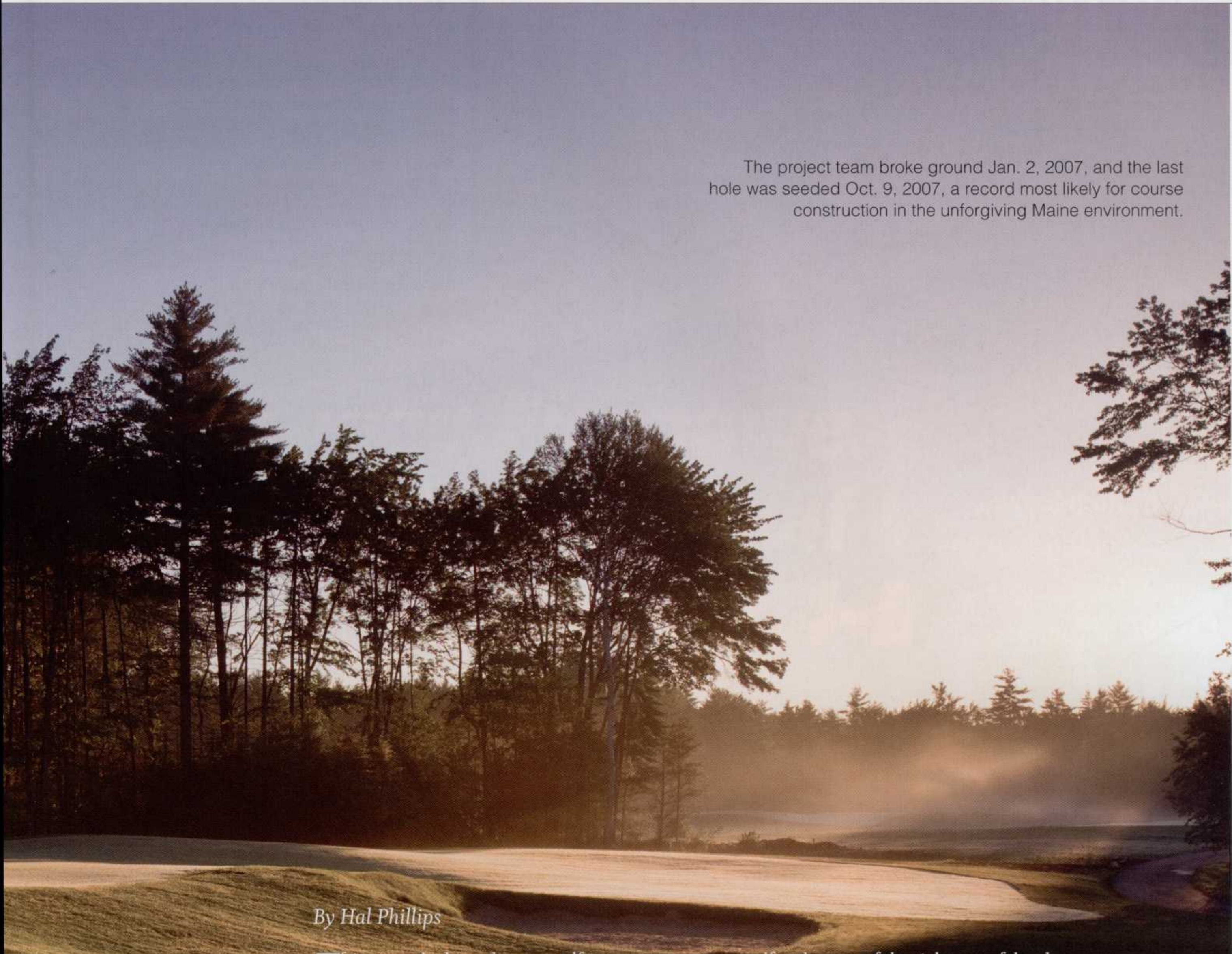


The project team broke ground Jan. 2, 2007, and the last hole was seeded Oct. 9, 2007, a record most likely for course construction in the unforgiving Maine environment.

