ASCE FLORIDA SECTION
Sun Coast Branch

October 2015
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Civil Times

PRESIDENT'S MESSAGE

Dear Members and Friends of ASCE,

The term of office for current Suncoast Branch Officers ended September 30. On behalf of the Executive Board Members, I thank all of you for the support in keeping the branch active and fun to learn, giving back, and networking with fellow engineers and our community. The branch has kept pace with all ASCE national, Florida Section, and branch programs. You provided support with funds, through sponsorship of events and volunteering your time for the many programs that the branch engages in.

To the past branch executive officers and members who provided great counsel to me, please accept my sincere gratitude for the kind gesture. It takes a village to raise a child and so does great counsel from members of an association to its executives enhances good practices and success. Please extend the same level of care to the new officers for the continued success of the Suncoast Branch.

The following are the names of the newly elected officers to handle the affairs of the association beginning October 1:

- President – Salvatore DePaolis
- Vice President – Norman Robertson
- Treasurer – Geza Bankuty
- Secretary – Marquis Bing

Please come support the new officers at their installation on October 15. The past president of the Florida Section, Mr. Adnan Javed, will be installing the new officers.

It was an honor serving you for the past year. Please let us welcome Mr. Salvatore DePaolis and his team.

- Kwamena Sankah, P.E., MBA

INSIDE THIS ISSUE

WANT MORE?

Help us to fill this space by submitting more content to our newsletter. Gain more exposure for you, your company, or your event by emailing your technical articles, announcements, Flyers, or photos to:

asce.suncoast@gmail.com

EDUCATION CORNER

The SunCoast branch is introducing a new section to our newsletter. This section will focus on providing valuable information to our members related to continuing education, opportunities for PDH credits, and information related to upcoming PE exams. Below is a PE exam-type question to give a little more practice for those taking the exam on October 30th. It should also help sharpen the skills of our experienced PEs.

500 gal/min of 100° water flows through 300 ft of 6-inch schedule-40 steel pipe (0.0002 specific roughness). The pipe contains two 90° elbows, two gate valves, a 90° angle valve, and a swing check valve. All connections are flanged and steel. The discharge end of the pipe is located 20-feet higher than the entrance.

1.) What is the total equivalent length of pipe of the valves and fittings?

a) 150 ft

b) 185 ft

c) 325 ft

d) 450 ft

2.) Using the Darcy-Weisbach equation, what is the pressure difference between the two ends of the pipe?

a) 8 psi

b) 10 psi

c) 12 psi

d) 14 psi

3.) Using the Hazen-Williams equation, what is the pressure difference between the two ends of the pipe? Assume C=100

a) 8 psi

b) 11 psi

c) 13 psi

d) 15 psi

The answers to these questions can be found on page 7

If you would like to make an announcement in the Education Corner or if you would like to submit an exam-type question for inclusion in a future edition, please email asce.suncoast@gmail.com

ANNOUNCEMENTS

ASCE SUNCOAST BRANCH MONTHLY LUNCHEON

WHEN: **Thursday, October 15, 2015**
Check-in begins at 11:40 AM

WHERE: **Derr Dutchman**

RSVP: **http://ascesuncoast.weebly.com/monthly-meetings.html**

TOPIC: **How to Attract, Hire, and Retain the Best People**

GUEST SPEAKER: CINDY MORAN

Cindy's 20+ years of experience and expertise in Learning and Development spans a variety of industries, including sales, healthcare, call center, financial, fitness, wholesale supply and non-profit. Her personal goal is to maximize the potential of the individual and the organization for growth, and she has guided companies both large and small through high growth and organizational change.

To complete a brief behavioral survey, go to http://predictiveresults.com/pionline. Enter the Referral Code "ASCE" and choose Cindy Moran as 'Referred By'.

INSTALLATION OF SUNCOAST BRANCH OFFICERS

As of October 1, 2015, the new ASCE SunCoast Branch elected officers are as follows:

* President – Salvatore DePaolis, P.E.
* Vice President – Norman Robertson, P.E.
* Treasurer – Geza Bankuty, E.I.
* Secretary – Marquis Bing , E.I.

Please join us at the October 15th meeting when our ASCE Florida Section Past President, Adnan Javed will be present to install these individuals into their new offices.

