

Stormwater Pond Beautification in East Tampa: The Basis for University, K-12, and Community Partnerships that Broaden Participation in Environmental Engineering

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Abstract - Though stormwater retention ponds play a vital role in flood and pollution control throughout Florida, community funded revitalization programs in East Tampa do not address water quality, maintenance or potential impacts of the pond and community members. Engineers for a Sustainable World University of South Florida Chapter (ESW-USF) received an EPA P3 award to establish collaboration between USF, Young Middle Magnet (YMM) (an East Tampa middle school adjacent to a beautified pond) and East Tampa that raises environmental awareness in East Tampa using stormwater ponds as an initial focal point. Student assignments in the undergraduate Environmental Engineering Laboratory at USF are linked to this project through water quality analysis. Informal education was done during East Tampa's Community Survival Day. Outputs from this project include: a) curriculum development for students at YMM; b) stormwater retention pond demonstration modules and community tour; c) baseline water quality data collection for three retention ponds in East Tampa and establishment of a sustainable water monitoring program that links USF classes with YMM's seventh grade class.

Key words: Community, outreach, K-12, education

INTRODUCTION

East Tampa is a historic, predominantly African- American (80.3%) community of 29,518 residents located in Tampa, Florida. Thirty-three percent of the population lies below the poverty line and 48.8% have less than a high school education. The area is home to 25 illegal dump sites and other potentially contaminated sites [1]. The community is currently undergoing tremendous community-driven revitalization and was recently awarded EPA funded Brownfield assessment grants [EPA, 1]. The East Tampa Community Revitalization Partnership (ETCRP) is a coalition of neighborhood groups that advises the city on redevelopment projects within a 7.5-square-mile area designated as a Community Redevelopment Area (CRA) since May 2004 [Johnson, 2]. Many of these projects, such as a new police station, are funded through a 2004 initiated Tax Increment Fund (TIF), which consists of a portion of the area's property taxes. One of the projects selected for funding is a retention pond redevelopment and beautification targeting three ponds in the community. This beautification project was designed under the guidance of Trent Green, Associate Professor at the College of Architecture in University of South Florida (USF), to create community-friendly open spaces with exercise paths and seating areas. Unfortunately, the beautification project does not address water quality issues or pond maintenance (managed by the City of Tampa's Stormwater Department) after the completion of the beautification.

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Properly maintained stormwater retention ponds play a vital role in flood and pollution control in communities throughout Florida [Livingston, 3], [Stoker, 4]. Community members also play a vital role in reducing pollution inputs to stormwater through actions taken in their own yards [Aponte Clarke, 5], [Bannerman, 6], [Lehner, 7], [Sarkar, 8], [Serrano, 9]. Community understanding and awareness of the water quality of these ponds and the health risks posed by consuming fish from these ponds is also needed in places where fishing occurs; an activity that East Tampa residents have already suggested occurs [Campbell, 10], [Campbell, 11], [Casey, 12], [Cole, 13], [Karouna-Renier, 14], [Marsalek, 15], [Yousef, 16]. Although programs such as Hillsborough County's "Adopt A Pond" have been successful at ensuring ponds are well maintained to serve their greatest potential, they require the active involvement of a volunteer community group [SWFWMD, 17]. The "Adopt A Pond" program does not serve communities within Tampa's city limits and there is currently no similar program serving these urban areas.

Water Awareness, Research and Education in East Tampa (WARE East Tampa) is a pilot project proposed for an initial EPA P3 award that focuses on stormwater ponds in an economically disadvantaged urban area. It involves the University of South Florida (Engineers for a Sustainable World Chapter, Civil and Environmental Engineering Environmental Laboratory Class), Young Middle Magnet School and the Health, Education and Social Services Committee (HESS) of the ETCRP. USF is less than ten miles away from East Tampa, making it easily accessible for research and educational projects. One of nine public schools in East Tampa, Young Middle Magnet School focuses on math, science and technology. Young Middle is conveniently located directly opposite one of the targeted retention pond beautification projects which was completed in August 2008.

