Native American tribe differentiates its new course from others in Michigan's Upper Peninsula

BY MARK LESLIE

The $4- to $5-million Sweetgrass Golf Club was built without borrowing any money, according to the council chairman of the Hannahville Indian Community. Photo: EPIC Creative

tion, including one project that owner Dan Grassi says he'll never do again – chiseling about 10 feet of ledge rock to create a waterfall and 10-acre water feature. Afraid of using dynamite because it could cause fissures in the ledge rock leading to leaks in the ponds, Grassi and partner Dana Morrow used excavators with three jackhammers to do the job, which took two months. Grassi and Morrow used the rock from the excavation to create 200 feet of waterfalls that cascade down from the double-green at the ninth and 18th holes and between the two fairways and settle in three ponds along the way. From there, the water flows into a creek that runs through the golf course.

BETTER DIRT

The other considerable challenge for Grassi was compensating for the heavy clay soils throughout much of the property. While creating mounding, bunkers and other features, Grassi also was able to use the clay to line the several ponds that were built. But still, they needed to cap the clay with soil on which a golf course could be built. Albanese's design called for all-sand California greens, and the tees needed to be sandcapped before they could be laser-leveled to promote drainage. When a 10-acre parking lot was built, Grassi used the soil from that project to build features and elevate greens and tees. Another soil source was the earth around about 30 acres of trees that were logged.

"We weren't allowed to burn," Grassi says. "A logger did the logging, and we did the stumping. Then we took an excavator and shook out the topsoil and loaded it into trucks to a pit for later use."

The stumps were used as fill.

NEW PLUMBING

Meanwhile, Grassi chose to be the first to install John Deere's new Aurora Decoder irrigation system, a two-wire system that includes more than 1,000 irrigation heads and almost 22 miles of pipe.

"Installation went 30-percent to 40-percent faster than a conventional irrigation system because you use fewer wires," Grassi says. "Typically, you irrigate a hole every couple days. We were able to get it down to a day, day and a half per hole. You use a lot less copper and run a lot less wire."

With the two-wire system, golf course superintendent John Holberton has individual head control, is able to operate it from a cell phone or computer, and, if he wants to add a head, can just run a piece of pipe and connect the wire to one of the nearest heads, not all the way back to the controller. That's good because Holberton, who joined the project in July 2006 after the irrigation choice was made, is adding more heads and might exceed more than 1,100 by the time he's done.

"Seeding lines exceeded irrigation," he says. "The wind blows every day, sometimes so hard that you only get water in one direction."

Sweetgrass is the first course to feature John Deere's new Aurora Decoder irrigation system. Photo: EPIC Creative

AT A GLANCE
Sweetgrass Golf Club

Location: Harris, Mich.
Type of project: New construction
Cost: Between $4 million and $5 million
Construction start: August 2005
Construction end: October 2007
Course opening: July 2008
Owner: Hannahville Indian Community
Architect: Paul Albanese
Builder: Grassi Enterprises
Superintendent: John Holberton
Turfgrass: L-93 bentgrass on the greens and fairways; a mix of L-93 and Southshore on the tees; hard and sheep fescues in rough

A COURSE APART

Meanwhile, Albanese has been busy creating a course he believes will be different than any other in the Upper Peninsula.

"We tried to minimize forced carries and make it exceptionally playable because there will be a lot of high-handicap golfers; yet, you could have a PGA Tour event here from the back tees without question," he says. "We tried to create a golf course where you can have as much risk-and-reward challenge as you want. From the back tees, if you take the risky route, you can run into quite a bit of penalty. But if you deal with it effectively, if you get over the correct bunkers at the right spot, you will be amply rewarded. But all day long, you can bail out and make bogey; you're not going to make double-bogey. That's the essence of a good design. You won't be overly penalized."

Mancilla, an avid golfer, agrees Sweetgrass is a special golf course.

"It's different than anything you will see in this area," he says. "People are used to tree-lined courses in the Upper Peninsula. The difficulty is getting down the fairway and keeping your ball in play. That's not the case here. A lot of the Upper Peninsula courses aren't that long. You're never hitting over a 7-iron into a par-4. Here, you will play every club in your bag, and that sets it apart for me."

