent. Regeneration and growth of roots and rhizomes will be more vigorous in spring and fall, and late summer is usually the best time to overseed cool-season grasses following core cultivation.

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Dear Turf Professional:

I am pleased to send you the first in our series of NOR-AM® Turf Management Reports. Designed specifically for the turf professional, each of these informative reports will deal with a specific operation for improving your business.

This first Turf Management Report covers the advantages of core cultivation (aeration) in overcoming thatch problems and encouraging more vigorous turf. It also describes the benefits of following up core cultivation with the use of NITROFORM slow-release nitrogen to assure the development of healthier turf on lawns, golf courses, parks and other areas.

NOR-AM will be creating additional Turf Management Reports from time to time to help your business. If you have any comments or suggestions, or would like additional information, do not hesitate to get in touch with me or your NOR-AM representative.

Sincerely,

B.J. Bilas
Marketing Manager

from the observation that annual bluegrass encroachment was greater where phosphorus levels were high. Also, the use of tricalcium arsenate to control annual bluegrass dictated that phosporus levels be low since phosphorus counteracted the toxicity of the tricalcium arsenate. Some recent observations have indicated that the turf's stress tolerance is reduced under low levels of phosphorus.

It would be wise to take periodic soil tests to monitor the phosphorus level especially where clippings are being collected. Don't entirely eliminate phosphorus from consideration in your fertility program.

3. Lime. Lime applications are necessary when growing Kentucky bluegrass on acid soils. Maintaining the proper pH in the soil will help ensure the maximum rate of thatch decomposition.

4. Sulfur. Just as lime applications can be used to raise soil pH, sulfur applications can be used to lower the soil pH. The reason for lowering the pH is to provide a better medium for plant growth. Some nutrients are not available to the plant at a high soil pH.

Ideally, sulfur should be incorporated into the seedbed before planting since it reacts slowly. It is important to be careful when using sulfur on established areas. Do not make large applications at any one time. Since the sulfur breaks down slowly and moves slowly, you can end up with an extremely low pH in the thatch layer. Consider applying sulfur after core cultivation.

Use soil tests to determine whether it is feasible to lower the soil pH with sulfur. Sometimes it is difficult to apply enough sulfur to lower the soil pH when the water used for irrigating the turf has a high pH or where free calcium carbonate is present in the soil.

Sulfur has been applied to creeping bentgrass putting greens to discourage the growth of annual bluegrass since the bentgrass can tolerate a low pH but annual bluegrass cannot. Flowable forms of sulfur are preferred to granular forms for applications to greens. Before starting a sulfur program on greens, consult with your state turfgrass extension specialist for information about using sulfur.

5. Iron fertilization. Iron applications may be necessary in parts of the country where soil pH is high and iron in the soil is not available to the plant. Iron can also be used to enhance the color of the turfgrass stand in areas of the country where iron deficiencies are not common. Iron sulfate applied at a rate of 1-2 oz. per 1000 sq.ft. will provide a response for several weeks. The actual length of the response will depend on the growth rate of the turf. Iron is not translocated in the plant. Once the treated tissue is mowed off, the response will fade.

6. Micronutrients. Applications of micronutrients (iron, manganese, zinc, copper, molybdenum, boron and chlorine) may sometimes be necessary on pure sand putting greens because of the low nutrient holding capacity of the sand, but they are rarely if ever needed on turfgrasses growing on pure soil or a mix containing soil.

With careful planning, a good fertility program can be developed for the golf course. It is important to realize that weather conditions can dictate departure from the basic plan. Do not be afraid to experiment with different programs.

Finally, seek help from a fellow superintendent if you are new in an area and unfamiliar with the weather patterns or the history of the golf course. Most superintendents are glad to help someone be successful. **LM**

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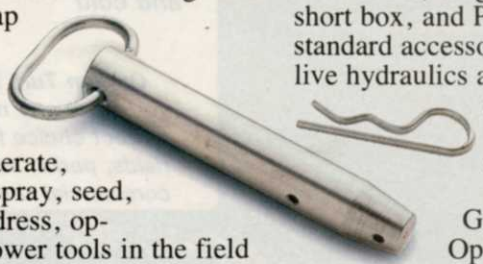

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Circle No. 108 on Reader Inquiry Card

ANATOMY OF AN I.P.M. PROGRAM

With concern over pesticide use, more cities are turning to Integrated Pest Management. IPM controls insects through spot treatments and cultural methods.

by Deborah Smith and Startan Gill

Montgomery Village cut costs by more than 55 percent over two years when they implemented an I.P.M. program.