Goals & Objectives

The goal of this university-community partnership is to establish a sustainable, collaborative mechanism that raises environmental awareness and understanding amongst East Tampa residents. Figure 1 depicts the envisioned collaborative mechanism which has been established for the implementation of this goal. Using a stormwater retention pond as a focal point, the three groups involved developed a framework to educate and communicate with each other and to the broader community about environmental issues related to water in Florida. The objectives for this pilot project are to:

- 1) Develop curriculum for K6-8 that integrates testing of water quality in local retention ponds.
- 2) Establish a sustainable, water quality monitoring program for the redeveloped retention ponds in East Tampa.
- 3) Collect baseline data on heavy metal (Hg, Pb, As, Cu) sediment concentrations in the three ponds targeted for redevelopment.
- 4) Engage East Tampa community members in WARE activities.

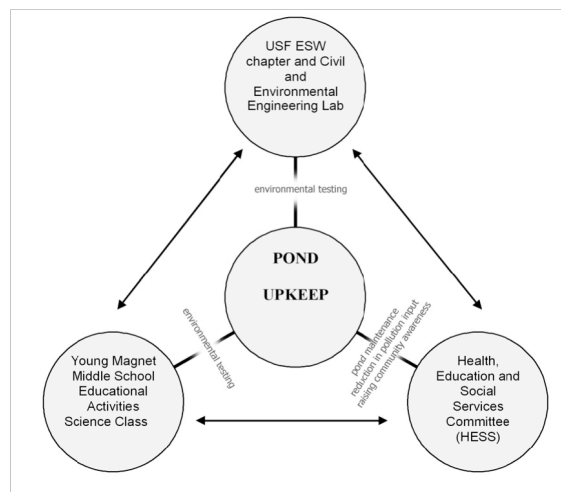


Figure 1: Proposed Model to Sustainably Manage Stormwater Ponds in East Tampa

PATH DESIGNED TO MEET OBJECTIVES

In order to attempt to attain the listed objectives there was an absolute need to ascertain that the right partnerships were fostered; as such the USF Collaborative was consulted. The USF Collaborative (www.usfcollab.usf.edu)

brings together University faculty and students, nationally known researchers, community service organizations and professionals, youth, neighborhood activists, government officials and ordinary citizens to build a better Tampa Bay community. The Director of USF's Collaborative facilitated initial meetings for the development of this project with the PI, ESW student representative, Young Middle Magnet Deputy Principal, Chair of the ETCRP and HESS committee. Details of these partnerships are provided below.



Figure 2. (a & b) Proposed beautification retention pond site in East Tampa directly across from Young Middle Magnet. Partner teachers (c) and some Community Survival Day members (d) apart of EPA P3 grant.

Young Magnet Middle School: This is one of nine public schools in East Tampa and has a math, science and technology focus. As depicted in Figure 2, the school is conveniently located directly opposite one of the stormwater redevelopment projects. A science teacher selected by the Principal and Deputy Principal was identified to work with project team members to develop the most appropriate curriculum that can be applied in the K6-8 classrooms at Young and shared with other schools and community members.

The Health, Education and Social Services Committee (HESS) of the East Tampa Community Revitalization Partnership (ETCRP): This volunteer committee is made up of East Tampa community members who are committed to improving the quality of life in East Tampa. The committee is responsible for an annual event called the East Tampa Community Survival Day (see Figure 2) and will make arrangements for this P3 project to have booth space there in August 2008. The committee will also work with the project to recruit community members interested in working to produce effective communication materials/methods to share project information with East Tampa residents. This also includes providing information for a guided East Tampa storm water pond bus tour that will be incorporated into Young's curriculum and shared with the community during this phase of the grant. The committee will also assist with the organization of the spring 2009 DARE workshop that will be held at Young Middle Magnet. The ETCRP has monthly community meetings in East Tampa where progress and activities of the various advisory committees (e.g. HESS) are shared. The HESS chairperson, Dr. Maxine Woodside, will report on the DARE project at these meetings which will be attended by the USF faculty and ESW students involved with DARE (two faculty advisors, Dr. Trotz and Mr. Trent Green already attend these monthly meetings in East Tampa).