"As a golf course contractor, you always feel one or two holes were left out, but the land here was so aesthetically pleasing and with Paul's routing, we've got 18 great ones," says Grassi, who has built a couple dozen courses during the past 26 years. "It seems that on every hole you're on your own private hole."

Aside from a sound design strategy, Albanese wanted to incorporate another aspect that would create interest beyond golf – something unique to the tribe and the Potawatomi Nation.

"We wanted to reflect native culture and tribal heritage, so we started to look at the native stories and legends as a way that we could incorporate them into the design," he says. "We wanted the overall earth-moving and grading to blend in to what was already there. It doesn't look artificial, out of place or over the top. When you look at that bunkering, you think, 'Wow! That's visually dynamic.' But there's a story behind it, a genesis that comes from a tribal legend or story."

On some holes, seeing the legend is like discerning an animal in the clouds, such as the Sacred Deer hole where a gigantic waste bunker across the fairway resembles a deer. On the Serpent and the Great Flood hole, a serpentine bunker curls down to the edge of a two-acre pond that represents the flood. Seven pot bunkers symbolize the seven grandfathers in another legend. Redan means fortress or fort in French, so Albanese designed a Redan-style green on the Michigami (Native American for "fort") hole.

OVER THE WATER

More visible to everyone will be the bridges. Tribal administrator Pat Groleau discovered the Michigan Department of Transportation was selling a historic one-car bridge for scrap metal. It happened that Albanese and Grassi were discussing the island green on the 15th hole, and a typical land bridge was planned because they didn't want to build a bridge. A cost analysis led to experimenting with a 104-foot-long iron bridge built in 1915. The bridge was disassembled, moved to the property, restored and reassembled at the island green. It looked so good, the Hannahville Indian Community bought four more, Mancilla says. The shortest is 50-feet long, and they all match, partly because they were built within 10 years of each other.

"It took a little more time and money than we anticipated, but those bridges have added a lot to the course," Mancilla says.

FRESH GRASS

Holberton, a Class A superintendent who came to Sweetgrass from Wild Bluff Golf Club in Brimley, Mich., has overseen a difficult grow-in period. Intense heat and only two-tenths of an inch of rain during 2.5 months caused concern and a lot of extra watering – so much so that Holberton had to make fungicide applications to halt diseases. But now the rains have fallen, his crews are mowing all but two fairways, and the opening is in sight.

L-93 bentgrass was chosen for the greens and fairways, while a mix of L-93 and Southshore was used on the tees. A large area of bluegrass stands between the fairways and secondary rough, where hard and sheep fescues will create a wispy, Scottish look. And the sweetgrass?

"It's all around the course," Mancilla says. "Sweetgrass is burned before any tribal meeting. It clears your mind. We thought, 'For golf, what could be a more perfect thing?' You can't have bad thoughts in your head when you golf. It naturally fit. Plus, it has a wonderful smell."

The tribe hopes that translates into the smell of success. **GCI**

Mark Leslie is a freelance writer based in Monmouth, Maine. He can be reached at gripfast@adelphia.net.

The all-sand California greens were grassed with L-93 bentgrass. Photo: EPIC Creative

BY DENNIS L. MARTIN, YANQI WU, JEFF A. ANDERSON, MICHAEL P. ANDERSON, GREGORY E. BELL AND NATHAN R. WALKER

Getting better

Investment yields high-quality Bermudagrass cultivars with improved cold hardiness

Bermudagrasses (*Cynodon* species) are the most widely used turfgrasses for golf courses, athletic fields and lawns in the Southern U.S. Tolerance of low mowing, as well as favorable heat, drought and traffic tolerance and few serious pests, makes Bermudagrass an attractive choice in tropical and subtropical areas.

Although widely adapted, Bermudagrass' susceptibility to freeze injury has been a continuing threat in many areas where it's used. Several years of mild winters might occur between catastrophic winter events. When severe winter-kill occurs, considerable time and expense can be involved repairing the damage, not to mention the potential for loss of revenues to severely damaged golf courses. Thus, there has been a long-term need for high-quality Bermudagrasses that have reduced risk of winter-kill.

