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Texas Wetland Condition Assessment

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Background

The Environmental Protection Agency (EPA) and its State, Tribal, and Federal partners implemented the first-ever national survey on the condition of the Nation's wetlands in the summer of 2011. The National Wetlands Condition Assessment (NWCA) survey was designed to provide regional and national estimates of wetland ecological integrity and rank the stressors most commonly associated with poor conditions. The process of designing and conducting the survey was intended to help build state capacity to monitor and analyze wetland condition while promoting collaboration across jurisdictional boundaries. This survey provided a snap-shot of wetland health, and condition nationally and within each state. However, the presence of a severe drought in Texas resulted in unique conditions that influenced the results of the study.

Study Area and Methods

Forty-two sites (22 on public land & 20 on private land) were surveyed in Texas in 2011 during severe drought conditions (Fig 1). Sites were randomly assigned based on the US Fish and Wildlife National Wetland Classification Status and Trends (NWCST) Layer. Additional water quality data including turbidity, TN, and TP were collected in Texas during this period to supplement the EPA suite of national indicators. A wide range of sites were selected, resulting in a variety of hydrological regimes. A 0.5 hectare Assessment Area (AA) was sampled at each site (Fig 2). Water quality, soil conditions, and plant communities were monitored at each NWCA site. In addition, Rapid Assessment Methods (RAM) were used to assess site conditions.

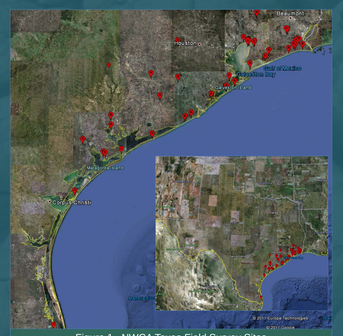


Figure 1. NWCA Texas Field Survey Sites

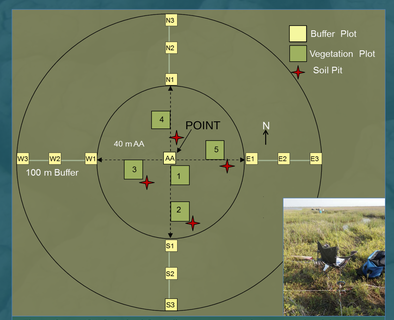


Figure 2. NWCA Standard Sampling Layout and photo example of the POINT and transect lines.

Figure 3. Example of a field survey site and Status and Trends wetland type category. Photo showing wetland type observed at this site.

Soil Characteristics

At each field survey site, 4 soil pits were excavated to 60cm depth, and one representative pit was dug to 125cm depth (Fig 2, see ✦) . All soil horizons, color, and prominent features were identified for each pit (Fig 4-6). Soil samples were collected from the representative pit for analysis of bulk density, soil chemistry, isotope, and enzyme activity. This soil data is under quality assurance review, and not yet available to the public.

Water Quality

Water quality was tested at all sites when water was present within the AA. Parameters such as dissolved oxygen, pH, specific conductance, and temperature were collected in the field with a YSI datasonde. Other parameters such as algal toxins, algal identification, chlorophyll-a, and general water chemistry were collected and sent to a lab for processing (Fig 7 & 8). This water data is under quality assurance review, and not yet available to the public.

Vegetation Survey

Detailed vegetation surveys were performed at 5 separate plots at each field survey site (Fig 2, see ■). Each Vegetation plot was 100m^2, including smaller 10m^2 and 1m^2 quadrats nested within (Fig 9). Species composition and abundance was recorded as well as any alien species, flora quality, guild composition, and height class (Fig 10). Voucher and unknown specimens were collected at each plot and verified by a second laboratory QA botanist.

Rapid Assessment Method

USA Rapid Assessment Method (USA-RAM) was used as a tool for evaluating the ecological integrity of wetlands and the risk posed by stressors affecting the broader environment. The purpose of USA-RAM is to effectively assess wetland conditions in a significantly shorter timeframe than required for more detailed sampling. Thirteen Buffer Sample Plots were assessed per site (Fig 2, see ■) using stressor RAM as well as natural cover strata, and invasive species designations.

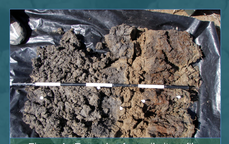


Figure 4. Example of a soil pit profile, showing marked soil horizons.

Figure 5. Field staff describing soil color using a Munsell chart.

Figure 6. Team using a king sampler to get sediment core.
(also important team trust building exercise)

Figure 7. Water Chemistry sample

Figure 8. Sampling algal toxins and algal taxonomic ID from epiphytes.

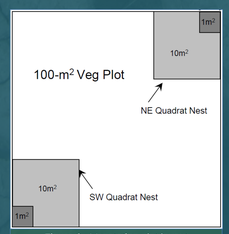


Figure 9. Vegetation plot layout

Figure 10. Field botanist and assistant setting up nested quadrats at a field site.

Figure 11. Example of drought conditions.