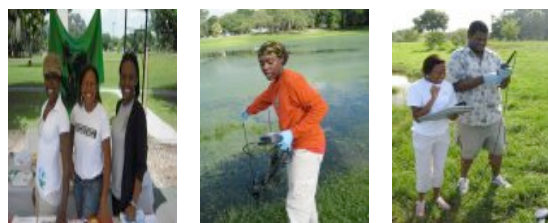


Figure 3. ESW-USF Members performing water quality measurements and participating in East Tampa Community awareness events.

The ESW-USF chapter (www.eswusf.org) started in 2005 to engage a multidisciplinary group at the University of South Florida in actively reducing poverty by improving environmental, social, and economic sustainability worldwide (Figure 3). Partner technical and educational resources to develop sustainable solutions in communities where need has been locally identified. Membership comprises both undergraduate and graduate students.

With the partners in place (Figure 2c & d), there was need to define specific tasks for the partners to partake in to achieve the specific goals. The tasks as outlined in the proposal are:

The science teacher from Young Middle Magnet School will work with USF faculty and students to develop K6-8 curriculum that can be approved and integrated into the school's educational program. They will conduct background research on stormwater ponds in East Tampa and their management, successful community driven management strategies used elsewhere, and relevant K6-8 curriculum. This task was completed in Summer 2008 and put into effect from Fall 2008; to follow on in Spring 2009 also. The curriculum includes water quality testing of the stormwater pond. Other criteria for the curriculum will be identified during this part of the project. Prior to the Spring semester the teacher will first spend a week at the USF campus with access to the lab and research facilities and continue throughout the length of the project with monthly meetings. ESW-USF group first gathered information on stormwater ponds in East Tampa and their management as well as successful community driven management strategies used elsewhere with the most appropriate options for curriculum integrated into the school's educational program and will also be explored and presented as a part of the final project report in March 2009.



Figure 4. ESW-USF members raising community awareness through (a) health understanding; (b) community engagement; (c) interactive water treatment models; and (d) detention pond model discussions.

The curriculum being developed will also include a retention pond bus tour for East Tampa that will be tested on a group of Young middle school students in the Spring of 2009. During the tour, participants will be provided with information about retention ponds, their purpose, construction, and the benefits of the ponds to the community as well as some community history. Chair of the ETCRP will work with the group on developing and delivering the tour. With the assistance of accompanying University of South Florida students and faculty participating Young Middle school students will also get an opportunity to perform basic onsite water analyses of the water in the ponds. In addition, students will take home information that they can share with the rest of their families. An audio and video recording of the tour will be made and disseminated through the eswusf.org website and incorporated into project demonstration modules for those unable to have the bus tour.

Stormwater demonstration modules such as those depicted in Figure 4 will also be developed by the project team for display at project activities throughout the project. These modules will continually improve as the project progresses and participant feedback is obtained. The modules will provide participants with a hands-on, multi media experience that raises awareness on stormwater ponds, their importance to quality of life, and factors affecting their usefulness. These will be shared as a part of the ESW-USF exhibit at the USF Engineering EXPO (February 2009), which attracts students and teachers throughout the Tampa Bay region; at community meetings (August 2008 and March 2009); in the classroom and at the national P3 EXPO. ESW-USF students will continue to attempt to identify the