Presidents & Governors Forum—September 2015

ASCE Headquarters, Reston, VA

REASSESSING THE EFFICIENCY OF STORMWATER DETENTION PONDS

IN LIGHT OF THEIR ABILITY TO CONVERT INORGANIC NITROGEN INTO ORGANIC FORMS

By: David A. Tomasko, PhD; Emily H. Keenan; Shayne Paynter, PhD, PE, PG; Megan Arasteh, PE

Stormwater management is a serious concern for communities in the State of Florida, as the health of springs, rivers, lakes, and estuaries can be adversely affected by pollutants from stormwater runoff. Recognizing this vulnerability, the State of Florida has adopted stormwater regulations that are designed to reduce the impact of common pollutants—such as the chemical nutrients nitrogen and phosphorus.

A key element in Florida stormwater management is the design and construction of wet detention ponds, which have proven to be an affordable and viable system for removing pollutants. The study profiled in this article was created to determine how efficient wet detention ponds are in removing biologically-relevant forms of polluting nutrients—and to determine if such ponds are more effective than normally assumed.

Regulatory background

Currently, wet detention ponds are designed and permitted under the assumption that the volume of water they receive during storms can be held on site long enough to reduce incoming loads of total nitrogen (TN) by approximately 30 percent. Current criteria for impaired waters require the nutrient-loading ability of ponds to be calculated to demonstrate that no additional loading is occurring, so that existing impairments will not be made worse by any proposed infrastructure projects. In many cases larger ponds are called for; in some cases the pollutant reduction rates are greater larger than wet ponds can provide, which forces more costly options (such as dry ponds) to be considered.

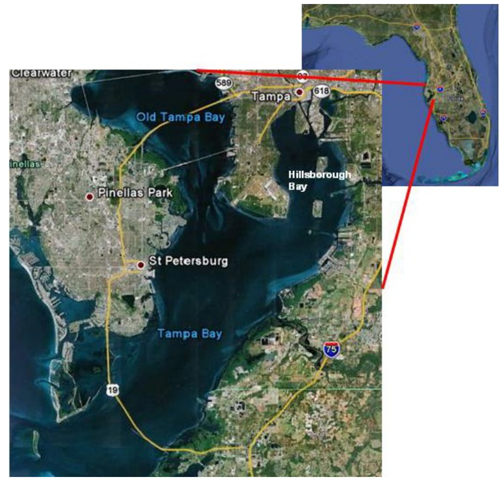


Figure 1. Tampa Bay region of Florida, showing Hillsborough Bay and Tampa

"...in estuarine systems, nitrogen is the typical nutrient of concern..."

Nutrients and their impact on water quality

All water bodies in the State of Florida are evaluated by either the U.S. Environmental Protection Agency (EPA) or the Florida Department of Environmental Protection (FDEP) to assess their water-quality status. An excess of nitrogen and/or phosphorus can result in the overproduction of phytoplankton (algae), which is typically quantified in units of the pigment chlorophyll-a.

With the adoption of numeric nutrient concentration criteria (NNC) by both FDEP and EPA, water bodies are now characterized based on the combined concentrations of chlorophyll-a and chemical nutrients. In estuarine systems, nitrogen is the typical nutrient of concern—as is the case in the Tampa Bay region (Figure 1). But in freshwater systems, phosphorus is normally the greater concern.

Nitrogen, which is generally more difficult for detention ponds to remove, is the focus of this study.

A body of water and its stormwater inflows can be characterized by their TN concentration. TN levels can be further subdivided into dissolved inorganic nitrogen (DIN) and organic nitrogen (ON). In turn, DIN is made up of three primary forms of nitrogen: ammonium, nitrite, and nitrate—and all of these forms are readily assimilated by phytoplankton.

In contrast, the dominant form of nitrogen in stormwater runoff is ON, which is not readily assimilated by phytoplankton (Seitzinger et al. 2002, Bronk et al. 2006, Urgun-Demirtas et al. 2008). ON can be further subdivided into two categories, known as particulate and dissolved fractions:

- Particulate organic nitrogen (PON) is comprised of small organisms and organic debris. PON is not readily available for biological assimilation until its particulate forms are first made available via remineralization—a process that can take days, weeks, or even months.
- Dissolved organic nitrogen (DON) is comprised of compounds less than 0.45 microns in size, such as amino acids and tannins. DON components may eventually become available for phytoplankton uptake, in which case DON is considered "labile." (When DON compounds do not become readily available for algal uptake, they are considered "recalcitrant.")