By Hal Phillips

If it weren't the only new golf course to open in New England in 2008, Old Marsh Country Club in Wells, Maine, probably would've stood out anyway. The course design is too strong, the development history too long and tortuous, the ultimate playing conditions too impressive and the concept too anomalous compared to other course fare on the Maine coast.

But the semiprivate club, developed by Bath, Maine-based Harris Golf, is the region's only new course this year – a year where far more facilities closed their doors, were dragged into receivership or were sold for alternate, more profitable use.

"The golf market is soft; there's no getting around that," says Jeff Harris, president of Harris Golf, owner and operator of Old Marsh, Sunday River Golf Club in Newry, and Boothbay Country Club and Penobscot Valley Country Club in Orono. "But quality golf at the core of the right sort of development can be successful, and Old Marsh is proof of that.

"We're beginning to branch out across New England, but we got our start developing golf courses in Maine where the market has never been as strong as elsewhere," Harris adds. "We've been opportunistic in no small part because we've had to be. We've learned how to identify markets, develop products for those markets and build courses efficiently."

Old Marsh is evidence of all these traits because:

- It broke ground the day after New Year's 2007. The last hole was seeded Oct. 9, 2007, nine months later, a record most likely for course construction in the unforgiving Maine environment.
- York County, home to coastal Wells, is underserved in terms of golf, yet a popular vacation spot.

At A Glance: Old Marsh Country Club

Location:	Wells, Maine
Online:	www.oldmarshcountryclub.com
Type:	New construction
Cost:	More than $5.5 million
Architect:	Brian Silva
Builder:	Harris Golf and AgriScape
Project superintendent:	Clayton Longfellow
Project started:	January 2007
Course opened:	June 2008
Course length:	6,800 yards
Greens:	SR1119 bentgrass
Tees and fairways:	SR1119 and Providence bentgrass
Immediate rough:	a blend of bluegrass, ryegrass and fescue
Far rough:	a straight mix of fescue

• Golf had first been proposed for this property in the late 1980s, but a succession of developers failed to get past the permitting process. Harris Golf, the fifth owner of the property, acquired it for pennies on the dollar.

"Yeah, I don't know what Jeff Harris is talking about with all this nine-month construction business," says New Hampshire-based architect Brian Silva with a wry smile. "I flagged this course in 1987. So, as far as I'm concerned, it's taken more than 20 years to build."

Silva designed Old Marsh and had been retained, in one manner or another, by all five owners, including Harris Golf.

