

the turfgrass industry is water conservation and increasing demand and competition for water, which has created a need for golf to exhibit good stewardship in action.

"There is a shift toward alternative water sources, but that often involves poorer quality water that contains various nutrients and salt," Carrow says. "Many courses use water run-off. Surface run-off is pretty high quality water, but you do have to be careful of sediments."

The quality of wastewater varies from being quite good to pretty poor and varies from site to site. Wastewater also will have more nutrients than run-off or potable water, which means superintendents have to watch the fertilizers they use. That adds complexity to the fertilizer program.

"It's an ongoing issue," Carrow says. "Water conservation will change the type of grass we use. For example, Seashore Paspalum can withstand poorer water quality. We're getting pressure to shift to poorer water quality, and that will change turf management."

Carrow says pest management is another topic superintendents need to keep educated about. He says that throughout the past 25 years, superintendents have made sure they don't contaminate ground water with pesticides, and the same philosophy of pest management will apply to water conservation.

"There are going to be changes in irrigation design and operation because of water conservation," he says. "There are a lot of spin-off issues of water conservation that are complex, but we won't have the length of time for pesticides that we will have for water conservation. The pressures are higher. Everybody is concerned about water. Today, there are statewide water conservation efforts across the country."

Time and money issues

In spite of the need for education in so many areas, limited time and money are barriers that prevent some superintendents from taking as many continuing education courses as they would like.

"Superintendents are too busy to leave golf courses," Buchen says. "Most work too many hours. It's a 24/7, high-pressure packed job."

Still, superintendents should aggressively seek out education whenever possible, Clarke says.

Superintendents should take every opportunity they can get to continue their education, Christians agrees.

"It's a good idea during the off season to attend one continuing education class, something totally different than they've done be-

fore," he says. "I highly recommend superintendents make time and budget the money to do it."

Engelke says that because there are many demands put on superintendent's time, they need to get the most out of continuing education classes. Taking regional classes in the off-season is a good way to do this.

Buchen says the GCSAA and the United States Golf Association have regional seminars that are easier for superintendents to attend because it reduces the time and cost to take a class. There's also a lot of information that can be gotten for a small fee.

"Superintendents need to set aside money in their maintenance budget to attend seminars every year," he says. "There's a lot of informal stuff out there. The Web can help to some extent, but that doesn't mean the information is good, it just means it's there."

Many superintendents also read trade magazines and file articles for future reference, Buchen says.

"There are now more books about turfgrass and golf course architecture," he says. "We're inundated with books. Superintendents are building their libraries more than ever."

With increasing educational options, cost can become less of an issue unless the training involves traveling, for example, to attend GCSAA's International Golf Course Conference and Show.

"An increasing number of superintendents have contacted me about giving talks locally," Buchen says. "Superintendents have to maintain a certain number of credits for their GCSAA membership."

But Engelke says the cost of continuing education is irrelevant because of its importance.

"Education should be viewed as an excellent investment in their future," he says.

GCSAA certification is another focus of education for superintendents. In 1997, 1,650 superintendents were certified. Today, 1,911 golf course superintendents throughout the country are certified, according to Combest.

Clarke says certification shows a certain level of education has been attained and demonstrates a superintendent's level of expertise.

"Certification is one of the greatest things going," Buchen says. "Some superintendents don't think getting certified is beneficial because it won't get them more money, but a GCSAA survey shows it will."

Superintendents also should strive toward

certification because it is a validation of the continuing education process, Engelke says.

"It sends a message to the employer that someone is going the extra mile," he says. "There a lot of guys who have been in the business 20 or 30 years and are not certified, and guys that are three or four years out of school who are not experienced enough yet to enter the certification program. It's not essential to get certified, but it opens doors."

Clarke says certification gives superintendents the recognition that they gave the effort to continue their education.

And the higher a superintendents move up, the more important certification will be, Christians says.



Clarke

Customized training

Combest says GCSAA's education program format has changed: It used to be a two-day format, and now it's a day or half-day program.

"Now we're engaging people more," she says. "They want questions and answers and want to be more involved. Continuing education continues to play a major role in their lives. The challenge for us is how to meet that need. In response, we're looking at new ways. For example, online education that is synchronous and nonsynchronous and starting Web casts. They are still intimate experiences. They are only open to 50 people."

GCSAA regional seminars also are popular, and chapters are offering more education.

