



Ideal for Fairways, Tees, Roughs and Transition Areas

Sealsle 1, a new salt-tolerant (halophytic), drought-resistant, warm-season turfgrass, is now available as "certified" sod or sprigs. After seven years of extensive research at the University of Georgia's Griffin Experiment Station, combined with careful evaluation of 35 small-plot golf course locations, Sealsle 1 was released in 1999 by plant geneticist Dr. R.R. Duncan. Unlike Adalayd, Futurf and other earlier medium and coarse-bladed paspalum cultivars, Sealsle 1 is similar in texture and wear tolerance to the hybrid bermuds. And Sealsle 1 has a number of other advantages, especially under difficult environmental scenarios. First and foremost, it can handle multiple stresses: prolonged drought, high salt levels, low light intensity, waterlogging and extremely high or low soil pH levels. Secondly, Sealsle 1 can tolerate most types of alternate water sources, including wastewater, effluent, ocean water, gray water and brackish water. It also requires less irrigating, less fertilizer and only minimal pesticide applications when compared to other warm-season cultivars. As water quality and water conservation become even more critical in the days ahead, Sealsle 1 may be the best choice for fairways, tees, roughs and transition areas. Sealsle 1 not only thrives in difficult environments, it also gets very high marks for turf quality, cold-hardiness, turf density and turf strength, disease and pest resistance, and rapid recovery from normal wear and injury. On top of that, Sealsle 1 has the most attractive, rich dark green color of any of the warm season grasses. See for yourself. Schedule a trip to see Sealsle 1 at one of these quality-conscious producers licensed to grow and sell certified Sealsle 1 seashore paspalum.

- Most Salt Tolerant Turfgrass - Can Be Irrigated with Ocean-Level Salt Water with Proper Management
- Tolerates Gray Water & Effluent Regardless of Contaminant Levels
- Helps Clean Up Contaminated Soils & Water
- Handles Wide Range of Soil pH Levels: 4.0-9.8
- High Tolerance to Salt Spray, Water Logging and Periodic Inundations
- Low Fertilization Requirements
- Minimal Pesticide Requirements
- Good Rooting in Sandy, Clay or Muck-Type Soils
- Darker Green Color Than Bermudagrass
- Can Be Overseeded with Bentgrass-Ryegrass-Alkaligrass Blends
- Excellent Low Light Intensity Tolerance
- Root Growth & Functionality Still Maintained in 40-55°F Soil Temperature Range
- Low Tree-Shade Tolerance (Similar to Bermuda)

Sealsle¹
Certified Seashore Paspalum

**To Order Your Certified Sealsle 1 Seashore Paspalum
 Contact One of These Licensed Sealsle 1 Growers**

Turfgrass America Tampa FL 800 881-0779 SMR Turf & Trees Bradenton FL 941 746-8873
 South Florida Grassing Hobe Sound FL 561 546-4191 The Turfgrass Group Marshallville GA 678-642-0915
 Rapid Turf, Inc. Rincon GA 912 826-2454 Phillip Jennings Turf Farms, LLC Norristown GA 478 668-3729
 Emerald Island Turf, Inc. Punta Gorda FL 941 637-4770 Southern Turf Nurseries, Inc. Punta Gorda FL 800 841-6413

Table 3.

Turfgrass varieties used by Florida golf courses, 2000.

Turfgrass Variety	Respondents		Mean	Standard Error	Share of Total		Expanded Total Acres
	Number	Percent	Acres	Acres	Percent	Acres	
Bermudagrass	214	96.0%	102	5	92.5%	136,773	
Bahiagrass	67	30.0%	4	2	3.5%	5,251	
St. Augustinegrass	89	39.9%	3	1	2.7%	3,996	
Mixed/other grasses	25	11.2%	1	1	0.9%	1,351	
Zoysiagrass	25	11.2%	0	0	0.2%	257	
Centipedegrass	6	2.7%	0	1	0.2%	299	
Specific other type(s)	26	11.7%					
Total					100.0%	147,927	

the list in second place was bahiagrass with 5,251 acres, representing 3.5 percent of the total, or 4 acres per course. Bahiagrass is typically limited to the golf course rough. St. Augustinegrass was the only other turf variety that was of significance, with 2.7 percent of the total acreage planted. Each of the remaining varieties constituted less than 1 percent, and are generally limited to the special tee and greens areas.

This study examined three aspects of water use by golf courses - sources of irrigation water, changes in water use per acre, changes in fertilizer use per acre, and whether or not the golf course had installed an automated irrigation control system. Total water use by Florida golf courses in 2000 was estimated at 172 billion gallons. Information related to water sources is shown in

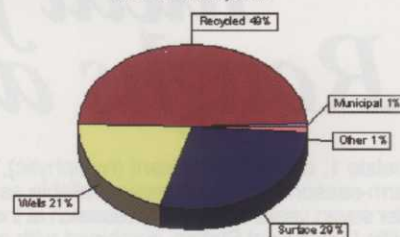
Figure 1. Nearly 85 billion gallons of water came from recycled water, compared to 49 billion for surface water, 35 billion from wells, and 1.5 billion from municipal sources.

