



THE COASTAL WETLANDS PLANNING, PROTECTION AND RESTORATION ACT COASTWIDE REFERENCE MONITORING SYSTEM TRAINING MANUAL

BEGINNER'S GUIDE TO RETRIEVING DATA

March 2014







COASTAL WETLANDS PLANNING, PROTECTION AND RESTORATION ACT

RESTORING COASTAL LOUISIANA SINCE 1990



MANAGING
AGENCIES :

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WHAT IS CWPPRA?

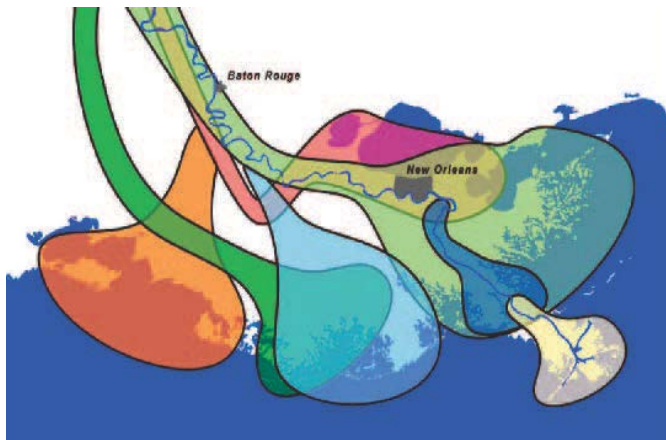
The Coastal Wetlands Planning, Protection and Restoration Act, (CWPPRA, pronounced kwĭp-rŭh), is federal legislation enacted in 1990 that is designed to identify, prepare, and fund construction of coastal wetlands restoration projects. Since its inception, approximately 150 coastal restoration or protection projects have been authorized, benefiting over 112,000 acres in Louisiana. The legislation (Public Law 101-646, Title III CWPPRA) was approved by the U.S. Congress and signed into law by former President George H. W. Bush. Learn more at LACoast.gov.

Why Protect Louisiana?

Louisiana wetlands are unique and vital ecological assets worth saving. Wetlands act as a storm buffer against hurricanes and storms. They act as flood control devices: holding excess floodwaters during high rainfall (much like a sponge). Wetlands replenish aquifers, and they purify water by filtering out pollutants and absorbing nutrients. CWPPRA funds have been instrumental in helping to restore Louisiana's vanishing wetlands. Approximately 40 percent of the coastal wetlands of the lower forty-eight states are located in Louisiana. Unfortunately, this fragile environment is disappearing at an alarming rate. Louisiana has lost up to 40 square miles of marsh per year for several decades – that's 80 percent of the nation's annual coastal wetland loss.



Example of a Louisiana wetland habitat



*Diagram of the Louisiana coast above shows
the development of historic lobes of the
Mississippi River*

History: HOW MARSH WAS CREATED IN LOUISIANA

Over millennia, sand, silt, and clay delivered via the muddy floodwaters of the migrating Mississippi River built the wetlands of Louisiana's coastal zone.

Problem: HOW MARSH WAS DISTURBED AND DESTROYED

With construction of the levees along the river to reduce flood risk to adjacent communities, the floodwaters responsible for creating the wetlands were channeled into the Gulf of Mexico. Without the annual re-nourishment of sediment and nutrients from the river, wetlands have been sinking and converting to open water. Additionally, man-made canals changed the hydrology of the area. Natural disasters, such as hurricanes, and manmade activity have also caused damage.

To date, Louisiana has already lost coastal land area equal to the size of the state of Delaware. This loss is at an average rate of approximately one acre every hour (pubs.usgs.gov/sim/3164/). If the current rate of loss is not slowed by the year 2040, an additional 800,000 acres of wetlands will disappear, and the Louisiana shoreline will advance inland as much as 33 miles in some areas.



Bald Eagle

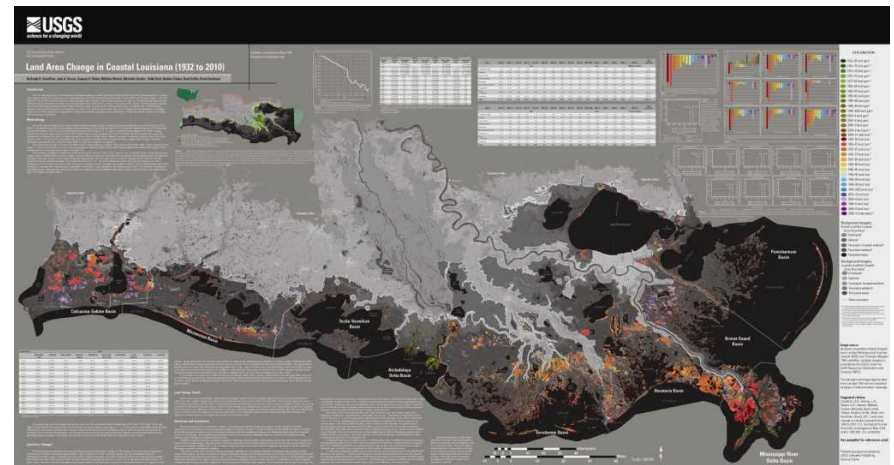
Wetlands also provide habitat for a variety of wildlife. Coastal Louisiana lands are the breeding grounds and nurseries for thousands of species of aquatic life, land animals, and birds of all kinds – including our national symbol, the bald eagle. This ecosystem also provides a migratory habitat for over five million waterfowl each year.

People also benefit from Louisiana's coastal lands. Louisiana is responsible for a major part of our nation's oil and gas production, shipping commerce, fisheries industry, fur harvesting, and oyster production. These industries account for over 55,000 jobs and billions of dollars in revenues.



Trawl Boat

Additionally, wetlands are wonderful recreational resources and are part of Louisiana's growing ecotourism business. To learn more about the economic value of our wetlands, read "The Cost of Doing Nothing" in WaterMarks (Summer 1999).



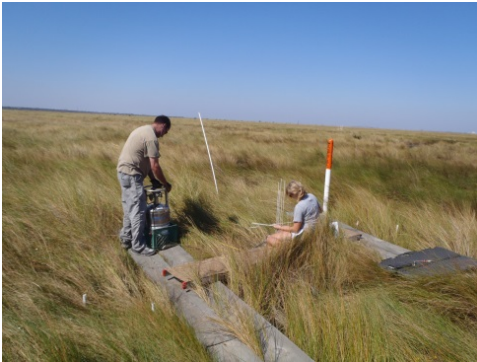
USGS Land Area Change in Coastal Louisiana from 1932 to 2010

CWPPRA project managers, scientists, and engineers use a variety of techniques to protect, enhance, or restore wetlands. Each restoration project may use one or more techniques to repair delicate wetlands. These techniques include but are not limited to: shoreline protection, barrier island restoration, marsh creation, fresh water reintroductions, sediment diversions, hydrologic restoration, marsh management, sediment and nutrient trapping, terracing, outfall management and vegetative plantings.

The CWPPRA Task Force implemented the Coastwide Reference Monitoring System (CRMS) as a mechanism to monitor and evaluate the effectiveness of CWPPRA ventures at the project, region or hydrologic basin, and coastwide level. The CRMS design implements a multiple reference approach by using aspects of hydrogeomorphic functional assessments and probabilistic sampling. This training manual is designed to help you learn more about the CRMS (pronounced crimms) by using the web at LACoast.gov/CRMS.

WHAT IS CRMS?

CRMS is the acronym for the Coastwide Reference Monitoring System. The Coastal Wetland Planning, Protection and Restoration Act (CWPPRA) has, from its beginning, monitored the health of



Scientist working a CRMS site

Louisiana's landscape. Initially, information was collected through aerial photography, on-the-ground assessments and comparisons of project to reference sites. But to improve methods of rebuilding Louisiana's resistance to erosion,

reducing conversion of her marshes to open water, and saving her from the fatal complications of starvation and sinking, more comprehensive data were soon needed. In 2003, CWPPRA established the Coastwide Reference Monitoring System (CRMS).