"I don't expect the chapters to do Web casts and distance learning," Combest says. "They don't have the bodies to do that. Members tell us three reasons they come to the national show: education, networking and new products."

Combest says people coming out of school often have a good theoretical knowledge of turfgrass management, and 95 percent of association members younger than 30 have some formal education. Seasoned professionals are still taking classes because this is an important part of their jobs.

"It's going to continue to be an interesting profession, she says. "Superintendents are, by nature, fraternal. They like contact with experts in the field. But it will be interesting to see how owners react to education needs if economic difficulties take hold. Education is often the first thing to go in the budget." GCN

The author is managing editor of Golf Course News and can be reached at jwalsh@gie.net.



Buchen

Devil's Thumb

PLANNING AND BUILDING AN AFFORDABLE COURSE THAT CAN BE FINANCIALLY SUCCESSFUL IN TODAY'S GOLF MARKET IS NO EASY TASK

by
PETER
BLAIS

Back in the late 1980s, the city of Delta, Colo., looked into the possibility of expanding its nine-hole Cottonwood Golf Course to an 18-hole facility. The city owned the land, and the Cottonwood Golf Committee operated the course. The city asked Phelps Golf Design of Evergreen, Colo., to analyze the property for expansion of the course. Although nothing was done at the time, the city eventually formed a golf task force consisting of city staff and Cottonwood members that were responsible for researching the situ-

ation and making recommendations.

"We came to the conclusion it wasn't possible to expand the Cottonwood site without encountering some of the same costs you would have in building a whole new course," says Rich Englehart, city manager. "The task force finally came to the city council with the idea of building a new course. We had some Bureau of Land Management and County of Delta acreage available, and we felt the land had some potential. Both entities also were willing to donate it. After having looked at



The Devil's Thumb course offers views of Colorado's rugged landscape. Hole three (view from the middle tees) is a par 4 and is 342 yards from the back tees.

Photo: Phelps Golf Design

numerous sites where we would have had to purchase the land or give up development rights, this site suddenly came into play at no cost."

Living near the Grand Mesa—a high plateau outside the city that's slightly above 5,000 feet—and with gorgeous views of the San Juan and West Elk mountain ranges, the 7,800 residents of this western slope community hoped to build a high-quality, affordable course with green fees between \$25 and \$40, a price range that would make it accessible for most local golfers.

"We had a feasibility study done by THK Associates of Denver," says Englehart, who was the assistant city manager at the time. "They did a market analysis to make sure we could support the course. Knowing it was a small town, we knew we had to draw on the locals and the surrounding area 50 miles out to Montrose, Grand Junction and Ridgeway. That was how far they thought people would travel for quality golf."

The task force issued requests for proposals, and in 1998, the city selected Rick Phelps to serve as the lead architect, develop conceptual plans and design the course.

"Rick's excitement for the location and vision fit into his selection," Englehart says.

"When I first looked at the property, I didn't think there was any way to build a golf course there," Phelps says. "It was rocky, dry and with scarcely any vegetation. It looked flat until you walked over to the eastern side, where it drops off in every direction. It actually had a lot of character and interest. I figured I could route the course to take advantage of that drop-off on both nines."

Water was a major concern until Phelps discovered an abandoned pipeline that came down from the Grand Mesa, which receives abundant snowfall.

"The golf course site gets about seven inches of moisture a year," Phelps says. "It's basically a desert site. But on Grand Mesa, they get better than double that amount of moisture. Twenty-five years ago, the two pipelines from reservoirs on the mesa used to provide Delta its drinking water. The pipelines aren't used for drinking water anymore, but the structures were still intact. The water was excellent snowmelt quality and was delivered right to our front door. All we had to do was repair the pipeline in a few places and tap into it with a new valve. We had plenty of water to grow in and maintain a golf course."

Once Phelps was on board, the task force interviewed three builders.

"We hired Niebur Golf because of its reputation," Englehart says. "They had worked with Phelps on some other projects and had a good working relationship. We wanted a team working on this. We didn't want this to be the city against the architect and builder. We wanted a management team. Teamwork and cooperation are imperative, especially when you have a limited budget—\$2.7 million for course construction and \$3.5 million overall."

Cost-conscious construction

Construction began in the spring of 2000. To meet its limited budget, the development team had to come up with creative ways to save money.

The two biggest ways to reduce construction costs

of a project of this sort are by minimizing earthwork and cart-path construction, according to Phelps.