Taking total irrigated acres and dividing it into the total amount consumed from all water sources, average consumption by Florida golf courses was 1.23 million gallons per acre, or 3.75 acre feet applied in 2000. The use of recycled water was the primary source for almost half of all golf facilities and has grown from 8 percent in 1974 to 21 percent in 1994 and to 49 percent in 2000. The second most common source was surface water such as canals and lakes (29 percent), followed by groundwater (21 percent) from wells. Use of surface water rose from 23 percent of golf courses in 1974 to 37 percent in 1994, but then declined to 29 percent in

2000. Groundwater as a source declined from 61 percent in 1974 to 41 percent in 1994, falling further to 21 percent in 2000. Clearly, much of the shift from surface and groundwater has been replaced by the dramatic growth in the use of recycled water to irrigate Florida's golf courses.

Survey data on changes in water and fertilizer use indicate that Florida golf courses have markedly reduced (60 percent) consumption of fertilizers and pesticides on a per-acre basis and were increasingly shifting sources of water from ground to recycled. From a water-policy and efficiency standpoint, perhaps even more important than total consumption per acre are changes in water-use patterns over time. To address this issue, golf course superintendents were asked whether irrigation water use per acre over the past five years had increased, decreased or

Figure 1
Irrigation Sources for Florida Golf Courses, 2000



Neo-Tec®

Effective, Environmentally Sound Nematode Control

It's true! **Neo-Tec** isn't like other nematicides. Neo-Tec is naturally derived and EPA registered under the safer pesticide rules. Neo-Tec is harmless to beneficial nematodes and is completely biodegradable.

- **Promotes healthier roots by controlling harmful nematodes**
- **Easy container disposal, minimal PPE and re-entry time**
- **Reduces damage to plant root in the following ways:**
 - ▶ **Disrupts the ability of plant parasitic nematodes to locate plant roots, thereby restricting penetration, feeding and reproduction**
 - ▶ **Reduced nematode feeding activity reduces the opportunities for invasion by pathogenic fungi**



Parkway Research

A Division of
BRANDT
CONSOLIDATED
Professional Agriculture

800.442.9821
info@parkwayresearch.com
Fax 281.590.3353

Table 4.
Changes in Florida golf course consumption of water and fertilizer use, 2000.

Change Variable	Respondents	
	Number	Percent
Irrigation water use per acre over past 5 years		
Increased	20	9.0%
Decreased	94	42.2%
Remained same	93	41.7%
Amount increased	18	8.1%
Amount decreased	83	37.2%
Fertilizer use per acre over past 5 years		
Increased	64	28.7%
Decreased	39	17.5%
Remained same	104	46.6%
Amount increased	64	28.7%
Amount decreased	39	17.5%

remained the same (Table 4). If it increased or decreased, respondents were asked to specify how much it had changed. By a slim margin, the majority (42.2 percent) indicated that their water consumption had decreased and the reduction in water use by this group averaged 37 percent. Slightly fewer (41.7 percent) said per-acre use remained the same. Nine percent of respondents indicated water use increased over the past five years and that it increased by roughly 8 percent.

A similar set of questions was asked about per-acre fertilizer use patterns over the past five years. Nearly half (46 percent) of all respondents stated that fertilizer use remained the same.

Table 5.
Geographic origin of golfers playing golf in Florida, 2000.

Geographic Origin	Respondent		Mean Rounds	Standard Error	Share of Total Percent	Expanded Total Million Rounds
	Number	Percent				
Local (county) residents	184	82.5%	20,372	1,315	53.7%	31.47
International visitors	133	59.6%	2,049	347	5.4%	3.16
US residents outside Florida	175	78.5%	10,277	980	27.1%	15.88
Non-local Florida residents	146	65.5%	5,209	663	13.7%	8.05
Total					100.0%	58.56

More than a quarter (29 percent) indicated that it had increased and that the average percentage increase was 28 percent. Almost a fifth (18 percent) stated fertilizer use had declined, with the magnitude of reduction a similar percentage (18).

Finally, respondents were asked whether the golf course had automated irrigation systems installed, and whether they were original or retrofitted from a manual system. Nearly all (94 percent) stated that their course had an automated system and more than half (53 percent) indicated it was installed at the time of original construction.

Visitor Originations

Florida is well known for its large influx of winter visitors from many northern states as well as international locations, particularly Europe and South America. The geographic origin of golfers in general tends to be associated with distance to the course. At 54 percent or 31.4

