

Seashore Paspalum Management in Florida

Should you change grasses on your golf course?

By R.R. Duncan, Ph.D. and R. N. Carrow, Ph.D.

Reality Check

Since water issues (quality, quantity, conservation) are and will continue to drive the Florida golf course industry and will dictate turf management strategies in the future, understanding the entire turf ecosystem is becoming more and more important.



The Crown Colony Golf Club in Fort Myers used *SealSle1* on its tees and fairways. Photo courtesy Sam Williams Advertising.

As alternative non-potable water is increasingly being used for irrigation on golf courses, water-quality challenges increase, either from escalating salinity and/or from nutrient load in effluent. Site-specific variability and interactions among the water, the soil, the turf species/cultivar, and the climatic conditions make management both confusing and complicated. The fact that you can grow and manage a salt-tolerant turf grass does not mean that you should be using ocean water for irrigation.

Each acre-inch of irrigation water containing 500 ppm salts will deposit 113 lbs of salt over the irrigated turf area per application; an acre-foot of water at the same salt load will deposit 1352 lbs of salt over the same area with one application. For ocean

water at 34,500 ppm salinity, you would deposit 7776 lbs salt per acre-inch and 93,307 lbs salt per acre-foot of irrigation water per application.

You must manage the salts before, during, and after managing the grass; otherwise, salt loading in the soil will overwhelm the tolerance of the grass and turf performance will decrease. Managing salt buildup in the soil is expensive and time consuming.

Seashore Paspalum as a Turf Consideration

Paspalum vaginatum Swartz is the most salt-tolerant (true halophyte) warm-season turfgrass in the world, but all cultivars vary in level of salinity tolerance from hybrid bermudagrass levels to near ocean-water levels.

The grass is native to moist, saline habitats, and the turf ecotypes originated in South Africa. The grass evolved on sand dunes exposed to ocean water and rainfall for moisture and nutrients. Seashore paspalum developed a rapid rooting capability as well as an extremely efficient nutrient uptake system while evolving on those beach sands. The grass is one of, if not the most environmentally friendly turfgrasses that can be grown.

Why is it an environmental turfgrass? It possesses five major inherent abiotic stress tolerances: salinity, drought, waterlogging/low oxygen, low light intensity (not tree shade), traffic/wear/compaction. The grass has reduced nitrogen requirements (30-50 percent less) compared to hybrid bermudagrasses, and has developed very sophisticated nutrient uptake and utilization mechanisms. It harbors high populations of beneficial predator insect populations (such as wasps), especially against the worm complex; this trait can be readily utilized in integrated pest management programs.

It has tremendous flexibility in utilization of alternative and variable quality irrigation water resources, ranging from effluent or recycled water to brackish sources. The grass has excellent environmental bioremediation/land reclamation/dune stabilization capabilities. Marketed cultivars vary in their response to these traits.

The Rumors are Rampant

One of the challenges for any grass is dispelling the rumors that surround the turf. Some of the attributes are embellished and most of the limitations never seem to surface. There is no perfect grass. Seashore paspalum is not a utopian grass or a miracle grass because of its high salt tolerance. It is a good grass that, if managed properly, has tournament quality and playability.

No, turf-type seashore paspalum is not invasive. Coarse-leaf-textured ecotypes of this grass have been in Florida for centuries. The turf ecotypes have been in the state since the 1950s with no invasive tendencies. An entire herbicide arsenal is available to take the grass out of bermudagrass or other grasses quite effectively.

Yes, seashore paspalum can be grown on non-salt-affected sites and you can use fresh water for irrigation. No, it is not just another warm-season grass like the hybrid bermudagrasses or St. Augustinegrasses. Management is totally different and unique to this species. Not all cultivars are created equal.

Yes, you will use less nitrogen fertilizer, but you may use additional amendments (Ca, K, Mn)

to effectively manage the saline irrigation water and potential salt loading in the site-specific soils. No, you cannot grow-in this grass with high salinity water unless you want a long grow-in period and want to spend extra money on grow-in management. Salt is a growth regulator even on seashore paspalum.

