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Iron (Fe) functions in certain respiratory enzyme systems. Its presence is essential for the formation, but it is not a constituent, of chlorophyl.

It serves as a catalyst in the reduction of nitrates. As iron is immobile in the plant, new tissues will tend to develop interveinal yellowing (chlorosis) when deficient.

The blades tend to lose color, (almost white), but necrosis is minimal. Wet or cold soils are conducive to iron deficiency. The solubility of iron decreases as the pH becomes more alkaline.

Iron content in turfgrass clippings is normally 5 ppm, but has great variability. In soils the normal ratio of available iron to manganese is 2 to 1.

A standard foliage spray for correcting iron deficiency in turfgrass is 2-3 pounds of iron sulfate per acre or 1 ounce per 1,000 square feet. An application of a 3 percent solution at seven to 14 day intervals is recommended during stress periods.

Potassium deficiencies are first indicated by drooping leaves, which feel soft to the touch.

Grasses are considered tolerant to low iron availability.

Manganese (Mn) is necessary for absorption of CO and for transforming carbohydrates.

Like iron, it is not a constituent of chlorophyl, but activates its synthesis. Manganese is more abundant in leaves than in other plant parts, but is immobile.

The manganese level in soils is usually adequate but anaerobic soil conditions (limited oxygen) can create an increase in Mn availability and concurrently favor iron deficiency. Alkaline conditions or intense leaching favor manganese deficiency.

Yellowing or striping between veins, along with stunting, curling or spotted turfgrass leaves may indicate a deficiency.

Deficient tissue has a very soft feel and the leaves tend to bend, giving them a very limp appearance.

The expected range of Mn in dry plant tissue is 22 to 140 ppm. A recommended spray to correct manganese deficiency is 1 to 2 pounds of manganese sulfate per acre. One or two applications may carry through a growing season.

Zinc (Zn) improves reproduction capabilities and is vital to oxydization processes within the plant. The plant requires only minute quantities of zinc.

It is not a component of chlorophyl, but like iron and manganese, it is required for chlorophyl synthesis. Zinc is immobile in the plant.

Dark, thin, desiccating leaves, which turn white in advanced stages, along with yellowing and bronzing of stunted leaves, witches broom, and reduced growth are symptoms of zinc deficiency.

Compaction, excess irrigation, and alkaline conditions reduce the availability of zinc to plants. Because zinc is readily fixed (made unavailable) in the soil, the surface soil accumulates a higher concentration of zinc than the lower soil levels.

Excess phosphates in soil precipitate insoluble zinc conditions. A range of 8 to 60 ppm of zinc in dry tissue is normal. To correct zinc deficiency an application of 0.4 to 0.8 pounds per acre of zinc sulfate is recommended.

Copper (Cu) is an activator of some enzyme systems and certain growth promoting substances. The copper content in a plant is highest in actively growing tissue. Copper is toxic except in dilute proportions. Water from copper downspouts can cause areas of turfgrass to be stunted.

Organic soils tend to be deficient because substances released as organic matter decay and tend to limit the availability of copper.

Boron (B) is necessary for plant reproduction and is related to calcium and phosphorus metabolism and protein synthesis. It affects the development of the plant cell wall, and is thought to be active in sugar transfer. It also aids in maintaining correct water balance in plants.

The new leaf tip has the highest concentration of boron within the plant. Because the leaf tips are removed by mowing, for limited periods turfgrass can tolerate higher boron concentrations than other plants.

Availability is reduced under alkaline conditions. Deficiencies of boron are evident in the growing points as chlorotic streaks. Also, the leaves are stubby and rosette-like in appearance.

Some plant stems become brittle and leaves become mottled.

The normal range of boron in dry plant tissue is 3 to 20 ppm. The normal boron concentration in the soil is 2 to 1,000 ppm, with an average of 30 ppm.

A corrective application of boron requires 0.1 to 0.3 pounds per acre. Where a deficiency exists, the maximum amount required for any boron sensitive crop is only 1 to 4 pounds per acre.

Molybdenum (Mo) is believed to be necessary as an activator for the enzyme regulating nitrate reduction. It is essential in the process of nitrogen fixation. Wilting, stunting, and cupping of leaves are possible symptoms of molybdenum deficiency.