In well-flushed tidal estuaries such as portions of Tampa Bay, the degradation processes necessary for DON to become DIN may take longer than the average amount of time a water mass resides in the bay. As a result, DIN is likely to have a greater affect on algal growth in well-flushed water bodies compared to DON. Stormwater treatment systems—and the regulatory basis for stormwater treatment rules—are therefore best considered in light of the differing abilities of DIN, DON, and PON to stimulate algal growth.

In assessing the implications of

this information, Seitzinger et al. (2002) concluded that nitrogen loading models that focus only on TN are likely to overestimate the biological impact of nitrogen, as not all forms of TN are equally able to stimulate algal growth.

The implications of differences in the biological availability of different nitrogen forms—and how these forms of nitrogen are modified in typical stormwater treatment systems—should be considered when contemplating changes to stormwater treatment pond regulations. For that reason, the authors designed this study to answer two significant questions:

- Do wet detention ponds in the Tampa Bay region that are managed by the Florida Department of Transportation (FDOT) remove DIN and TN at rates similar to what has been previously documented for wet detention ponds from other types of developed land uses?

- If performance rates are similar, does the elevated rate of DIN removal mean that pond outflows have less of an impact to receiving water bodies than can be predicted solely through TN reduction rates?

Nutrient removal efficiency in stormwater treatment systems

Smith (2010) summarized the nitrogen makeup of more than 900 Florida stormwater samples and found the average sample predominantly contained DON (69 percent of TN by mass) with DIN making up the remaining 31 percent. Those numbers compare favorably with values found by Rushton et al. (1997), where DON made up 72 percent of TN in stormwater, by mass, with the remaining 28 percent in the form of DIN.

Prior studies found that wet detention ponds reduce TN concentrations by about 32 percent, but they reduce DIN concentrations by 68 percent (data from Rushton et al, 1997 and Johnson Engineering 2006, 2008, and 2009). Various FDEP-developed total maximum daily load (TMDL) reports indicate that wet detention ponds can be expected to reduce stormwater TN loads by about 30 percent (e.g., FDEP 2008).

Current evaluations of the effectiveness of stormwater treatment ponds focus only on TN removal. However, when the different forms of nitrogen are considered, these ponds may be more efficient at reducing the impact of nutrients than their presumed efficiencies would suggest—therefore, the impact of treated stormwater on algal populations in a well-mixed water body (such as Tampa Bay) could be minimal.

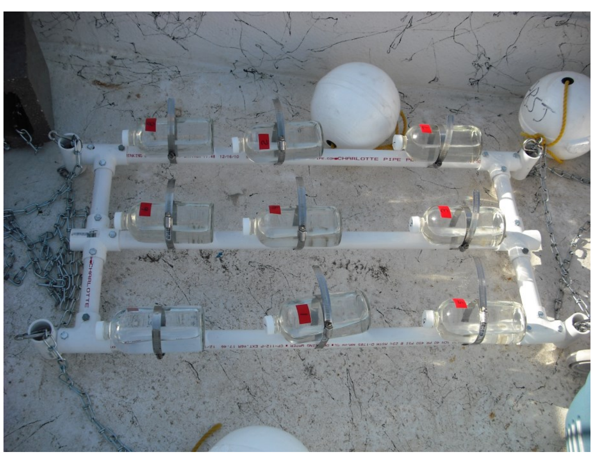
This hypothesis is based on the following logic:

- Water discharging from stormwater treatment ponds has much lower levels of inorganic nutrients than water entering such ponds.

- The organic forms of the majority of nutrients discharged from these ponds are much more refractory than inorganic forms.

A study of wet detention ponds in the Tampa Bay region

For this study, three wet detention ponds were selected for the source of incubation waters from both pond inflows and outflows (ponds referred to herein as D, 3S, and 1). The drainage basin for each pond was comprised solely of transportation land uses. The stormwater ponds are located in Tampa, and discharge into tidal portions of Tampa Bay. Samples from Hillsborough Bay (a subsection of nitrogen-limited Tampa Bay) were used to represent receiving waters and phytoplankton responses to treated and untreated stormwater runoff. The study was conducted in several phases, including testing responses in both wet and dry seasons.