Yes, you can potentially conserve water (30-50 percent) with this grass compared to the hybrid bermudagrasses, but it depends on salt load in the irrigation water, the site-specific environmental (i.e., rainfall distribution and frequency) conditions, the efficiency of the irrigation system, and how much leaching of excess salts must be accomplished. Proper management is the key.

Salt Removal?

Seashore paspalum is a phytoaccumulator of heavy metals and nutrients, but not high levels of salt compared to total salinity concentrations normally found in soils. The entire root and shoot portion of the turf will hold about 9-17 percent salt (mainly sodium) on a dry-weight basis.

The grass very strictly regulates uptake of sodium and eventual movement/ compartmentalization of that sodium at sufficiency levels internally in the plant. If all clippings and total plant material (roots

and shoots) are removed from all turf areas, the total salt ion removal with harvested tissue would range from 553-3488 lbs/acre/yr, which is minimal compared to the total salt load in soils.

Attributes of the Grass

Compared with other turfgrasses, seashore paspalum has a wide soil pH adaptability range across ecotypes (3.6-10.0), depending on ecotype/cultivar, but management under precision turf conditions is still recommended between pH 5.5-8.0 to optimize turf performance because of soil-related and nutritional problems at each extreme pH.

Most alternative and variable quality irrigation water sources can be used for irrigation. The grass is primarily rhizomatous and secondarily stoloniferous, with an inherent capability to develop about twice the root volume of the hybrid bermudagrasses when managed properly. When the grass is injured from excess traffic or disease/insect infestation, seashore paspalum shifts into a rhizome/root regeneration mode, with carbohydrates allocated to below-ground turf organs and minimal carbohydrate maintenance of the shoot portion.

The grass has low mowing height tolerance (1/10-inch to 1/8-inch range, depending on culti-

var). The efficient nutrient uptake and utilization system has been mentioned. There is no "genetically inherited grain" in the greens. Seed heads may be produced but the probability of viable seed being produced is extremely low because of extremely precise temperature and genetic requirements needed for seed set.

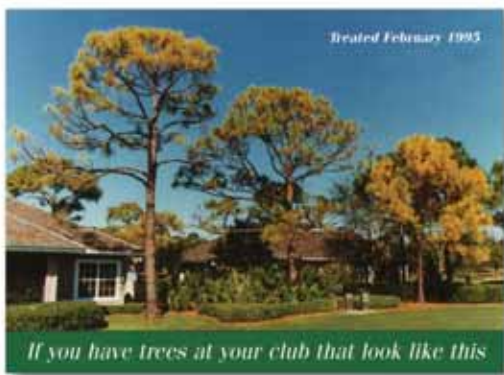
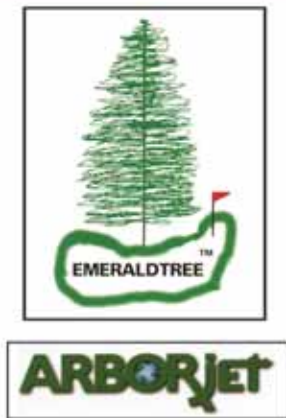
There is virtually no or minimal morning dew on the grass due to the high wax load on the leaves (the hybrid bermudagrasses have numerous small hairs that will hold water droplets). The grass has a shiny dark green hue similar to Kentucky bluegrass or perennial ryegrass.

Seashore paspalum has the capability to root into most soil types, ranging from sands, expanding and non-expanding clays, to silt, to mucks/swamps. At this point, no verified mutations (compared with the hybrid bermudagrasses) have occurred with this species. The genome apparently is very stable compared with other warm-season grasses.

Limitations of the Grass

There are always positives and negatives with any grass. Seashore paspalum is no exception. As with any other turf species, it is important to know the specific attributes inherent in each individual cultivar,

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rather than generalized attributes of the grass based on where it may have originated. Significant variations occur across cultivars for salinity tolerance, traffic tolerance, low light intensity tolerance, mowing height response characteristics, and other traits. Thus, one area of confusion is the tendency to claim attributes for a cultivar that has not been documented by scientific-based research data followed by multiple on-course evaluations and involving several years.

