

# Sanibel Golf Course Fertilizer and Lake Management Recommendations Annual Report Card



September 2017



This report was specifically prepared for:

**The Dunes Golf and Tennis Club**

## Introduction

Stormwater runoff from urban landscapes and golf courses is a major source of nutrients contributing to algae blooms and water quality impairments in Florida. Poor water quality not only impacts wildlife habitat and the quality of life for island residents, but it can directly impact our local economy by reducing property values and the overall experience of visitors to our island. As a result, protecting Sanibel's water quality is of paramount concern to the City of Sanibel.

The Florida Department of Environmental Protection (FDEP) is the state agency responsible for protecting Florida's waters. Waters that do not meet the state's water quality standards are deemed "impaired" under the Florida Impaired Waters Rule (Ch. 62-303, F.A.C.). To address these impairments, the FDEP is developing Total Maximum Daily Loads (TMDL) for each waterbody that does not meet minimum water quality standards. The TMDL is the maximum amount of a pollutant that a waterbody can assimilate on a daily basis without causing an imbalance in the natural flora and fauna. As part of the TMDL process, all local governments with impaired waterbodies within their jurisdiction will be required to participate in a Basin Management Action Plan (BMAP) process and will be required to address pollutant sources that are contributing to the impairment. In August 2017, the FDEP established a TMDL for the Sanibel Slough to address nutrient impairment in both the East and West Basins of the Slough system. To meet the target conditions set in the TMDL, a 26% reduction in existing total nitrogen (TN) loads and a 34% reduction in the existing total phosphorus (TP) loads are necessary in the West Basin. In the East Basin, a 54% reduction in existing TN loads and a 74% reduction in existing TP loads are necessary to achieve target conditions.

The City of Sanibel has taken several measures to improve water quality throughout the island. These measures include acquisition of environmentally sensitive lands, mangrove protection, native plant protection and sod limitations, beach and dune protection, conversion from septic to central sewer, responsible development through reductions in impervious surfaces and onsite stormwater management, implementation of the National Pollutant and Discharge Eliminations System Program, island-wide water quality monitoring, adoption of

an urban fertilizer ordinance, and nutrient and lake management recommendations for golf courses. In June 2017, the City launched the Sanibel Communities for Clean Water (SCCW) program, which aims to educate residents in regards to the role they play in protecting water quality, and what actions they can take to improve water quality in their community. While the City has taken a very proactive role in improving water quality, the Sanibel Slough and many residential and golf course lakes on Sanibel remain “impaired” for nutrients such as nitrogen and phosphorus. Managing stormwater runoff from golf courses on Sanibel is critical to ensuring that fertilizer and other chemicals used to maintain turfgrass do not inadvertently impact sensitive areas such as lakes, wetlands, and coastal waters. While we realize that each golf course is unique and was designed and permitted to function in a very specific way, all of the golf courses on Sanibel have the potential to discharge into natural waterbodies, either directly or indirectly. As a result, the City has taken additional measures to ensure that water leaving golf course lakes meet the water quality standards of the receiving waters.

In October 2008, in an effort to improve the quality of water discharged from Sanibel’s golf courses, City Council adopted a list of Nutrient Management Recommendations that were based on the Florida Department of Environmental Protection’s *Best Management Practices (BMPs) for the Enhancement of Environmental Quality on Florida Golf Courses (2008)*. These recommendations provide specific guidance for golf course managers on how to reduce fertilizer use and improve water quality within their respective golf course lakes. Since their adoption, City staff has worked closely with each golf course to provide technical assistance to help implement these recommendations.

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The City Natural Resources staff met with Club Manager Brian Kautz and Superintendent Mitch Miller of The Dunes Golf and Tennis Club in October 2017 to review the status of implementing the City’s Golf Course Nutrient and Lake Management Recommendations. As a result of that meeting, the City has updated the annual “report card” for the Dunes.