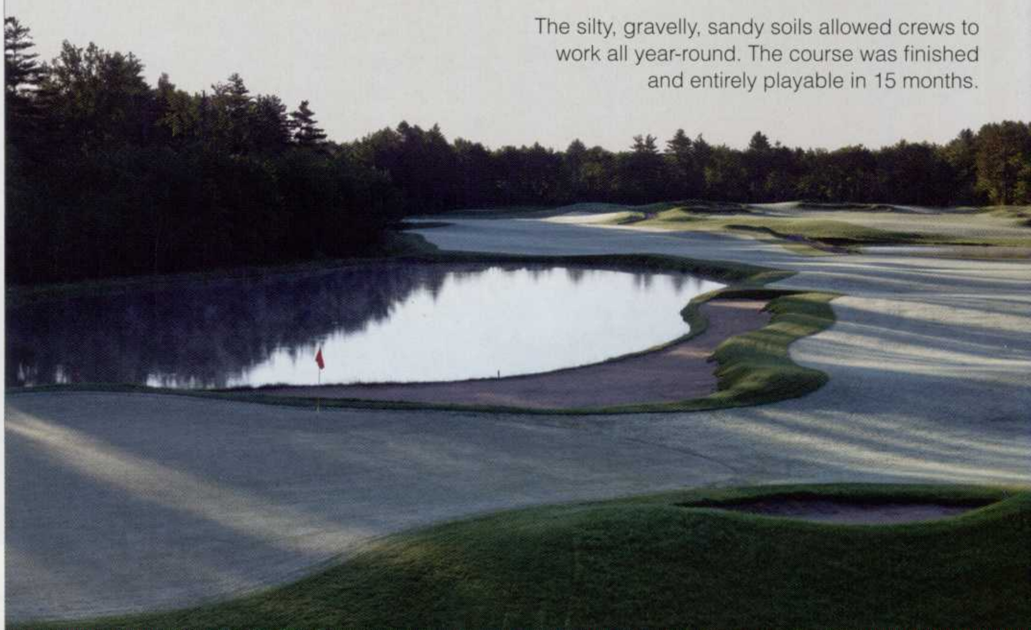
YEAR-ROUND SOILS

Harris spent more than $5.5 million on course construction. Silva laid out the course, and Harris Golf built it with collaboration from Connecticut-based AgriScape. Course builders in Maine typically wait until spring before rolling in the heavy equipment, but Harris Golf called its crew to work at Old Marsh Jan. 2, under the direction of project superintendent Clayton Longfellow. The cuts and fills – all the rough shaping – on the first nine holes were done by the end of February, says Longfellow, who also serves as director of agronomy for all the Harris Golf facilities.

"It took us 2.5 years to build Sunday River," Longfellow says. "Old Marsh essentially was finished and entirely playable in 15 months. We schemed it well and worked efficiently, but the site at Old Marsh is completely different from anything we've ever worked on before – and that's a good thing."

Because Sunday River featured heavy, rocky soils and 200-foot elevations, Longfellow says the project team could never have worked there during the winter. However, the silty, gravelly, sandy soils at Old Marsh allowed crews to work all year-round.

"In fact, we were better off using the heavier equipment during the winter, on frozen ground," he says. "In the spring, it would've been difficult to deploy that equipment with the same efficiency."



The silty, gravelly, sandy soils allowed crews to work all year-round. The course was finished and entirely playable in 15 months.

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The only way to craft the course was to excavate ponds and use the material to raise and drain the land, Brian Silva says.

BACK TO LIFE

Harris Golf has made a habit of setting new precedents. Sunday River Golf Club was another project that sat dormant (for more than 10 years) and was presumed dead before Harris Golf swooped in. It opened all 18 holes in 2006.

Old Marsh is another back-from-the-dead project. Golf was proposed there first in 1985. Since then, four owners had been frustrated with their attempts to develop the piece of land, first known as Ocean 18, then Maine National. After 20 years, all manner of environmental restrictions, impact issues and permitting squabbles had presumably doomed the project forever. It wasn't until Harris Golf expressed an interest in the property 24 months ago the wheels started turning, again.

"There were all sorts of sticking points with this project, but the environmental issues were paramount," Harris says. "There are a large amount of wetlands on site, but we learned you have to have the right consultants and engineers involved, so they can work their way through the issues and set the right course. There's give and take. In Wells, for example, we're creating and preserving about 280 acres of wetlands and wildlife habitat in return for the 14 acres we'll impact in building the golf course.

"Some developers fight with the state and federal agencies and say, 'This is my land; I can fill that wetland if I want,'" Harris adds. "Well, that's not how it works, and that sort of attitude just bogs down the process."

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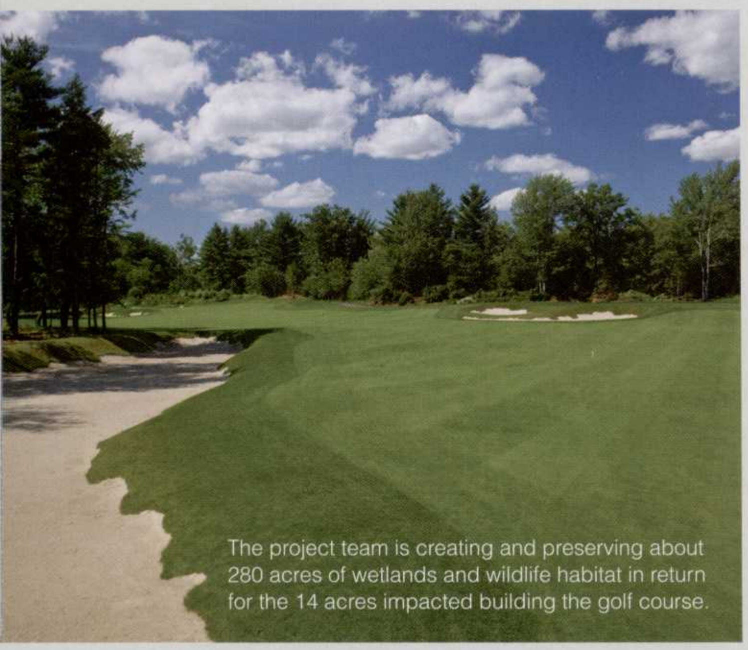