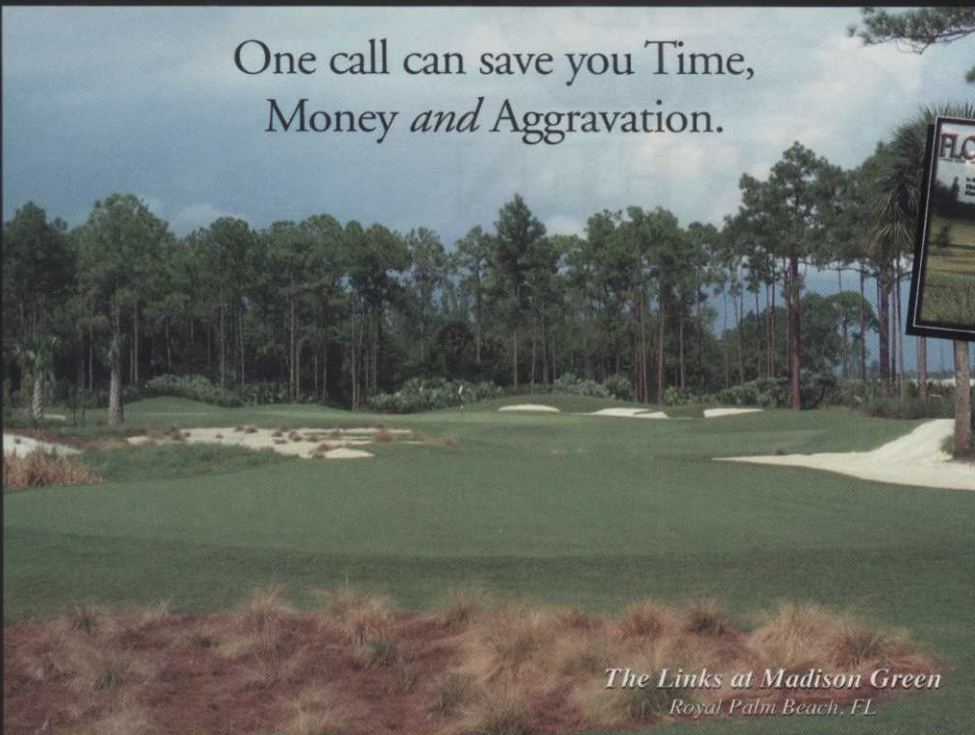
million rounds, local county residents were the group most frequently playing golf (Table 5). The second-most-common group comprised U.S. residents from outside Florida, representing 27 percent of total rounds played. Nonlocal Florida residents were the third-ranked group with 14 percent or 8 million rounds, followed finally by international visitors who accounted for just over 5 percent or 3.2 million rounds of golf. A total of over 19 million rounds (32%) were played by out-of-state visitors to Florida.

Florida Golf Visitors and Expenditure Impacts

One of the objectives of this research was to estimate the total economic impact of golf visitors to the state of Florida. The tourism industry publishes information regarding the impact of tourism to the state, but estimates of the impact of golf-related recreation specifically have not been made. Information was obtained from the National Golf Foundation on golf traveler characteristics in

Thinking about remodeling your course?

One call can save you Time,
Money and Aggravation.



The Links at Madison Green
Royal Palm Beach, FL

John Sanford Jr.,
Member of
American Society of
Golf Course Architects



*The Links at
Madison Green*

Voted "Florida's Best
New Public Golf
Course" by Florida
Golf Magazine



**SANFORD
GOLF DESIGN**

866.233.4SGD

DESIGN • REMODELING • CONSTRUCTION MANAGEMENT

www.sanford-golf.com

the United States, such as the average number of rounds played per day and per year, the number of days spent annually in golf-related travel, the average number of golf trips per year, and average expenditures per trip.

The typical U.S. golf traveler makes 6.6 golf-related trips per year with an average of 3.95 days per trip, or a total of 26 days each year in golf-related travel, and spends an average of \$1,114 per trip or \$282 per day on lodging, local transportation, food, entertainment, golf lessons, gifts, and miscellaneous other expenses, but excluding transportation to the destination (Table 6).

This study assumed that U.S. average golf travel data are representative of golf travelers to Florida since this state is the largest golf travel market in the United States. The U.S. travel data were used together with the survey data on total rounds of golf played in Florida by out-of-state visitors (19,046,060) to estimate a total of 3.12 million golf-playing visitors to Florida in 2000, who made 20.6 million golf-related trips and spent a total of 81.5 million visitor days in Florida.

Based on the U.S. average golf-travel expenses per day and the estimated number of golf-visitor days in Florida, total golf-travel expenditures

by Florida visitors amounted to nearly \$23 billion (Table 6). Based on the number of travel days and number of rounds of golf played, we estimate that 23.4 percent of the total trip expenditures, or \$5.4Bn, may be attributed to golf.

As noted earlier, visitors to Florida impact the economy at three levels - directly on expenditures such as food, recreation, lodging and entertainment, indirectly by the receiving industries of those dollars as they in turn spend money to purchase goods and services to operate their businesses, and induced impacts from personal consumption expenditures by the employees of these companies and their allied suppliers.

The cross-section of industries influenced by tourist dollars, for the major sectors of the Florida economy, and the three levels of economic impact are shown in Table 7. These impacts (direct, indirect and induced) are extrapolated and classified into three types of impacts - output, value added, and employment.

- **Output impact** is a gross figure that represents total revenues generated from the three levels of economic activity.
- Total **value-added impact** is a net figure that removes all purchased inputs used by the respective industry to generate their goods and services. This is similar to net income after cost of goods sold (COGS) have been subtracted from total income.
- Finally, the **employment impact** represents the jobs that are generated from all the activity across

Table 6.
Travel expenditures by Florida golf visitors, 2000.