Results

Study results were analyzed using graphical methods and principal components analyses (PCA) to evaluate spatial patterns between sites based on physical and water quality characteristics. A total of 42 sites were visited during the study. Twenty seven (64%) sites were classified as Estuarine Intertidal Emergent (E2EM), 9 (21%) as Estuarine Scrub/Shrub (E2SS), 3 (7%) as Palustrine Emergent (PEM), and the remaining 3 sites were Palustrine Forested (PFO), Palustrine Scrub/Shrub (PSS), and Palustrine Farmed (PF). PCA failed to detect any patterns in similarity between sites based on the NWCST designations (Fig 12). Instead observed patterns were more related to watershed proximity (Fig 13). Using the Rapid Assessment Methods, we assessed the health of TX wetlands during a drought year as well as other potential stressors.

- **Water Quality:** Standing **w**ater was present at only 13 (31%) of the 42 surveyed sites due to drought conditions (Fig 11). Of the sites where water was present, only one was a non-tidal site (NWCA 11-2566). Water quality varied greatly between sites (Table 1).
- **Buffer:** Buffer is defined as the area of natural vegetation surrounding a wetland that is not directly affected by human activities. The average buffer width is the distance (up to 100m) from the POINT where a non-buffer is encountered. This metric can be used to determine human alteration stresses on a wetland site. A total of 34 sites (just over 80%) had an average buffer width of 100m, while only one site had an average buffer width of less than 70m.
- **Vegetation:** Of the 42 sites visited, 16 (38%) had alien species present in the AA (Fig 14). The most common non-native species found was *Phragmites australis*, and was generally found in thick stands. The vegetation richness was ranked using a Patch Mosasic Complexity metric, and 50% of the sites had a complexity value of 2 out of 4 (with 4 being the most complex) (Fig 15).

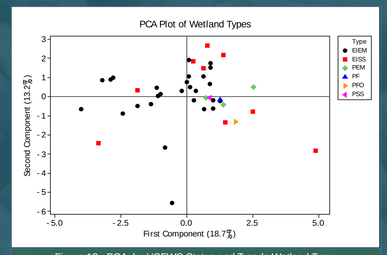


Figure 12. PCA by USFWS Status and Trends Wetland Type.

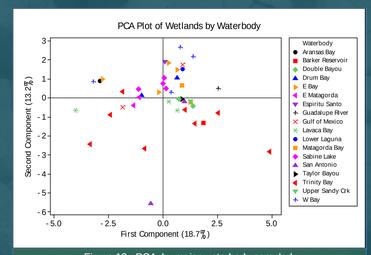
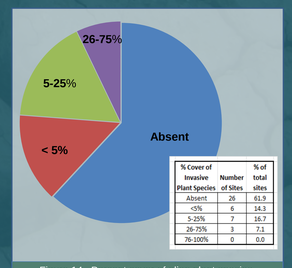


Figure 13. PCA by major waterbody sampled.

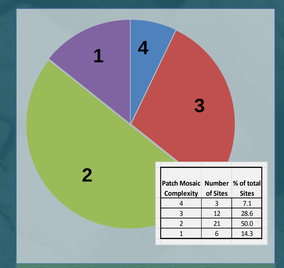
Site ID	Spec. Cond. (uS)	Water Temp (°C)	Salinity (psu)	DO (mg/L)	pH
NWCA11-2599	54270	27.1	34.29	1.8	7.29
NWCA11-2538	45000	28.6	26.93	15.8	8.98
NWCA11-2575	79624	28.6	>42.00	1.2	8.00
NWCA11-2603	52150	30.2	30.72	5.6	8.04
NWCA11-2598	48730	29.4	28.95	3.0	7.78
NWCA11-2529	55336	24.50	35.78	6.00	7.78
NWCA11-2566	33	27.4	<2.00	3.6	8.11
NWCA11-2540	82771	28.4	>42.00	4.4	8.26
NWCA11-2541	13646	27.4	7.48	*	7.05
NWCA11-2564	50090	30.5	29.19	9.2	7.71
NWCA11-2573	11294	27.2	6.12	1.0	6.75
NWCA11-2589	26750	29.1	15.01	7.3	7.86
NWCA11-2593	33310	20.9	22.87	5.6	8.27

Table 1. Water Quality Data collected at NWCA field sites.
* D.O. failed post-calibration.



% Cover of Invasive Plant Species	Number of Sites	% of total sites
Absent	26	61.9
<5%	6	14.3
5-25%	7	16.7
26-75%	3	7.1
76-100%	0	0.0

Figure 14. Percent cover of alien plant species.



Patch Mosaic Complexity	Number of Sites	% of total Sites
4	3	7.1
3	12	28.6
2	21	50.0
1	6	14.3

Figure 15. Vegetation Patch Mosaic Complexity

Future Work

The majority of data collected during the NWCA is still undergoing QAQC review and is not yet available for analysis. The National Report is scheduled for completion in 2013 and will include complete data analysis from all NWCA-monitored states. This baseline dataset will help researchers and regulators better understand wetland conditions in not only Texas, but nationwide. Future applications include development of wetland water quality criteria and establishment of baseline monitoring programs to help manage state wetland resources.

Acknowledgments

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For Further Information

Please contact *oakley@uhcl.edu*. More information on this and related projects can be obtained at EIH webpage: www.eih.uhcl.edu