"You move as little earth as possible to accomplish your design strategy and maintain aesthetic interest," he says. "We only moved 170,000 cubic yards of dirt, with 70 percent of that being for the irrigation reservoir and clubhouse. And you must not put in any more cart path than necessary, which we took to an extreme on this project."

Another way to control costs is to make use of all available resources.

"We used the honors camp from a local minimum-security prison that was very valuable in the rock-picking process," Englehart says.

"They mostly picked rock from the tees and fairways to prepare for grassing," says Phelps of the 12-man crew. "That probably saved the city \$200,000. It wasn't the most productive crew, as you might expect, but it worked out fine."

One of the city park department employees, Tony Bohling, worked closely with Niebur and Phelps to build the rock retaining walls and landscaping.

"The whole site was inundated with rock," Englehart says. "Now we have a tremendous rock wall lining the course. It's a nice benefit for the community. In fact, the general public is welcome to take the rock from a designated area to use for landscaping their own homes."

The developers grassed the course in late summer

AT A GLANCE:

Devil's Thumb Golf Course

Location:	Delta, Colo.
Course Type:	Municipal
Cost:	\$2.7 million
Construction began:	Spring 2000
Course opened:	July 21, 2001
Yardage:	Five sets of tees ranging from 5,180 to 7,176 yards
Par:	72
Number of bunkers:	60
Average greens size:	5,500 square feet
Greens:	Bentgrass blend
Tees:	Bluegrass
Fairways:	Bluegrass
Accent:	Fine fescues around bunkers
Slopes:	132, 125, 122, 112, 120 (back tee to front)
Ratings:	72.9, 70.3, 67.6, 65.7, 68.9 (back tee to front)
Professional:	Dave Way
Superintendent:	Matt Smith
Customer Service:	Judy Hays
Architect:	Rich Phelps, Phelps Golf Design
Builder:	Niebur Golf



The nine additional holes to the Cottonwood Golf Course, including the 435-yard sixth hole, was constructed with a limited budget. To reduce construction costs, earthwork and cart-path construction were minimized.

Photo: Phelps Golf Design



Photo: Phelps Golf Design

The Devil's Thumb course, including the 155-yard seventh hole, was budgeted to generate \$587,000 of revenue during 2003. In its first full year of operation, it generated \$665,000.

and had the grand opening July 21, 2001.

"We came in on budget," Phelps says. "We spent a little more money than anticipated on rock excavation, especially in the water-reservoir area. It worked out well, though. We had all the rock we needed to build the water features, retaining walls and tee boxes. The city parks employee was able to do all that work, which saved a bunch of money."

The only environmental issue concerned lining the ponds. The original budget was insufficient, so the city continues to work on this aspect.

"We created some wetlands to make some habitat," Phelps says. "Otherwise we tried to leave the area as natural as possible around the golf course. We didn't plant any trees. I

refer to it as 'Colorado desert style.' It's not quite target golf, but it's pretty close. If you get off the 105 irrigated acres on the course, you're in the desert."

Bluegrass is the dominant turf on the tees, fairways and first cut of rough. The greens are a bentgrass blend. Lighter-colored fine fescues are used to accent the areas around the bunkers and second cut of rough.

Earning recognition

The city has been pleased with Devil's Thumb, which finished second in *Golf Digest's* Best New Affordable Public Course rankings for 2002.

"The *Golf Digest* designation is a real tribute to Rick's design as well as Niebur Golf, our superintendent, his staff and our pro," Englehart says. "The course has become a source of pride for the local golfing community."

Devil's Thumb has more than met its original goals. At \$35 per round with a cart for residents

and \$40 for nonresidents, the course, with national recognition and design, is a bargain, Englehart says.

Financially, the course has exceeded its original projections. The facility was budgeted to generate \$587,000 of revenue during 2003, its first full year of operation, Englehart says. The course did \$78,000 better than that, generating \$665,000 during 2003.

Revenue was off about \$9,000 through the first two months of 2004, compared to the same period a year ago.

"But that's mainly because of the weather," Englehart says. "We were only open two days this January. Last year in January, we took in \$41,000. This year it was only \$4,000. But we bounced back in February. Last year, we brought in \$14,000 during February. This year we brought in \$42,000. We felt good about last year and hope this year will be even better."

To attract players, Devil's Thumb benefits from its location. Delta, Grand Junction and Montrose are located in Colorado's "Banana Belt," which stays warmer and drier through

Water was a major concern until Rick Phelps discovered an abandoned pipeline that came down from the Grand Mesa, which receives abundant snowfall.

the winter than any area of Colorado except the southeastern portion of the state, according to Phelps.