In 1986, the Oklahoma State University, with support from the USGA, began a joint venture to improve the cold hardiness, as well as visual and performance qualities, of seeded turf Bermudagrass. At the time, the only choice of seeded Bermudagrasses was between the less winter hardy Arizona Common (*C. dactylon* var. *dactylon*) and the more cold hardy but coarse-textured Guymon (*C. dactylon* var. *dactylon* Guymon). The Bermudagrass breeding effort at OSU eventually would grow to encompass vegetatively propagated types.

An interspecific hybrid and an agressive common Bermudagrass duke it out during the establishment phase. Inability to eradicate on-site agressive common Bermudagrass leads to mixtures with reduced playing surface quality. Work is under way at Oklahoma State University to determine if rapid-spreading improved types can compete better against common Bermudagrass. Photo: Oklahoma State University

BERMUDAGRASS DEVELOPMENT

Collection of *Cynodon* germplasm for culture and scientific use began about the start of the 20th century in South Africa and the U.S. (Taliaferro, 2003). Bermudagrass germplasm collection and taxonomic characterization at OSU was under way in the 1950s and '60s by Drs. Harlan, de Witt and Huffine (de Wet and Harlan, 1970; Harland et al. 1970a; 1970b). Turf Bermudagrass improvement at OSU with support by the USGA began in earnest in 1986 under the direction of Charles Taliaferro, Ph.D., with assistance from Mike Kenna, Ph.D., and Jeff Anderson, Ph.D. Joel Barber, Ph.D., joined the development effort in 1987. The initial broad objective was to develop finer textured, seed-propagated, cold-tolerant Bermudagrasses (*C. dactylon* var. *dactylon*) for the U.S. transition zone. The initial efforts involved collecting additional germplasm, characterizing appearance and performance, improving the fertility and texture of breeding populations that were known to be cold tolerant, and improving the cold hardiness in populations known to be highly fertile.

By 1990, the effort was expanded to include the development of high-quality, cold-hardy vegetatively-propagated materials for golf course fairways and tees and to examine the possibility of generating improved African Bermudagrasses (*C. transvaalensis*) for use on putting greens. Field plantings of improved African Bermuda-