A report card is provided annually to each golf course to help track progress and guide implementation of the City’s recommendations. The report card uses a point system to evaluate performance. Each recommendation or best management practice (BMP) is scored from 0 to 5, based on the completeness of implementation. Out of 13 BMPs, a maximum of 65 points can be earned. The score is calculated as follows: 0–80%, Not in Compliance; 81–90%, Partially in Compliance; and 91–100%, Full Compliance.

The Dunes Golf and Tennis Club earned **61 out of 65 points**, for a score of **94%**. This is a **31% improvement since 2011**, and a **1% improvement from 2016**. The Dunes is in **“Full Compliance”** with the City’s BMP recommendations.

BMP Matrix / Staff Recommendation	Score
<b>Education</b>	
Require that each superintendent ensure that all course employees are trained in the <i>Best Management Practices for the Enhancement of Environmental Quality on Florida Golf Courses</i> (FDEP 2007), including water quality related issues and environmentally sensitive areas around the golf course.	5
<b>Lake Management</b>	
Within 5 years of adoption, a minimum of 30% of the littoral zone of each golf course lake must be planted and maintained with submerged or emergent aquatic vegetation on a minimum of 3' centers.	4
Require that golf courses monitor the water quality in their lakes 2x/year (wet season/dry season) and provide the data to the City's Natural Resources Department. Minimum parameters should include dissolved oxygen (DO), total nitrogen (TN), total phosphorus (TP), chlorophyll a (chl-a), and copper (Cu). If nutrient or heavy metal concentrations are excessive, City staff will meet with golf course management staff to review and determine a mitigation plan.	5
Require that all fish kills and algae blooms are reported to the City's Natural Resources Department.	5
<b>Fertilizer Management</b>	
Limit soluble nitrogen applications to ½ lb/1,000ft <sup>2</sup>	5
Identify and map environmentally sensitive areas within the golf course and identify no fertilizer buffer zones around all of the waterbodies and map drainage patterns.	5
Require 25-foot native plant or unfertilized grass buffers around environmentally sensitive areas such as lakes and wetlands, where practical. When a 25-foot buffer is impractical, a minimum 10-foot buffer is required.	4
Require that grass buffers around environmentally sensitive areas such as lakes and wetlands be mowed 2" higher than the other grass to slow and filter overland flow to waterbodies.	4.5
Require that all washdown facilities have runoff properly treated prior to discharge off of the site.	5
Require periodic inspections of fertilizer storage areas and washdown facilities by DNR staff.	5
Require that all golf courses on the island maintain annual fertilizer and copper sulfate logs and make them available to the City's Natural Resources Department.	5
<b>Irrigation and Fertigation</b>	
Require that all reuse water be setback 25-feet from all waterbodies and that all irrigation heads using reuse water or fertigation (application of fertilizer through an irrigation system) be setback 25-feet from a waterbody. When a 25-foot buffer is impractical, a minimum 10-foot buffer is required.	3.5
Require that golf courses quantify their water use and differentiate between reuse and potable water supplies. This information can be used to account for the nutrients in reuse water when making fertilizer calculations.	5
Total Points (out of a maximum of 65 points):	<b>61</b>

