

# Sometimes Successful Agronomy Means Starting Over

---

by **PAUL VERMEULEN**

Agronomist, Western Region, USGA Green Section

**W**HY DO some putting greens endure the stresses of summer successfully while others slowly melt away despite the superintendent's best efforts? Perhaps it is related to how greens are constructed, or how they have been managed. There is no doubt, though, that the problems with a certain percentage of these greens would best be solved by total reconstruction.

Most superintendents and club officials react to their problem greens by looking for a relatively quick, simple, inexpensive cure. They often start by trying the most recent miracle fertilizer, plant extract, or soil conditioner. When that fails, and a new superintendent is on the job, he tries the next stage of cures, including conventional aerification, deep-tine aerification, and tree

removal and the like. If these worthwhile but sometimes insufficient programs fail, the next superintendent has to rebuild the greens from scratch.

How to decide which cure to apply to the problem greens can be a real challenge. After all, many greens can be salvaged by proper cultural management programs. Rebuilding the greens according to good specifications would certainly resolve most problems, but rebuilding is expensive, and it takes the greens out of play for several months at least.

Several factors to consider in preparing to attack problem greens:

**Soil Variability** — Topmix components used for putting green construction vary tremendously throughout the country. If someone were to sample newly built greens from different sec-

tions of the country he would surely see everything from 100 percent washed plaster sand suitable for highway construction, to red clay suitable for professional pottery. Interestingly, both materials have their advantages. For instance, pure sand resists compaction and promotes rapid drainage, while pure clay has excellent water and nutrient retention. In order to build a successful putting green, though, the best characteristics from both materials are required. At first glance, the perfect balance might seem to be a 50:50 mix between sand and clay, but it turns out that such a soil would be equally bad, and perhaps worse, for putting green construction than the pure form of either material.

Consider the problems at two courses, each of which built greens with economy

*These contours would probably be too much for 120,000 rounds of golf.*



in mind. One course built greens according to the ever-popular "modified" USGA Putting Green Specifications, and the other followed the equally popular "almost built" to USGA Putting Green Specifications.

The "modified" USGA greens received a topmix consisting of an 80:20 sand/soil mix. (It is a widely held misconception that a USGA topmix is always 80:20, regardless of the quality of the components. This is an incorrect and sometimes fatal notion.) The mixture was not tested by a soils laboratory, and the soil component turned out to contain a significant amount of silt and clay.

The "almost" USGA greens were constructed using an untested 80:20 mix as well, but this time the sand was much too fine. Also, to save some money, the club dispensed with the tile drains and skimmed on the depth of the topmix.

Despite being built in an era when scientific, time-tested construction methods are available, the greens at both courses caused the same endless nightmare. Turf is lost on a regular schedule, and the blame for these failures is attributed to poorly devised cultural programs and neglect. In truth, all the miracle cures and deep aeration in the world cannot compensate for a poorly drained soil. Without reconstruction, the future of these two courses rests in the hands of nature. During favorable weather, these putting greens are satisfactory, but during periods of heat and heavy precipitation they can deteriorate quickly.

If the original construction materials have physical properties that cannot be overcome through conventional means, then reconstruction may be the only solution. Where, then, can we find a soil suitable for putting green construction?

One proved method is to mix and match several different combinations of sand and organic matter according to USGA specifications. Not just any sand and any organic matter can be used, only those that conform to proved specifications. Developing a topmix with desirable bulk density, porosity, water infiltration, and resistance to compaction requires physical soil testing by a reputable laboratory. Remember the old saying, "Exercise caution, and never look for bargains when considering brain surgery." The same is true for putting green construction.

Although it is an important consideration, the wide range of soil textures used in the greens' original construction probably doesn't account for half the

variability in soil profiles on established golf courses. What really separates one course from another and makes each of them unique is their management history. Depending on the ages of the courses, and how many different topdressing materials have been used, soil profiles are as individual as human fingerprints.

Consider too the variability in subsurface drainage, and you can quickly appreciate why each putting green requires individual consideration. An old putting green, for instance, built from a well-drained native soil and topdressed for years with a good-quality sandy material may have very good drainage characteristics and require no special cultural practices.