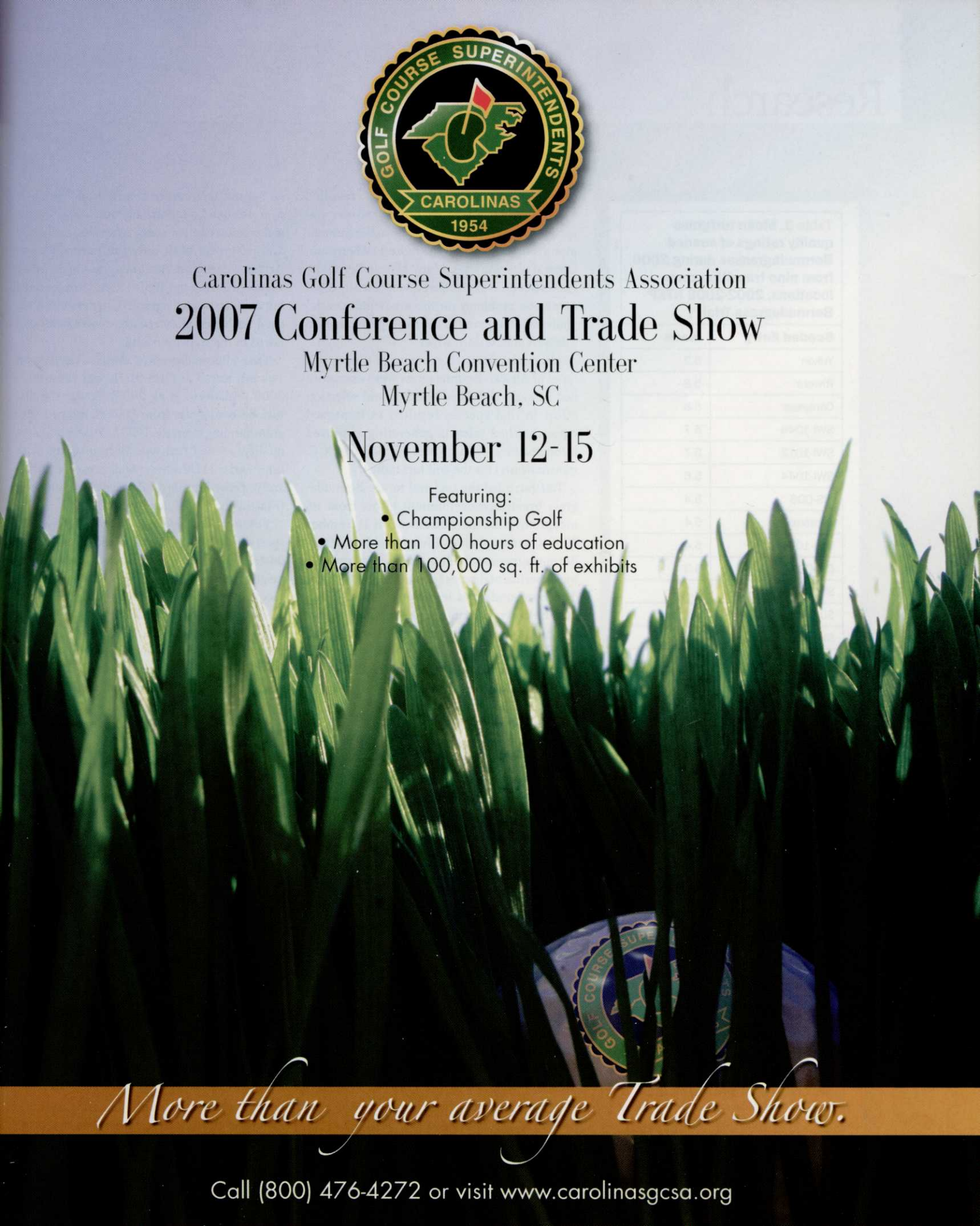

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Table 3. Mean turfgrass quality ratings of seeded Bermudagrasses during 2006 from nine transition zone locations, 2002-2006 NTEP Bermudagrass Trial. †

Seeded Entry	Mean
Yukon	6.2
Riviera	5.8
Contessa	5.8
SWI-1046	5.7
SWI-1012	5.7
SWI-1044	5.6
CIS-CD6	5.4
Veracruz	5.4
SWI-1014	5.4
CIS-CD7	5.3
SWI-1003	5.2
Sunbird	5.1
SWI-1001	5.1
Princess 77	5.0
Tift No. 2	5.0
Transcontinental	5.0
CIS-CD5	4.9
Tift No. 1	4.8
SR 9554	4.8
Panama	4.7
LaPaloma	4.7
FMC-6	4.7
Arizona Common	4.7
Southern Star	4.7
NuMex Sahara	4.6
Mohawk	4.6
Sundevil II	4.5
Sunstar	4.5
B-14	4.5
LSD (0.05)	0.3
Coeff. of variation (%)	12.3

† Excerpted from Tables 3b, p. 14., of the 2006 NTEP Progress Report NTEP No. 07-6. Quality rated on a 1 – 9 scale where 1 is poor and 9 is excellent.

grasses in tropical areas of the U.S. revealed the species performed well in fall, winter and spring but declined substantially in the summer months in tropical and the more southern subtropical planting sites. Many African Bermudagrass selections also suffered substantially more nematode problems on the sandy gulf coastal plain soils compared to the interspecific hybrid Tifdwarf and its derivatives.

Although efforts to generate putting green types of African Bermudagrass were discontinued by early 1997, the breeding and selection effort in that species resulted in improved types that had value in generating improved interspecific hybrid crosses (*C. dactylon* X *C. transvaalensis*) for the golf turf industry.