Concentration of molybdenum is highest in the leaf blade and tends to accumulate in plants as they mature. Molybdenum, like zinc, tends to accumulate near the soil surface as a result of plant decay and subsequent release of this micronutrient.

Leaf tissue to be used for testing should be dried before any deterioration occurs.

It is less available under acid soil conditions. Applications of lime to acid soils can improve availability.

The expected range of molybdenum in dry tissue is 2 to 8 parts per million, but plants with tissue contents of 11 to 15 ppm were produced on soils high in molybdenum.

Corrective treatment of soils lacking Mo is 0.1 pounds per acre.

Preparation for Testing

Leaf tissue to be used for testing should be dried before any deterioration occurs.

The clippings of leaf tissue may be dried by spreading them in a thin layer on a clean surface in the open air and sunshine. Stirring the leaves occasionally helps them to dry uniformly.

They may also be dried in a warm (not hot) oven for a limited time. It is suggested that approximately one pound of fresh leaf tissue be dried out though only a few grams of tissue are actually needed for the laboratory test.

The sample container should be clearly labeled. Information and questions concerning the sample can be helpful in securing more complete interpretation of the data.

The following Table 1 (from page 26) Turf Managers Handbook, Daniel & Freeborg, is an example of tissue analysis showing the range of elements within a plant. Such an analysis can serve as a basis for interpretation and correctvie action. Soil testing laboratories will supply additional information on processing tissues for testing. **WT&T**

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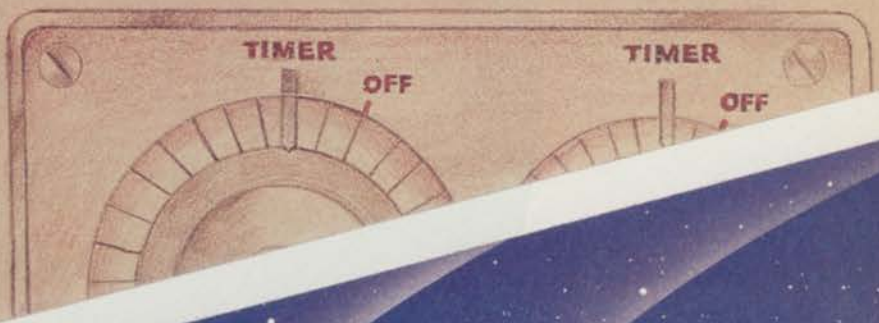

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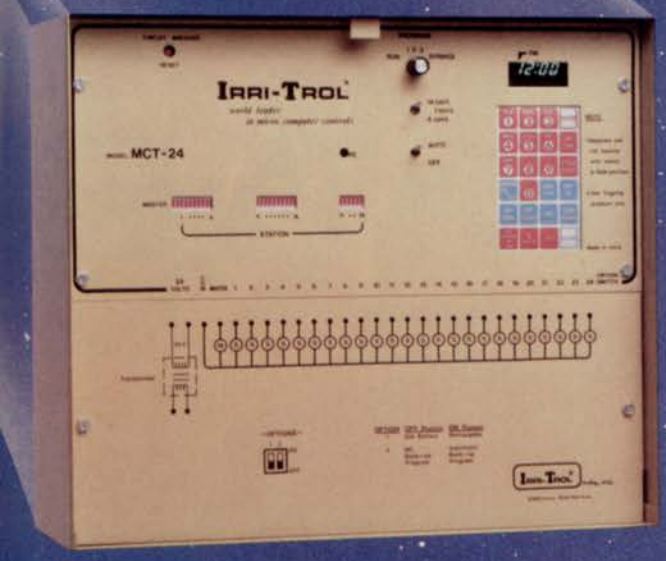

