Spray Tanks—

(Continued from Page 10)

It is possible to encounter all three forms of a single pesticide: *EC, WP* and *F.* Wettable powders and flowables are safer to use but slower acting than emulsifiable concentrates. Because the aromatic solvents used in preparing *ECs* are notoriously phytotoxic, *ECs* used with low gallonage spray invite phytotoxicity.

> Never tank mix emulsifiable insecticide concentrates with other chemicals, but insecticides can be tank mixed with each other for better control.

Phytotoxicity will occur when the aromatic solvent sits on the grass blade. In addition, the insecticides, according to the labels, must be sprayed with large volumes of water (10 to 30 gallons), sometimes followed by heavy watering to move them down to the grubs. Wettable powder and flowable formulations will not burn but still require watering in for grub control. Insects are rapidly developing strains that are resistant to insecticides. Repeated use of the same insecticide invites the development of resistant strains. Dr. Roscoe Randell at the University of Illinois recently reported that he obtained good insect control by mixing half rates of Dursban EC and Sevin-F; when he used full rates of each separately, he obtained only moderate control.

This permits the tank-mixing of a tremendous variety of chemicals, and it allows the applicator to spray four or more chemicals simultaneously.

> All insolubles can be tank mixed without incurring phytotoxicity, provided the products are sprayed at recommended rates.

Where money is no object, broad spectrum control is a must. The applicator should not rely on only one chemical to control a target disease. Note how pathologists at the various agricultural colleges are mixing different pesticides in an attempt to achieve better control in their experimental plots.

With the advent of systemic fungicides, the broad spectrum mixture has assumed more importance because of the longer residual control attainable with the addition of a systemic to one or two contact fungicides in the spray tank.

Before the development of systemics, it was accepted that contact fungicides did their job on the grass blade and in the thatch and were dissipated within 2 to 3 days. A good contact fungicide, which will kill germinating spores at a few parts per million, is usually sprayed on the grass blade at about 5,000 practices. It doesn't take more than 3 days to get down to a dilution below the effective 5 parts per million.

In hot, humid weather accompanied by sporadic showers, an applicator had to spray twice a week or the grass would go unprotected the latter part of the week. Systemics have changed all this because they hydrolyze in the soil to knock down the fungus population. They act not only in the soil but also within the grass blade by diffusion through the root system, thereby giving extended protection.

I maintain that the ideal fungicide tank mix is a three-way combination of soluble contact—insoluble contact—insoluble

(Continued on Page 13)

Spray Tanks— *(Continued from page 12)*

Only one soluble chemical can be tank mixed with one or more insolubles. If two soluble chemicals are tank mixed with or without insolubles, avoid phytotoxicity by cutting the rate of each soluble in half.

systemic chemicals. For years I have even recommended mixing two soluble contacts, each at half rate, to get broader coverage than the single soluble at full rate.

All the insolubles can be tank-mixed, and they can be tank mixed with one of the solubles. If the solubles are tank-mixed, cut the dosage in proportion to the number of chemicals added. If three solubles are tank-mixed, cut the dosages to one-third of the recommended rate of each soluble component.

Soluble fertilizers and trace elements can be added individually or mixed, provided the amount will not exceed 2 ounce solid per gallon of tank spray mix in hot weather, or 4 ounces per gallon in warm weather. Six ounces per gallon can be used in cool weather.

Hot weather is considered to be temperatures in the 90s, warm weather as temperature in the 80s and cool weather as temperatures in the 70s. Some soluble fertilizers have a greater burn potential than others. The nitrates, sulfates and phosphates are truly inorganic soluble salts, whereas urea is truly an organic soluble. It must hydrolyze and oxidize before it is available to the plant. It has less burn potential than the soluble salts. Formolene is a solution of urea and methylol urea possessing less burn potential than straight urea. Finally, two ureaform polymers are categorized as insolubles. They are Fluf and Nitroform, which contain a mixture of soluble methylene ureas and insoluble methylene urea polymers. They are considered very safe and can be used at rates higher than the rates referred to previously.

Adding Nutrients

Iron and magnesium, elements necessary for chlorophyll can be sprayed as sulfate salts, but due to their ease of hydrolysis they are not as effective as they are in chelated forms. It goes without saying that N, P and K are also necessary for chlorophyll production. Of these three, too much reliance is placed on the semiannual granular feedings to provide adequate amounts of slow-release N and K. The slow release of nitrogen in granular feedings leaves a lot to be desired, and I know of no insoluble salt of potassium. Nitrogen and potassium deficiencies are real. In an attempt to supply adequate amounts of nitrogen, the tendency is to add large amounts at infrequent intervals, which results in lush growth, particularly in the absence of potassium (which provides turgidity or hard growth).