Taliaferro led the turf and forage Bermudagrass breeding/development effort from its inception until his retirement in December 2005. Guymon, Yukon, Riviera and Patriot turf Bermudagrasses as well as a number of promising experimental types (still under study) were developed under his leadership. Additionally, his familiarity with cultivar development helped facilitate cooperative releases of Midlawn and Midfield hybrid Bermudagrasses between Kansas State University and OSU in 1991. Midlawn and Midfield were developed by Ray Keen, Ph.D., of KSU with field testing assistance by John Pair, Ph.D., and Jack Fry, Ph.D., of KSU amongst other scientists.

The successes of the OSU turf Bermudagrass development program are because of USGA investment and the leadership of Taliaferro in concert with a number of past and current faculty, staff, graduate students and cooperating industry scientists.

Following the retirement of Taliaferro, an extensive search was conducted that resulted in the hiring of Yanqi Wu, Ph.D., in July 2006 to head up the OSU Bermudagrass breeding and development effort. Wu completed his Ph.D. under the tutelage of Taliaferro in 2004. A substantial portion of the newer Bermudagrass germplasm in our program was collected by and is in an ongoing state of characterization by Wu.

CULTIVAR RELEASES

Preceding the USGA-funded turf development effort at OSU, the forage/pasture effort resulted in the release of Guymon Bermudagrass (*C. dactylon* var. *dactylon* Guymon) in 1982 (Taliaferro et al. 1983). Guymon was arguably the first seeded Bermudagrass with improved cold hardiness over Arizona Common. Guymon found favor in soil erosion control areas, roadsides, rangeland and pastures. With only the noncold-hardy Arizona common Bermudagrass seed being available during the 1980s, the coarse-textured but cold-hardy and vigorous Guymon was often used on lower maintenance sports fields and lawns in the transition zone.

Yukon Bermudagrass (*C. dactylon* var. *dactylon* Yukon), tested as OKS 91-11, was released in 2000 (Taliaferro et al. 2003). It was the first turf Bermudagrass from OSU developed with grant funding from the USGA. Yukon is a high-quality, seeded turf-type Bermudagrass with improved cold hardiness (Anderson et al., 2002) and improved spring dead spot disease tolerance (Martin et al. 2001, Morris, 2005).

Yukon found favor on some golf courses, sports fields and in the lawn and landscape industry. It performs well at the 0.5 inch mowing height typical of Bermudagrass fairways. Divot recovery rate of Yukon varies from intermediate (Martin, unpublished) to rapid (Karcher et al. 2005). Although Yukon seed availability has been limited recently, increased availability of seed is anticipated in the near future. Yukon continues to provide excellent quality in transition zone climates (Table 3). Yukon seed production rights are licensed to Seed Research of Oregon, a division of Pick Seed USA.

Riviera Bermudagrass (*C. dactylon* var. *dactylon* Riviera), tested as OKS 95-1, was released in 2001. Riviera is a high-quality, medium fine textured seeded Bermudagrass. Riviera seed production yields are typically higher than those of Yukon (Taliaferro et al. 2004). Riviera has improved cold hardiness (Anderson et al. 2007) and improved tolerance to spring dead spot disease (Morris, 2002b; 2005). Its divot recovery rate varies from intermediate (Karcher et al. 2005) to rapid (Martin, unpublished). Riviera is receiving increased use on fairways, tee boxes, athletic fields and lawns when a high-quality seeded Bermudagrass with improved cold hardiness is desired. Although originally created as a seed-propagated Bermudagrass, arrangements have been made to allow for the production of Riviera sod for use on sites where installation deadlines are too tight for seeding or high erosion potential demands sodding. Riviera seed production rights are licensed to Johnston Seed Co.

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- ❑ C-Director of Golf/Head Pro
- ❑ D-Club President
- ❑ E-General Manager
- ❑ F-Golf Course Owner
- ❑ G-Builder/Developer
- ❑ H-Architect/Engineer
- ❑ I-Research Professional
- ❑ K-Assistant Superintendent
- ❑ L-Golf Course Management Company Executive
- ❑ Z-Others (please describe)

_____

4. Number of Holes: *(check one)*
- ❑ A-9 Holes
- ❑ B-18 Holes
- ❑ C-27 Holes
- ❑ D-36 Holes
- ❑ E-Other

6. Total Annual Maintenance Budget: *(check one)*
- ❑ 1-Less than $50,000
- ❑ 2-$50,000-$99,999
- ❑ 3-$100,000-$249,999
- ❑ 4-$250,000-$499,999
- ❑ 5-$500,000-$749,999
- ❑ 6-$750,000-$1,000,000
- ❑ 7-$1,000,000+