"The busy season extends from March through mid-November, roughly three months longer than ski areas like Vail and Aspen," he says, noting that 30 percent of the course's play comes from outside the immediate area.

The Delta County airport is adjacent to the course and houses a pair of golf carts to take visiting players from their private planes to the course.

But the support of local golfers and citizens is the main reason this small-community project was built and why it prospers. That support was illustrated vividly during the first weekend of March when almost 75 volunteers attended a barn raising to build a 3,300-square-foot clubhouse to replace the temporary facility that had been used since opening day.

"One thing we do here in Delta is rely on local citizens to get engaged," says Englehart, noting the volunteer labor and materials donations will save the community a substantial amount on the clubhouse's final price tag. "The city council will make

decisions and move forward to make something happen, but in most instances, only if the citizens want it to happen and get involved. The barn raising is a good example. We had some quality people on site. The relationships built and the ownership they felt in the project was incredible. We had people from as far away as Carbondale, which is up near Aspen. It was pretty cool."

Community development director Rich Sales, a licensed architect who is overseeing the project, says that by the end of the first weekend of construction, all exterior walls had been framed and sheeted, interior walls framed, openings prepared for the plumbing and mechanical utilities in the concrete flooring system, roof trusses raised and braced, roof sheathing started, window openings cut and heavy timber entry framing placed. Electrical, mechanical and plumbing contractors were scheduled to start their work in mid-March. The clubhouse is expected to open by summer.

"The best result of this effort was not about sticks or bricks or money," Sales says about the clubhouse project. "The best part was that we had citizens from all sectors of



Photo: Phelps Golf Design

Bluegrass is the dominant turf on the tees, fairways and first cut of rough. The greens are a bentgrass blend.

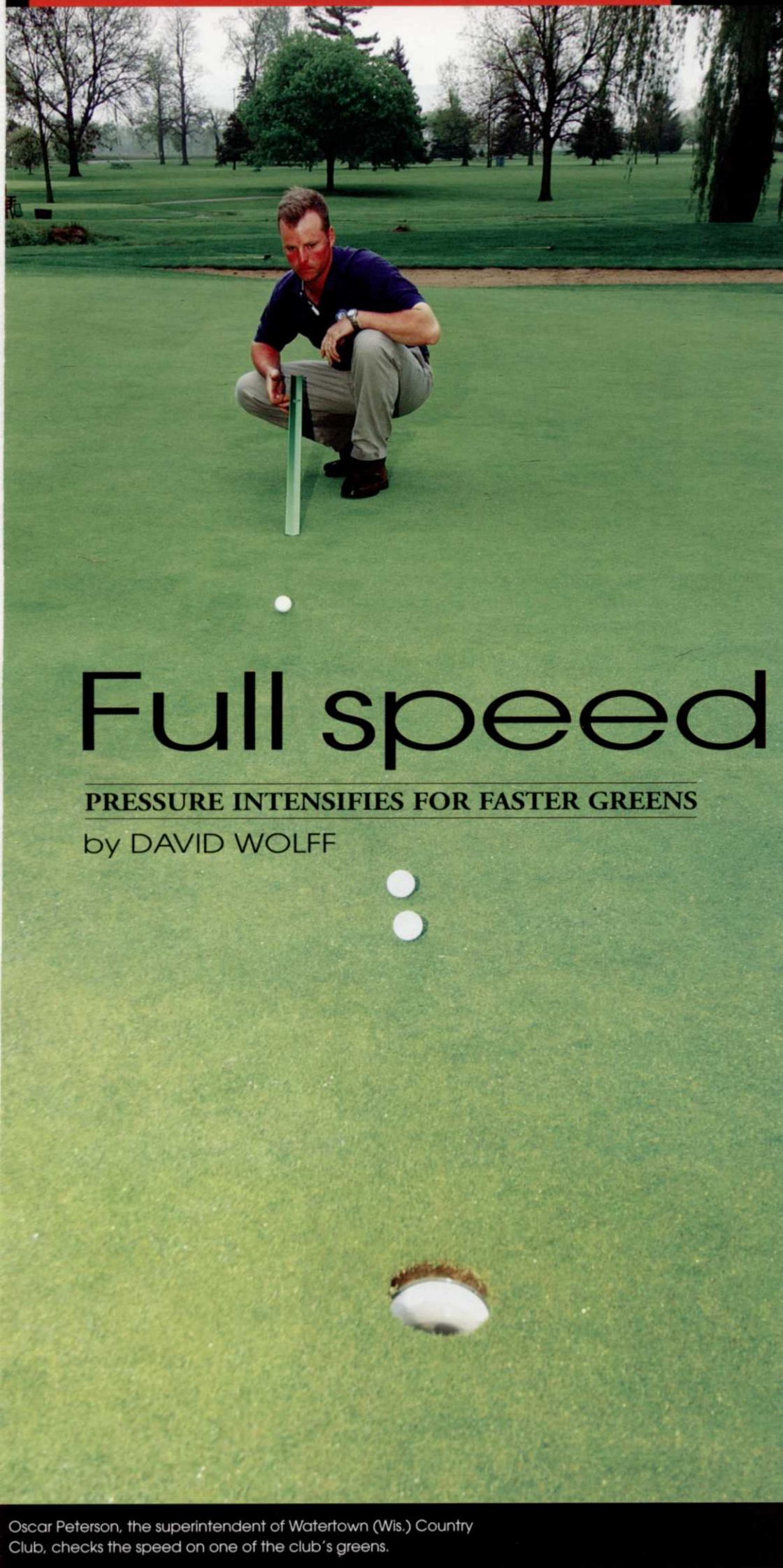
our community come together, work hard, work well together and create something enduring for the community." GCN