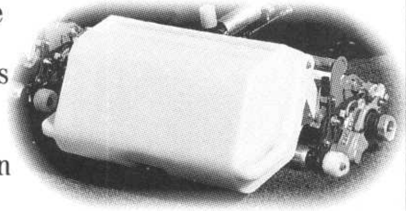
What a great opportunity the chemical spray operator has to add nitrogen, potassium, iron and magnesium to the spray tank in small increments every time he sprays.

I have witnessed better disease control when these elements are added to a fungicide program because they help the grass grow out of stress. The same result is witnessed when post-emergent herbicides are used that have a narrow safety factor

(Continued on Page 28)

Jacobsen exclusives help deliver a smooth as silk cut.
In head-to-head comparisons, the LF-100 delivered superior fairway mowing, in all kinds of grasses.

Our exclusive heavy-section, 22″ reels, combined with our unique, dual-spring down pressure system, follow ground contours closely for a smooth manicured cut. Even at production mowing speeds of more than 5 mph.



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Fertility Management of Sand As A Growing Medium for Turfgrass

James M. Latham, Director
USGA Green Section
Great Lakes Region

The development of high sand content sports fields and golf greens has been heralded as a major advance toward the multipurpose, all-weather utilization once thought possible only with artificial turf. It seems, however, that these rugs have as many problems as natural turf except inside domed stadia.

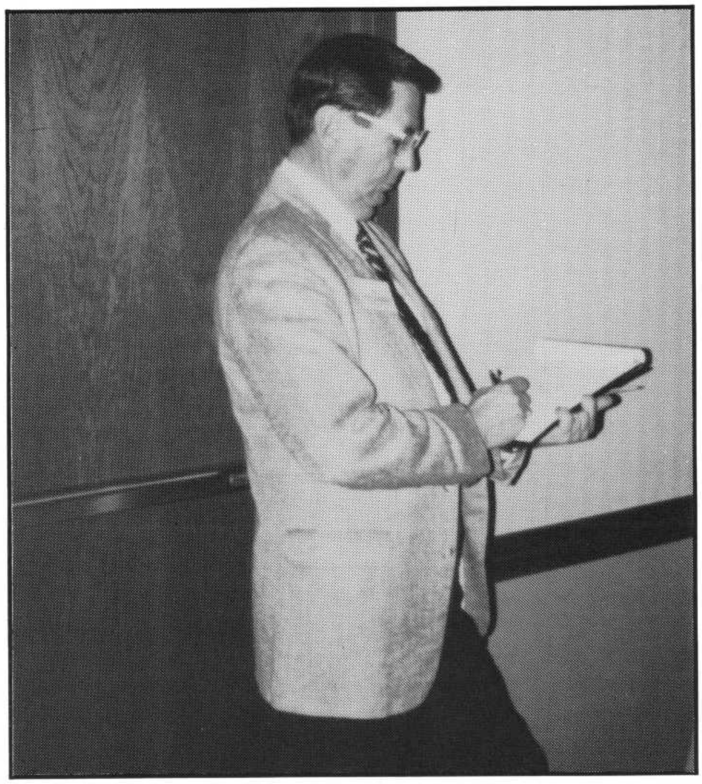
The sands are far from foolproof and finding the right components for a mixture does not end problems in a sand-based program. Fertility management can be difficult and the related problems as insidious as any faced by a turf manager. The major problems are related to high leaching potential, low cation exchange capacity, nutrient balance difficulties and other problems related to pH levels. These things were considered to be worthwhile trade-offs when compared to problems associated with highly compactible, poorly drained (and aerated) soil mixtures used in the past.

High sand-growing media are supposed to support traffic and drain readily. That same porosity makes nutrient retention quite difficult and nitrogen is particularly subject to loss due to the very nature of the sandy substrate. Ammonium ions (NH4) are rapidly converted to nitrate ions (NO3) in the well-aerated sand. The nitrates have no physical attraction to negatively charged soil or organic matter and are readily washed out of the root zone by the sand's high permeability.