7. Total Course Acreage _____

8. Course Renovation Plans for the Next 12 Months
- ❑ 1-Full Reconstruction
- ❑ 2-Partial Reconstruction
- ❑ 3-Greens
- ❑ 4-Tees
- ❑ 5-Fairways
- ❑ 6-Irrigation System
- ❑ 7-No Renovations Planned

9. If Only a Partial Reconstruction is Planned, Please Indicate the Number of Holes _____

10. What is the Name of the Architect Who Designed the Course?

_____

11. What Year was the Course Built? _____

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2. Golf Course Management Company
3. Municipal Course System
4. None of the above

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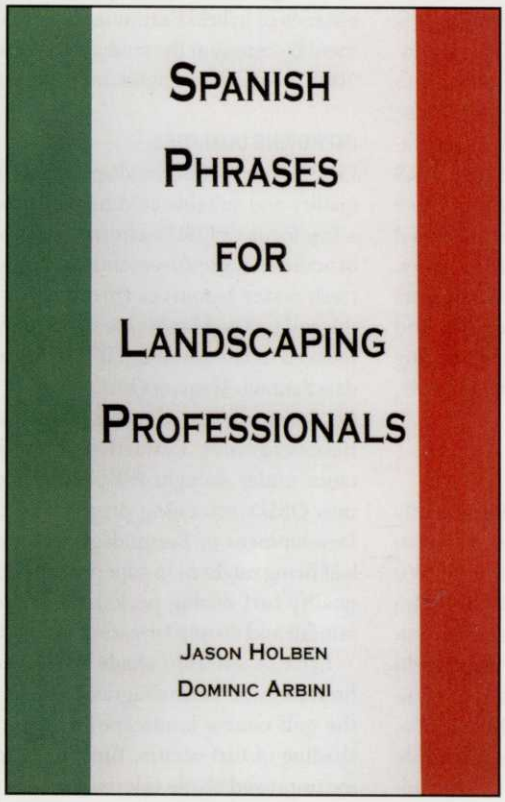

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Patriot Bermudagrass (*C. dactylon* X *C. transvaalensis* Patriot), tested as OKC 18-4, was released in 2003. Patriot is a vegetatively propagated hybrid characterized as having improved color, quality and cold hardiness (Anderson et al, 2007). Divot recovery rate has been characterized as medium (Karcher et al. 2005) to rapid (Martin, unpublished). Licensed producers have reported rapid sod production cycles from planting to harvest. Improved tolerance to spring dead spot disease (Morris, 2002b; 2005) has been documented in Patriot. We believe Patriot to be the first commercialized interspecific hybrid turf-type Bermudagrass that's a tetraploid. It was created by the cross of the hexaploid 'Tifton 10' and an improved African Bermudagrass (a diploid) from our collection.

Patriot is well adapted to golf course tee box and fairway use and is experiencing increased use by the golf course industry. Patriot has been widely accepted as a sports turf playing surface for football, baseball and soccer in the transition zone and upper region of Bermudagrass adaptation.

DOWNSIDES

For those unfamiliar with Bermudagrass, types with improved cold hardiness still experience canopy (leaf and aerial shoot) discoloration under short day length and chilling temperatures, as well as when death of leaves occurs from freeze injury.

Although these Bermudagrasses often perform suitably in full sun areas of USDA Hardiness zones 5a or 5b during summer, they still can experience significant winter-kill during cold winters as seen in National Turfgrass Evaluation Program Trials (Morris, 1997). The USDA Cold Hardiness zone map it is located at: http://www.usna.usda.gov/Hardzone/ushzmap.html. Prospective Bermudagrass users are urged to conduct a thorough risk/benefit analysis before making a decision to switch from one Bermudagrass to another or if switching from a cool-season grass to Bermudagrass.