Peter Blais is a contributing editor based in North Yarmouth, Maine. He can be reached at pblais@maine.rr.com.



Photo: Phelps Golf Design

Support of local golfers and citizens is the main reason the small-community golf course, including the 414-yard 13th hole, was built and why it prospers.



Full speed ahead

PRESSURE INTENSIFIES FOR FASTER GREENS

by DAVID WOLFF



Green speed is a range

Despite printing several articles in the club newsletter detailing the agronomic issues of maintaining putting greens and explaining what Stimpmeter numbers mean, green speed continues to be an issue among the membership at Crystal Downs Country Club in Frankfort, Mich., according to superintendent Michael Morris, CGCS.

Working closely with his greens committee chairman, David Rosenberger, Morris concluded that the first step to address the topic was to determine the range of green speeds at his course. That could be expected throughout the day on a daily basis. After addressing this issue, Morris would be able to present the appropriate green speed for Crystal Downs to the greens committee and membership.

To conduct his research, Morris measured the speed of two greens with a Stimpmeter everyday from Memorial Day to Labor Day in 2001 and 2002. This also was done twice a day, once in the morning and again in the afternoon.

Morris' next step was to survey 20 golfers who represented a cross section of the membership to determine their satisfaction with the course's green speed. They were asked four questions about their perception of the greens. During the season, Morris received 260 responses from them. At the same time, Morris and his staff looked for ways to fine tune

**COURSE DESIGN AND
NEW MOWER
TECHNOLOGY ARE
AMONG NEW
DEVELOPMENTS THAT
IMPACT GREEN SPEED.**

Photo: David Wolff

Oscar Peterson, the superintendent of Watertown (Wis.) Country Club, checks the speed on one of the club's greens.

There are times when bigger is better.



Riverdale has grown into Nufarm Turf and Specialty

As Nufarm Turf and Specialty, we're a global enterprise that draws on the resources of 13 Nufarm locations – worldwide. Over 2,500 Nufarm employees formulate and distribute turf and crop protection chemicals in more than 100 countries. So, we have an expanded ability to keep weeds, pests and disease under control all year long. And you can still depend upon familiar products like Millennium Ultra, Manor, Corsair and Magellan to keep your weeds down and your greens free of pythium.

Same great products, same great service – all with a new name and powerful corporate backswing that will keep your maintenance handicap very, very low.

For more information contact your local distributor. Millennium Ultra, Manor, Corsair and Magellan are trademarks of Nufarm Americas Inc.



Nufarm
Turf & Specialty

Phone: 800.345.3330
www.riverdalecc.com
www.turf.us.nufarm.com

H O M E O F R I V E R D A L E B R A N D S



Photo: David Wolff

The pursuit of fast greens increases course maintenance budgets to provide firm, true and fast surfaces. But golf course superintendents should consider the influence this trend will have on putting green design.

maintenance practices to minimize considerable differences in green speed.

The results of this research produced surprises for Morris.

