Louisiana’s Coastwide Reference Monitoring System-\textit{Wetlands} (CRMS): Past, Present, and Future

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Restore America’s Estuaries
November 4\textsuperscript{th}, 2014
Louisiana’s Coastwide Reference Monitoring System (CRMS) Sites and Coastal Wetland Planning Protection and Restoration Act (CWPPRA) Projects

392 CRMS Monitoring Sites in 9 Coastal Basins. >100 Coastal Restoration Projects Constructed creating ≈150,000 acres and benefitting > 425,000
Louisiana’s Coastwide Reference Monitoring System (CRMS) Measures

**Water Elevation and Salinity (Hourly), Elevation Change and Accretion (Fall/Spring), Vegetation (Late Summer), Aerial Photography % Land (3 Yr), Bulk Soil Characteristics (10 Yr)**
How we got here: Monitoring and Assessment of CWPPRA Projects Pre-CRMS

- Projects were selected and funded by CWPPRA partners through the Breaux Act process
- Project goals were defined and appropriate monitoring measures were selected
  - Reference Areas were identified
  - Initial data was collected over a short period Pre-construction
- The project was monitored for 20 years Post-construction
- Results were often confounded
  - Inappropriate Reference Areas
  - Limited Pre-construction data
CRMS provides a network of potential reference stations. Projects are assessed relative to sites in the same marsh type both within a hydrologic basin and across the coast. Data collection began in 2006.

CRMS Challenges

- LANDRIGHTS – CRMS was based on a random design that didn’t consider landowner or accessibility.
  - Hunting Restrictions – Teal Season begins in September, “Big Duck” starts in November and goes through January, Goose continues into March. Alligator is in September. NO AIRBOAT ACCESS on many landowners.

- DISTURBANCE – People, Hurricanes, Fire, Grazing, Herbivory
  - Boardwalks are designed to be cheaply replaced.
  - Loss of Surface Elevation Table Rod is a big setback.

- ELEVATION – All of the sites are tied to a vertical datum (NAVD88). EVERYTHING IS SINKING from the survey benchmarks to the sonde equipment. Sites were surveyed when they were constructed and were re-surveyed in 2014.
  - New survey is a network solution that ties all of the CRMS sites together. We have good relative elevations.
SONDE SNORKEL – Hydrology recording equipment is vented to the atmosphere for water level monitoring. The vent was moved up above potential storm surge height.

- Most stations kept logging through Hurricane Isaac in 2012.

New to Louisiana Species:

- *Juncus paludosus* – Swamp rush
- *Boltonia apalachicolensis* – Doll’s Daisy
- *Symphyotrichum bahamense* – Bahaman Aster
CRMS Data are Publically Available – Through a Mapping Interface
www.lacoast.gov/crms2
CRMS Data are Publically Available – Through a Charting Interface

Data is available for download – Raw from CPRA, Derived from CRMS website

Monitoring Data

Hydrographic Data
Hydrographic data are now available in two general formats: data collected monthly and data collected for water temperature, specific conductance, and salinity. In some rare instances water velocity and wind speed data are collected.

Hydrographic Monthly Data
Retrieve Monthly Data
Monthly hydrographic data can be downloaded either by project, CRMS (Coastwide Reference Monitoring System) site, or occasionally per station per year. In general, there is a much greater number of data for CRMS sites than for stations. For example, since one year of monthly sampling will yield approximately 12 records per station per year, in general, there is a much greater number of such records than for CRMS sites. For this reason, we recommend that as data be downloaded by station and not by project, as data are not necessarily available for download from all stations. However, if you would like to request data, an alternate request option is available (see Data Options, below).

Hydrographic Hourly Data
Retrieve Hourly Data
Hourly hydrographic data may also be downloaded either by project, CRMS (Coastwide Reference Monitoring System) site, or occasionally per station per year. In general, there is a much greater number of data for CRMS sites than for stations. For example, since one year of hourly sampling will yield approximately 12 records per station per year, in general, there is a much greater number of such records than for CRMS sites. For this reason, we recommend that as data be downloaded by station and not by project, as data are not necessarily available for download from all stations. However, if you would like to request data, an alternate request option is available (see Data Options, below).

Accretion Data
Retrieve Accretion Data
Accretion data can be downloaded either by project, CRMS (Coastwide Reference Monitoring System) site, or occasionally per station per year. In general, there is a much greater number of data for CRMS sites than for stations. For example, since one year of hourly sampling will yield approximately 12 records per station per year, in general, there is a much greater number of such records than for CRMS sites. For this reason, we recommend that as data be downloaded by station and not by project, as data are not necessarily available for download from all stations. However, if you would like to request data, an alternate request option is available (see Data Options, below).

Forested Swamp Vegetation Data
Retrieve Forested Swamp Vegetation Data
Forested Swamp Vegetation data can be downloaded either by project, CRMS (Coastwide Reference Monitoring System) site, or occasionally per station per year. In general, there is a much greater number of data for CRMS sites than for stations. For example, since one year of hourly sampling will yield approximately 12 records per station per year, in general, there is a much greater number of such records than for CRMS sites. For this reason, we recommend that as data be downloaded by station and not by project, as data are not necessarily available for download from all stations. However, if you would like to request data, an alternate request option is available (see Data Options, below).

Herbaceous Marsh Vegetation Data
Retrieve Herbaceous Marsh Vegetation Data
Herbaceous Marsh Vegetation data can be downloaded either by project, CRMS (Coastwide Reference Monitoring System) site, or occasionally per station per year. In general, there is a much greater number of data for CRMS sites than for stations. For example, since one year of hourly sampling will yield approximately 12 records per station per year, in general, there is a much greater number of such records than for CRMS sites. For this reason, we recommend that as data be downloaded by station and not by project, as data are not necessarily available for download from all stations. However, if you would like to request data, an alternate request option is available (see Data Options, below).