Now consider an old putting green built from a poorly drained, easily compacted soil and topdressed with the same quality sandy material. Because the underlying soil has such poor characteristics, the green might be a good candidate for deep-tine aeration. If this process does not dramatically improve the drainage, however, oxygen can become a limiting factor during heavy irrigation or rainfall, and the potential for serious turf loss is a constant threat. The final chapter in this story should then be reconstruction.

**Water Variability** — Water quality has been given close attention in recent years, and for some very good reasons. In considering water quality, two important aspects deserve discussion.

First, for the irrigation system to operate properly, suspended matter, such as organic debris, should be eliminated. This problem might easily be solved by the installation of a filtering system or settling pond.

Second, water pH and the presence of dissolved salts and other compounds should be considered in relation to soil chemistry.

The solutions to some of these problems might well be difficult, and they may even include putting green reconstruction.

To determine scientifically if water quality is a problem, a case history using soil and water test reports should be put together. Keep in mind that even potable water with low levels of soluble salts can cause significant turf loss if internal drainage is inadequate.

If the irrigation source is tainted with soluble salts, adequate drainage is of critical importance. It is essential, though, to define soil drainage properly as it applies to putting greens. There are greens constructed with well-drained

soils, and then there are greens constructed with poor-quality soils but drained artificially to remove puddles.

Water does not stand on either type of green, but only the well-drained soil allows leaching of soluble salts. The putting green constructed with artificial drainage could suffer from toxic salt accumulations in the soil between the drain lines.

Should the club consider irrigating with salty water, reconstruction with a well-drained root zone mix and artificial subsurface drainage should be a foregone conclusion.

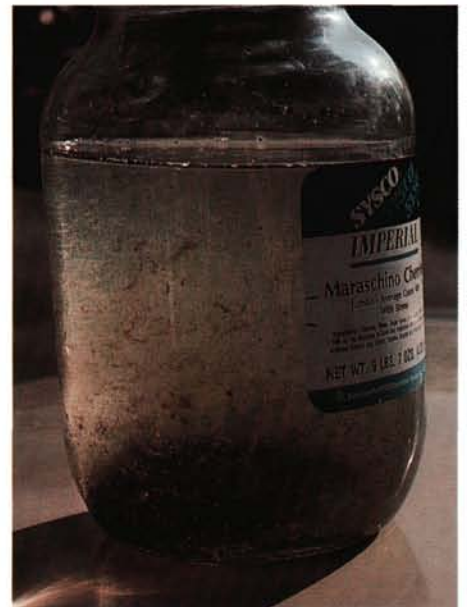
When irrigation water contains other compounds, such as bicarbonates, or has an unusually high pH, programs should be instituted to neutralize their effects on the soil. Sulfur-containing materials applied directly to the soil in most cases are used most often to lower pH.

Looking to the future, new technology that employs reverse osmosis and other techniques may help relieve some of the deficiencies of today's irrigation sources. Until this technology can deliver quality water at an affordable price, however, we must continue to rebuild putting greens to provide the necessary drainage.

**Surrounding Vegetation** — When evaluating problem putting greens for possible reconstruction, don't underestimate the impact of nearby large trees. Courses that have resisted the temptation to over-plant with an abundance of trees invariably enjoy greater success with their greens than those where too many trees have been planted. The reason is that large trees planted too close to important turf areas often restrict air circulation, inhibit sunlight penetration, and invade under the turf surface to compete with the grass for water and nutrients.

The failure of greens surrounded by tall trees is too often attributed to an outbreak of disease or some other problem. In truth, the disease may have dealt the final blow, but the trees were probably responsible for predisposing the turf to disease activity. The moral is, never decide to rebuild a green without first considering the effects trees might have. Rebuilding the problem green without dealing with the trees will probably not solve the problem, and even well-built new greens will likely be difficult to maintain.

To evaluate greens for tree-related problems, compare the problem green located next to large trees with another green located in an open area. If the two



*(Top) These trees beget disease.*

*(Left) Good-quality topdressing on a well-drained soil deserves praise, not reconstruction.*

*(Above) Poor-quality irrigation water can force reconstruction in some cases.*

greens are built with the same soil and have been managed similarly in the past, most often the putting green located among the trees will show problems.