Type of Expenditure	Average Per Trip (1)	Average Per Day (2)	Estimated Total Expenses (3)	Estimated Expenses Attributable to Golf (4)
Type of Expenditure	\$	\$	\$ Million	\$
Lodging	403	102	8,303	1,941
Transportation	87	22	1,793	419
Food	203	51	4,183	978
Entertainment	113	29	2,328	544
Golf lessons	106	27	2,184	510
Gifts	87	22	1,793	419
Other	115	29	2,369	554
Total expenses (5)	1,114	282	22,953	5,364

1 National Golf Foundation, 1999. *The U.S. Golf Travel Market, 1998 Edition*. Publication 99MR002.
 2 Average per trip divided by average number travel days per trip.
 3 Average expenditure per day multiplied by estimated number of traveler-days.
 4 Share of trip expenses attributable to golf (23%).
 5 Excludes transportation expenses to destination of \$227 per trip.



Foliar Fertilizer & Nutrients

Bulk Liquids

Custom Liquid Blends

Wetting Agents, Stickers, Defoamer, Indicator Dye

TEE-TO-GREEN TURF PRODUCTS, INC.

P.O. Box 2224
 Palm City Florida 34991

E-mail: Tee2green2001@aol.com

Fax: 772-692-4887

Mobile & Voice mail: 561-719-3462

1 - 800-900-6444

Superior Solutions for Turf Professionals®

the economy due to golf.

The output impact from golf tourism spending totaled \$12.86Bn. It was dominated by three sectors - services, which accounted for \$5.06Bn, or 39 percent of the total; trade with \$3.05Bn, or 24 percent of the total; and finance, insurance and real estate, which comprised 10 percent or \$1.36Bn. Combined, these three sectors represented more than four-fifths of the total output impact.

A similar dominance by these sectors occurred for total value-added impact, with services accounting for \$3.27Bn (39 percent), trade for

\$2.14Bn (25 percent), and finance, insurance and real estate comprising \$984M (12 percent) of the \$8.46Bn total. Value-added impacts also included an impact on labor income of \$5.58Bn and impact on indirect business taxes paid to local, state, and federal governments of \$792M.

Finally, the number of jobs generated by golf tourism, measured as an employment impact, was 215,873 in 2000. The component responsible for the majority of employment was the service sector with 96,000 jobs, followed by trade with 72,000 jobs, and third was the government, which accounted for nearly 17,000 jobs.

Table 7.
Total economic impacts of golf visitor expenditures in Florida, by industry sector, 2000.

Industry Sector	Total Output Impact (\$million)	Total Value Added Impact (\$million)	Total Employment Impact (jobs)
Services	5,060	3,268	95,641
Trade	3,049	2,144	71,574
Finance, Insurance, Real Estate	1,355	984	7,092
Transportation, Communication, Public Utilities	1,031	649	11,229
Government	971	886	17,109
Construction	779	282	7,509
Manufacturing	534	192	3,321
Agriculture	63	36	1,385
Other	11	11	958
Mining	6	3	55
Total	12,860	8,455	215,873

Pull the Plug on Drought Stress

Michigan State University bentgrass test plot plug

Grow flourishing, healthy plants with deeper, denser roots--even in sandy, drought, or water-restricted areas--with Hydrozone.

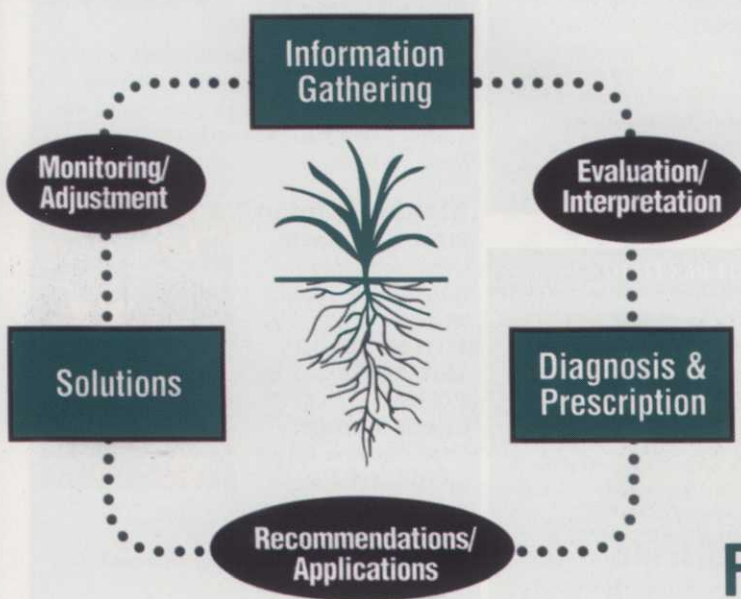
HYDROZONE™

Conserving water for today and the future.

Call (877) 994-3494 for a free video

The Floratine Approach

"Prescription Without Diagnosis is Malpractice"



- Accumulation of comprehensive, site specific information from laboratory analysis, physical examination, and client dialogue.
- Evaluation and interpretation of information to understand and explain agronomic conditions.
- Recommendation of scientifically sound, environmentally responsible methods and materials to promote optimum soil functioning and turf quality.
- Continuing conscientious monitoring and appropriate program adjustment to achieve maximum health and aesthetics.