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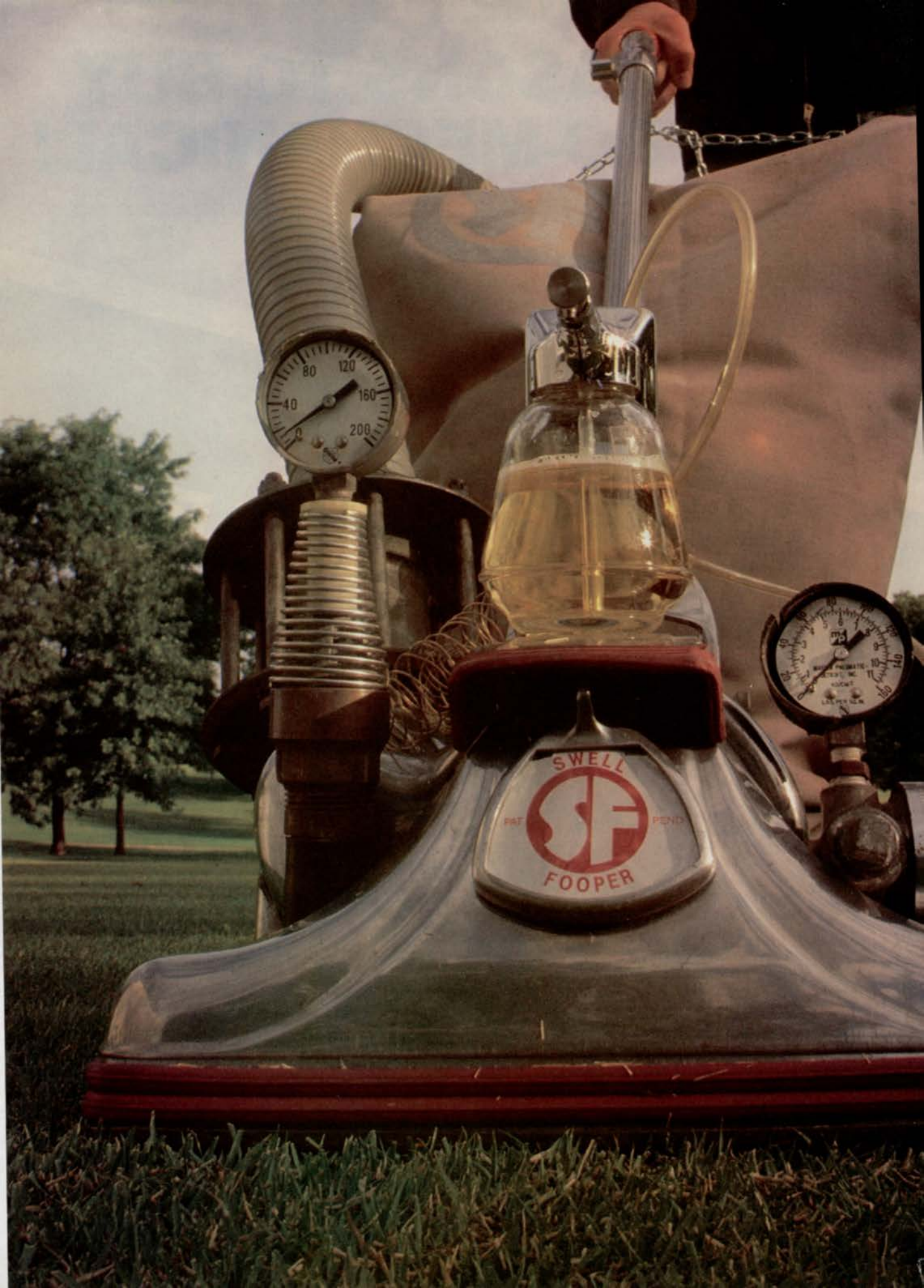
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Building the Team

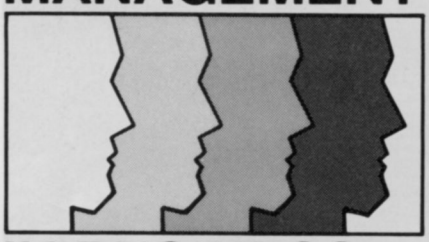
Hiring and retention of personnel is the cornerstone of any business's success. Understanding the components of recruiting qualified employees is half the battle.

by Rudd McGary and Ed Wandtke

("Building the Team" begins the first in a three part series on team management. Parts II and III will appear in the September and October issues, respectively.)

PART 1

TEAM MANAGEMENT IN BUSINESS



There are a great many questions that come up when discussing how to hire and develop a successful workforce and develop it into a productive team.