“The old wives’ tale that greens are faster in the afternoon as they dry out was almost never the case on our course,” he says. “The greens were almost always slower in the afternoon as the grass grew and the putting surface received traffic. We also found that green speed decreased drastically during the day if we did not get a good cut in the morning. When we mowed the green twice—once before the morning measurement and again before the afternoon measurement—we would see a noticeable increase in speed.”

The average decline of speed throughout the day was about 6 inches but could be as great as 18 inches. Morris determined that a green speed of 9.5 feet to 10.5 feet was a realistic target. Golfer surveys indicated speeds below 9.5 consistently were too slow, while speeds approaching 11 consistently were too fast.

“What we learned regarding our maintenance practices is that they are very specific to our golf course, resources, golfers and greens,” he says. “Every golf course searching for the most appropriate green speed will likely encounter a different set of variables. We discovered that a superintendent could indeed determine a green-speed range

that is manageable throughout the season and satisfies the golfers at his course.”

Designed for speed

As Morris’ example demonstrates, golfers judge many superintendents on green speed. Clearly, the pursuit of fast greens increases course maintenance budgets to provide firm, true and fast surfaces. But there should be consideration given to the influence this trend will have on putting green design.

“Simply put, fast greens will need to be flatter or will have to be significantly larger in size to allow the ball to come to rest near the cup,” says Cornell University’s Frank S. Rossi, Ph.D. “While there are no strict provisions for green speed and cupping area in the Rules of golf, there is some acceptance that fast greens with severe contours will not permit the ball to come to rest near the cup. Subtly, we have been observing this phenomenon the last few years at the U.S. Open.”

Consider the 18th green at Southern Hills Country Club in Tulsa, Okla., site of the 2001 U.S. Open Championship. Much was made of the severe slope that was questioned by players during the practice rounds for being too fast, penalizing a good shot as balls rolled off the putting surface. Here was a case in which the de-

sign conflicted with agronomics.

John Szyllinski, the golf course superintendent at Southern Hills, was focused on providing the highest quality putting surfaces with the new generation bentgrasses installed during the renovation of his course. These bentgrasses were bred for high shoot density that permits and requires low mowing heights. The consequence was that green contours maintained at normal green speeds would be acceptable, yet speeds generated with the new bentgrasses wreaked havoc among players and officials.

“When emeritus professor Joe Duich of Penn State University developed the new generation high shoot density bentgrasses, he clearly had green speed in mind,” Rossi says. “The same design for speed was true for the breeders of ultradwarf Bermudagrasses. It seems the breeders had it right. The new generation grasses that provide fast greens are being planted on 90 percent of the new courses. They have become the standard.”

Now that fast greens are the standard on new courses, mechanical and chemical technology should be available to maintain the surfaces. New mowers able to cut lower, and growth regulators that enhance plant density and slow growth are keys to providing speed.

Architects have responded to this trend by increasing the putting area but keeping the contours, although many have chosen less severe undulation. This is easier in new construction, but what’s happening with renovating old courses?

When greens were renovated and new grasses were planted at Apawomis Country Club in Rye, N.Y., there wasn’t enough cupping room. Some greens had to be rebuilt because they were too small and too fast for the design.

“Apawomis removed some of the severe undulations but did not plant the highest shoot density grasses,” Rossi says. “They opted for L-93, a notch below the Penn A and G series in shoot density, mixed with some experimental greens-type annual bluegrass from professor Dave Huff’s breeding program at Penn State. The superintendent told me the greens look great and have a consistent appearance with the existing greens that were not renovated.”

It seems that while green speed is important and can influence design, aesthetics can also play a role. The visual consistency ap-

SOME GREENS HAD TO BE REBUILT BECAUSE THEY WERE TOO SMALL AND TOO FAST FOR THE DESIGN.

“Amending the sands with organic materials such as peat or compost has been shown to enhance a uniform moisture level throughout an undulating surface.”

preciated at Apawomis is an example. It's possible fast greens aren't the only things that make a round of golf pleasurable.

“We need different grasses,” course architect Rees Jones says. “Breeders are taking away my ability to add contours to my designs. The grasses need to be cut so low, I have to flatten my thinking.”

Jones is a proponent of traditional shoot density bentgrass species such as Penncross and Pennlinks. These grasses can be maintained at mowing heights that produce more average green speeds in the 8-foot to 10-foot range.

