apart from all the other minor elements. It should be said in passing that in the absence of any other positive identifying feature the question may be raised as to whether copper deficiencies can be recognized, especially in close cut turf.

Editor's comment about practical application.

In the early days of golf turf culture, little thought was given to the minor elements. The reasons were simple. Management practices furnished the needed trace amounts of the minors, thus a deficiency was unheard of.

Soils were newer and better than the lower cost marginal lands now being used in construction. Soils tended to be higher in clay and organic matter content, and thus inherently richer in these vital plant nutrients. They were also better aggregated; with better aeration for better availability of nutrients; and traffic from man and machine was light.

Prior to World War II, frequent topdressing with manure based compost was also commonplace,and an excellent source of the elements discussed in this article. Our, then, lower analysis chemical fertilizers (3-12-4, 5-10-5, etc,) supplied secondary as well as minor elements at a no cost fringe benefit to the customer. Dolomitic limestone used as a conditioner furnished trace amounts of copper, manganese, zinc, boron and iron as well as calcium and magnesium. The phosphorus in the low analysis mixture came from rock phosphate treated with sulfuric acid to furnish sulfur in addition to phosphorus. And, invariably, the mixed fertilizer contained natural organic materials as well as chemicals.

Today, this picture has changed. Putting green soils are high in sand content, and thus easily leached with low retention properties for most plant food elements applied. The conditioners and impurities had to be eliminated from mixed fertilizers to produce the high analysis materials so strongly advocated by some agricultural agencies. In other words, the secondary and minor elements were removed in favor of increased nitrogen, phosphorus and potassium. The words "in favor of" must be used advisedly as grass will not grow on N-P-K alone.

The increased use of irrigation, especially where drainage is poor and traffic is heavy further complicates the minor element problem. Under these conditions, and even though present in adequate amounts, the poor aeration may "tie up" an element so it is temporarily unavailable for growth. This is especially so in the case of iron, and overuse of phosphorus can do the same thing. Thus, the article on Minor Element Deficiency Symptoms in Turfgrass is both timely and important to all progressive golf courses.

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New Mix for Bare Turf Spots

A synthetic soil mix has been developed for patching bare spots in turf, by Dr. Raymond Sheldrake, who is on the staff at Cornell University.

A thin layer of this mix, about one-half inch thick, is spread over the bare spot. Grass seed is sprinkled over this base, covered wth about an eighth-inch of mix and watered. That's all there is to it. No burlap cover is ever needed.

The mix consists of horticultural vermiculite, sphagnum peat moss and a blend of plant nutrients. It weighs about half as much as regular soil, reduces watering time and speeds up the growing time of turf by as much as 30 per cent, according to Dr. Sheldrake.

The mix should prove useful for starting new greens and tees, since weed infestation is minimized by using it.