The project team is creating and preserving about 280 acres of wetlands and wildlife habitat in return for the 14 acres impacted building the golf course.

hosting major championships. It's a resort track from the old school, a Florida-style course 1,500 miles north of anything quite like it. Sand-capped fairways and copious amounts of rain in August contributed to great playing conditions.

Many New England courses feature holes that are set low, and the natural terrain imparts their character for good and bad, says Silva, who has worked throughout New England and in Florida. At Old Marsh, the terrain was basically flat, and the site didn't drain well.

"The only way to craft the course was to excavate ponds and use that material to raise and drain the land, which is the way you build courses in Florida," Silva says.

Silva's formula depended on the amount of excavation the developer is willing to undertake, which is a function of spending.

"I give Jeff Harris credit for making the necessary investment here because just clearing a few trees and pulling the stumps wouldn't have done the job on this particular piece of ground," he says. "We had to raise every square inch of the property to make sure the course was playable all season long. We needed to excavate an extraordinary amount, and that costs money. Jeff and his people gave me all the dirt I needed."

The architect used the excavation to his advantage, making the greens stand out. The first one, punctuating a 380-yard par-4, is sprawling and raised, pitched slightly to the right and incorporates four distinct lobes that fade into each other without seams.

Additionally, Longfellow was anxious about the amount of water this summer for the grow-in. The area was dry right up to early July. Nonetheless, the grow-in was satisfactory, he says.

"After much deliberation, we made the decision to pump from the pond on No. 10 over into the irrigation pond," he says. "Shortly after we made that decision and got everything set up and running, it started to rain for weeks. The only thing missing as far as this first year was rain. You can irrigate, and you can pump, but we all know it's rain that makes a grow-in happen."

The project team received many comments from golfers about how mature Old Marsh seems for its age compared to other grow-ins.

"A lot of newer superintendents are reluctant to stray from what they learned in school," Longfellow says. "My experience out in the field is that in a grow-in situation you have to fertilize, fertilize, fertilize. You've just got to slam turf with fertilizer. Old Marsh is a good example of the success of that strategy."

OLD WORLD MEETS NEW WORLD

Silva is familiar with interpreting classic designs. He's worked on dozens of Donald Ross designs, including Interlachen Country Club in Edina, Minn., and Penobscot Valley, restoring Ross' original intents. But Seth Raynor is Silva's true spiritual guide. Raynor's influence – deep, flat-bottomed bunkers; huge greens that fall off steeply into those bunkers; numerous, randomly placed bunkers that give fairways movement and contour – is everywhere at Old Marsh.

Raynor and his mentor, C.B. Macdonald, were known for taking famous Old World holes and adapting them to the New World courses they designed and built. Silva follows suit but with his personal twists.

On the par-4 second hole, Silva combines two Raynor standards – an Alps feature and a punchbowl green. The Redan green on five sits at the terminus of a dogleg par-4. The Cape, another Raynor/Macdonald standard, is reprised several times at Old Marsh, including on 16, a long par-4 that bends around marshland.

Then there are the Silva originals. The par-5 13th is a seemingly horseshoe-shaped double cape that's reachable. The driveable par-4 14th finishes at a triangular shaped green flanked left by a sprawling, cavernous bunker and right by a giant kick-slope designed to help long drives.