At first face this leaching loss indicates that slow release nitrogen sources are naturals for porous media turf growth. This is not always the case, since sand is essentially sterile or at least has a small population of microorganisms. The release of nitrogen from sources requiring microbiological breakdown is, consequently, slow for a while. These products are ureaformaldehydes, methylene ureas, process tankages, sewage sludges, etc. Encapsulated particles, IBDU, etc., are not so limited. The restriction release does not last long, but must be considered in the early stages of use. Combinations of soluble and insoluble sources of nitrogen produce the best results until the population of microorganisms grows.

Another penalty to be reckoned with is low cation exchange capacity. We have lost the forgiveness of soil. Clays and organic matter have a tremendous capacity to absorb cationic nutrients, which reduces leaching loss. In sandpeat mixtures, though, the total Cation Exchange Capacity is around 5 and that means that this mode of nutrient retention is very low. Additionally, the normally weak adsorption of potassium on clay or organic matter is readily overcome by irrigating with hard water, which contains high concentration of calcium and magnesium ions. Furthermore, we have always heard that phosphorus does not leach but accumulates in the upper root zone. This does not occur in sands. The phosphates go right on through - just like the nitrates. Trace elements or minor nutrients may be lost in the same way, but the manner of their availability is not as clear because the chemistry of these nutrients has not been worked out in this medium or with turfgrasses.

One of the most confounding problems with sand relates to its pH. We usually expect sand to have a neutral pH of 7, but this is seldom the case in the central U.S. Soil tests show pH



Jim Latham, USGA

levels up to 8 or more, indicating high calcium levels. Sands with alkaline reaction are subject to close observation and careful application of trace elements thought to be needed. In most cases, it is iron. These nutrients should be applied individually to determine the reaction of the turf. Shotgun mixtures are not recommended, because of potential toxicity from overapplication of the wrong nutrient, but don't forget that the alkalinity also offers some protection against toxicity due to excess copper and zinc levels.

Nutrients should be applied as in hydroponic gardening until the root system is well established and has cycled through death and reestablishment of new roots several times. The residual left by dead roots is the best potential for maintaining nutrient stability throughout the root zone. It also provides the nutrition needed to develop adequate populations of beneficial organisms. Only then can a stable plant community be established and dependable nutrient balance based upon a well established fertility management program be developed.

One final word of caution is needed in relation to optimum use of sand. That is the possibility of contamination. These growing media with little or no buffering capacity are susceptible to contamination by poor chemical water quality, overuse of pesticides, and even silting in by dust storms or muddy water. All in all, sand as a growing medium for turf is a major advance in our field. It is imperative, however, to select the sand carefully, approach nutrition programs with knowledgeable caution and revise almost everything one has learned about turf management using natural soils. Since we have lost the forgiveness of soil, we must make up for the loss by a better understanding of the material with which we now work.

Cushman GA™ 60 Aerator

The GA 60 Aerator has proven to be more effective than any competing tractor-pulled reciprocating fairway aerator on the market. Features such as twin aerating heads, its own source of power, and floating turf guards deliver greens-caliber aeration even on undulating terrain. The heavier and beefier aerating heads provide greater strength to cover a broader range of turf conditions.

The GA 60 is easy to hook up. One person can attach or detach the ball hitch without bolts or tools. As with all of the revolutionary Cushman® 5th Wheel Implements, its low 11 psi minimizes ground compaction.

Large enough to cover your fairways in record time, the GA 60 lets you aerate up to 1.1 acres per hour. Maximum coring depth is a deep 4". You can vary the coring pattern from 2 1/2" x 3 1/2" to 2 1/2" x 5". Turf-Truckster® hydraulics allow the aeration unit to be raised for easy transport and lowered for quick operation.

Quality large area aeration is a big order to fill, but the GA 60 delivers...and then some.

Only Cushman increases your productivity with a complete line of 5th Wheel Implements.

Cushman 5th Wheel Implements provide the highest capacities available to meet the demands of intense turf maintenance practices. They are exclusively designed to keep ground pressure to less than 12 psi. When you have to aerate, haul, dump, spray, spread or top dress, no one offers more capabilities than Cushman. No one!

Contact us today ... for a free demonstration.