CRMS site in a marsh area of Louisiana

Today, about 390 CRMS sites, spread throughout coastal Louisiana, broaden the reach, increase the frequency and expand the detail of wetland data.

The CRMS project, under the direction and funding of CWPPRA, is one of the largest coastal habitat monitoring networks in the United States. The CRMS team effectively delivers data to a variety of audiences with roughly 60 scientists employed to go out into the field to collect data from CRMS sites and additional analytical teams of scientists, computer programmers, and software engineers designing Web delivery of large data sets.



Scientist gathers data at a CRMS site

Monitoring data include:

- water level,
- salinity,
- sediment accretion,
- surface elevation change,
- composition and abundance of vegetation,
- ratio of land to water, and
- soil characteristics.

The information is analyzed and summarized in maps, charts, tables, graphs, and indices, and finally incorporated into interactive report cards available online.

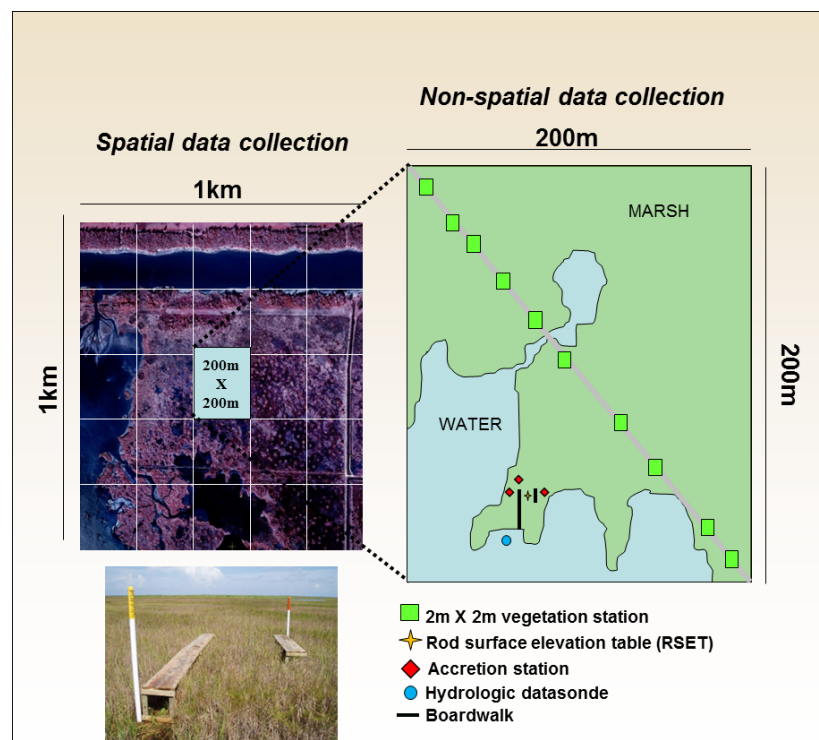
From identifying areas in need of restoration through evaluating a project's long-term effects on the landscape, the CRMS program contributes to the successful planning, modeling, and study of coastal restoration.

List of Parameters:

Parameter	Method	Scale	Frequency	Type of Data
Land to Water Ratio	Satellite Imagery	Hydrologic Basin	At least once per year	Spatial
Land to Water Ratio	Digital Aerial Photography	CRMS Site (1 km ²)	Once every 3 to 5 years	Spatial
Surface Water Salinity, Temperature, and Water Levels	Submersible Data Logger	In available water within 200 meters of CRMS site or in a well	Hourly	Non-Spatial
Soil Porewater	10 and 30 cm syringe sippers	3 samples per depth per site and at vegetation plots	Intermittently and Annually	Non-Spatial
Herbaceous Vegetation	% Cover, Species Richness, Height of Dominant Species	(10) 2 m by 2 m plots per marsh site or (9) plots per swamp site	Annually during peak biomass	Non-Spatial
Forested Vegetation	DBH (diameter at breast height), Canopy Cover, Understory Vegetation	(3) 20 m by 20 m forested plots per swamp site and (9) 6 m by 6 m understory plots per swamp site	Once every 3 years during peak biomass	Non-Spatial
Soil Characteristics	Core samples profiled into 4 cm increments to 24 cm. Bulk Density, % Organic Matter, Soil Salinity, pH, and Moisture	3 cores, 18 archived samples per site	Once every 6 to 10 years	Non-Spatial
Marsh Elevation Changes	Rod Surface Elevation Tables (a.k.a. RSET)	4 directions per site	Bi-annually	Non-Spatial
Vertical Accretion	Feldspar Plots/Cryogenic Cores	Multiple plots per site	Bi-annually	Non-Spatial

See Appendix 1: For Details on CRMS DATA COLLECTION INFORMATION AND SCHEDULE

CRMS Site vs. CRMS Station

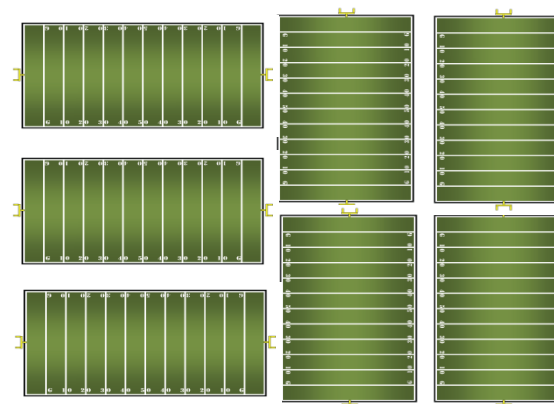


Typical CRMS Marsh Site

CRMS Sites

CRMS *sites* are very large. Land to water classification of a CRMS site is the spatial or three dimensional data that are collection within a 1km² area. That is approximately the size of **187 football fields**.

However, the majority of on-the-ground data collection is conducted within a smaller non-spatial data collection area. Non-spatial data include: information about water, vegetation, soil, marsh elevation, and vertical accretion.



The non-spatial data collection area is 200m² or about the size of **7 football fields**.

CRMS Stations or Data Plots

Within the data collection area, many data stations (or plots) exist. Each CRMS site has a hydrologic station, vegetation stations, accretion stations, etc. In the diagram you can see how the stations are laid out within a CRMS site. The 10 vegetation stations are in a diagonal transect across the 200m² data collection area. The rod surface elevation and accretion stations are nested around a boardwalk. The hydrologic station is generally in a bayou or water body near the boardwalk.

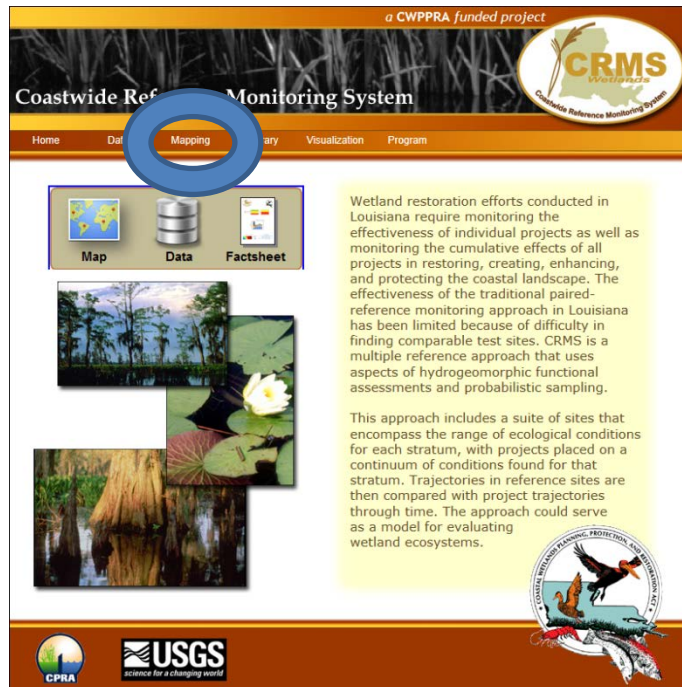
Naming Convention

CRMS sites and stations have a standardized naming convention. CRMS sites are indicated by 4 numeric digits following the letters CRMS (ex, CRMS0001). CRMS station names have the CRMS site name followed by a hyphen and the station number. For example CRMS0001-V01 would indicate vegetation station 01 at CRMS site 0001. Each data type has a distinct letter in the station naming convention. Appendix 1 should help you translate the station names.