The 210-yard, par-3 17th features another giant kick-slope, and the large lakeside green features a combination of swales and girth.

"The 17th is a good nutshell example of why Old Marsh works," Silva says. "There wasn't originally going to be a lagoon beside that green. We created it to enable the shaping of an enormous, flamboyant green setting.

"When you're obliged to create so much of the playing contour, Florida style, you can create any and all the angles and strategy you want," he adds. "I've always wondered why courses built like this in the Southeast aren't more interesting strategically. No one will ever level that charge at Old Marsh." GCI

BY H. SAMARANAYAKE, PH.D., T. J. LAWSON AND JAMES A. MURPHY, PH.D.

Stressed out

Foot and cart traffic affects putting green and fairway turf

Putting greens and fairways are subject to traffic stresses, which lead to wear and compaction. Creeping bentgrass is considered to be less tolerant of wear and stresses resulting from soil compaction than many other turfgrass species. However, genetic-based differences in traffic tolerance occur within and across species. Also, species compositions of swards can change in response to traffic.

Bentgrass cultivars' ability to maintain a dense turf cover and recover from traffic stresses can influence resistance to weed invasion. Annual bluegrass can invade cool-season species subjected to wear and become the dominant species on golf courses in mild temperate and subarctic climates.

James Beard, Ph.D., characterized annual bluegrass as an opportunistic grass that becomes established in nonaggressive bentgrass cultivar turfs. Reports demonstrate creeping bentgrass cultivars vary in turf density and the ability to resist annual bluegrass invasion under nontrafficked conditions. The relative dominance of bentgrasses in a sward mixture with annual bluegrass under traffic hasn't been reported.

Creeping bentgrass has been studied more extensively for golf course turf than velvet bentgrass, which produces a high-density turf but is reputed to be soft with a strong thatching tendency, characteristics that influence traffic tolerance. The release of the cultivar SR 7200 aroused interest in the use of velvet bentgrass for golf. Trials at Sports Turf Research Institute in Bingley, England, show improved wear tolerance of velvet bentgrass compared with many creeping or colonial bentgrass varieties. Other trials, such as in New Jersey, also indicate velvet bentgrass has broader adaptation for golf.

The objective of this research was to assess the performance of bentgrass cultivars in a sward mixed with annual bluegrass when subjected to wear and/or compaction on simulated putting green and fairway turf.

Table 1. Interaction effects of wear x cultivar in 2000 and cultivar main effect in 2001 on average turf density in a putting green trial grown on a sandy loam.

Bentgrass cultivar	2000 turf density: Wear x cultivar, No wear	2000 turf density: Wear x cultivar, Wear	2001 Turf density: Cultivar main effect
	1-to-9 scale†		
Vesper‡	8.6	7.7	7.9
7001‡	7.9	7.3	7.2
SR 7200‡	8.4	7.8	6.8
Penn A-4	8.1	7.6	7.2
Penn G-2	8.5	7.4	6.7
Century	7.7	7.0	6.3
L-93	6.9	5.9	5.5
SR 1119	6.5	5.9	5.2
Providence	6.4	4.4	4.3
Southshore	5.8	5.6	4.3
SR 1020	5.9	4.3	4.0
Putter	5.4	4.5	4.1
Penneagle	5.1	4.1	3.6
Pennlinks	4.7	3.4	3.0
Penncross	4.6	3.3	3.0
$LSD_{0.05}$	0.8		0.4

† 9 represents the best average turf density, and 5 represents the minimally acceptable rating.
‡ Denotes velvet bentgrass cultivar; all others are creeping bentgrass.

EXPERIMENTAL DESIGN, TREATMENTS

Two studies were conducted: One was managed as putting green turf, and the other as fairway turf. Trials were initiated on a sandy loam (fine-loamy, mixed, mesic Typic Hapludults) at a research facility in North Brunswick, N.J.