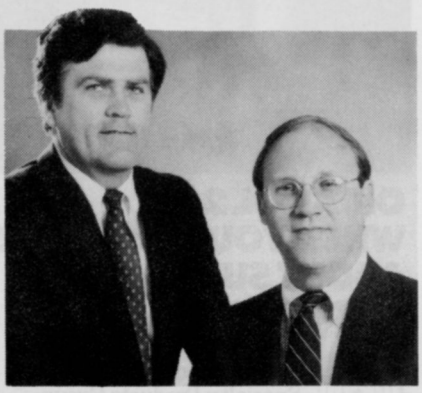
Let's first define what teams are outside of sports and then go on to the major questions of hiring and recruiting of personnel that will make up your team.

Common objective

Teams are two or more people working towards a common objective within a given timeframe and with a strong central management or leadership function present.

If any of these parts are left out you simply won't have a team. The common objective must be understood by all the people you hire and all the people that are currently on the team, your employees.

Unless there is some reason for the team's existence, and that reason is to accomplish something, you can't hire or recruit anyone. You should note that often different parts of your team have different specific objectives, but that overall the team has to understand how those different parts fit together toward one unified goal.



Wandtke and McGary are partners in All-Green Management Associates, Columbus, OH.

One division may be working on obtaining more customers while another division may be working on profit improvement through reducing cancels, improved quality of service or more frequent customer communications. A second part is the timeframe that you expect a specific task or objective to be accomplished in.

Don't say, "We want to give better service by next year," because the time frame is too long. While that may be your final objective you have to give the team members short term objectives so that they can have the feeling of accomplishment and understand how they are expected to perform in a given space of time.

A more realistic goal would be: Cancels for round 1 will be 35 percent below last year's round 1 cancels.

The third major part of the team concept is that there must be a strong central figure that is in charge. In sports this is a coach, in business it's the manager/owner.

The coach

Telling a group of people that you want them to work like a team is useless unless you have someone who is reponsible for the performance of the team. The reason why committees take so long to get things done is usually the fact that no one person is in charge.

Companies need the strong management function in place all the time. This last statement doesn't mean that you have to beat people over the head all the time, simply that responsibility for the team's performance is with the manager. They don't fire the players in baseball, they fire the managers.

In business we often see the reverse; they fire the subordinates and leave the management in place. A true team's performance is the reponsibility of the top man, and there is no way that a good team manager can give up that responsibility, or should want to.

Let's look at how building a successful team starts with the hiring and recruiting of all your personnel.

Below are some key points to consider.

- 1. When hiring be sure you have a specific function for the new team member. It isn't enough to hire bodies. You must be aware of the reasons why that person is being brought into the team. Over-staffing is expensive.
- 2. You should have some standards of operations and performance that are made clear to the new team member.

Frequently people who are hired, particularly in part-time positions, don't really know what is expected of them. Don't have employees just standing around when there is no specific task to do, have them check back with their manager.

- 3. During the hiring interview make sure it's really an interview, not just a sales job by you to get them to come to

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work for you. Know what you want to find out in the interview, and then stick to it until you do find it out. You can do this best by writing down what you want to know before you begin the hiring interview. Be consistent in obtaining a standard body of information about each job applicant.

■ 4. Not everyone on the team has to be a superstar. You're going to hire mostly people who do standard jobs. When you're hiring consider the fact that most teams have a few superstars and then a lot of good workers around them. You can't expect everyone on your team to be great at what they do, particularly if their position doesn't require greatness, just competence.

■ 5. There are two major ways to find new people. One way is to advertise in newspapers or magazines. This will bring responses from anybody that thinks they can do the job described and gives you a broad base to work from. A second way is to use personal references from those that are already working for you. A good worker generally wants a good worker next to him or her and should be encouraged to suggest new people for job openings.

■ 6. Plan as far ahead as possible for hiring. If you trap yourself into having to hire anybody who applies for a job because you put yourself under time pressure, you won't put much of a team together and you deserve what you get.

When you're hiring consider the fact that most teams have a few superstars and then a lot of good workers around them.

■ 7. Keep a list of those people that you've interviewed. Sometimes three people interview for a job and all three are almost as good. You still have to choose one but if you keep a list, with comments, you can help yourself if you get in a hiring crunch. (Throw away the peoples' names that didn't make a good impression in the interview, generally they won't get any better.)

■ 8. Make sure you have minimum standard for hiring. Everybody puts together a profile of the perfect employee. They are hard to find. You have to set a minimum standard. Never go below this.