See Appendix 1: For Details on CRMS DATA COLLECTION INFORMATION AND SCHEDULE

NAVIGATE THE WEBSITE

CRMS is easily accessed on the web at LaCoast.gov/CRMS. The website is currently in its second generation of web design. When you first arrive at the page, you will see a “home” page similar to the one below.

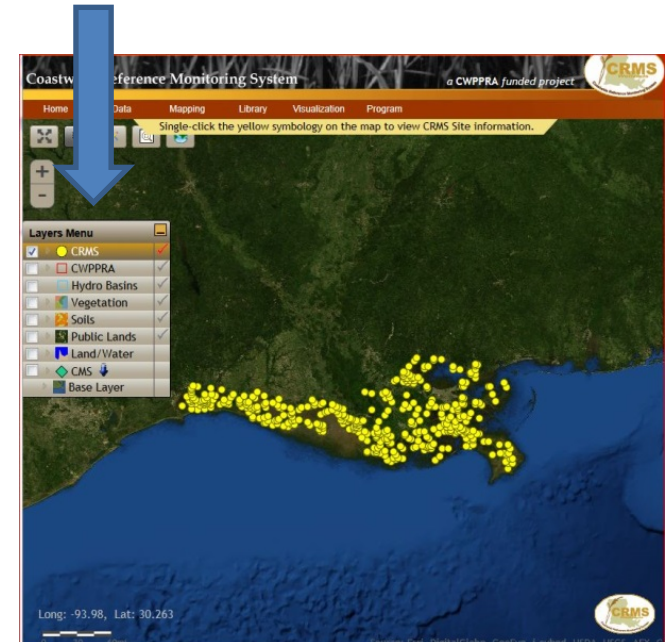


Notice: In general, it is better to use a web browser such as Mozilla Firefox or Google Chrome. Some features of the CRMS website cannot be properly viewed in older versions of Internet Explorer.

Clicking on the mapping menu item at the top of the webpage will load an interactive map of the Louisiana coast. By hovering over the word “Mapping,” a drop box will appear. Choose Basic Viewer by clicking

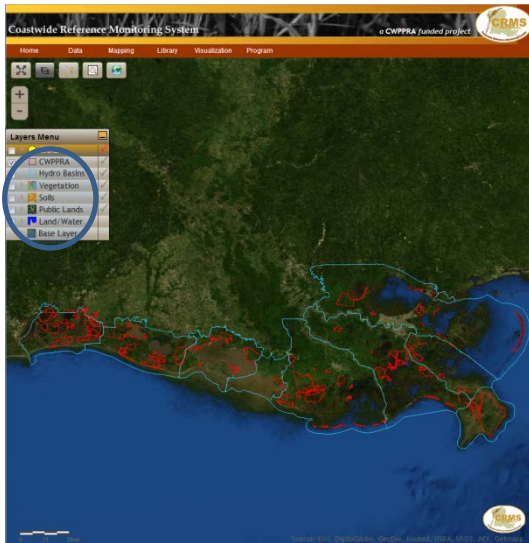
one time or alternatively, click on the map icon. The page below will appear. Each of the yellow dots indicates an actual CRMS monitoring site. Parameters are measured and recorded at each of these sites.

Additionally, on the left hand side of the page you will see a “Layers Menu” that can be used to view different layers. Clicking on checked boxes on the left side of the layers menu will load data onto the map. This data is relevant to the layer item.



IMPORTANT: Click in the check box on the left and the layer will be visually displayed. Click on the red check on the right side and the data becomes active. Clicking on a map item in an active layer will provide information about the layer item. Example: Activate the CRMS layer and when you click on a yellow dot, a site information box appears

NOTE: *You can only have one RED CHECK active at a time!*

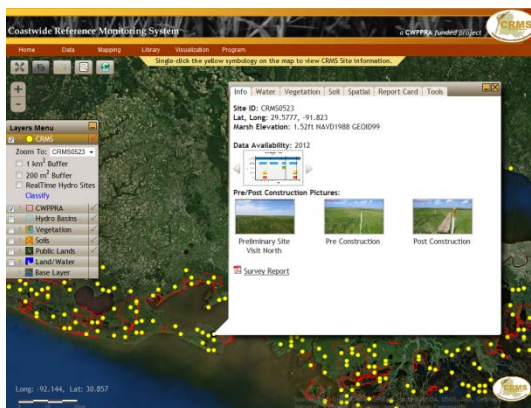
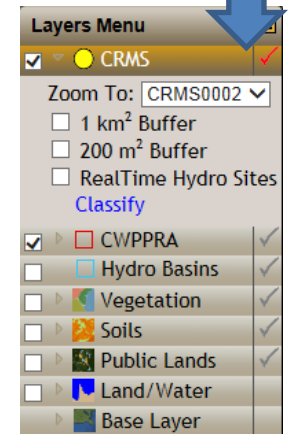


Try this step by step example:

1. In the Layers Menu, click on the box next to the yellow CRMS dot. The check will disappear and the CRMS data will be removed from the map.
2. Now click on CWPPRA and Hydro Basins. Both the CWPPRA projects and the Hydrologic Basins will be displayed on the map.
3. Try clicking on each of the “layers” to see how the map changes. Note that some of the layers are not transparent and so it can be difficult to see several layers at one time. However, if you expand the layers categories you will see “fill” controls like Vegetation and Land/Water that allow you to adjust layer transparency (by clicking on the arrows to the left of the layer category name).

Using CRMS for Site Specific Data

As mentioned earlier, each yellow dot represents a CRMS data collection site. If you would like to find out information about a particular CRMS site, single click on the bar just after the letters CRMS (or the CRMS text in the layer menu data). A drop down



menu will appear, similar to the one at the right of this page. The small black down arrow just after CRMS0002 will show a drop down menu with all of the active CRMS sites. Scroll through and pick the CRMS site of your choice. This technique will work to show a drop down menu for each of the layers. For the purposes of demonstration in this manual, look at **CRMS** site **CRMS0523** and **CWPPRA** project **BA-20** to investigate how the CRMS information is organized. CWPPRA project names that correspond to the numbers can be found at

LACoast.gov/new/Projects/List.aspx

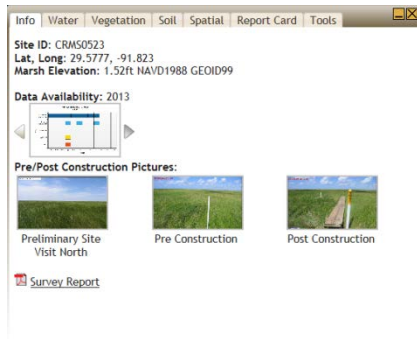
Note: The layers menu was setup to only have one menu open at a time. In other words, only one layer category can be expanded at one time. This keeps the menu from getting too large and going beyond the height of the screen.

Example: Selecting a CRMS site. *CRMS Site0523* Use the “Zoom To” drop down list to select CRMS0523. Click once on CRMS0523 to select the site from the drop down list. The site number will be highlighted in blue in the drop down list. When selected, the map will zoom to the site CRMS0523 and an information box will appear.

Each of the tabs at the top of the site information box will provide facts for the user. Included in the tabbed markers are: Information, Water, Vegetation, Soil, Spatial, Report Card and Tools.

INFO TAB

The **Information** tab includes the site ID number, the latitude and longitude, marsh elevation, a data availability graph, monitoring site pictures, and a PDF report that includes details about elevation surveys of the site.