Both trials used split-plot designs with main plots (wear and compaction) arranged as two-by-two factorials. Wear at two levels (no wear and wear) and compaction at two levels (no compaction and compaction) were randomly assigned to main plots (5 feet by 56 feet). Fifteen cultivars of creeping bentgrass and velvet bentgrass were assigned randomly to subplots (5 feet by 3 feet). The 12 creeping bentgrass cultivars evaluated in the putting green study were: L-93, Penn A-4, Penn G-2, Century, SR 1119, Providence, Southshore, SR 1020, Penneagle, Putter, PennLinks and Penncross. Velvet bentgrass entries were: SR 7200, 7001 (an experimental selection) and MVB later released as Vesper. The fairway study evaluated the same cultivars except Vesper was substituted – because of a seed shortage – with Penn G-1 creeping bentgrass. The putting green study was replicated four times and the fairway study three times.

Before seeding the bentgrasses in each trial, the entire plot area was topdressed with soil cores taken from putting greens at Plainfield Country Club that contained seeds of annual bluegrass. The cores were stockpiled for one year to kill bentgrass vegetation, spread onto the soil surface, and hollow-tine cultivated and verticut to incorporate them into the soil. Creeping bentgrass cultivars were seeded at 3.6 $g\ m^{-2}$ and velvet bentgrass at 2.1 $g\ m^{-2}$ based on number of seeds per unit area. An unseeded subplot was included. Volunteer establishment of bentgrass in unseeded subplots was negligible. The initial soil pH value was 6, and available phosphorus and potassium were 22.2 and 36.5 $g\ m^{-2}$, respectively. Irrigation was applied only when wilt stress was imminent to maintain relatively dry soil conditions and to wash-in fertilizer. Fungicides were applied as

Table 2. Interaction effects of wear x compaction (comp) x cultivar in 2000 and compaction x cultivar in 2001 on average annual turf quality in a putting green trial grown on a sandy loam.

Bentgrass cultivar	2000 turf quality				2001 turf quality	
	No wear No comp	No wear Comp	Wear No comp	Wear Comp	No comp	Comp
	1-to-9 scale†					
Vesper‡	8.2	8.1	7.3	7.4	7.7	7.5
7001‡	7.5	7.0	6.9	7.0	7.2	7.0
SR 7200‡	7.5	7.5	7.3	6.4	6.5	6.0
Penn A-4	8.5	8.5	7.6	7.8	6.8	7.0
Penn G-2	8.3	8.7	7.2	7.4	6.1	6.5
Century	7.5	7.6	6.6	6.6	6.1	5.7
L-93	7.3	6.6	6.3	5.6	5.4	5.0
SR 1119	6.5	6.8	5.4	6.0	4.6	4.7
Providence	6.8	5.5	5.0	4.0	4.6	3.7
Southshore	5.8	5.3	5.6	5.0	4.1	3.7
SR 1020	5.6	6.0	4.3	4.9	3.9	4.1
Putter	5.3	4.9	3.8	3.8	4.2	3.9
Penneagle	5.1	4.5	4.3	4.0	3.4	3.3
Pennlinks	4.5	4.5	3.6	2.9	3.2	3.0
Penncross	4.2	3.9	3.1	3.4	2.8	2.8
$LSD_{0.05}$	0.7				0.8	

† 9 represents the best turf quality, and 5 represents the minimally acceptable rating. ‡ Denotes velvet bentgrass cultivar; all others are creeping bentgrass.

needed to avoid disease stress.

The putting green trial, which was seeded Sept. 30, 1998, was fertilized with 4.9, 2.1, 4.1 g m^{-2} of nitrogen, phosphorus and potassium on Sept. 30, 1998. Two postplant fertilizations applied 7.5, 2.4, and 5.2 g m^{-2} of nitrogen, phosphorus and potassium, respectively. Fertilizer treatments (19 times) applied a total of 26.1, 7.1 and 12.7 g m^{-2} of nitrogen, phosphorus and potassium in 1999; 6.4, 1.1, and 2.0 g m^{-2} of nitrogen, phosphorus and potassium in 2000 (four times); and 14.1, 4.5, 9.3 g m^{-2} of nitrogen, phosphorus and potassium in 2001 (nine times).