The grass has minimal tree shade tolerance, similar to the hybrid bermudagrasses. The rule of thumb is that if you have tree-shade problems with bermudagrass, then you will have tree-shade problems with seashore paspalum. The primary problem is the excessive tree shade, and not the turf species (zoysiagrass or St. Augustinegrass are usually better turf choices under heavy tree shade).

However, seashore paspalum does a better job of utilizing ultraviolet wavelengths coming through cloud cover, smog, or fog compared to the hybrid bermudagrasses with SeaIsle1 exhibiting the best low-light-intensity tolerance found in research studies to date. Seashore paspalum seems to utilize deflected or reflected light better than the hybrid bermudagrasses.

Cold hardiness is similar to the hybrid

bermudagrasses. The grass cannot be established with highly saline water (greater than 5000 ppm total dissolved salts; recommended salinity load for grow-in is less than 2000 ppm) without delaying grow-in for any of the currently marketed cultivars. Seed head persistence as a cosmetic problem varies by cultivar, but plant growth regulators are available to suppress seed heads when warranted. There are very few pesticide labels that include seashore paspalum, but this problem is slowly improving.

The grass absolutely should not be scalped. The authors have noted one university publication that states that seashore paspalum does not mow cleanly — early research at the University of Georgia documented that 'Adalayd' and some of its derivatives were difficult to mow properly, but the improved university-researched cultivars do not have this problem. Overall worm complex (fall armyworm, sod webworm, grubs) resistance is, at best, low to medium low compared with bermudagrasses and this insect response goes across all paspalum cultivars on the market. The number-one problem with the grass is the lack of understanding on how to effectively manage this turfgrass and how to continuously manage the salt load in the irrigation water.

Infrastructure Improvements for Effective Salt Management

As water quality decreases and salinity challenges increase, spending money on golf course infrastructure can effectively reduce long-term maintenance budgets and improve grass management that will be easier to reach the performance expectation levels for the grass on the golf course. The best money can be spent on the irrigation system to enhance water distribution efficiency, either as a retrofit or upgrade, or installation of a more modern system. This is the best water conservation decision that any golf course can make — being able to apply the water exactly where it is needed, when it is needed, and at the quantity needed to efficiently manage the salts in the water and the soil.

Install drainage, especially in low fairway areas and on the low edges of greens to effectively pull salts away from the turf root system. Utilize soil profiles that are conducive to salt and water movement (continuous infiltration/percolation at effective rates); for example, utilizing sands in the greens that range between 0.25-1.00 mm, with less than 10-15 percent total combined clays, silt, fine sands and organic matter (peat), and percolation rates greater than 10 in./hr.

Utilize irrigation water as low in salinity

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SeaDwarf, which was used on the Crown Colony Golf Club shown here, is another of the popular paspalum cultivars being used on golf courses. Photo by Joel Jackson.

as possible, depending on the various sources that can be blended. Install chemigation equipment on the irrigation system to have the flexibility to apply liquid fertilizers, amendments such as flowable lime or gypsum, wetting agents, or other chemicals.

Install moisture- and salinity-monitoring equipment on the course to improve salinity and water-use management. On coastal sites, get a geohydrology assessment completed to determine tidal influences on subsurface soil profile (i.e., acid sulfate conditions) and salt water inundation potential into on-site water resources.

Availability of Cultivars

Since cultivars are not created equal, selection of golf course friendly cultivars can be a critical decision. Two cultivars from the University of Georgia USA – Seaisle1 (www.seaisle1.com) for fairways, tees, roughs and occasionally for greens, and Seaisle 2000 (www.seaisle2000.com) for greens and now being grassed on entire golf courses are available. Seaisle1 and 2000 are the only patented, certified, and university-researched seashore paspalum cultivars available globally. Extensive research on these two cultivars has been published and is available from the authors.

At the present time, there are 17 total seashore paspalum cultivars available in the world. A new cultivar – experimental SI98 or OC03 (formal name is pending) was released from the University of Georgia in November 2004 and should be available for grassing late this year. This new cultivar is suitable for course-wide planting from greens to roughs. Other proprietary cultivars available for grassing in Florida include Seadwarf and Salam.

