You may use the information and images contained in this document for non-commercial, personal, or educational purposes only, provided that you (1) do not modify such information and (2) include proper citation. If material is used for other purposes, you must obtain written permission from the author(s) to use the copyrighted material prior to its use.
Characterization of annual ambient water quality in natural and created wetlands of the Texas coast

Natasha Zarnstoff* and George Guillen

Environmental Institute of Houston, University of Houston-Clear Lake/School of Science and Computer Engineering, Houston, Texas, 77058

Conclusions and Continued Analyses
• Preliminary results suggest that open water and saltmarsh nutrient levels are equivalent.
• Significantly higher TN and TP values in freshwater marshes may be due to increased total suspended solids, large amounts of decaying detritus, and excess organic waste from organisms.
• Significant differences in NO₃ and NO₂ between created and natural saltmarshes may be attributed to delayed breakdown of nitrogenous compounds or increased concentrations of dredge material in base soils, though this requires further analysis.
• Statistical analyses are ongoing, including evaluation of additional water quality parameters and influence of possible contributing factors.

Acknowledgments
We would like to thank the Environmental Institute of Houston for funding this project. We also appreciate all the assistance in the field and lab from the staff, graduate students, and volunteers.

Background
The US EPA has expressed interest in creating water quality criteria and standards specific to coastal and inland wetlands. Environmental agencies and professionals have long recognized the fundamental difference in ambient water quality between wetlands and open water systems. Saltwater wetlands provide a variety of ecosystem services, but little research has been published on water quality of these wetlands. To date, no studies comparing annual water quality trends among created, natural, and freshwater marshes have been conducted. Here, we present preliminary results on the range of annual water quality conditions among created, natural, and freshwater wetlands compared to ambient open water quality.

Methods
• Surface water quality of 3 marsh types within Galveston Bay (Figure 1)
  • 2 created saltmarshes (created)
  • 2 natural saltmarshes (natural)
  • 1 freshwater marsh (freshwater)
• 6 sampling events from Nov. 2013 to Oct. 2014 w/ handheld YSI
• Collected in-situ samples
• NO₃, NO₂, TN, NH₃, & TP
• Analysis completed using a Hach DR/890 colorimeter
• Statistical analysis – One-way ANOVA (α = 0.05)
• Open-water vs. marsh type
• Created vs. natural saltmarsh

Results
• No significant differences between created marshes or natural marshes compared to open water sites
• Freshwater marshes showed significantly higher TN (F₁,₁₇ = 5.69, p = 0.026) and TP (F₁,₁₇ = 28.71, p < 0.001) (Figure 2)
• Created salt marshes had significantly higher levels of NO₃ (F₃,₁₄ = 10.10, p = 0.002) and NO₂ (F₃,₁₄ = 10.93, p < 0.002) compared to natural marshes (Figure 3)

Contact Information
• Questions or comments: zarnstoff@uhcl.edu
• Information on this and other projects can be found at: http://prtl.uhcl.edu/portal/page/portal/EIH

Figure 1. (A) Map of Galveston Bay displaying site locations and marsh type; (B) Collecting water samples at a created saltmarsh; (C) Hach DR/890 Colorimeter; (D) Using YSI handheld monitoring device.

Figure 2. Comparison of open water mean (± SE) nitrate (NO₃), nitrite (NO₂), total nitrogen (TN), ammonia (NH₃), and total phosphorus (TP) values in mg/L to created saltmarshes (A), natural saltmarshes (B), and freshwater marsh (C).

Figure 3. Comparison of mean (± SE) nitrate (NO₃), nitrite (NO₂), total nitrogen (TN), ammonia (NH₃), and total phosphorus (TP) values between created and natural saltmarshes.

* Indicates significant difference

Figure 4. Comparison of mean (± SE) nitrate (NO₃), nitrite (NO₂), total nitrogen (TN), ammonia (NH₃), and total phosphorus (TP) values between created and natural saltmarshes.