Professional landscape managers need to be concerned with efficient pest control programs designed to keep the customer happy, provide maximum plant protection, and provide a healthy profit.

For years, cover sprays have been the traditional method of pest control. A blanket spray on all landscape plants is assumed to prevent possible pest problems. However, preventive sprays may actually produce some detrimental side effects in urban areas; such as increased pest resistance to pesticides, resurgence of target pests following treatment and outbreaks of secondary pests once the target pest has been killed.

An additional problem associated with pesticide use in urban settings is the environmental hazard resulting from drift to non-target treatment areas.

Incidents of pesticide misuse are sensationalized by the media. Insurance rates for pesticide applications have increased 200 to 300 percent from previous years. Insurance companies are hesitant to insure pesticide applicators because of the problems with liability insurance. Many homeowners are thus questioning the required frequency of pesticide applications around their homes.

In Maryland, for example, environmental groups and concerned citizens have successfully petitioned local government in two counties to enact legislation requiring the posting of signs for each lawn pesticide application. Likewise, Maryland barely voted down a bill requiring such restrictions

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on commercial application of pesticides on residential lawns and landscapes.

If this trend continues, landscape managers will have to look at ways to modify spray tactics so that the public is convinced that pesticides are being used in the absolute safest manner and only when absolutely necessary.

Customers ironically want complete protection from pest damage but do not wish to have pesticides overused around their homes. Are there presently any viable substitutes to cover sprays?

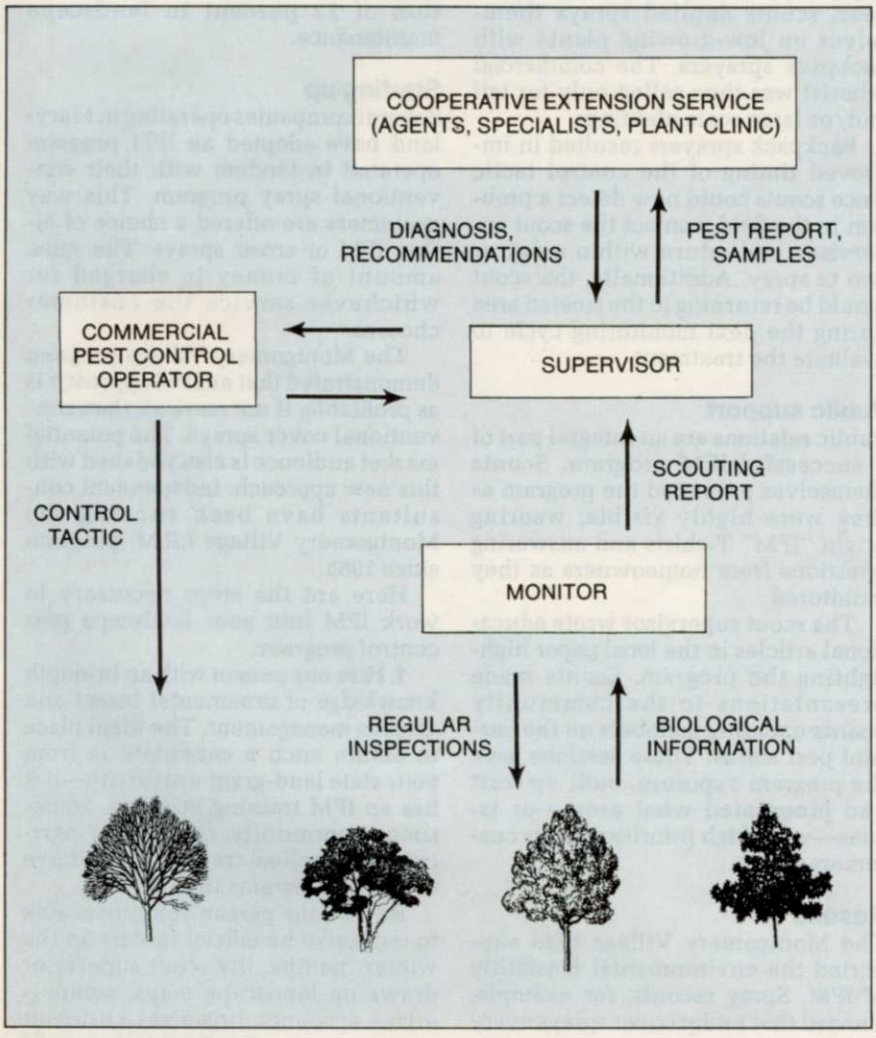
Research has tested a management concept called Integrated Pest Management in urban landscape settings. I.P.M. programs use a monitoring program in which landscapes are regularly inspected for cultural problems, insects and disease pests. Cover sprays are eliminated; instead, individual plants (hot spots) are spot treated with the least toxic pesticide available once the pest is noticed. Control material could be a biorational (such as *Bacillus thuringiensis*, milky spore or insecticidal soap), or a short residual, low toxicity pesticide, such as a synthetic pyrethroid.