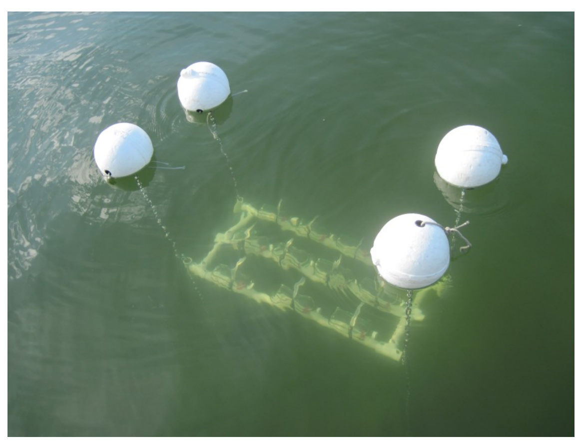


Figure 2. Study apparatus with bottles used to suspend stormwater samples in water column (left). Apparatus with samples incubating in Hillsborough Bay (right).

Results and discussion

Measuring the nutrient concentrations of the stormwater pond inflows and outflows revealed that:

- Inflows were dominated by DON, not DIN. This suggests that TN loads from road runoff are mostly comprised of nitrogen forms that are not as biologically available for algal assimilation as nutrient loads with higher DIN contents.
- Pond outflows became even more dominated by DON as the ponds transformed DIN into DON.
- FDOT ponds reduced DIN concentrations at rates consistent with existing literature.

In pond inflows, DIN comprised from 13 to 46 percent of TN. On average, DIN comprised 29 percent of the TN load. Outflow DIN represented between 1 and 9 percent of the TN load, with an average of 3 percent. Results for the samples taken in August 2011 are summarized in Figure 3.

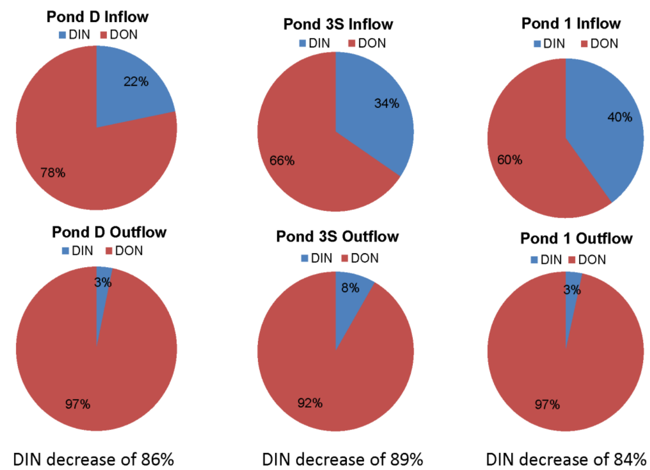


Figure 3. Nitrogen Speciation (August 2011)

Phytoplankton responses to stormwater inflows

Initial and final chlorophyll-a concentrations were measured during every phase of the study. The results suggest that neither pond inflows nor outflows were consistently capable of stimulating phytoplankton growth in bottles filled with ambient water from Hillsborough Bay (Figure 4):

- For the nine events where pond inflows were tested, chlorophyll-a concentrations increased seven times. But for six of those times the increase was 2 µg/L or less—a value not much greater than the detection limit for chlorophyll-a analysis.
- For the nine events where pond outflows were tested, chlorophyll-a concentrations increased three times, but all of the increases were 2 µg/L or less.

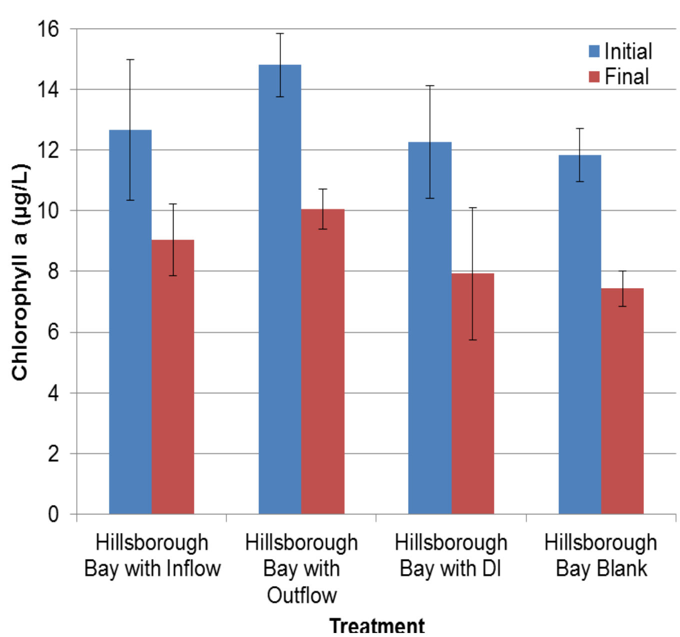


Figure 4. Average algal bloom response for pond inflow s and outflows

Conclusion

The study results suggest that:

- The authors' findings complement existing literature, confirming that wet stormwater detention ponds reduce TN concentrations by approximately 30 percent—but they also reduce DIN concentrations by more than 80 percent.
- In most cases, stormwater runoff from transportation

land use did not stimulate algal growth in Hillsborough Bay.

- Also in most cases, water discharging from FDOT stormwater ponds did not stimulate algal growth in Hillsborough Bay. However, there is evidence that algal populations in these ponds include genera with fairly wide salinity tolerance; and it is possible for these algae to survive in the higher-salinity waters of Hillsborough Bay—at least over a 24-hour period.

The results further indicate that the three FDOT ponds studied may be more efficient at reducing downstream environmental impacts than their presumed TN load-reduction efficiencies of 30 to 40 percent. It appears that modifications to the current design of wet detention ponds may not be needed—at least for FDOT projects—because the ponds may be better at removing biologically relevant forms of nutrients (average of 86 percent) than has been assumed.

Most importantly for FDOT, wet detention ponds appear to provide sufficient environmental benefits when taking into account the biologically relevant forms of nitrogen in stormwater runoff that are found in well-flushed and nitrogen-limited water bodies. Given the hydraulic grade-line limitations facing many FDOT projects, the ability to use wet detention ponds offers substantial cost savings over other stormwater detention solutions.

Proposed changes to Florida's stormwater regulations could require detention ponds to remove 85 percent of nitrogen loads. The good news is that wet detention ponds appear to be able to nearly match dry pond nitrogen removal rates—if the conversion of nitrogen into biologically less available forms is considered. That, in turn, may eliminate the need to build larger, more costly dry retention ponds or dry-wet treatment systems in many (if not most) situations.

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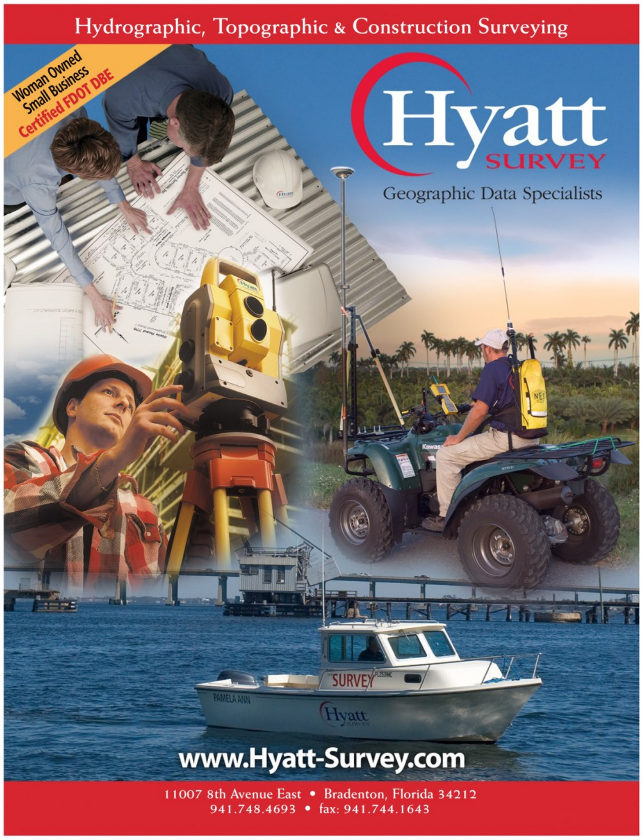

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Answer to Education Corner question: 1.) a; 2.) c; 3.) d

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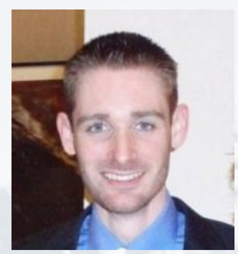

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