SELECTIONS WITH PROMISE

OKC 70-18 Bermudagrass developed in part with funding from the USGA recently has undergone intensive internal as well as external testing (2002-2006 NTEP Bermudagrass trial). This variety ranked first in overall quality at nine transition zone test sites during several years of the 2002 to 2006 NTEP trial. OKC 70-18 has several meritorious characteristics and a decision concerning possible release is forthcoming.

Three promising experimental Bermudagrasses from our program were entered into the 2007-2011 NTEP Bermudagrass trial. These included OKC 11-19 and OKC 11-34, vegetatively propagated types and a seeded type, OKS 2004-2. Sixteen NTEP testing sites are in place for the 2007 NTEP trial. Besides the traditional parameters of color, quality, texture, density, green-up and living cover, additional parameters monitored at selected sites will include sod tensile strength as well as tolerance to spring dead spot disease, salinity and traffic (Morris, 2007b).

CURRENT BREEDING

A new broad-based breeding population recently was formed using desirable Chinese *Cynodon* material selected from a collection by Wu made in 11 provincial regions of China. Selections were made based on extensive evaluation of chromosomal, morphological, seed yield potential and DNA marker investigations completed in 2004 (Wu et al. 2004, 2005, 2006a, 2006b). The population contains favorable traits for turf cultivar development, including darker green color, relatively fine texture, good winter hardiness and good sod density. Study of genetically relatedness assists the turf breeder in elimination of possible duplication of breeding efforts due to close relatedness of parents. Additionally, this work might help in locating crosses that have increased likelihood of compatibility. Complimentary to this work, Kevin Kenworthy, Ph.D., (now of the University of Florida Turfgrass Program) recently completed an assessment of the variability in 21 performance traits of African Bermudagrass while in our program (Kenworthy et al. 2006). The work determined which traits can most easily be improved in the African Bermudagrass parents that are subsequently used for developing interspecific crosses.

Applied field trials comparing later-stage promising experimental entries and industry standards are on-going for turf quality, divot recovery, spring dead spot disease resistance and sod tensile strength. Because of the inability to eradicate preexisting aggressive *C. dactylon* var. *dactylon* types from many installation sites, some superintendents choose not to renovate to improved Bermudagrass cultivars. To address this issue, a preliminary study investigating the resistance of hybrid Bermudagrasses to encroachment by common Bermudagrass was initiated in 2006 by master's candidate Holly Han.

IMPROVING QUALITIES

Development of Bermudagrasses with high turf quality and suitable cold hardiness will remain a key focus of OSU's efforts. However, pursuit of additional improvements has begun. Limited fresh water resources threaten the vitality of the golf turf and landscape industry. Work commenced in late summer 2007 by master's candidate Santanu Thapa of OSU's program to evaluate the water use rate of several experimental OSU Bermudagrasses. Evaluation of leaf-firing resistance under drought will also be incorporated into OSU's screening program in the future. Development of Bermudagrasses with delayed leaf firing might help superintendents maintain quality turf during periods of limited natural rainfall and during irrigation restrictions.

Lack of suitable shade tolerance is a key limitation of Bermudagrass (Beard, 1973). As the golf course landscape matures, increased shading of turf occurs. Breeding and selection for improved shade tolerance in Bermudagrass has been conducted successfully by turfgrass scientists at the University of Georgia (Hanna and Maw, 2007). Screening of Bermudagrass germplasm for improved shade tolerance commenced in our program in summer of 2007 by Greg Bell, Ph.D., and Yanqi Wu, Ph.D. The work incorporates the use of a combination of natural and artificial shade.

CONCLUSIONS

USGA support has been instrumental in continuing a long-term turf Bermudagrass development effort at OSU. A comprehensive, interdisciplinary team of scientists has been assembled focusing on turf Bermudagrass improvement. The effort has resulted in extensive collection, characterization and improvement of breeding populations of Bermudagrasses from the *Cynodon dactylon* and *C. transvaalensis* species.

Studies aiding in the understanding of fundamental mechanisms of stress tolerance occurred. Improvements in turf quality, cold hardiness and spring dead spot tolerance occurred.

The improved turf Bermudagrasses Yukon, Riviera and Patriot were direct results of the