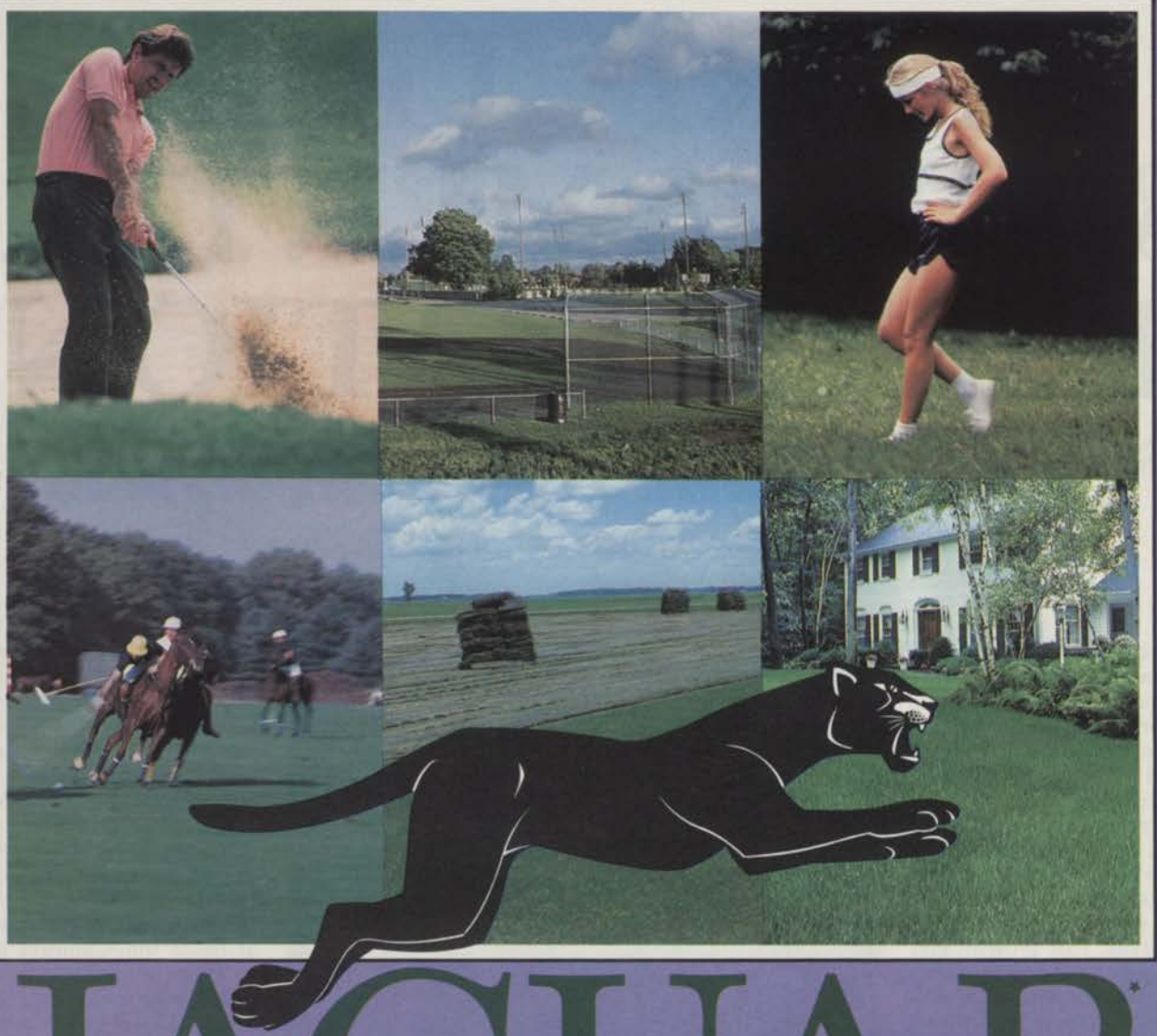
■ 9. Don't expect to find too many great team members when you're hiring entry level personnel. Consider the position and the salary when you begin your interviews. Sometimes you can get lucky and find extraordinary people at low prices. Sometimes it rains in the Sahara desert, too.

■ 10. Do the interviews in person. Resumes and phone interviews give you some idea of the person but since you are recruiting for your team do it yourself to be certain the individual will meet your standards and complement the needs of the team. Putting a team together is not an easy process. Managing it is even tougher.