Soil Properties Data
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Surface Elevation Data
Retrieve Surface Elevation Data
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Coastal Protection and Restoration Authority of Louisiana

Data Available from Louisiana’s Coastwide Reference Monitoring System - Wetlands
Leigh Anne Sharp, Dona Welfenbach, and Tommy McGinnis
Coastal Protection and Restoration Authority of Louisiana
Operations Division – Lafayette Regional Office

CRMS Analytical Tools – Developed

Hydrologic Index (HI)
The Hydrologic Index (HI) (a) is developed to assess the vulnerability of a wetland to hydrologic alteration. It is based on the interaction of several factors, including hydrologic regime, water level, and hydroperiod. HI values range from 1 (least vulnerable) to 10 (most vulnerable).

Foloristic Quality Index (FQI)
The FQI (b) is a measure of the floristic richness and diversity of a wetland. It is based on the number and abundance of plant species present. HI values range from 1 (least floristic) to 10 (most floristic).

Submergence Vulnerability Index (SVI)
The SVI (c) measures the susceptibility of a wetland to submergence. It is based on the interaction of several factors, including hydrologic regime, water level, and hydroperiod. HI values range from 1 (least susceptible) to 10 (most susceptible).

CRMS Analytical Tools – Being Developed

Forested FQI (FFQI)
A new Forested FQI (FFQI) is being developed. It is based on the interactions of several factors, including hydrologic regime, water level, and hydroperiod. HI values range from 1 (least floristic) to 10 (most floristic).

Vegetation Community Salinity (VCS)
A new Vegetation Community Salinity (VCS) is being developed. It is based on the interactions of several factors, including hydrologic regime, water level, and hydroperiod. HI values range from 1 (least floristic) to 10 (most floristic).

References

Contact
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CRMS PROGRAM via CWPPRA

3103: CWPPRA Task Force approved CRMS-FWI
- Provide a network of “safety-net” reference sites to evaluate the response of wetlands to hydrologic changes
- It is assumed that the comprehensive coastal restoration plan is effective in reversing hydrologic trends and whole coastal ecosystems

2001: Construction of CRMS sites began. Monitors were installed and data was collected on a seasonal basis.

2007: Monitors were destructed with data used in active public abatement.

ACKNOWLEDGMENTS

The framework of CRMS sites distributed across the marsh types in the coastal zone can be used to assess trends in salinity, pH, water levels, and wind speed.

CRMS SITE DESIGN

CRMS site locations are distributed across the marsh types in the coastal zone and are used to assess trends in salinity, pH, water levels, and wind speed.

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CRMS Vegetation Tools – Floristic Quality Index (FQI)

Species Quality (0 to 10)
- **Coefficient of Conservatism (CC Score)**
- **0** = Disturbance, invasive, low fidelity to habitat
- **10** = Stability, high fidelity

FQI helpful in determining project success when goal is to create or maintain a healthy, stable marsh.

Site scores are compared to all of the other CRMS sites in the same **marsh type**, **basin**, and across the **coast**.
Indexed by Marsh Type

VVI helpful when project goal is to simply to create or maintain vegetated marsh without quality expectations.

FQI consistently scores emerging freshwater marshes low because they are composed of weedy, annual species that receive low CC Scores.

Could contribute to biomass estimates if paired with productivity data.
Species salinity (ppt) is calculated as the weighted average of all paired median growing season salinity and species cover observations. Vegetation Community Salinity (ppt) is calculated at the station level based on species salinity and cover in the plot.

Useful when the restoration goals are to change or maintain particular marsh types.
Community Salinity scores will help us visualize trends in habitat before habitat shifts occur (Brackish to Intermediate) and will help non-botanists to interpret vegetation community data.

Floristic Quality is relatively stable while Community Salinity shows the site freshening.
Of 251 species scored, most species are Fresh ($\approx 200$), some are Intermediate ($\approx 40$), and very few would be considered Brackish ($\approx 10$) or Saline ($\approx 5$) according to textbook marsh type classifications.
Of 388 CRMS sites distributed across coastal Louisiana, the calculated salinity of vegetation communities shows three distinct marsh types: **Fresh** (≈ 100 sites), **Intermediate/Brackish** (≈ 125), and **Saline** (≈ 50).
2012 Vegetation Community Salinity at CRMS Sites

Community Salinity (ppt)
- 0.0 - 2.5
- 2.6 - 7.5
- 7.8 - 11.0
- 11.1 - 22.6
2008 - 2012 Vegetation Community Salinity Change at CRMS Sites
CRMS – Future Work

• Continue adding tools to the database
  • USGS Open File Reports – Vegetation Volume Index, Forested Floristic Quality Index, Vegetation Community Salinity Tool

• Apply new survey
  • Update water elevations from Geoid 99 to Geoid 12A

• Continue assessing Louisiana’s restoration effort
  • Individual Projects and Overall
Questions?

Contact:
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337-482-0659
Poster STP66
<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Species Salinity (ppt)</th>
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<tbody>
<tr>
<td>Spartina alterniflora</td>
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<tr>
<td>Juncus roemerianus</td>
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<td>Distichlis spicata</td>
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<td>Hydrocotyle umbellata</td>
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Coastal Wetland Planning Protection and Restoration Act (CWPPRA)

Hydrologic Restoration, Marsh Creation (Beneficial Use of Dredged Material), Freshwater and Sediment Diversion, Barrier Island Restoration, Shoreline Protection, Terracing