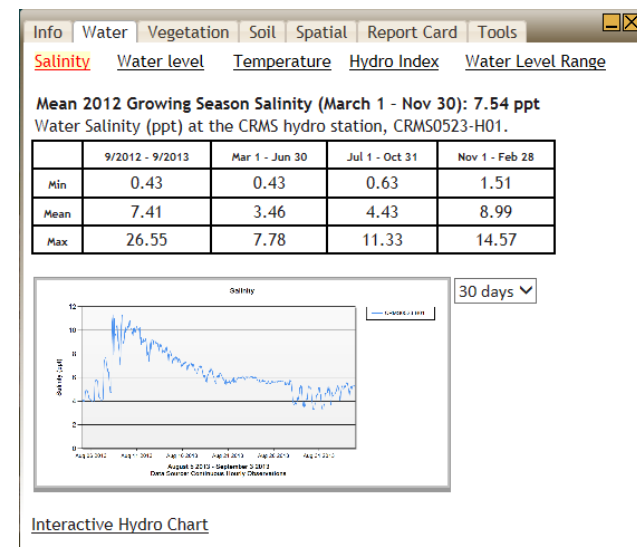


If a site is located within a CWPPRA project (ex., CRMS0672) the CWPPRA project name and project type will also be included on the information tab.

The data availability graph includes information about what data were collected at this particular site each year. There is a standard data collection protocol with established sampling periods but in special cases a site might not have data (ex., a hurricane destroyed accretion plots). Simply click on the arrows to see the data that were gathered each year. By clicking on the data availability graph once, the graph will be displayed larger, showing details such as which months the data were collected.

WATER TAB

The **Water** tab has information about salinity, water level, temperature, the **hydrologic index**, and water level range. Each underlined subheader will provide additional graphs and data. Salinity, water level, and water temperature graphs can be selected for the most recent 30 or 90 days of available data. These intervals allow for a better understanding of what is happening at each site. If you would like a different period of record for the data type you can choose date ranges in the Visualizations/Charting section of the website.



The Interactive Hydrology Chart at the bottom of the Water tab/Salinity subheader can chart several factors at one time.



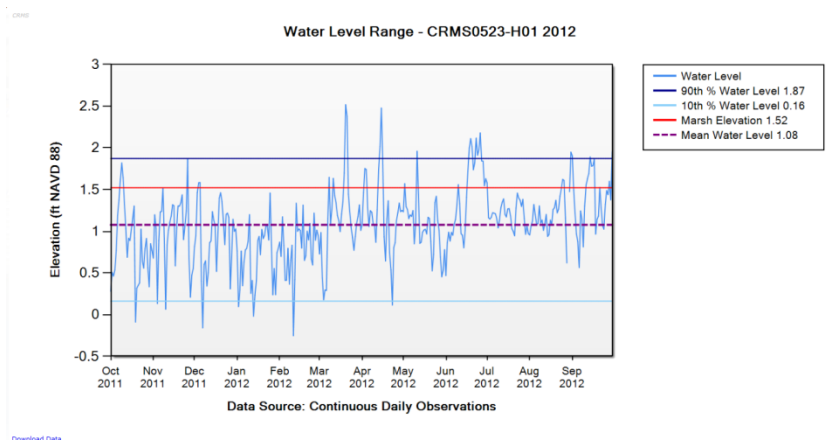
Click on each of the underlined words (subheaders) to investigate the water data for CRMS0523.

Scientists and educators use these data to answer important questions about the health of wetlands. Questions such as:

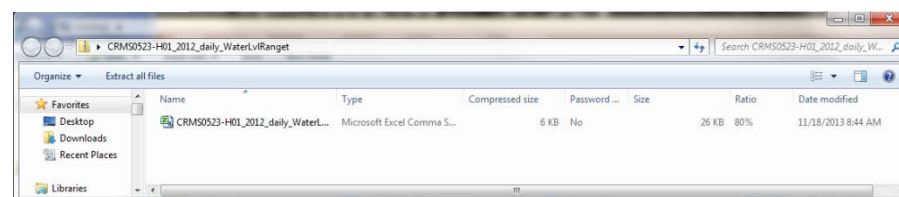
- What might be a cause of the daily changes in salinity? Or, what influences salinity?
- Which day during this month had the highest salinity?
- What might be a cause for the spike in salinity?
- What day had the lowest salinity?
- Identify organisms that are affected by salinity.
- Estimate the number of days during the month that the marsh is inundated or covered with water?
- Estimate the high tide on a particular day?
- Estimate the low tide on a particular day?
- How deep is the water over the marsh surface when the marsh is flooded at a particular CRMS site?

The final two subheadings (Hydrologic Index and Water Level Range) help assess site specific hydrologic conditions. The Hydrologic Index (HI) jointly assesses the suitability of two critical aspects of wetland hydrology, average salinity and percent time flooded, in maximizing vegetation primary productivity for the 5 different marsh classifications in coastal Louisiana including swamp, fresh, intermediate, brackish, and saline. The Water Level Range graph compares site specific marsh elevation with mean water level and water level observations.

In the lower left corner of this water level graph there is a link to download data. This "Download Data" link appears on graphs throughout the website. By clicking the link the data will be downloaded to your computer as a Microsoft Excel file. Once downloaded, opening the files will display actual numeric values of the data on the graph.



[Download Data](#)

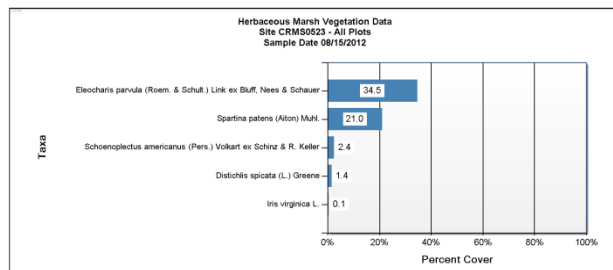
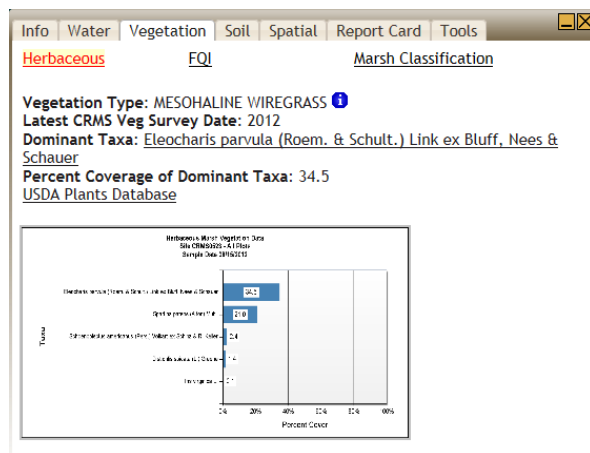


Station ID	MonDate	Salinity	Water_Level	Water_Temperature
1 CRMS0523-H01	10/1/2011 0:00	7.343333	0.278571	23.26083
2 CRMS0523-H01	10/2/2011 0:00	6.6625	0.504583	22.155
3 CRMS0523-H01	10/3/2011 0:00	6.772917	0.46125	22.40083
4 CRMS0523-H01	10/4/2011 0:00	6.794167	0.335	23.48208
5 CRMS0523-H01	10/5/2011 0:00	6.612083	0.766667	24.1475
6 CRMS0523-H01	10/6/2011 0:00	6.508333	1.184583	24.62458
7 CRMS0523-H01	10/7/2011 0:00	6.0175	1.371667	24.64083
8 CRMS0523-H01	10/8/2011 0:00	5.357917	1.620833	24.93417
9 CRMS0523-H01	10/9/2011 0:00	4.683333	1.8175	24.69667
10 CRMS0523-H01	10/10/2011 0:00	4.374166	1.64	24.21083
11 CRMS0523-H01	10/11/2011 0:00	4.790833	1.322917	24.79625
12 CRMS0523-H01	10/12/2011 0:00	5.1875	1.02875	25.77417
13 CRMS0523-H01	10/13/2011 0:00	5.55625	0.686667	26.35417
14 CRMS0523-H01	10/14/2011 0:00	5.217916	0.915	25.52958
15 CRMS0523-H01	10/15/2011 0:00	4.767917	0.8875	25.5225
16 CRMS0523-H01	10/16/2011 0:00	4.937083	1.018333	25.98167
17 CRMS0523-H01	10/17/2011 0:00	5.232917	1.154167	26.31458
18 CRMS0523-H01	10/18/2011 0:00	5.908182	1.300454	25.18091
19 CRMS0523-H01	10/19/2011 0:00	5.56625	-0.09	15.80667
20 CRMS0523-H01	10/20/2011 0:00	6.751364	0.317143	16.85333
21 CRMS0523-H01	10/21/2011 0:00	6.8425	0.34875	18.57125