Mowing the green was initiated Nov. 7, 1998, at 0.62 inch. The height was lowered to 0.14 inch on June 12, 1999, and 0.12 inch on March 23, 2000. The green was mowed six times a week, and clippings were removed.

The study was topdressed eight times from April to December 1999 for a total of 10.9 L m^{-2} with medium-sized sand conforming to USGA guidelines. Two topdressings were applied each in 2000 and 2001, totaling 1.7 L m^{-2} and 1.9 L m^{-2}. Solid-tine cultivation was performed before topdressing on Dec. 10, 1999, and vertical mowing (0.18-inch depth) was performed before and after topdressing in July 2001. Traffic treatments were initiated on July 21, 1999.

The fairway trial was seeded Nov. 10, 1998. It was fertilized with 3.2, 0.4 and 1.3 g m^{-2} of nitrogen, phosphorus and potassium Nov. 10, 1998. Two postplant fertilizations applied 5.9, 0.8, and 3.4 g m^{-2} of nitrogen, phosphorus and potassium. Fertilization applied (14 times) a total of 34.1, 5.3, and 17.2 g m^{-2} of nitrogen, phosphorus and potassium in 1999; 2.4 g m^{-2} of nitrogen in 2000 (once) and 8.0, 2.3, 4.5 g m^{-2} of nitrogen, phosphorus and potassium in 2001(five times).

Mowing was initiated Dec. 14, 1998, at 0.62 inch and was lowered to 0.53 inch Oct. 21, 1999, and 0.41 inch March 23, 2000. Mowing was performed three to four times a week with clippings removed. Traffic treatments were initiated July 22, 1999.

Wear was applied using a 2.6-foot-wide wear simulator constructed from a modified walk-behind power broom. Compaction treatments were applied using a 2-foot-wide, 952-pound water-filled turf roller or a 2.6-foot-wide, 2,586-pound vibratory pavement roller. Wear and compaction treatment consisted of two passes of the wear simulator and/or compaction roller applied twice per week (four passes a week) from mid-May through September. Once every two weeks, the 2,586-pound vibratory pavement roller was used in replacement of the water-filled roller to apply two passes to ensure adequate compactive force was applied.

Figure 1. Bulk densities of 0-to-51-mm surface depth as affected by traffic on a putting green grown on a sandy loam in 2001.

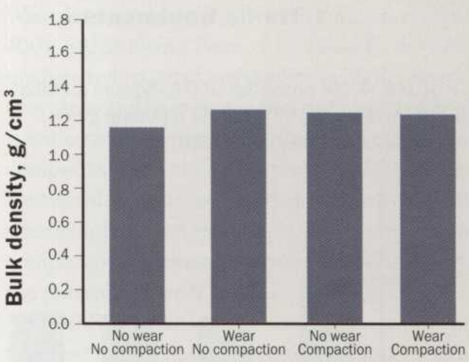
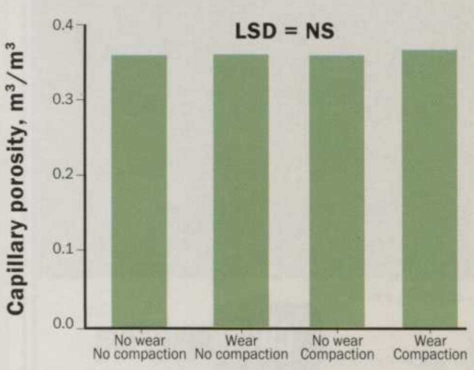


Figure 2. Capillary porosities of 0-to-51-mm surface depth as affected by traffic on a putting green grown on a sandy loam in 2001.



OBSERVATIONS, DATA COLLECTION, ANALYSIS

Plots were evaluated in early spring, late spring, summer and fall for quality during 1999, 2000 and 2001, and in spring and late summer for density using a 1-to-9 scale (1 representing poorest quality turf, 9 the best quality turf, and 5 the minimally acceptable rating). A line-intersect grid count method provided 209 observations per plot for determining the bentgrass population in spring, summer and fall of 1999, 2000 and 2001.