Floratine of Florida

Terry Brawley
727-638-3481

Jim Lawson
941-633-6398

Tom Phillips
561-719-6265

Carl Bronson
727-638-5858



Table 8.
Employment by Florida golf courses, 2000.

Employee Type	Respondents		Mean	Standard Error	Expanded Total
	Number	Percent			
Golf course maintenance, full-time	221	99%	16	1	21,205
Golf course maintenance, part-time/seasonal	156	70%	3	0	2,396
Clubhouse/other, full-time	190	85%	27	3	30,170
Clubhouse/other, part-time/seasonal	167	75%	19	2	18,268
Total Employment	222	100%	56	4	72,038

Golf Course Employment

Employment is a vital indicator of an industry's contribution to a local, regional, or national economy. Wages stimulate an economy when they are spent locally in the purchase of other goods and services. In 2000, Florida's golf-course industry employed a total of 72,038 people, including 51,375 full-time workers and 20,663 part-time workers (Table 8).

Almost one-third (32.7 percent) of these full- and part-time employees worked on golf course maintenance activities, while the remaining two-thirds (67.3 percent) worked for the golf course clubhouse and/or related food service or recreational concerns.

The average golf course employed 16 full-time and three part-time people for its highly intensive maintenance work, which includes both the care of the course and the equipment used to maintain the turf-grass. On a per-acre basis, this translates into roughly one person for every 5 acres of maintained grass.

At two-thirds of the total, the clubhouse component of the golf facility utilizes the larger share of total employment, due primarily to the larger number of separate business activities. For example, depending on the size of the facility, services may include hotel operations, restaurant management and service, and recreational services such as golf and tennis instruction. The average golf course employed 27 full-time people and 19 part-time or seasonal labor for clubhouse-related activities.

On average, total facility employment translates into one employee for every \$150,000 of financial assets - land, vehicles and equipment, irrigation systems, and golf-owned buildings and installations.

These figures attest to the substantial employment impact Florida's golf course industry has on the state's economy. Put in different perspective, golf course industry employment was close to the 80,000 people that work for all the theme and amusement parks in the state and greatly exceeded the 50,000 wage and salaried employees in agriculture (Florida Statistical Abstract 2000).

Summary

Economic impacts of the Florida golf industry were estimated for year 2000 based upon a survey of golf courses, together with other published data and regional economic models. Respondent golf courses were classified as private (50%), semi-private (27%), public (14%), municipal (9%), resort (5%), and military (1%).

Total annual revenues amounted to \$4.44 billion (Bn), including membership and initiation fees (38%), playing fees (27%), food and beverage services (18%), retail sales (6%), lodging (4%), and miscellaneous other activities (9%). The revenues for year

2000 were 49 percent higher than a previous estimate of \$3.0Bn in 1991-92, representing an average annual growth rate of 5 percent in nominal dollar terms.

Total industry employment was 73,000 persons, including clubhouse personnel (68%), and golf course maintenance personnel (32%), with 71 percent as full-time and 29 percent as part-time, temporary or seasonal employees.

Water used for irrigation amounted to 173 billion gallons, of which surface waters were the dominant source (90%), with lesser amounts from recycled water sources (7%) and wells (3%). Compared to 5 years ago, water use per acre was increased by 9 percent of firms, decreased by 42 percent, and remained the same for 42 percent. Fertilizer use per acre was increased by 29 percent of firms, decreased by 18 percent, and remained the same for 47 percent. The irrigation control system was automated by 94 percent of courses.

ACKNOWLEDGMENTS

This study was made possible by a sponsored research project funded by the Florida Turfgrass Association, WCI Communities, Inc., Florida Golf Alliance, Florida Golf Course Superintendents Association, Everglades Golf Course Superintendents Association, Taylor Woodrow, and Bonita Bay Group. Guidance on the study objectives and survey design was provided by golf industry professionals including Ken Plonski and Lou Conzelmann, WCI Communities; Roy Bates, Florida Turfgrass Association; Ron Garl, Florida Golf Alliance; Geoff Coggan and Joel Jackson, Florida Golf Course Superintendents Association; Michael Fiddelke, Florida Club Managers Association; Ken Hylkema, FPCA; Jack Brennan, Paladin Golf Marketing; Amy Courson, PGA Tour; Stephanie Gordon, Florida Golf Course Owners Association; Matt Taylor, Royal Poinciana Golf Club; and Bill Wert TruGreen ChemLawn. Survey data entry was performed by Effie Philippakos, University of Florida.

LITERATURE CITED

Haydu, J.J., A.W. Hodges, P.J. van Blokland and J.L. Cisar. 1997. Economic and environmental adaptations in Florida's golf course industry: 1974-1994. *International Turfgrass Society Research Journal* 8:1109-1116.

Hodges, A.W., J.J. Haydu, P.J. van Blokland and A.P. Bell. 1994. Contribution of the turfgrass industry to Florida's economy, 1991/92: A value added approach. University of Florida, Institute of Food and Agricultural Sciences, Food & Resource Economics Dept., *Economics Report* ER 94-1.