Seashore Paspalum Playability Factors

Several factors are contributing to the

acceptance of seashore paspalum for use on golf courses. The high salinity tolerance and flexibility in using alternative poor quality irrigation water, the cosmetic appearance resembling Kentucky bluegrass, the tournament-quality playability — putting quality under close mowing heights and the ball “set up,” and the environmental attributes are all contributing to this acceptance.

The positive playability factors include ball set up, color — shiny dark green hue, ball striking control, no “grain” in the greens, density of putting surface, and trueness of ball roll.

The negative playability factors include a “sticky” surface, slow greens, greens that are difficult to read, bumpiness or “chatter” in the ball roll, and the trueness of ball roll: all of these negative complaints are directly attributable to the overall management program and understanding how to effectively manage the grass under greens heights.

*AUTHORS' NOTE: The authors invite questions on comprehensive and correct management protocols, assessing the salinity impact on your golf course, and long-term performance of the grass. A comprehensive list of published seashore paspalum articles can be sent via email attachment if requested. The contact information for all authors is listed on the inside front cover. At Florida Green presstime, two articles by Drs. Duncan and Carrow were scheduled to be published in **Golf Course Management** regarding comprehensive greens management details for seashore paspalum).*

EDITOR'S NOTE: We are not promoting this turf variety over any others, but there may be growing sentiment for using this grass among regulatory agencies, and we want you to know as much as possible about the pros and cons of these new turf varieties.

References

- Copyrighted Workbook for GCSAA-sponsored 1-day workshop: Seashore paspalum management on golf courses (taught by the author)
- Copyrighted Workbook for GCSAA-sponsored 2-day workshop: Salt-affected turfgrass sites: assessment and management (co-taught by the author)
- Copyrighted Workbook for GCSAA-sponsored 1-day workshop: Turfgrass water quality: assessment and management (co-taught by the author)
- Copyrighted Workbook for GCSAA-sponsored 1-day workshop and online course (W.A.T.E.R. at www.gcsaa.org): Best management practices for turfgrass water conservation (co-taught by the author)
- Duncan, R.R. and R.N. Carrow. 2000. Seashore paspalum—The Environmental Turfgrass. Ann Arbor Press, Chelsea, MI (now John Wiley Inc., NY at www.wiley.com or www.gcsaa.org).
- Braman, S.K., R.R. Duncan, W.W. Hanna, and M.C. Engelke. 2003. Arthropod predator occurrence and performance of *Geocoris uliginosus* (Say) on pest-resistant and susceptible turfgrasses. *Environmental Entomology* 32(4):907-914.
- Jiang, Y.W., R.R. Duncan, and R.N. Carrow. 2004. Assessment of low light tolerance of seashore paspalum and bermudagrass. *Crop Science* 44(2):587-594.
- Lee, G., R.N. Carrow, and R.R. Duncan. 2004. Photosynthetic responses of salinity stress of halophytic seashore paspalum ecotypes. *Plant Science* 166(6):1417-1425.
- Carrow, R.N. and R.R. Duncan. 1998. Salt-affected turfgrass sites: assessment and management. Ann Arbor Press, Chelsea, MI (now John Wiley Inc., NY at www.wiley.com and www.gcsaa.org).
- Duncan, R.R. 2003. Seashore paspalum (*Paspalum vaginatum* Swartz). P.295-307. In M.D. Casler and R.R. Duncan (eds.). *Turfgrass Biology, Genetics and Breeding*. John Wiley Inc., NY.
- Duncan, R.R. 2001. All seashore paspalums are not created equal. *Golf Course Management* June: 89-93.
- Duncan, R.R. and R.N. Carrow. 2002. Thou shalt not scalp seashore paspalum. *Golf Course Management* April:57-60.
- Duncan, R.R. and R.N. Carrow. 2002. Growing in seashore paspalum with multiple challenges. *USGA Green Section RECORD* 40(3):22-28.