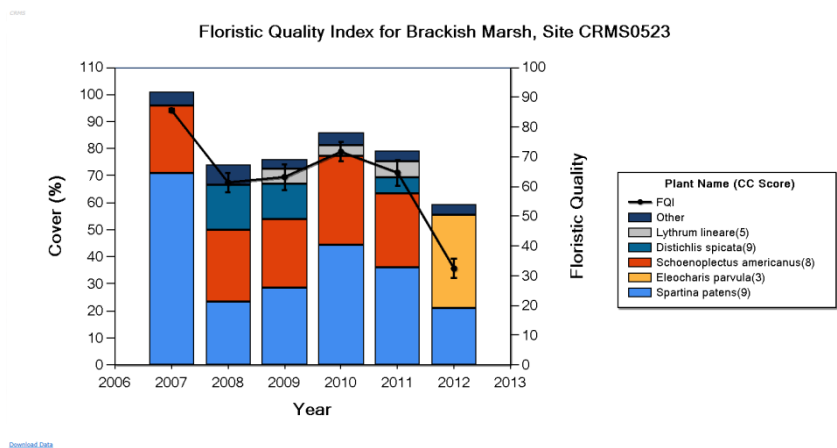
VEGETATION TAB

The **Vegetation** tab includes three basic subheaders: herbaceous, FQI, and marsh classification. The **Herbaceous** subheader provides information about the observed vegetation at CRMS sites. The vegetation surveys are done in 4 meter² (usually 10 stations [i.e. plots] per CRMS site) along a diagonal transect that crosses the 200 meter² data collection area for each CRMS site.

Again, by single clicking on the graph; the graph will enlarge and the names of the plants and the associated percent coverage are displayed on the bar graphs. Clicking on the graph one more time will make the graph small and return you to the original vegetation tab.

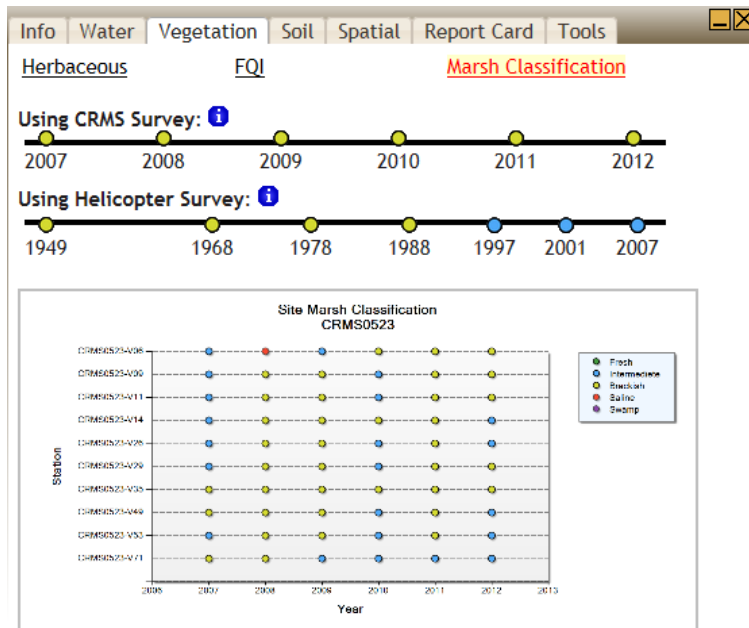


The **FQI** subheader contains information about the Floristic Quality Index. The Floristic Quality Index (FQI) was developed for coastal Louisiana, similarly to other regions of the U.S., to determine the quality of a wetland based on its species composition. The FQI is scored from 0 - 100 which can be calculated at the CRMS station, site, or project scale. To learn more about FQI, click on the “What does this chart mean?” information link under the graph.



The FQI graph displays both the percent cover and the FQI score for each vegetation survey. Each species is identified by name and a legend is provided to indicate which species corresponds to each color and what the coefficient of conservatism score (CC) is for each species observed.

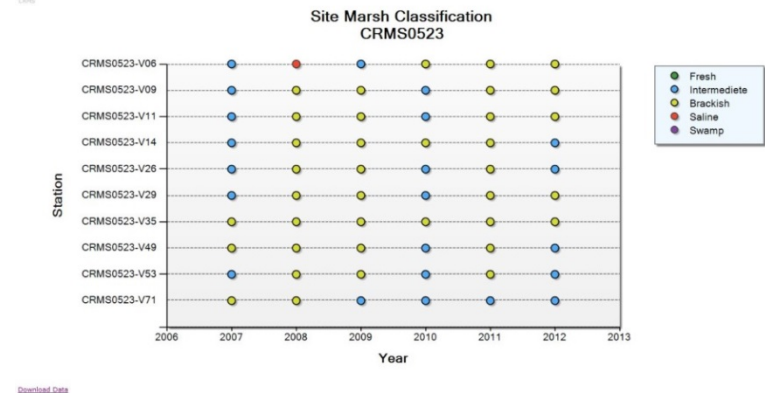
The last subheading under Vegetation is **Marsh Classification**. Marsh classification is important because it helps the scientific community determine whether physical conditions at a site are changing and causing shifts in the vegetation. For example, is a site becoming more saline due to salt water intrusion or is a site freshening due to a freshwater introduction project.



There are two ways that the vegetation data are collected: by helicopter survey and on-the-ground CRMS vegetation surveys.

Vegetation types of fresh, intermediate, brackish, saline, and swamp are assigned to CRMS sites by an algorithm that uses species composition and cover data collected annually from the sites. Every CRMS site is assigned a marsh classification each year using the available vegetation data at the site.

The graph below for CRMS0523 shows that marsh stations (i.e., plots) within a CRMS site can vary in classification. Again, actual data can be downloaded as a Microsoft Excel spreadsheet by clicking on the Download Data link at the lower left of the graph.



[Download Data](#)

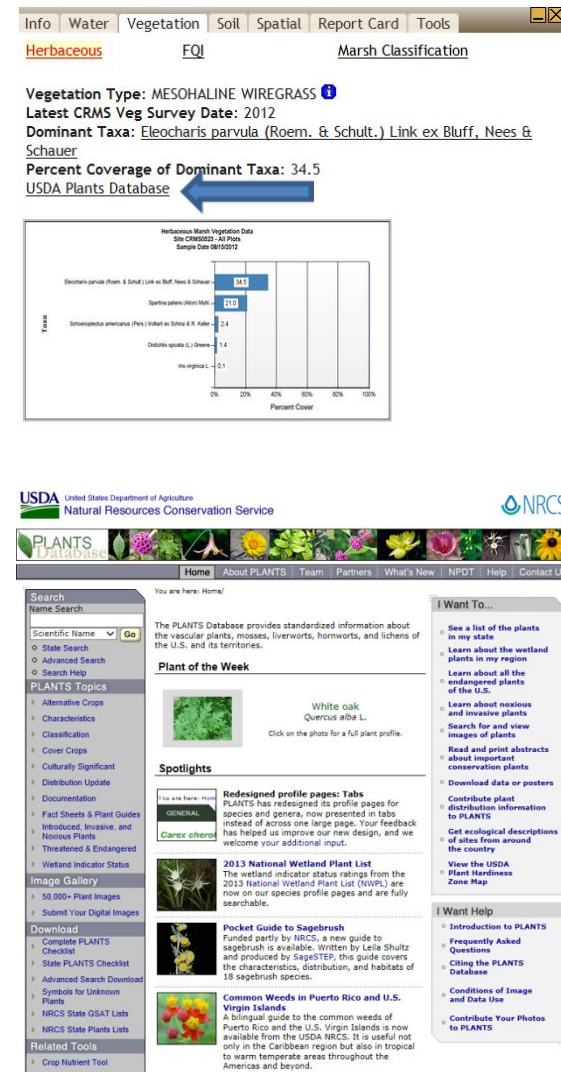
A careful look at the graph indicates that the area was primarily intermediate in 2007 and changed in 2008 to brackish or saline. Questions about what caused that change might include: whether drought conditions existed during 2008 or did Hurricane Gustav bring in salt water. These types of data extension questions promote higher order thinking skills in scientists and students alike.

