



*Golf course superintendents will be further challenged in the future to continue to maintain high-quality golf courses while balancing the fragile environment in which we live and work. Metedeconk National Golf Club, Jackson, N.J.*

# Golf Course Management Standards and Practices for a Fragile Environment

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**T**HANKS TO golfers' expectations and superintendents' performance, golf course standards have neared perfection. The wall-to-wall high-management philosophy common at many facilities has resulted in playing surfaces of a pristine and uniform color and double-digit green speeds. Tournament or near-tournament conditions are maintained day in and day out.

This drive for constant perfection has resulted in the adoption of maintenance

practices that often do little to enhance the health and vigor of the grass plant. Green speed is maintained through extremely low mowing heights. Color and playability are maintained through irrigation and fertilization practices geared more for acceptable appearance of the course than for the agronomic needs of the plant.

The result of these extreme management practices is, more often than not, a surface that is highly playable, but

balanced precariously on the edge of survival. To ensure that the turf does survive, increasing amounts of water, fertilizers, and pesticides are used.

Now this philosophy of management is being challenged more strongly by the realities of the fragile environment in which we live and work. We confront challenges daily in every phase of our operations.

One of these challenges is competition for a fair share of water resources.

As populations continue to grow and shift, water demands increase significantly. Water for irrigation becomes more and more scarce, and — however unfairly — golf courses are usually near the bottom of the regulatory priority list. Frequently, the available water is only of marginal quality, but priced at a premium.

Land for new golf course development is in short supply. The land that is available is often marginal for development or has other very limited potential, which can mean that it is an environmentally sensitive area, such as a wetland or other valuable wildlife habitat.

Irresponsible or excessive use of pesticides leads to concerns about the effects of exposure — not only the exposure of wildlife and those who play golf courses, but also those who maintain them.

Obviously, things must change. We can no longer afford to manage golf courses using the old standard. New standards must be developed that are more in tune with natural and agronomic realities.

Wall-to-wall management can no longer be considered acceptable. Natural or less-maintained areas must become a growing part of all golf courses.

Management practices must take into account the agronomic realities of the grasses being grown and not the desire to maintain tournament conditions on a daily basis. To this end, water and fertilization practices must meet the needs of the turfgrass plant, not some aesthetic standard. Green speeds must be based on the agronomic limitations of the turfgrass plant — not a standard established by a grooved stick.

Do these changes mean that golfers are going to have to accept lower-quality playing surfaces? One school of thought says that if current practices are changed, quality of the playing surface will suffer. But a closer look may reveal that this new standard will not result in a decrease in quality, but a continuation of excellent playing surfaces — with healthier turf.

The quality of a golf course can roughly be described by the following formula:

$$Q = (S + EI + T)A$$

Where:

Q = Quality

S = The species or cultivars being grown

EI = The sum of all inputs

I<sub>f</sub> = Fertilization

I<sub>w</sub> = Water

I<sub>m</sub> = Mowing

I<sub>c</sub> = Cultivation

I<sub>p</sub> = Pesticides

T = Technology available

A = Ability of the superintendent

Even in this simplified form, it is clear that a number of interrelated factors impact the quality of golf course turf. By reevaluating and manipulating these factors, we can provide high-quality playing surfaces within the framework of the new standards.

Turfgrass selection dictates the management practices required to maintain a quality playing surface. In the past, selection has too often been made based on the concept of the "ideal playing surface," instead of on the ability of the turfgrass to survive. Not surprisingly, these selections have frequently required intense management and increased chemical inputs to remain playable.

Today, turfgrass breeding programs are regularly developing and releasing new grasses, adapted for a variety of environmental conditions and more resistant to a number of diseases. These grasses can and do thrive under less intense management regimes — when properly selected.

The future promises an even wider selection of grasses. Varieties that maintain higher quality with fewer inputs of water and fertilizer and that extend areas of adaptation are already in test plots at a number of universities.

Species that are not thought of today as suitable for golf course use may be the grasses of the future. With the refinement of biotechnology and genetic engineering, combining the characteristics of several species into a single "super species" may someday be possible.

However, the conversion to new grasses will not be fast or universal. In the short term, economic realities will limit the use of new grasses to new developments and golf courses with extensive budgets. Over time, other conversions will occur more slowly, as the need arises.

Whether maintaining new grasses or existing varieties, it is generally accepted that, in the future, management inputs will change significantly. Much of this change will be caused by reductions in available resources, but some will result from alterations in management philosophies and strategies.

Irrigation practices will have to change significantly in the future because quality water for irrigation will be in short supply. While increases in effluent water use will offset some of the loss of potable water, it is unlikely that all courses will have access to such sources. As a result, superintendents will be forced to use available water more intelligently and judiciously.

Many of the pesticides in use today may one day be unavailable or have their use restricted. One result of this will be an increased emphasis on IPM techniques. Available pesticides will still be a part of pest management but will be used in conjunction with other management practices.

Losses in chemical and water resources need not result in a reduction in quality. Instead, compensatory changes in other management practices can optimize turf quality within the framework of a fragile environment.

One example of this principle is fertilization practices based on factors such as turf species, soil characteristics, and turf use, rather than aesthetic perceptions.

Mowing practices can be manipulated to reduce stress, and cultivation programs can be designed to improve rootzone characteristics — all to produce optimum turf quality.