If you start with a good hiring process at least you have a better than even chance at getting the people you want. If you start with a mediocre group of people chances are you will put together a mediocre team. **WT&T**

Next month's column will deal with motivation of teams. One preview thought. Hiring of the team will be a key variable in the success of the team. All the great coaches were good at getting great personnel. If it were easy, everyone would be doing well. It is possible, though.

Excellent Overall Performance



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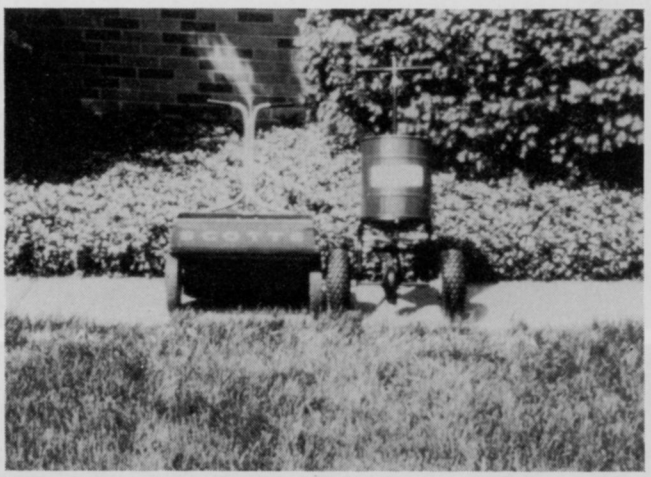
1985 GUIDE TO:

TURF, TREE & ORNAMENTAL FERTILIZATION

by Richard Rathjens and Roger Funk, Ph.D, Davey Tree Expert Co.

Traditionally, turfgrass managers apply fertilizer in spring and fall using color and the amount of leaf growth as guides to the rate and frequency of application.

Promoting good color and stimulating shoot growth are primary objectives, but nutrient influences on carbohydrate reserves, root growth, and the plant's ability to tolerate disease and environmental stress are often overlooked. Understanding these factors refines a fertilizer program.



Granular fertilizer and pesticide *formulations are normally applied to turfgrass with either a gravity (left) or centrifugal (right) spreader.*

Timing applications

An objective in timing fertilizer applications is to build carbohydrate reserves and promote root development. The response of warm-season and cool-season turfgrasses differs.

The predominant **cool-season** turfgrasses (bluegrass, perennial ryegrass, fescue and bentgrass) initiate and develop root systems in the early spring and fall. Fall application of nitrogen is needed because it increases carbohydrate reserves and root growth. It also improves turf density by promoting greater rhizome and tiller growth.

In addition to regular fall fertilization (September-early October), the relatively new concept known as **late fall** or late season fertilization is being included in many maintenance programs. Late fall fertilization is applied when shoot growth slows or approximately at the time of the last regular mowing of the season.

Nitrogen applied at this time greatly enhances the photosynthetic production of carbohydrates. These carbohydrates are stored for use the following growing season, providing earlier spring greenup and an energy source for turfgrasses to recuperate from environmental and mechanical stress.

Another advantage of late fall fertilization is that it reduces the need for high amounts of spring-applied nitrogen. Excessive **spring** fertilization can actually reduce carbohydrate reserves and root development by stimulating rapid shoot growth. This is because growing shoots take priority over roots for carbohydrate utilization.

Both spring and summer fertilization is used to maintain the color and density produced with fall and late fall fertilization the previous year. Fertilization at these times should not produce succulent plant tissue which can increase the severity of turfgrass disease and reduce the plant's ability to withstand heat, drought, mowing or wear stress.

Applications of **potassium** contribute to the hardiness of the plant and help "temper" the stimulating effects of nitrogen.

In contrast, most of the root growth in the **warm season grasses**—such as Bermuda, zoysia, and St. Augustine—occurs in spring and summer. Fertilization during these periods stimulates root growth. However, only moderate applications should be used in early spring in areas where warm-season grasses experience winter dormancy.

Bermudagrass and St. Augustinegrass experience **spring root dieback** following greenup. Heavy fertilization in early spring may result in additional stress during this critical period.

Like cool-season turfgrasses, warm-season grasses accumulate carbohydrate reserves in the fall when

Rathjens is senior agronomist and Funk vice president of technical and human resources for the Davey Tree Expert Co., Kent, OH