If trees cause a green to be difficult to maintain, root prune the trees by digging a trench two-and-a-half feet deep around the perimeter of the greens. Trenching between the green and the surrounding trees will sever the invasive tree roots, and allow the turf to absorb water and nutrients without competition. After reviewing the irrigation system layout, the trench should be established as close to the greens as possible. Then thin out and prune the surrounding trees to improve air circulation and sunlight penetration. As a guideline, continue to prune and remove trees until the problem green receives the same amount of sunlight as greens located in open areas.

After these important steps have been taken, it's time to wait. If the trees were indeed the primary problem source, some improvement should be noted during the next several weeks or months. If the green does not show signs of recovery, then other problems need to be addressed, and reconstruction may have to be considered.

**Putting Green Contours** — In the race to achieve faster putting green speeds, the slopes on many older greens are becoming unplayable. Not only do severe slopes frustrate the average

player, but they also limit the number of good hole locations available on each green. Concentrating the hole locations in the same areas over an extended period of time inevitably leads to a thin turf canopy and soil compaction.

The alternatives for dealing with severely sloped greens are very much limited. One choice would be to reduce the speed of the greens to allow for more hole locations. The other would be to restrict the number of rounds so the few available hole locations would not suffer excessive compaction and wear injury. If these solutions are impossible or unacceptable to the golfers, then it is probably time to approach a golf course architect and construct a larger green with a less severe slope.

**Membership Demographics** — There is no doubt that the passion for golf is growing throughout the country. The result is that some golf courses designed for 15,000 to 20,000 rounds annually are now entertaining from 70,000 to 120,000 rounds. Despite great advances in equipment technology and significantly greater understanding of the principles of turfgrass science, discrepancies such as this are more than can be dealt with. In such instances, rebuilding greens may be the best solution.

If all your detective work reveals that reconstruction is necessary, it would be

wise to employ a golf course architect. He can be given the task of preserving the architectural theme of the original design, and he can be held responsible for the finished product. Furthermore, the architect can provide accurate blueprints to work from during construction, and he can help ensure a successful renovation program.

The USGA Specifications for Putting Green Construction are certainly not the only construction specifications available, but they do have a successful record in all geographic locations. These specifications are the result of years of scientific investigation and field experience, and are highly recommended. Simply mixing sand and soil together based on intuitive feel often leads to disastrous results.

In summary, deciding whether or not to rebuild problem greens can be a very complex business. Each case must be considered individually, and all the potential causes of failure must be given due consideration. This includes studying what makes each course unique by looking at soil and water test reports, surrounding vegetation, putting green contours, and membership demographics. After this information has been carefully evaluated, it might well be the right time to approach the Board of Directors with a greens reconstruction proposal. Sometimes successful agronomy means starting over.

---

# Putting Green Construction: Interpreting Physical Soil Test Data

---

by JAMES M. LATHAM

Director, Great Lakes Region, USGA Green Section

**T**HE LABORATORY procedures followed for establishing the physical characteristics of mixtures used in putting green construction haven't changed much since the USGA Green Section Specifications were introduced some 30 years ago. The specific recommendations based on the results, however, have evolved through the years to correspond to continuing research and experiences in the field. The agronomic success of greens built with mixtures of sand and peat, with little or no soil, has led not only to a critical evaluation of all the types of

components, but also to the laboratory data the mixtures are based on.

In earlier days, when soil was considered to be a mandatory part of topmixes, concrete-grade sand was used to create resistance to compaction and to furnish large, non-capillary pores for drainage. Greens built with concrete sand during the late 1950s and early 1960s, however, were hard, because of the gravel content, and they required more time to mature than many people thought necessary. To compensate for the hardness, many superintendents used softer topdressing materials, which

often turned out to be incompatible with the gravely topmix.

The evolution of component specifications began in the early 1970s, and favored greater sand uniformity and a trend to medium-sized, round particles. Articles published by Madison<sup>1</sup> and Spomer<sup>2</sup> furthered the movement to near soil-less greens and topdressing. Some researchers promoted the use of fine and very fine sands in topmixes, but experiences in the field have not supported this.

The upshot of these evolutionary advances is the present set of specifications