Table 1

ENVIRONMENTAL AND ECONOMIC IPM IMPACT

	1982		1983		1984			
Community	number of plants sprayed	cost of spray $	number of plants sprayed	cost of spray $	number of plants sprayed	cost of spray $	2 Year Average Percent Spray Reduction	2 Year Average Percent Cost Reduction
A	738	2,985	78	784	142	822		
B	914	3,750	66	1,663	136	2,986		
C	195	1,325	107	510	128	401		
Total	1,897	7,970	251	2,957	406	4,209	83	55
Labor Cost* $	0		2505		4209			
Final Cost $	7,970		5,462		6,988			22

* includes salaries of 2 scouts in 1983 and 4 scouts in 1984



Sprays are eliminated or curtailed when natural predator and parasite insect activity is observed controlling the pest.

Urban I.P.M. programs have been tested in residential landscapes, city street trees and institutions. These programs have shown that I.P.M. methods control pests even better than do cover sprays, primarily since monitors (scouts) observe and control pest populations before they reach damaging levels.

Environmentally speaking, the amount of pesticide used is reduced when cover sprays are replaced by spot sprays, which in turn reduces the potential risk of human exposure.

Research has shown that I.P.M. programs not only control more pests, but also have lower pesticide costs than cover spray programs. However, labor costs are higher because of the time scouts spend monitoring landscapes. Considering this, is I.P.M. an economically feasible venture for a commercial company?

To answer this, the University of Maryland Cooperative Extension Service set up a demonstration I.P.M. program in 1982 in Montgomery Village, a planned community in suburban Maryland. People in the community wanted the program for two major reasons:

(1) they felt their present eight-year cover spray program was giving inadequate pest control for the money

they were spending; and

(2) they actively expressed concern over what they perceived as hazardous pesticides being applied unnecessarily.

Our solution was to set up a comprehensive pest management program in their community. Using previous Maryland I.P.M. programs as guidelines, our goal was to eliminate preventive sprays and thus limit treatments only to active, damaging pest infestations. The Montgomery Village program was started in 1983 on 354 acres. In 1984, the success of the program led to an addition of 122 acres, bringing the total land area to 476 acres. The program covered common ground plants, street trees, community centers and parks and recreation sites amidst single family homes and townhouses involving 3850 residents.

Extension agent Deborah Smith checks plant material for insect damage.

Program organization

The program was set up in such a way that all scouting activities were coordinated by a scout supervisor specifically hired to oversee the program. Each community was monitored at two- to three-week intervals.

Undergraduate plant science students from the University of Maryland were hired as scouts; however, experienced gardeners from the area were found to make excellent part-time scouts. Scouts were trained before the onset of the monitoring season (April to September) by cooperative extension agents.

The training topics focused on plant and pest identification, insect and disease problems and plant stress factors. After completion of a plant inventory in each community, a list of the most abundant plants was used as a basis for training. By knowing the most common plants, the pest complex could be predicted and emphasized during training. Supplemental training was supplied at monthly scout meetings by the scout supervisor.

For programs in townhouse communities, which typically had a wide variety of densely-planted plant material, rough landscape maps were sketched and monitoring notes were made directly on these maps by field scouts. For larger communities, these maps were too time-consuming to draw, so street maps provided by the builder were used to pinpoint large scale pest populations for spraying. Scouting notes were then written on printed forms detailing location, condition, and the number of plants affected by the observed problem.

Spray recommendations

The scout supervisor compiled all scouting information and coordinated control recommendations among communities. During the program's first year, all control recommendations were supplied to the community maintenance director, who contracted with a commercial arborist to apply the spot sprays. The second year, scouts applied sprays themselves on low-growing plants with backpack sprayers. The commercial arborist was thus called only for tall and/or large scale plantings.

Backpack sprayers resulted in improved timing of the control tactic since scouts could now detect a problem in the field, contact the scout supervisor, and return within a day or two to spray. Additionally, the scout would be returning to the treated area during the next monitoring cycle to evaluate the treatment.

Public support

Public relations are an integral part of a successful IPM program. Scouts themselves promoted the program as they were highly visible; wearing bright "IPM" T-shirts and answering questions from homeowners as they monitored.