Again, a legend to the right of the graph identifies the primary habitat types as fresh, intermediate, brackish, saline and swamp. Certain species (indicator species), when present at designated abundance levels, can be used to assign marsh types to CRMS sites.

After viewing the **Vegetation** tab, questions about plant composition in the area might include:

- What year was the first data recorded about plants at this site?
- What year was the last data recorded at this site?
- Which plant is the most common in the most recent year?
- Give the percent coverage of *Spartina patens* from the herbaceous marsh vegetation graph.
- Why is plant diversity important in an ecosystem?
- Which plant(s) make up less than one percent of the plant composition?
- What role do you think plants play in habitat restoration?
- As a student, if you were going to help out with coastal restoration, which type of activity would you prefer to do and why?
 - Grow new plants for restoration.
 - Volunteer to help with a coastal restoration planting event.
 - Write an article in the school newspaper to share information about restoration.
 - Create a video to share information about coastal Louisiana.

The other important tool on the Vegetation tab, Herbaceous subheader is a link to the U.S. Department of Agriculture (USDA) Plant Database. This link will direct you to an official list of all the plants identified by the USDA.



SOIL TAB

The **Soil** Tab includes three subheaders: percent organic, bulk density, and surface elevation/accretion/SVI. The primary function of this section is to provide information about the soil at each particular site. Although all CRMS sites are in coastal wetlands, soil characteristics vary greatly across the landscape and even within one soil core.

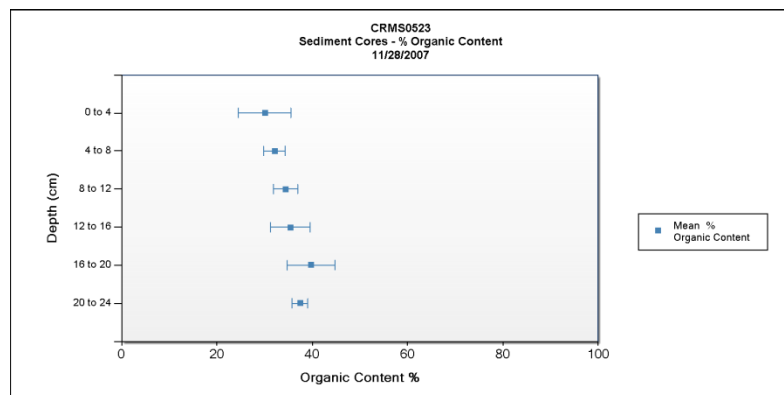
Info	Water	Vegetation	Soil	Spatial	Report Card	Tools
Marsh Elevation: 1.52ft NAVD1988 CRMS Measured Bulk Density: 0.221 g cm⁻³ NRCS Soil Type: Lafitte association						

Percent Organic

Bulk Density

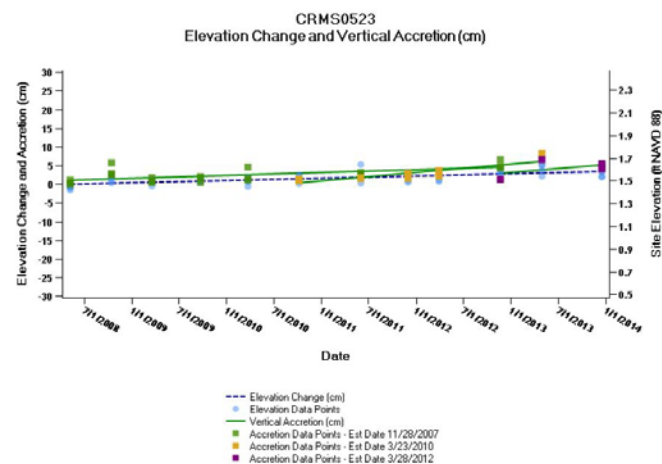
Surface Elevation/Accretion/SVI

Depth (cm)	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20	20 - 24
% Avg Organic Matter	30	32.04	34.37	35.4	39.75	37.4
Error	±5.5	±2.28	±2.56	±4.15	±5.01	±1.66



Open each of the subheaders to view the graphs that include information about the sediment cores. Again, data can be downloaded to a Microsoft Excel spreadsheet by clicking on the lower left corner of the enlarged graphs for both percent organics and bulk density.

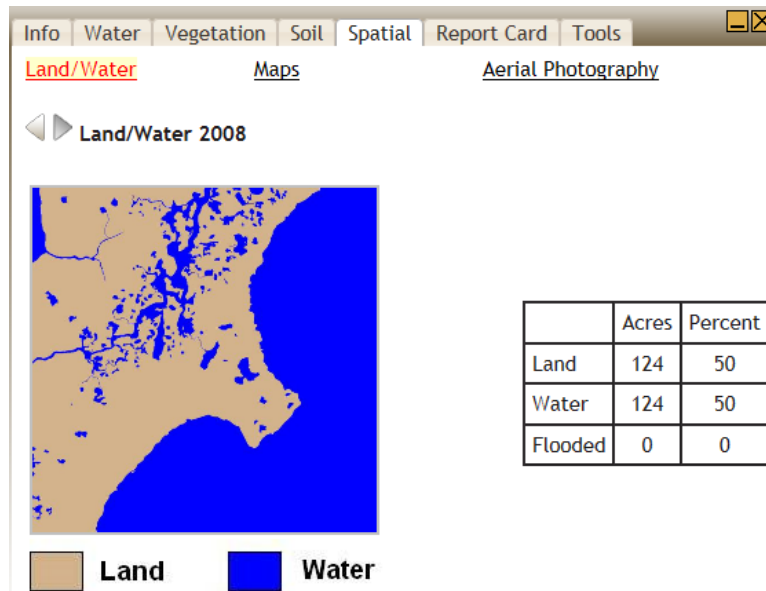
The **Surface Elevation and Accretion** data help to determine if a location is maintaining a consistent elevation or is it submerging or emerging through time.



Elevation change is measured with the Rod Surface Elevation Table (RSET) and is calculated cumulatively, relative to readings made during station establishment. Vertical Accretion is measured above feldspar marker horizons. Original marker horizons are established concurrently with initial RSET measurements. New feldspar marker horizons are regularly established, providing multiple vertical accretion measurements. The lines in this figure are linear fits through the elevation change measurements for each direction (n=4 per sample date) and vertical accretion measurements (n=3 per sample date, establishment date).

SPATIAL TAB

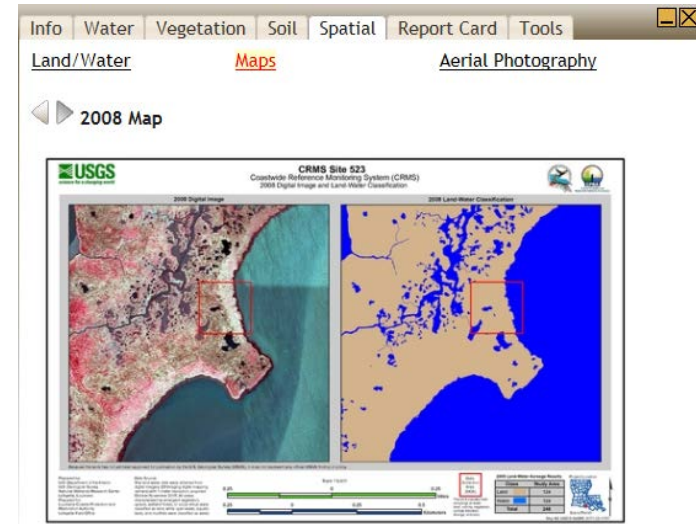
The **Spatial** tab includes three subheadings: land/water, maps, and aerial photography. Click on all three to test the interface. The **Land/Water** subheader gives a visual overview of the percent land at the CRMS site.