most appropriate ways to deliver the demonstration modules developed for Objective 1 to the community. The stormwater project was initially introduced to the community through a booth exhibit at the 2008 East Tampa Community Survival Day fair. Additionally, ESW-USF students will work with HESS to deliver a workshop on the importance of the stormwater ponds and develop a bus tour of East Tampa's stormwater ponds. The USF Engineering Expo (<http://expo.eng.usf.edu/index.php>) is an annual USF event celebrating National Engineers' Week, featuring the work of the College of Engineering and other professional engineers working in the Tampa bay area as well as exhibits by individual professional societies that provide examples of their projects and activities. EXPO is attended by high and middle schoolers throughout the area, as well as religious and youth groups of all interests, and gives them the opportunity to interact with the leading technical and engineering firms, and the University of South Florida's student body and faculty members, all at the same place and time. With the help of the HESS committee and the USF College of Engineering's Student Services all middle and high schools in East Tampa will be encouraged to attend this EXPO and participate in the P3 exhibit.

Based on the newly remodeled pond environments, the ESW-USF students will determine if there are any other interventions needed to maintain pond water quality and identify the most sustainable solutions (e.g. use of certain types of vegetation, solar powered fountains).

The three groups involved in this project will examine the feasibility of expanding the project model to cover more retention ponds in East Tampa and include more K-12 schools. They will also identify the most appropriate methods for informal science education within the community based on the project (e.g. a multimedia learning kiosk at the pond site).

ESW-USF students and the faculty advisors will identify the most sustainable mechanism for monitoring and sharing data for the three ponds. This will include sampling and analyses as a part of the USF Environmental Engineering Laboratory course taught by the principle investigator. Additionally, there will be an implementation of the data and input from the Young Middle students regarding the pond opposite their school. In Summer 2008 ESW-USF went out to do sampling at the ponds of interest to collect baseline data. The water samples were analyzed for alkalinity, phosphorus levels, mercury and arsenic concentrations in addition to the basic parameters reported on the portable multimeter (i.e. pH, temperature, total dissolved solids, specific conductivity, turbidity and dissolved oxygen). As a follow up on this baseline, the pond opposite Young Middle school was incorporated into the final group project for ENV 4004L Environmental Engineering Lab during Fall 2008. For the project the student groups were given various aspects of the sampling and analysis. Sampling was done by a single lab team four times over a 24 h period. This group was responsible for collection a water sample at each sampling time while using the multimeter to record the parameter variability over the day. Once the samples were brought in to USF, one lab team used the water samples to test for alkalinity; total nitrogen; phosphorous; total hardness; calcium concentration; magnesium concentration; total suspended solids and total dissolved solids. This project is expected to be extended during the same class offering in Spring 2009.

In March 2009 the project will hold a workshop at Young Middle Magnet with community members and educators from the schools in East Tampa. The results from the project will be discussed. Participants will use the demonstration modules and visit to the retention pond opposite the school. Members of the ETCRP, media, and city government will be invited, including the stormwater department for the City of Tampa. All faculty co-advisors will participate in this activity as well as ESW students and members of the USF Civil and Environmental Engineering lab class will be invited. Ideas generated from this meeting for the further development of the project will be integrated into the final project report which will be available on the eswusf.org site and delivered to the ETCRP. The HESS committee will assist with the organization of this event.

CONCLUSION

WARE is designed to promote long term environmental protection of stormwater ponds in East Tampa, an economically disadvantaged urban community. Through WARE's community education and awareness campaign, local pollutant inputs to storm water will be reduced; an activity that not only impacts local pond water quality, but also water quality in the Tampa Bay. The beautification and redevelopment of the three stormwater ponds in East Tampa will provide open spaces for the community and improve quality of life (e.g. availability of exercise paths) and WARE will be instrumental in ensuring the ponds themselves are healthy, a factor that could influence visitors. Given the community members' habits of fishing in the retention ponds, WARE will initiate testing for mercury. In the short-term, WARE will establish a mechanism through which community awareness and education is tied in with curriculum in the local middle school and local university.