National Golf Foundation. 1999. The U.S. Golf Travel Market, 1998 edition. Jupiter, FL, Pub. 99MR002.

National Golf Foundation. 2001. Golf Facilities in the U.S., 2001 edition. Jupiter, FL.

University of Florida. 2001. Florida Statistical Abstract. 2000. Bureau of Economic and Business Research, Warrington College of Business Administration.

PLANTS OF THE YEAR FOR 2002 - PART 3

Editor's Note: This program, sponsored by the Woody Division of the FNGA, introduces purchasers to under-utilized, but proven Florida plant material. Selected each year by a panel of horticulturists, nurserymen, educators, landscape architects and other professional members of the horticulture industry, these plants have attributes which attract wildlife or have minimal maintenance impact on the environment.

Robin Holly

BOTANICAL NAME: *Ilex x 'Robin'* (tm) 9486
HARDINESS: Zones 7-9
MATURE HEIGHT AND SPREAD: 10'-15' tall, 6'-8' wide

CLASSIFICATION: Evergreen shrub
LANDSCAPE USE: Specimen shrub, small tree or hedge

CHARACTERISTICS: large, dark green spiny leaves have a reddish-maroon foliage when new growth emerges. The glossy foliage shows off the red berries of this improved plant.



Hidden Ginger

BOTANICAL NAME: *Curcuma zedoaria*
HARDINESS: Zones 8-11

MATURE HEIGHT AND SPREAD: 4'-5' tall
CLASSIFICATION: Perennial
LANDSCAPE USE: Specimen or ground cover for shade

CHARACTERISTICS: Maroon colored inflorescence with yellow flowers appears in the spring before the foliage. Leaves are tropical looking with a purple midrib. The bloom can be cut for a long-lasting cut flower.



Mammy Croton

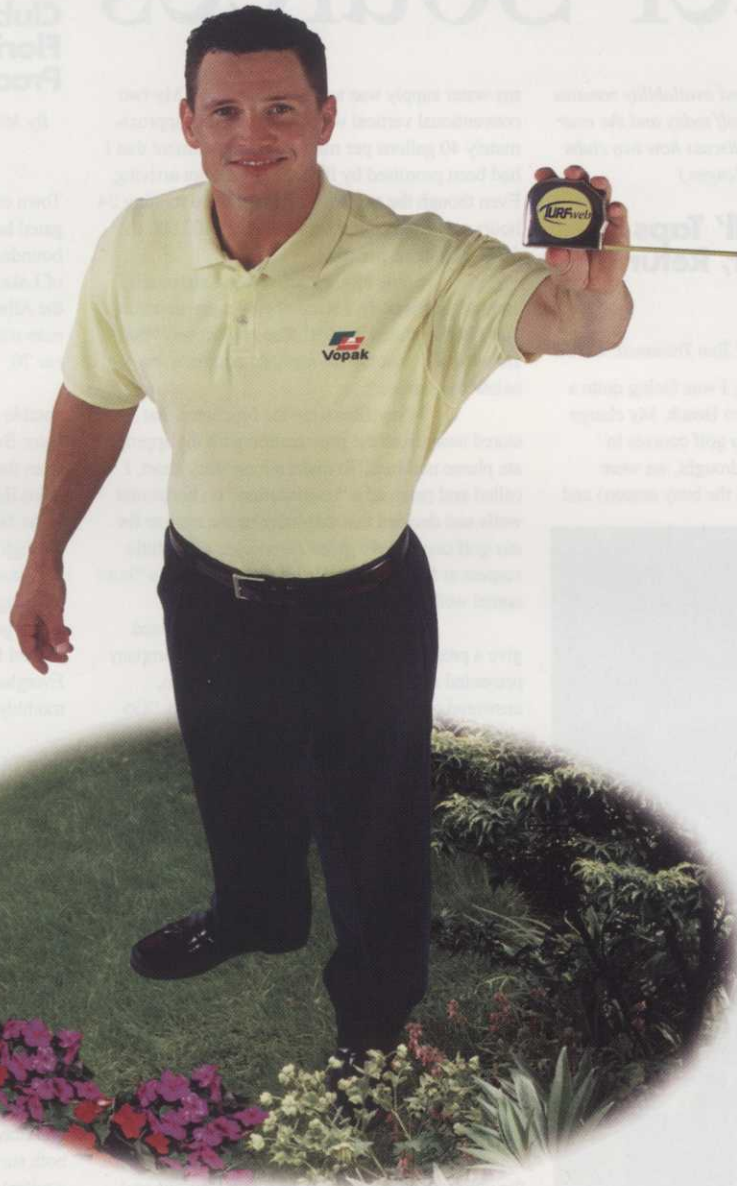
BOTANICAL NAME: *Codiaeum 'Mommy'*
HARDINESS: Zones 9B-11


MATURE HEIGHT AND SPREAD: 3'-5' tall, 2'-3' wide
CLASSIFICATION: Colorful shrub for full sun
LANDSCAPE USE: Accent, hedge or specimen

INTERIORESCAPE USE: Color specimen in very high light
CHARACTERISTICS: Leaves are a fiery orangish-red with variegation of green and yellow. The narrow leaves form a slight twist to give this plant a different look from the ordinary croton.