The scout supervisor wrote educational articles in the local paper highlighting the program. Scouts made presentations to the community boards updating members on the current pest status. These sessions gave the program exposure, built up trust and pinpointed what areas—or issues—were high priorities to our customers.

Results

The Montgomery Village data supported the environmental feasibility of IPM. Spray records, for example, showed that under cover sprays every evergreen (totalling 567 trees) in the program area was sprayed twice a year for bagworms—regardless of whether they were infested or not.

IPM monitoring showed that only 19 trees had a high enough bagworm population in 1983 and 1984 to warrant a spray. All in all, only 657 plants were sprayed over the two-year IPM program—an 83 percent reduction in the number of plants sprayed as compared to one year of cover sprays.

The majority of these sprays were for mid-to-late season pests, such as orange-striped oakworm, which were never targeted by early season cover sprays.

In 1982, the year proceeding the program, $7970 was spent on three pesticide cover sprays plus two citizen request sprays. IPM spray costs averaged $3583 a year, yielding a 55 percent cost reduction over two years. This demonstration was quite labor intensive due to regular monitoring.

Scout salaries in three communities averaged $2426 per year. When salaries are included in program costs, the entire IPM program averaged $6009 per year—but even this represents an average annual cost reduction of 22 percent in landscape maintenance.

Starting up

Several companies operating in Maryland have adopted an IPM program operated in tandem with their conventional spray program. This way customers are offered a choice of either IPM or cover sprays. The same amount of money is charged for whichever service the customer chooses.

The Montgomery Village program demonstrated that an IPM approach is as profitable, if not more so, than conventional cover sprays. The potential market audience is also widened with this new approach. Independent consultants have been running the Montgomery Village I.P.M. program since 1985.

Here are the steps necessary to work IPM into your landscape pest control program:

1. Hire one person with an in-depth knowledge of ornamental insect and disease management. The ideal place to obtain such a candidate is from your state land-grant university—if it has an IPM training program. Sometimes community colleges or agriculture/applied trade schools have two-year programs in IPM.

Be sure the person you hire is able to recognize beneficial insects. In the winter months, the scout supervisor draws up landscape maps, computerizes accounts, organizes customer

Continued on page 50

Photograph Courtesy NASA

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records and drums up business. Prior to the onset of the growing season, he or she trains a few regular employees in landscape plant identification, pest identification and control, and plant environmental (stress) problems.

This initial training covers the most prevalent pests ("key pests") and past problems recorded in customer accounts, as determined by spray records. When a list of the most abundant plants scouted in the property is used as a basis for training, the pest complex of these can be predicted and emphasized during training.

One precaution: companies that have tried to use an employee who has been using cover spray methods for years as a program manager have met with failure. It is difficult to change attitudes of people ingrained with cover spray concepts.

It is preferable to hire someone who has been trained in the methodology of IPM if the program is to work for your company. The manager must be familiar with beneficial insects, cultural and mechanical controls, biorational pesticides, and pesticides.

2. Define the type of customer you wish to work with. Will you take on residential home landscapes, community common ground landscapes, or commercial building landscapes? Each of these different landscape situations requires different time commitments for a monitoring program.

The average ½-acre residential landscape takes 30 to 40 minutes for a thorough inspection in the spring, and 15 to 20 minutes by midsummer when fewer pests are active.

3. Decide on how many customers you can handle. One good scout supervisor should be able to handle 40-50 half-acre residential homes per season. Once the program is established, future expansion can be planned based on how many field personnel the scout supervisor can train to perform the monitoring.

4. Contact your local extension service for help. Extension agents in urban agriculture are experts in plant diagnosis.

5. Decide on a price for your service. Most companies presently using IPM are charging the same amount charged for cover sprays. We suggest determining how often during the season the location will be monitored, how much time is required for personnel to be on location, then add your profit margin.

Disregarding periodic insect outbreaks, your contracts should become easier to maintain over the years once pest populations are pinpointed and managed under regular monitoring.

6. Advertise your IPM program and let customers know of its advantages. An article in a local paper is a great way to get your message out to the public. Don't forget your regular customers; let them know they have a choice of programs. It is most likely that new customers are the ones who will be most interested in this approach of pest control.

7. Print up a brochure advertising your IPM approach with a simple explanation of what the program entails. Be sure to emphasize the objectives of the program; including reduced pest damage, use of natural controls and resistant plant material, selectivity and timing of pesticides, and a reduction in the number of plants being sprayed.

8. Become familiar with IPM research. Get copies of past research programs, and talk to those involved. True IPM programs are very similiar in methodology, yet actual organization may differ. **LM**