REFERENCES

- [1] EPA. Brownfields 2007 Grant Fact Sheet, Tampa, FL. EPA 560-F-07-172 http://www.epa.gov/brownfields/07arc/r04_fl_tampa.pdf. Accessed 12/18/07
- [2] Johnson, E. East Tampa Community Redevelopment Area. http://www.tampagov.net/dept_economic_and_urban_development/files/CRA_Fact_Sheets/East_Tampa.pdf. Accessed 12/18/07.
- [3] Livingston, E.H. (1995). Lessons learned from a decade of stormwater treatment in Florida. Stormwater Runoff and Receiving Systems: Impact, Monitoring, and Assessment. E.E. Herricks. Boca Raton CRC Press: 339-364.
- [4] Stoker, Y.E. (1994) Effectiveness of a stormwater collection and detention system for reducing constituent loads from bridge runoff in Pinellas County, Florida. U.S. Geological Survey (USGS) Open File Report 96-484.
- [5] Aponte Clarke, D. M., Lehner, P. H., Cameron, G. P., and Frank, A.G. (1999). Community response to runoff pollution: Findings from case studies on stormwater pollution control. Sixth Biennial Stormwater Research & Watershed Management Conference, Tampa, FL.
- [6] Bannerman, R. T., Owens, D. W., Dodds, R. B., and Hornewer, N. J. (1993). Sources of Pollution in Wisconsin Stormwater. Water Science and Technology, 28(3-5): 241-259.
- [7] Lehner, P. H., Aponte Clarke, D. M., Cameron, G. P., and Frank, A.G. (1999). Stormwater Strategies: Community Responses to Runoff Pollution. Natural Resources Defense Council, New York, NY.
- [8] Sarkar, S.K. and Bhattacharya, A.K. (2003). Conservation of biodiversity of the coastal resources of Sundarbans, Northeast India: an integrated approach through environmental education. Marine Pollution Bulletin, 47(1-6): 260–264.
- [9] Serrano, L. and DeLorenzo, M.E. Water quality and restoration in a coastal subdivision stormwater pond. Journal of Environmental Management (2007), doi:10.1016/j.jenvman.2007.01.025.
- [10] Campbell, K.R. (1994). Concentrations of heavy metals associated with urban runoff in fish living in stormwater treatment ponds. Archives of Environmental Contamination and Toxicology, 27(3): 352–356.
- [11] Campbell, K.R. 1995. Bioaccumulation of Heavy Metals in Fish Living in Stormwater Treatment Ponds. Technical Publication SJ95-1, St. Johns River Water Management District, Palatka, Florida.
- [12] Casey, Ryan E. (2007) Temporal trends of trace metals in sediment and invertebrates from stormwater management ponds. Water, Air and Soil Pollution, 178(1-4): 69-77.
- [13] Cole, R.H., Frederick, R.E., Healy, R.P. and Rolan, R.G. (1984). Preliminary findings of the priority pollutant monitoring project of the National Urban Runoff Program. Journal of the Water Pollution Control Federation, 56: 898–908.
- [14] Karouna-Renier, N. K. and Sparling, D. W. (2001). Relationships between ambient geochemistry, watershed land-use and trace metal concentrations in aquatic invertebrates living in stormwater treatment ponds. Environmental Pollution, 112(2): 183-192.
- [15] Marsalek, J. and Marsalek, P.M. (1997). Characteristics of sediments from a stormwater management pond. Water Science and Technology, 36(8-9):117–122.
- [16] Yousef, Y.A., Wanielista, M.P., Hvitved-Jacobsen, T. and Harper, H.H. (1984). Fate of heavy metals in stormwater runoff from highway bridges. Science of the Total Environment, 33(1-4), 233–244.
- [17] SFWMD (Southwest Florida Water Management District). Adopt-A-Pond. <http://www.swfwmd.state.fl.us/documents/publications/files/adopt.htm>. Accessed 12/15/07.

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