The arrows directly above the images allow users to view which parts of the CRMS site were land and water during previous years when land to water analyses were completed.

In addition to the brown and blue map, a table indicates the number of acres of land and water and the percent of land and water at each CRMS site.

The **Maps** subheader displays a map created using aerial imagery. The red box indicates the 200m² data collection area for the CRMS site.

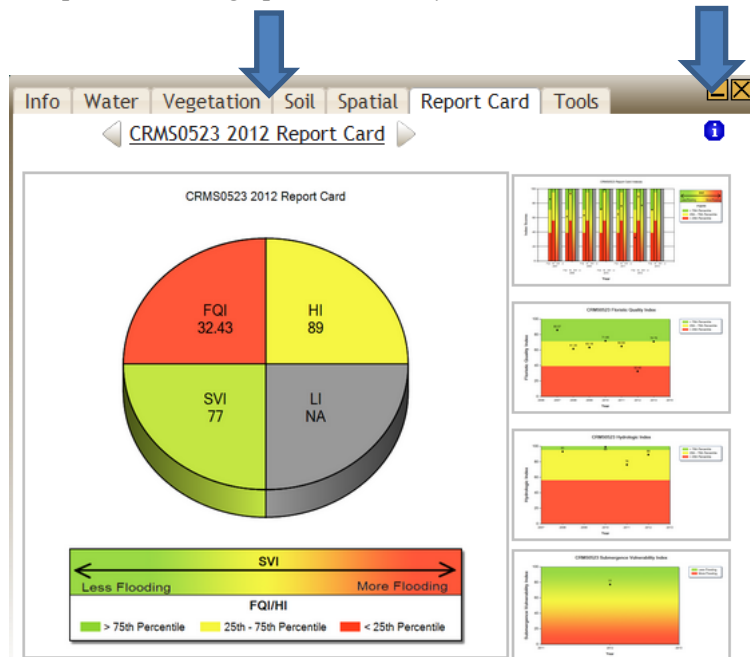


Aerial photography has been used widely in the United States since the 1930s to assist land managers in the evaluation of natural resources. Under the **Aerial Photography** subheader, digital imagery is used to create “false colors.” The red color is associated with live vegetation.



SITE LEVEL REPORT CARD

As evidenced by the review of just one monitoring site, CRMS collects monitoring data for numerous ecological parameters. Data have been summarized in a "Report Card." Using CRMS data, unique indices have been developed by the CWPPRA program to create an interactive report card. The report card summarizes information and displays scores and detailed information for individual CRMS sites, restoration projects, hydrologic basins and the entire Louisiana coast. The report creates pie charts and graphs for a variety of indices.



A detailed description of what information is in the report card and what that information actually represents can be found by clicking on the **Report Card** link at the top of each Report Card tab.

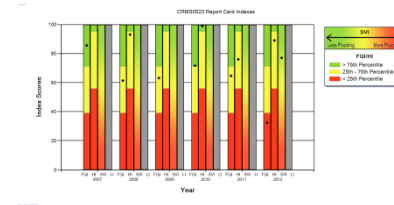
Report Card file sizes may be large and may take a minute to download.

Clicking the arrows to the left and right will cycle through report cards available for other years. The graphs available on the Report Card tab are meant to give a brief overview of how the site is performing without having to read the entire report card. Report cards are created for each year that sufficient data are available. You can also access report cards at LACoast.gov/chartingwebservices2/report_cards

Observe that each index helps explain the conditions of a particular aspect of the coastal wetlands ecosystem. By comparing indices at various times and spatial scales, managers can understand the overall condition of coastal wetlands in Louisiana.

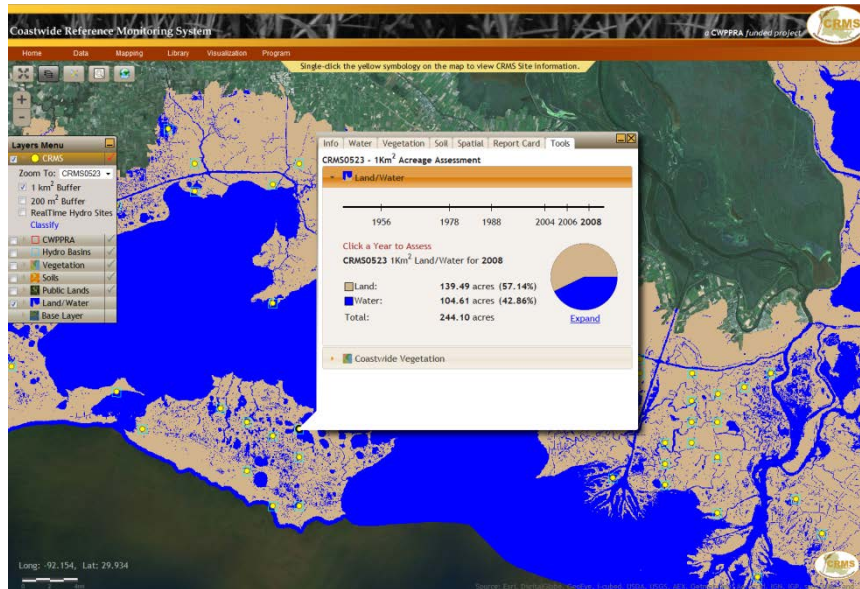
Because no regulatory thresholds currently exist for the ecological parameters of interest in the CRMS program, it was not possible to assess index scores based on previously defined values that would indicate an acceptable or unacceptable score. The report card was designed to help resource managers evaluate the ecological conditions and trajectories of change for a site, a restoration project, projects, or even hydrologic basin.

There is also a small "i" button on the top left of the report card page. If you click that "i," it will give a description of how the CRMS team assessed indices for the report card. The breaks for good, fair, and poor are based on the distribution of index scores across all CRMS sites.



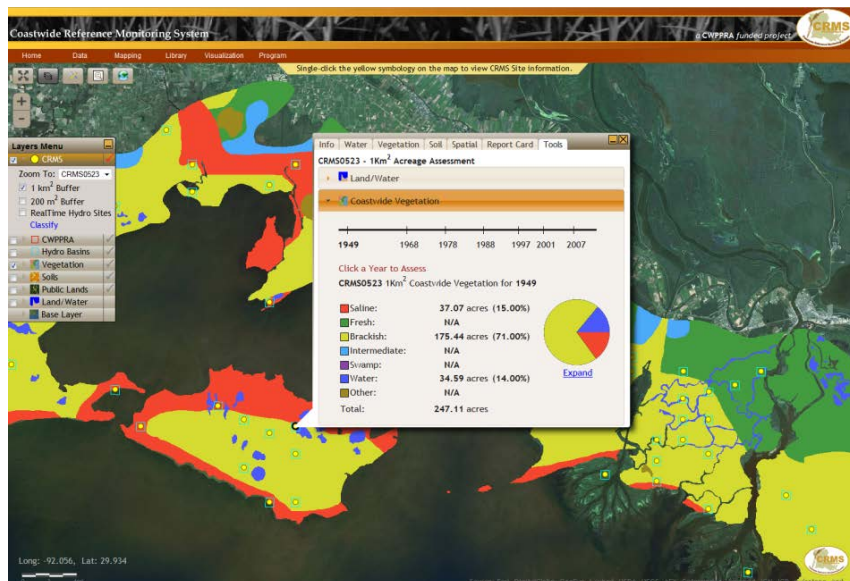
Much like a student report card, the values are given in percentile.