Flat green soils

There are below-ground consequences of putting green design that will influence root-zone selection and performance. Flat greens place a greater emphasis on subsurface drainage. This compares to older undulating greens built with native soils that emphasized surface drainage. The advent of sand dominated root zones, such as the United States Golf Association specifications for putting green construction allows for greens to be flat and indirectly fast.

“Flat greens can reduce the need for amendments that might aid in water holding,” Rossi says. “Amendments have been shown to be of particular importance to water management of undulating surfaces, as peaks of severe slopes will drain more rapidly. Amending the sands with organic materials such as peat or compost has been shown to enhance a uniform moisture level throughout an undulating surface.”

Research by professor Ed McCoy of Ohio State University investigated the effect of root-zone profile and putting-green slope on internal drainage.

“The results of his study concluded that the USGA method for green construction that includes a gravel layer below the sand root zone permits more rapid and complete drainage,” Rossi says. “Furthermore, undulating surfaces built to USGA specifications performed better than the straight sand California specifications.”

Root zones of flatter greens might reduce cost by performing well with less organic amendments, which permit more uniform drainage to enhance soil aeration.

“Theoretically, based on cupping area, flat greens could be smaller in size, depend-

ing on the amount of traffic expected, and require less total inputs,” Rossi says.

Is speed sustainable?

The technology is available to most golf courses to provide fast greens. Biological advancements with high-shoot-density bentgrasses and ultradwarf Bermudagrasses are where it begins. Conditioning required to maximize the performance of these grasses is available with mowers, top dressing equipment, rollers, etc. A lingering question is: If greens are designed for interest with contouring and maintained for speed, will the result be an enjoyable round for the average player?

“Lost in the discussion of speed are the functional aspects of grasses and soils that would allow reduced water and pesticide use,” Rossi says. “Disease resistance and drought tolerance of these grasses appear to have been an afterthought to the breeders. Obsession with high permeability root zones that allow rapid drainage assumes a plentiful supply of water. As we begin to hold designers to higher standards for environmentally friendly designs not just focused on speed, why shouldn't we hold the breeders and soils scientists accountable as well?”

Manage for speed

The next generation of bentgrasses offers improvements in shoot density, heat tolerance and possibly some new challenges with recuperative ability. The bottom line is that many new bentgrasses offer the ability to tolerate low mowing heights while maintaining acceptable quality. Many research studies suggested the relationship between low mowing and ball-roll distance (Stimpmeter measurements), meaning the lower the mowing height, the greater the ball roll distance. Rossi's research at Cornell University demonstrated that performance of specific varieties at heights as low as 0.080 inches can produce ball roll distances of more than 14 feet.

“Our results indicated that up to 3.5 feet can be gained in ball roll distance by reducing cutting height from 0.125 to 0.095 inches,” Rossi says. “Yet, it is important to note that except for Penn G-1, no other cultivars were able to maintain acceptable quality at the close cutting height under

traffic treatments.

“Furthermore, as cutting heights were lowered to 0.125 inches and below, many of our plots exhibited significant reductions in surface density,” he says. “Plots established at the recommended seed rate of 0.5 had a 25 percent to 50 percent greater incidence of algae compared to high seed rate plots, especially for the more prostrate growth habit cultivar Penncross. As cutting heights were increased above 0.125 inches in early fall, algae was not evident. In addition, there was a surprising increase in the incidence of take-all patch associated with the low seed rate plots.”

Just as an entire industry might have been established to support the care of Penncross, it appears the management of the new bentgrasses, especially the high-shoot-density varieties in the Penn A and G series, will require different management. A study conducted at the University of Wisconsin investigated the amount of top dressing material picked up by mowers. Almost 4 percent of the applied top dressing was collected in the first mowing for Penn A-4, with about 3 percent for G-2. Penncross and annual bluegrass resulted in 2.5 and 1.5 percent, respectively.

Many top superintendents who currently manage the Penn A and G series say no increased maintenance is required.

“This should be expected at the top clubs with adequate maintenance budgets that already are aggressively top dressing, liquid feeding and maintaining superior equipment,” Rossi says. “However, these grasses are not for clubs that cannot realistically support a high level of care. Leading the next level of bentgrasses are Crenshaw, L-93, SR1119, Cato and Southshore, which offer many advantages of the high-shoot-density varieties without



Root zones of flatter greens might reduce cost by performing well with less organic amendments, which permit more uniform drainage to enhance soil aeration.

Photo: David Wolff

much of the additional care. These grasses all perform well at mowing heights at or below 0.125 inches and offer myriad of disease and environmental stress tolerance.”