A cause-and-effect relationship exists between individual cultural inputs and turfgrass response. The interaction between several cultural inputs, however, leads to a less direct and far more complex set of responses.

When we thoroughly understand these complex interactions, we can develop strategies to compensate for losses in available inputs or overcome other variances from best agronomic practices.

For example, when we understand the impact of reducing mowing height, we can change other cultural practices to counter these negative effects. By manipulating the whole set of inputs to optimize the health of the plant, we can reduce the need for some chemical applications, thereby softening the impact on the environment.

Many of the negative assumptions about the quality of future golf courses fail to take into account technological improvements. Changes in available inputs must lead to improvements in technology.

Human nature does not usually allow men to simply give up when faced with significant dilemmas. But rather, it is



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more in our nature to find new and better alternatives for what is no longer available, or better ways of using what is still available.

This technological evolution has always been an important part of golf course management. It has become even more important as we deal with the challenges of today and the future.

Where is changing technology taking golf course management? Seeing that available water supplies are shrinking, companies are developing new irrigation systems that offer more precise application. Computerized systems monitor water use and apply water when and where it is needed in more exacting amounts. The result is less water wasted, healthier turf, and no decline in playability.

In the future, these technologies will become even more exact and will be supplemented with new instrumentation. An array of new equipment and techniques — infrared reflectometry is just one example — is under development. Such methods will permit more exact measurement of the grass plant's

need for water. Research with this equipment will also determine the exact requirements of specific turfgrass species and cultivars.

The future of pesticides may not be as bleak as many people portray it to be. Certainly, many of the pesticides in use today may not be available in the future. But in all likelihood, they will be replaced with new materials that, in most cases, will bear little similarity to those in use today.

Biological agents will become more important in the future. While the biologicals are still quite new and unproven, new techniques like genetic engineering will eventually lead to the creation of effective materials.

Biotechnology can lead to new agents for pest management. Growth hormones that prevent insect pests from maturing, or genetically engineered viruses that attack and destroy specific pests are only some of the possibilities this new technology offers.

Basic chemical research also offers promise for new pesticide technologies. New families of pesticides that are pest-

specific, have extremely low non-target toxicities, and are used at rates measured in fractions of grams of active ingredient per acre will be available in the future.

Fertilizer technology will continue to change. Precision-release materials that more accurately match the growth characteristics of the grass plant will be developed. These materials will provide the plant nutrients directly when needed, allowing for more precise application and less concern about runoff and leaching.

Biotechnology may also play a role in the development of new fertilizers. The day may come when a nitrogen-fixing microorganism will be engineered to affix itself to the roots of the grass plant. These microorganisms will capture nitrogen and provide it to the plant in a usable form as it is needed.

As the need for improvement increases, technology will have a continuing impact on other cultural inputs. New cultivation equipment will allow for more frequent, deeper aeration without disrupting play and resulting in

better rootzones and healthier turf. Whether it involves lasers or new mulching techniques, new mowing equipment will be developed that will eliminate the need for dealing with clippings. The list of possibilities is endless.

New turfgrasses, changes in inputs, and improved technologies are all interrelated. In the extreme, new grasses lead to new input requirements, which in turn drive the search for new technologies. These relationships tend to be direct and additive.

But there is one variable in turfgrass management that is not additive — its impact is much stronger.

That is the role of the course manager. The course manager is the driving force that makes the interactions of species, inputs, and technology work.

Decisions made by a superintendent can have a profound and long-term effect on the quality of a golf course. Correct decisions will result in the development and implementation of the combinations of turfgrasses, practices, and technologies that optimize turf quality and have a positive impact on the environment. Incorrect decisions can result in a decline in playability and potential environmental disaster.

The decision-making process will become increasingly complex. New technologies often mean more complex and more expensive technologies.

Some examples: To understand and operate new, precise irrigation systems, the course manager must have and be comfortable with a computer. Failure to understand the workings of the system will waste, rather than preserve, water resources.

New pesticides will have a short residual life and be highly pest-specific. This means the course manager will have to be able to identify turf pest problems accurately and have a thorough understanding of the factors that affect pest management strategies to obtain satisfactory results.

One thing is certain about changing inputs and improving technologies: They will be more expensive. As a result, course managers will not be able to afford to make mistakes in selecting or using new technologies.

Today and in the future, golf has much to lose if the wrong management decisions are made. The course manager is the vital link between the playing field as a living thing and the game of golf.

The future of the game depends on the ability of course managers to make sound choices in the management of the playing surface. Golf cannot afford under-educated, uninformed turf managers. A commitment to continuing education is crucial to the success of course managers and the game of golf.

Future challenges will require a course manager who is a true professional.

A professional who understands not only the science, but the art of managing a golf course.

A professional who can interpret and use scientific data to make sound management decisions for the betterment of the golf course and the environment.

A professional who understands the beauty of the game and the nuances and the “feel” of the golf course.

A professional who avoids making senseless, irrational changes in a faddish attempt to alter required inputs.

A true professional — one who understands the art and science of golf course management — will be able to provide quality playing conditions within the limitations that will face him in the future.

The professional golf course manager must face the new world with new thinking.

*Innovative maintenance practices developed by golf course superintendents have improved turf quality and reduced pesticide and water use.*