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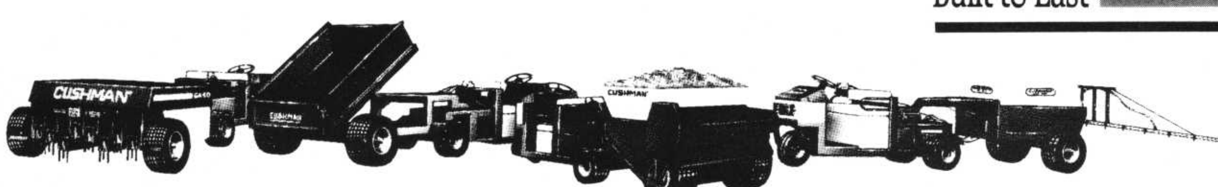

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Cushman 5th Wheel Top Dresser

This large-capacity implement can help you save time by cutting big jobs down to size. Its 20 cubic foot hopper can hold up to 2500 pounds of material. Yet, because Cushman® never lets a detail go unattended, the weight is evenly distributed to minimize compaction. It exerts a very low 12 psi ground pressure.

The Cushman 5th Wheel Top Dresser is big enough to cover large areas quickly, light enough on its feet to use on greens. A hydraulic motor powers a durable conveyor that feeds material through a rotating brush. Add the Turf-Truckster's exclusive ground speed governor, and you've got a consistent spreading thickness over a 60" swath.

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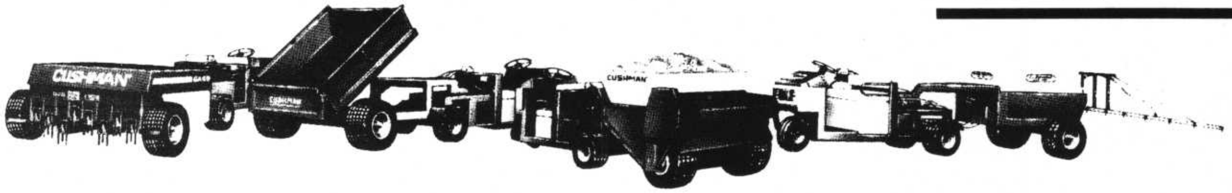

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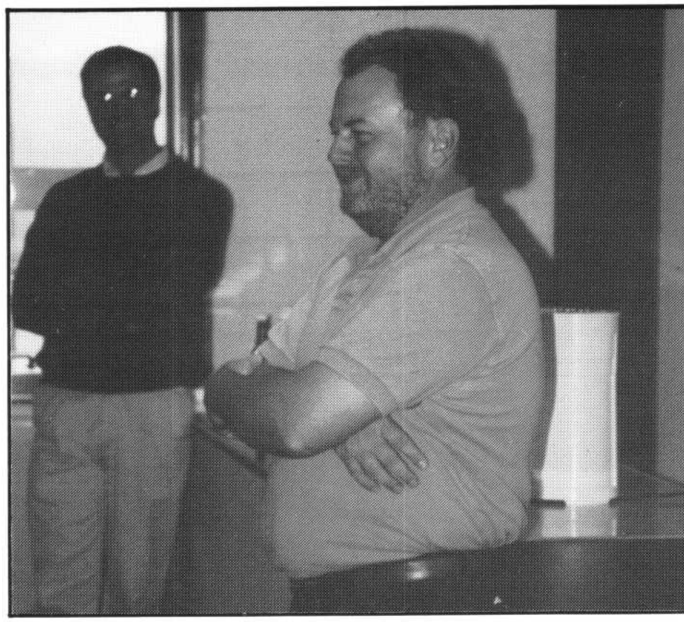
AT FIRST MEETING OF THE YEAR