Four 76-mm-diameter undisturbed core samples were taken randomly from the 0-to-51-mm surface soil depth of unseeded subplots of main (traffic) plots in October 2001 for assessment of physical properties. The turf's composition was predominantly annual bluegrass. Saturated water conductivity of each core sample was determined from a 0.5-h flow period after 4-h of constant-head flow. Air-filled porosity was determined by subtracting capillary porosity measured at -10 kPa water potential from the calculated total porosity.

Data were analyzed using the analysis of variance procedures of SAS (version 9.1). Soil physical properties data were analyzed using a 2-by-2 factorial arrangement of wear and compaction factors in a randomized complete block design for both trials. All other data were analyzed using a split-plot design with main plots arranged as a 2-by-2 factorial and 15 cultivars as subplots. Turf quality and density ratings were averaged for a given year.

RESULTS: SOIL PHYSICAL PROPERTIES

In the putting green study, bulk densities of the surface 0 to 51 mm of the plots were relatively low (Figure 1) because of the large organic matter content in the thatch-mat layer where biomass was accumulated in the form of crowns, roots and stolons. This organic matter added resiliency, which limited the damaging effects of compaction from bi-weekly and weekly treatments using 2,586-pound and 952-pound rollers. Bulk densities of all traffic plots were higher than the nontraffic plots, and traffic treatments didn't affect capillary porosity or K_{sat} (Figures 2 and 3).

Compaction increased bulk density and decreased air-filled porosity of nonwear plots without affecting wear plots (data not shown). Similarly, wear treatments didn't affect bulk density and air-filled porosity on the plots that also received compaction treatments but increased bulk density on noncompacted plots. It's possible the repeated wear thinned out the turf and the resiliency of the turf was reduced and allowed compaction of the surface from the rotating flexible paddles on the wear simulator. Bulk density changes were a result of decreased air-filled porosity, yet K_{sat} wasn't affected, which further illustrated the resiliency of this sand topdressed turf grown on sandy loam (Figures 3 and 4).

In the fairway study, the surface layer of 0 to 51 mm indicated lower bulk densities than the putting green trial (Table 3) because of the sand topdressing practice that added sand (high particle density material) to the thatch-mat layer of the putting green. Surface bulk density of fairway plots was increased by compaction and wear treatments (Table 3). Air-filled porosity and K_{sat} levels were higher than the soil green trial, especially under the no traffic and wear-only treatment plots.

Compaction decreased air-filled porosity and increased capillary porosity, while wear only decreased air-filled porosity (Table 3) compared to plots receiving no nontraffic treatments. This structural change at the surface of wear plots wasn't large enough to reduce K_{sat}, whereas compaction treatments reduced K_{sat} (Table 3). Despite lower bulk densities, other physical properties in the fairway trial indicated the fairway turf cover wasn't as resilient to traffic as turf cover in the putting green that received sand topdressing.

CULTIVAR RESPONSES TO TRAFFIC

While traffic and cultivar effects explained much of the variation in turf responses, significant

Figure 3. Saturated hydraulic conductivities of 0-to-51-mm surface depth as affected by traffic on a putting green grown on a sandy loam in 2001.

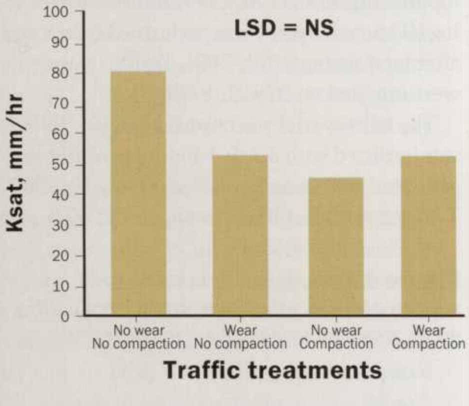


Figure 4. Air porosities of 0-to-51-mm surface depth as affected by traffic on a putting green grown on a sandy loam in 2001.