MEASURE YOUR SUCCESS WITH VOPAK.



Let's talk success. Measurable success. Not the, "well, things seem to be going okay" kind of success. We're talking the "we spent less time and got 50% greater weed control thanks to that new product you recommended" kind of success. That's what you get with Vopak. Vopak's turf and ornamentals sales representatives bring you the products, training and knowledge that give you measurable results. Want your success to take root and grow? Call your Vopak T&O representative today or visit www.turfweb.com. 

 **Vopak** (formerly Van Waters & Rogers)

To contact the Vopak office nearest you, call 1-800-888-4897.



Alternative Water Sources

Editor's Note: Water quality and availability remains the number-one issue facing golf today and the near future. The following articles discuss how two clubs sought solutions to those challenges.)

'Horizontal Well' Taps Surficial Aquifer, Returns Investment

By Tom Trammell, CGCS

In August of 2000, I was facing quite a dilemma at Hawks Nest in Vero Beach. My charge was maintaining one of the top golf courses in Florida, we were already in a drought, we were going into the dry season (and the busy season) and



Tom Trammell, CGCS, stands in front of the horizontal well installed more than one year ago. The well provides more than 300,000 gallons of water per day for irrigation usage. Trammell notes that he has made sizeable savings over the last year due to improved water quality and reduced electrical cost for pumping from the shallow source. Hawk's Nest is scheduled to add one more well in the summer of 2002.

my water supply was terribly inadequate. My two conventional vertical wells were yielding approximately 40 gallons per minute and the effluent that I had been promised by the county was not arriving. Even though the two existing wells were running 24 hours a day, the course was still short 400,000 to 500,000 gallons per day.

Some effluent arrived, but not nearly enough. Fortunately, I remembered a presentation that I had attended in 1990. The subject was "horizontal wells" that tap the surficial aquifer a few feet below the surface.

In my files were the brochures that I had stored away from the presentation with the appropriate phone numbers. To make a long story short, I called and received a "re-education" on horizontal wells and decided that they may be the answer for our golf course. My green committee was a little suspect at first, because no one had heard of a "horizontal well."

I asked the company to come in and give a presentation to the committee. The company presented a short video, made a presentation, answered questions, and the committee said, "Go ahead." I was a little nervous, because it was all on my recommendation, but I plunged forward and had the well installed.

I am writing this article in March of 2002 and, here in Florida, we were still in the midst of a drought. The horizontal well not only has provided ample, good quality water (and continues to do so), I am using less electricity because the well is only 18 feet deep. Additionally, I am applying fewer soil supplements because of the quality of the water, and I am recycling anything that is unused. I was able to make a presentation to my green committee that demonstrated our horizontal well would pay for itself in 10 years.

The horizontal well taps the water that lies near the surface and directly beneath the golf course in a surficial water zone. This technology has the ability to recover water from this resource and deliver it in sufficient quantity to satisfy irrigation and lake augmentation needs. Surplus water that is not used in actual irrigation is returned to the surficial aquifer to be reused later. The system can be permitted to be used as a stand-alone water supply source or to supplement existing water supplies.

The horizontal wells are site specific. However, they work in most places in Florida. To determine if a horizontal well will work at your golf course, you need to spend approximately \$2,500 to \$3,000 for a 25- to 30-foot boring and have a hydrologist run computer models. The report will be pretty accurate and give you a much better idea of what you will get with the horizontal well than you

will ever have when you drill a conventional vertical well.

This is a technology whose day has come. If your site will accommodate a horizontal well, then chances are you will not only have a more-than-adequate supply of good quality water; you will also have a return on your investment.

Club Taps Surficial, Floridan Aquifers, Processes in Own RO Plant

By Michael Caglioni, P.G. and Peter Brooks, CGCS

The Everglades Club is located in the Town of Palm Beach, which is located on an elongated barrier island, the Island of Palm Beach, bounded to the west by the man-made saline estuary of Lake Worth/Intracoastal Waterway, to the east by the Atlantic Ocean, and to the north and south by man-made inlets. The Everglades Club is a private, par 70, 18-hole golf club that covers 70 acres.

The original irrigation water supply was potable drinking water purchased from the Town of Palm Beach Utilities, which purchases its bulk water from the City of West Palm Beach. The City of West Palm Beach obtains its raw water from a surface water body, Clear Lake, and is treated mainly through green sand filtration. The Everglades Club irrigation water was supplied by transferring a drinking water source to the barrier island and then to the golf course. When using potable water purchased from the Town of Palm Beach, The Everglades Club Golf Course had an average monthly water bill of \$20,000.