Lake City Hosts a Great, Well-attended Outing

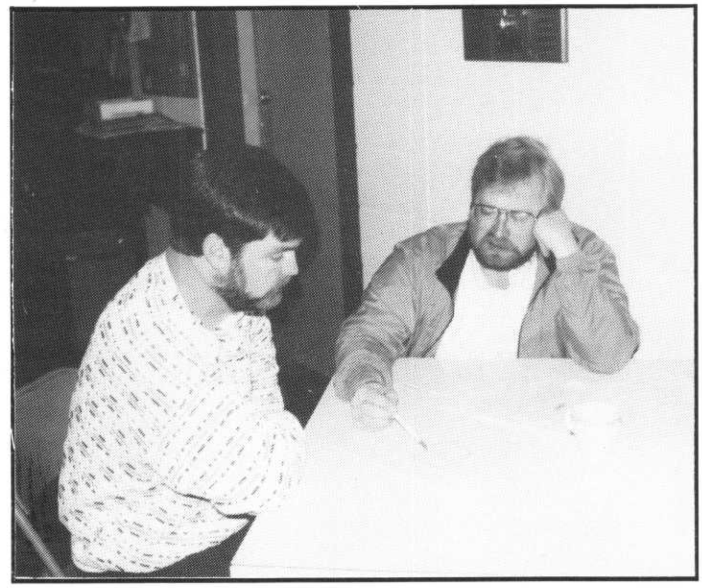
Monday the 13th has a strange ring to it, but with snow flurries in the air and a stiff wind out of the north, who'd ever think of playing golf? Lake City Golf Club was the site of our first meeting, and just because a lot of us drove south thinking that we are getting closer to the Equator means the temperatures are going to warm up, well that just isn't so sometimes. The wind was brisk (a real reality grabber) and just because Ol' Sol didn't stick around to warm us up, doesn't mean that we didn't have a wonderful outing. Host Superintendent Cliff Reynolds and his assistant Dean Sperling did a great job in getting Lake City ready for us. The golf course was in great shape for the 70 members that attended, and for the 40 who played at least nine holes, the golf course was even better and for the 10 who played 18 holes, it was a real treat to get out and enjoy the golf course and the great outdoors.

— *Dale Wysocki*

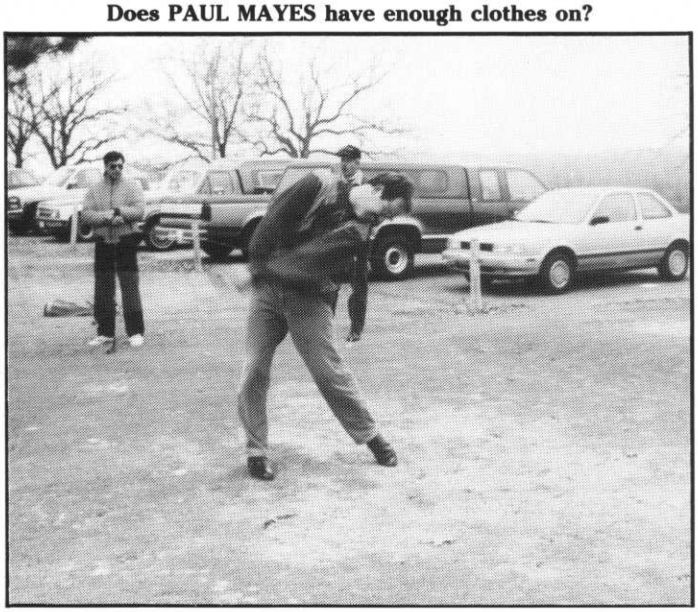


Host Superintendent Cliff Reynolds

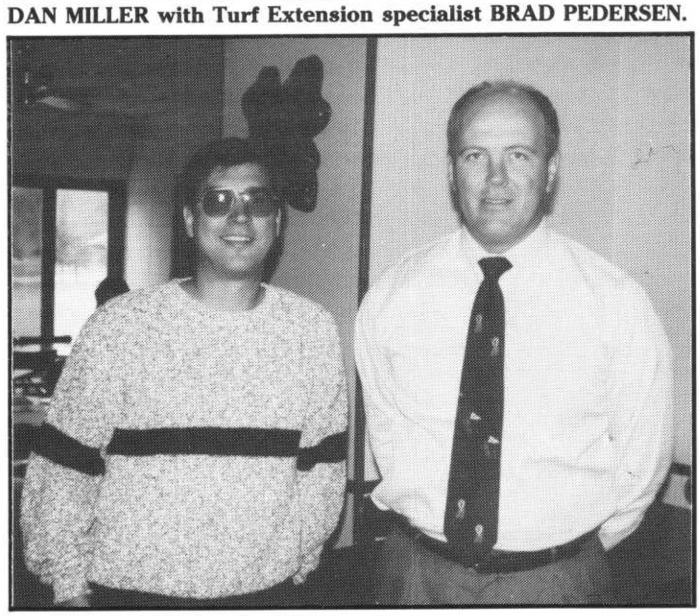
Does PAUL MAYES have enough clothes on?



DAN MILLER with Turf Extension specialist BRAD PEDERSEN.



JIM GARDNER of Rochester Golf & Country Club



LARRY THORNTON, Wilbur-Ellis and OWEN TOWNE, Ciba-Geigy.