### Areas meeting the City's recommendations:

1. *Best Management Practices training for golf course staff.* In May 2011, The Dunes developed a formal BMP training program for golf course personnel. In July 2017, golf course employees participated in the annual training and have acknowledged they have been trained and understand the basic principles of the *Best Management Practices for the Enhancement of Environmental Quality on Florida Golf Courses*.
2. *Water quality monitoring and reporting.* Since October 2008, The Dunes has collected water quality data on a semi-annual basis and has provided the results to City staff. This data is used by staff to help track water quality in the golf course lakes. In April 2012, The Dunes contracted with the SCCF Marine Lab for water quality monitoring services. Monitoring includes water quality sampling, storm event sampling, mapping of drainage patterns, and recommendations on how to improve water quality in the golf course and community lakes. The 5th annual report was submitted in September 2017. Previous monitoring reports have shown downward trends in mean nitrogen values and chlorophyll *a*. Phosphorus in the lakes has been less responsive and has displayed an increasing trend. With this latest analysis, the downward trends previously found have been reversed and an upward trend in chlorophyll *a*, nitrogen and phosphorus values is apparent. According to the SCCF report, these changes are likely "a short term deviation from a longer term water quality improvement. The recent decay in water quality may be caused by unusually great rainfall volumes from the wet season of 2015 through the wet season of 2016. They may also be an indication that further water quality improvements will be more difficult to achieve due to groundwater interactions and/or continued use of reclaimed water."
3. *Reporting of fish kills and algae blooms in golf course lakes.* The Dunes staff reported several small fish kills in 2017. In January, a small kill of tilapia was observed in Lake 3; in May, a small kill of mullet occurred in Lake 4; and in August, a small fish kill was reported in Lake 1 (following several days of heavy rainfall). Several algae blooms were also reported (January, March, October 2017). The October bloom spanned several of the golf course lakes and was likely due to resuspension of nutrient rich sediments by Hurricane Irma. In response to a bloom of filamentous green algae in March 2017 in Lake 4, golf course staff manually harvested a significant quantity of algae, ultimately removing nutrients from the system.
4. *Limit soluble nitrogen applications to ½ lb/1,000 ft<sup>2</sup>.* Fertilizer data provided to the City by The Dunes staff demonstrates that they currently limit application of soluble nitrogen to ½ lb/1,000 ft<sup>2</sup>. This minimizes the potential for runoff of soluble nitrogen into golf course lakes available to algae. Applications of soluble nitrogen are mostly limited to ½ lb/1000 ft<sup>2</sup>.
5. *Identify and map environmentally sensitive areas around golf course lakes.* Formal mapping was completed in July 2012. A map showing all

environmentally sensitive areas was provided to City staff on June 14, 2012. A map showing drainage patterns was provided in SCCF's first quarter monitoring report (July 5, 2012).

6. *Require 25-foot native plant or unfertilized grass buffers or 10-foot buffers where 25-foot is impractical around environmentally sensitive areas.* At a minimum, 10-foot buffers have been established around most of the environmentally sensitive areas, including lakes and wetland areas. Additional vegetation buffers were added to two bulkhead areas in 2014; additional buffers should be installed along bulkheads where feasible.
7. *Require that grass buffers around environmentally sensitive areas such as lakes and wetlands be mowed 2" higher than other grass to slow and filter runoff.* Grass is allowed to grow at least 2" higher than grass on greens, fairways and tees to slow water and nutrient runoff. Additional buffers should be installed along bulkheads where feasible.
8. *Proper maintenance of washdown facilities and runoff.* The Dunes maintenance area and washdown facility were in good working order at the time of inspection and there were no signs of washdown water being discharged from the site.
9. *Allow City staff to conduct periodic inspections of golf course facilities.* The Dunes staff has been very cooperative and has provided full access to the golf course and all of its facilities for annual inspections. During the most recent inspection, all fertilizer and chemicals were properly stored and the maintenance facility and washdown area appeared to be in good working order.
10. *Maintain and make available fertilizer records and copper sulfate logs.* The Dunes maintains annual fertilizer and lake management records. This data was made available to City staff. Although the Dunes did not apply any phosphorus in 2015, phosphorus applications were made to the greens in 2016 (0.26 lbs/1000 sf) and to greens and tees in 2017 (0.68 lbs/1000 sf and 0.21 lbs/1000 sf, respectively). From September 2016-August 2017, as compared to the same period one year ago, nitrogen applications increased on all areas of the course--greens by ~50% (renovated in 2016), tees by 70%, and fairways/roughs by 14%. The Dunes has not applied copper sulfate to its lakes for algae control since 2011.
11. *Quantify golf course water use and the source of water used.* The Dunes quantifies their water use; all water used to irrigate the course is reuse water provided by the City. From September 2016-August 2017, the average nightly irrigation was 139,740 gallons.

