structors and fertilizer dealers all were testing soil with these kits. Soil testing with kits was reliable only when performed by an experienced technician. The soil test kit was replaced with electronic instruments in the 60's.

Computer processing of soil test results was pioneered at the University of Wisconsin by L.M. Walsh, currently Dean of the College of Agricultural and Life Sciences. In 1964, electronic reporting was made available to commercial soil testing labs through Agricultural Records Cooperative (now known as Wis. Dairy Herd Improvement Coop). Approximately 200,000 samples are processed by WDHIC annually in Wisconsin. The results are stored on magnetic tape and summarized by county every four years.

The routine soil test for turfgrass is pH or acidity, buffer pH, organic matter, phosphorus, potassium and soluble salts. The buffer pH is used to calculate the lime requirement of acid soils. The soluble salt test is used to indicate problems due to over-fertilization. Other tests available upon request in Wisconsin are calcium, magnesium, sulfur, boron, zinc, manganese and particle size distribution (percent sand, silt, clay).

Plant Analysis

Plant analysis is the quantitative analysis of the elements in plant tissue. Carbon, hydrogen, and oxygen come from air or water and are not analyzed routinely because they seldom limit plant growth. Chlorine and molybdenum are normally sufficient. Thus, most plant analysis labs analyze plant tissue for nitrogen, phosphorus potassium, calcium, magnesium, sulfur, boron, zinc, copper, manganese and iron. Aluminum and sodium are sometimes included even though they are not essential to plants.

The general relationship between nutrient level and plant growth is shown in Figure 1. When a nutrient is deficient, addition of that nutrient results in increased plant growth and usually an increase in the concentration of the element in the plant. As the level of the deficient nutrient increases, plant growth increases until some other factor limits growth. Further additions of the element will cause the concentration of that element in the plant to rise more rapidly because it is not being diluted by additional dry matter. Eventually, toxicity of that element may occur.

Plant analysis has proven useful in confirming nutrient deficiencies, toxicities or imbalances, identifying "hidden hunger," evaluating fertilizer programs, determining the availability of elements not tested for by other methods, and to study interactions among nutrients.

For most field crops, the portion of the plant sampled and the stage of maturity influence the nutrient composition. These factors are less critical for turfgrass that is mowed regularly. If allowed to grow to maturity or senscence, however, the analyses are difficult to interpret. Unfortunately, there is not much research being conducted on the optimum nutrient composition of different species of turfgrass.

Plant analysis complements soil testing. Sometimes adequate nutrient levels may be present in the soil but, because of other problems such as insect feeding, root damage, too much or too little moisture, or compaction, inadequate amounts of nutrient get into the plant. Plant analysis, along with soil tests, can help pinpoint the problem.

Editor's Note: Dr. Emmett Schulte is a Professor of Soil Science at the University of Wisconsin — Madison. He has a B.S. degree in Chemistry, a M.S. and a Ph.D. in Soil Science and has been a UW—Madison staff member since 1964. His responsibilities include instruction, research and extension work in soil fertility and he currently is also the Director of UWEX Diagnostic Labs. He also spent a number of years overseas as a member of the USAID-University of Wisconsin team at the University of Ife, Nigeria.

GOLFERS BID FOND FAREWELL TO STRUM'S SAND GREENS!

Golfers had their final chance on the weekend of June 8 to play the sand greens of Strum's Viking Skyline Recreation Area golf course, a remnant of yesteryear.

A brand new par-36, nine-hole course with big grass greens has been built around the old golf course. A sand green is the putting surface of a golf hole in which smooth sand takes the place of the closely mowed grass. Sand greens were common in all sections of America in years past. The club held a tournament that began on the nine-hole sand-green course and ended on the grass green course. Over one hundred players participated. The tournament, however, was not the highlight of the weekend celebration. The "drags," pieces of carpet with handles attached to them for smoothing the sand each time they putted, were burned in a ceremony on Saturday night! The golf course originally opened in 1965 and made the switch to grass this year because members were simply tired of the sand. The course is part of a 300 acre recreation area and started with sand greens because of the lower expense associated with maintaining them. However, in recent times the golf course was losing business because of them and faced closing if changing to grass was delayed or avoided.

Sand greens are rapidly disappearing around the country. Except for the novelty of it, playing sand is little fun. The sand is left black and hard by the twice-a-year oiling, and it leaves golfers with a oily residue on hands and shoes.