Alternative Water Source No. 1: Surficial Aquifer

In order to reduce the irrigation costs to the golf course, the Everglades Club investigated the potential of installing its own well field for irrigation purposes. Hydrogeologic investigations indicated that the Everglades Club could install a shallow, surficial aquifer well field that would supply brackish raw water with a total dissolved solids range of 2,000 to 6,000 milligrams per liter to an on-site, reverse osmosis plant for treatment. The finished water is to be utilized for irrigation of the golf course. The Everglades Club received a permit from the South Florida Water Management District to withdraw 146 million gallons per year total from both surface water and ground water (surficial aquifer) sources.

Topography plays an important part in the surficial hydraulic regime of a barrier island and, therefore, the Everglades Club. Normally, the water table will approximate the topography (contours) of the land surface. The height of the water table above mean sea level is a function of the elevation of the land surface, the nature of the hydrogeology (aquifer characteristics), and the amount of rainfall. The topography of the Everglades Club golf course is relatively low, approximately six feet above mean sea level at the eastern edge of the property. To the east of the golf course is a topographic high (consolidated and unconsolidated sand dune to ± 15 feet MSL) on which housing and roadways have been

ONE CALL HANDLES IT ALL

JOHN DEERE LANDSCAPES

It's a superintendent's ideal situation: Keeping the course 100 percent playable throughout the season. Now there's a new team member ready to provide the irrigation supplies, service and support you need to achieve that goal – John Deere Landscapes.

Your local John Deere Landscapes branch is among the most comprehensive suppliers of golf course irrigation equipment in the U.S. With a nationwide network of branches and field staff, John Deere Landscapes has the professional expertise and equipment to solve any site challenge.

Renovation or new construction? John Deere Landscapes features the industry's most advanced

irrigation management tools to control water, labor and energy costs – while helping you achieve that goal of 100 percent playability. Call today: 800-642-3706.



**Professional Irrigation System
Repairs, Renovations, New Construction**

Irrigation Systems Featuring Hunter Golf Reliable rotors, valves, central control systems, maintenance radios

Pump Stations Customized for your course

Fountains and Landscape Lighting AquaMaster and Oase fountains, Vista Professional Outdoor Lighting

BoardTronics Controller Board Repairs Replace outdated Toro® and Rain Bird® controller boards: 888-855-9132

Direct Sales Quantity shipments of landscape products and nursery stock: 866-880-9380

More Than 220 Branches Nationwide



**JOHN DEERE
LANDSCAPES**



The top of the Floridan Aquifer is more than 1000 feet below the surface of the Everglades Club.

developed. This topographic high increases the height of the freshwater head between the golf course and the Atlantic Ocean and impedes the potential of lateral saltwater movement from the Atlantic Ocean to the golf course.

The hydrogeologic investigation (which included the drilling of a test well and collection of lithologic and water quality samples) indicated the presence of a really extensive, clay unit, approximately 1-2 feet thick, from a depth of approximately 29 feet to 31 feet below MSL. The clay unit impedes the upward movement of saline water. As is expected on a barrier island, the water increased in salinity (conductivity) with depth. Below the clay unit, the water quality decreased significantly (more saline).

Twelve irrigation wells were constructed along the eastern edge of the golf course and withdraw water from approximately 19 to 29 feet MSL. This water is pumped and treated through a reverse osmosis membrane plant designed to treat brackish ground water with TDS levels of 2,000 to 6,000 mg/L.

The average TDS concentration of the production wells is 1,500 mg/L. This treated water is pumped into lakes for storage and is then pumped from the lakes to the irrigation system for distribution.

The brackish water lens and the well field are monitored by six saltwater monitor wells. The wells are used to monitor for saline intrusion,

both lateral intrusion and upconing of saline water from greater depths.

The RO water treatment plant at the Everglades Club is designed to output (permeate) 75% of the raw water intake. Each RO plant must consider the raw water quality for proper design and efficiency.

In addition, the disposal method of the reject water (concentrate) must also be considered. The Everglades Club currently discharges its concentrate water to a pond for percolation and evaporation near the Intracoastal Waterway. This pond naturally has a higher salinity than the concentrate water. This disposal option is available to the Everglades Club because of its proximity to saltwater bodies. Other options for concentrate disposal in South Florida include infiltration trenches, injection wells, and discharge to a sanitary sewer system. Each option has its associated regulations and costs. Each of these options should be investigated prior to installation of an RO plant.

The surficial aquifer has limitations of use during drought conditions because of upconing and lateral saltwater encroachment. Computer groundwater modeling was performed to assess the limitations of the surficial aquifer. The model predicted that lateral saltwater encroachment would occur after 10 days of continuous pumping with no recharge.

The Everglades Club is able to minimize the potential for the lateral encroachment of saltwater

Producers of Quality Turfgrasses
for Golf Courses and Athletic Fields



Producers and Installers of Fumigated Georgia Certified Bermudagrasses

- Tifway
- TifSport
- TifEagle
- Tifdwarf
- Centipede Sod/Seed
- Meyer Zoysia

Pike Creek Turf inc.

Route 2, Box 376-A, Adel, Ga. 31620

1-800-232-7453

Rowplanting Services Available



50 Years of Excellence

50th Annual Florida Turfgrass Association Conference & Trade Show

September 16-18

Downtown Hyatt Hotel, Tampa FL
For exhibiting info call Jane at 1-800-882-6721