### Areas for improvement:

1. *Planting of shoreline vegetation along golf course lakes to facilitate nutrient removal.* Within 5 years of adoption of the City's recommendations, all golf courses should have a minimum of 30% of the shoreline of each lake vegetated with submerged or emergent aquatic plants. Significant shoreline improvement has been achieved simply by reducing/eliminating shoreline mowing and discontinuing herbicide treatment within the lakes, allowing native submerged aquatic vegetation to establish. Although important, plantings on the upper lake banks (canna, sea-oxeye daisy) do not provide the same nutrient uptake benefit as submerged and emergent vegetation. It is important that The Dunes continue efforts to establish emergent vegetation particularly along the shoreline of holes #5, 6, 7, 8, 9, 10, 11, 16, 17, and 18.
2. *Require that all irrigation heads using reuse water be set back 25' from all waterbodies or 10' where 25' is impractical.* The current irrigation design includes several heads that are located within 10' of waterbodies and sensitive wetland areas. The Dunes staff, often informed by concerned residents, closely monitors these irrigation heads to prevent re-use water, which may also contain fertilizer (fertigation), from spraying directly into golf course lakes; new sprinkler heads are kept on-hand allowing for immediate replacement of malfunctioning heads. A complete redesign of the irrigation system would be needed to move heads a minimum of 10' from all waterbodies. However, in making repairs to the irrigation system post-Irma, approximately 400 linear feet of irrigation line directly adjacent to the bank of Lake 5 was relocated 25-feet away from the edge of the lake. As a result, 6 irrigation heads are now compliant with this recommendation. Additional strategies identified in the Dunes Lakes Water Quality Report to reduce runoff from reuse water should be implemented, including eliminating irrigation during periods when turf is already saturated with water and not spraying on roads, cart paths, driveways.
3. *Additional buffer zones along the bulkheads should be considered in order to meet the minimum 10-foot buffer requirement.* In 2017, The Dunes experienced significant damage to one of its bulkheads due to an irrigation failure; several others were damaged as a result of Hurricane Irma. As The Dunes explores methods of potential repair/replacement, consideration should be given to options that would allow for these areas to be redesigned to establish more gradual slopes that may ultimately be planted with native species and improve uptake of nutrients from the course before entering the adjacent lakes. Installation of a "Beemat" or other floating treatment wetland system could provide benefits in areas where buffers and/or redesign are not feasible.
4. *Consider soil phosphorus storage capacity testing.* Since SCCF began monitoring water quality in The Dunes, phosphorus concentrations have

remained constant or increased, which is likely due to the high concentrations of phosphorus in the reclaimed water used for irrigation. According to the SCCF report, although phosphorus is typically adsorbed to soil particles or used by vegetation, it is likely that soils in the golf course are saturated with phosphorus and act as a source rather than a sink from long term use of reclaimed water. Therefore, it is highly recommended that The Dunes perform soil phosphorus storage capacity tests to better understand how the application of additional phosphorus may effect nutrient concentrations in runoff and groundwater. The results of the testing may suggest that phosphorus applications are unnecessary, and golf course phosphorus needs can be met through phosphorus sources already present in the soils. The continued use of nutrient-rich reclaimed water will also help to meet the phosphorus demands.

### **Additional Noteworthy Efforts**

1. With data from the flow monitoring equipment installed in 2014 at Dunes stormwater weir (Lake 4), SCCF estimated that in 2015 at least 38 million gallons of stormwater were discharged from the Dunes stormwater system into Tarpon Bay, carrying 860 pounds of nitrogen and 50 pounds of phosphorus. On high tides, estuarine water overtops the existing weir, flowing into the lakes and reducing the capacity of the lakes to accommodate stormwater runoff. In partnership with the Dunes, the City completed the installation of a tidal flap gate at the Dunes stormwater weir in September 2016 to prevent high tides from filling the lakes and reduce harmful discharges to Tarpon Bay.
2. In 2017, Lake 4 in The Dunes began accumulating large quantities of floating vegetation. Rather than using chemicals to treat this vegetation, which would result in the release of nutrients via decomposition, The Dunes contracted a lake management company to mechanically remove algae with a Truxor algae-harvesting workboat. The Truxor performed three full days of vegetation harvesting and removal in Lake 4. This practice has undoubtedly resulted in a large export of nutrients and a reduction of internal loading in the waterbody.