It's the mowers

But Morris offers a different point to Rossi's contention that new grasses have a major

influence on green speed. He asserts that green speeds should be managed—either speeded up or slowed down—with grass type, green contours and golfer expectations in mind. At Crystal Downs, it became clear to

him during his investigations how much cultural practices influence green speed.

“There is a new course just down the street from us that is facing the same issues we do with regard to green speed,” Morris says.

“It's a world class facility with A-4 bentgrass greens. In a comparative study, we found that their green speeds exhibited the same degree of fluctuation as ours did day to day. Though their greens are maintained 6 inches to 1 foot faster than ours, the design of the greens accommodates that speed. If the greens at that course are maintained any faster, golfers sometimes begin to complain that they are too fast for the design.

“The issue of green speed is not about the grass; it's about how you take care of it,” he says. “To manage our greens at a speed of 9.5 to 10.5 feet, we looked at mower set-up, roll-

ing frequency, irrigation, fertilization, use of plant growth regulators and top dressing. Our goal for each of these elements was consistency. We tried to eliminate anything that might cause a drastic change in green speed.”

Morris found the most important factor to maintaining green speed was mower set-up.

“Once we determined the appropriate mowing height for our *Poa annua* greens, we found that a daily check of the height of cut and quality of cut is critical,” he says.

“The greatest swings in speed we recorded could be traced directly to a mower that was not sharp or not properly adjusted. As a result of our study, our mechanic has developed an intensive mower set-up and reel grinding schedule for our greens mowers.”

Morris also found green speed fluctuates.

“The results of our efforts proved to me that green speed is not a number, but a range,” he says. “Maintaining a 1-foot range is a good target. Our data told us that if we can do this 60 (percent) to 70 percent of the time, that's excellent. We also gathered weather data every one-half hour throughout the day of our survey period. Precipitation was the greatest influential factor, not humidity or temperature. If we had one-half inch of rain, the next day our green speed would drop 6 inches.”

The price of speed

Frequent low mowing has been shown to be

stressful to turf. One study that looked at Penncross and Crenshaw creeping bentgrass mowed at 0.125 inches and 0.157 inches. The results showed that mowing at 0.125 inches regardless of the bentgrass variety produced weaker, stressed plants. The weaker plants were the result of an increase in energy usage required from close mowing and reduced energy production from photosynthesis, which is naturally lower under high temperatures. The study concluded that increasing mowing height by 0.03 inches significantly increased stress tolerance.

Other studies have shown increased disease associated with low mowing heights. For example, researchers found that annual bluegrass mowed at 0.157 inches had 40 percent less summer patch than the same annual bluegrass mowed at 0.125 inches.

“Clearly, the high price of speed can be devastating and costly to maintain with increased disease pressure requiring additional fungicide inputs,” Rossi says.

Telling the difference

With the amount of time, effort and money being spent to maximize green speed, golfers should be able to discern subtle differences in green speeds. Can a golfer tell the difference between a 5-foot, 6-inch green and a 6-foot, 6-inch green any better or worse than the difference between a 9-foot, 6-inch green and a 10-foot, 6-inch green?

Researchers at Michigan State University set up several putting-green areas with a variety of speeds. Golfers of various handicaps were asked to putt on the greens and choose the faster green. In general, the golfers in the study weren't able to discern a difference in green speed less than 6 inches. Conversely, golfers were able to detect differences of 12 inches. Greater than 80 percent chose the faster green when the difference was between 7-feet, 10-inches and 8-feet, 10-inches, whereas 68 percent could tell the faster green between 8-feet, 6-inches and 9-feet, 6-inches.

“Green speed differences of 6 inches or less across a golf course is a sign of consistency,” Rossi says. “Also, green speed changes of 1 foot have less chance of being noticed by the average golfer once speeds get above 9 feet. Therefore, there could be other psychological factors involved in the golfers assessment of green speed. In the end, the pursuit of speed is easy, yet complex, with a variety of biological, physical and psychological factors at play.” GCN

David Wolff is a contributing editor based in Watertown, Wis. He can be reached at dgwolff@charter.net.

“THE ISSUE OF GREEN SPEED IS NOT ABOUT THE GRASS; IT'S ABOUT HOW YOU TAKE CARE OF IT.”



In general, golfers aren't able to discern a difference in green speed less than 6 inches, according to a study by Michigan State University.

Photo: David Wolff