TOOLS TAB



The **Tools** tab is the final tab on each CRMS site information box. It includes information on land and water changes over time and coastwide vegetation over time. Simply click on the year to access the information.

Under **Land/Water** the data is displayed in both acres and percentage with a pie graph to accompany the data. The map behind the information box also changes to display the land/water map for the year that is chosen. Note: The map to the left is for 2008.



Under **Coastwide Vegetation**, each of the habitat types are identified and both the acres of each type and a pie chart of the habitat types are available. The map behind the information box also changes to display the coastwide marsh classification map for the year that is chosen. Note: The map to the left is for 1949 and predates CRMS on-the-ground vegetation surveys. These coastwide vegetation types are based on the helicopter survey data. Additional information is provided about the helicopter based vegetation classifications below.

CRMS

MOVE CLOSE

2007: [Sasser, C.E., Visser, J.M., Mouton, Edmond, Linscombe, Jeb, and Hartley, S.B., 2008, Vegetation types in coastal Louisiana in 2007: U.S. Geological Survey Open-File Report 2008-1224, 1 sheet, scale 1:550,000, 2007 Data](#)

2001: Linscombe, G., and Chabreck, R., [n.d.], Task III.8—Coastwide aerial survey, brown marsh 2001 assessment: Salt marsh dieback in Louisiana—Brown marsh data information management system, accessed June 4, 2006, at <http://brownmarsh.net/data/III.8.htm> [2001 Data](#)

1997: Chabreck, R.H., and Linscombe, G., 1997, Vegetative type map of the Louisiana coastal marshes: Baton Rouge, Louisiana Department of Wildlife and Fisheries. [1997 Data](#)

1988: Chabreck, R.H., and Linscombe, G., 1988, Vegetative type map of the Louisiana coastal marshes: Baton Rouge, Louisiana Department of Wildlife and Fisheries, set of 10 maps. [1988 Data](#)

1978: Chabreck, R.H., and Linscombe, G., 1978, Vegetative type map of the Louisiana coastal marshes: Baton Rouge, Louisiana Department of Wildlife and Fisheries. [1978 Data](#)

1968: Chabreck, R.H., Palmisano, A.W., Jr., and Joanen, T., 1968, Vegetative type map of the Louisiana coastal marshes: Baton Rouge, Louisiana Department of Wildlife and Fisheries. [1968 Data](#)

1949: O'Neil, T., 1949, The muskrat in Louisiana coastal marshes: New Orleans, Louisiana Wildlife and Fisheries Commission, 28 p. [1949 Data](#)

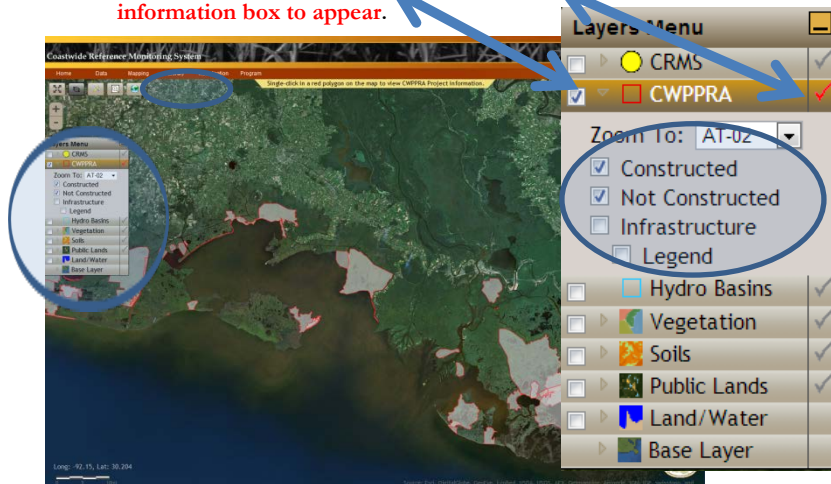
● Saline ● Intermediate ● Swamp
● Brackish ● Fresh ● Other

Using CWPPRA Project Information Layer

From the CRMS home page (LACoast.gov/crms), hover over the word “Mapping.” By hovering over the word “Mapping” a drop box will appear. Choose Basic Viewer (Current) by clicking one time. The page below with a map of Louisiana’s coastal zone will appear. The map may contain different markings such as CRMS sites but by clicking on the box to the left, the layers are easily changed.

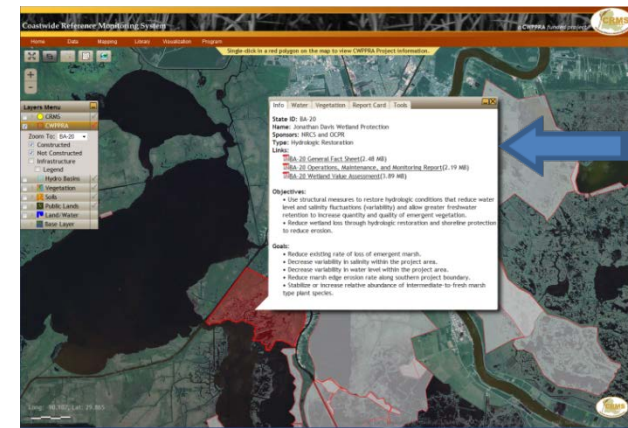
Now that we have gone over the data and options available from the CRMS layer, let’s go into the CWPPRA layer. Click on the gray check to the right of the CWPPRA layer text inside the layer menu. This will make the CWPPRA layer the active layer and will allow the map to display data relevant to it. Click on the white box to the left of CWPPRA, a left check will appear and then click on the bar next to the acronym CWPPRA. A drop down menu will appear that includes the words Zoom To, Constructed, Not Constructed, Infrastructure, and Legend. Choose the items you would like to have displayed or visualized. **Note: *UNCHECK* boxes you do not want displayed or visualized. Each of the grey areas on the map that are surrounded by a red line indicates a CWPPRA project boundary.**

BE SURE BOTH THE LEFT AND RIGHT BOXES are checked for project information box to appear.



You can click on the down arrow next to the project letter/number designation or scroll over the map to choose a project. As an example, click the down arrow and choose **BA-20** at the bottom of the list. This letter/number combination is part of the coastal restoration project naming convention for Louisiana. Instead, you may choose to simply click on highlighted area of the map to view a project.

The project number **BA-20** is named **Jonathan Davis Wetland Protection**. The project is in SE Louisiana. When BA-20 is clicked, the map will automatically enlarge and shift to take to a close up view of the project area and an information box will appear.



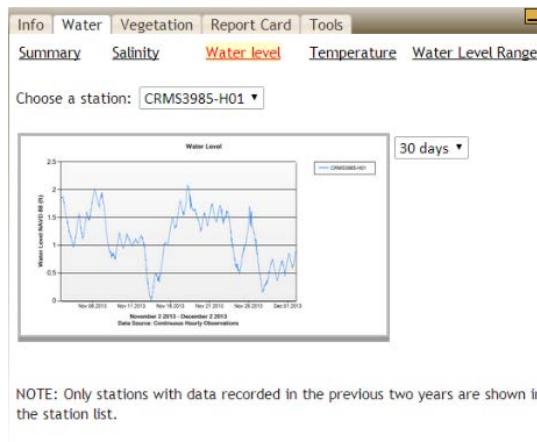
INFO TAB

The **Info** tab contains information including: the **State ID Number**, the project **Name**, acronyms for the federal and state **Sponsors**, the **Type** of restoration technique that is primarily being used, a **Link** to the general project fact sheet and the **Objectives** and **Goals** of the project.

Click on the link to see the General Project Fact Sheet for BA-20 the Jonathan Davis Wetland Protection project. Note: The LACoast.gov website contains a host of information on each project under the Project tab at LACoast.gov/new/Projects/List.aspx.

WATER TAB

The **Water** tab has information about **salinity**, **water level**, **temperature**, and **water level range**. Each underlined subheading will provide additional graphs and data. Salinity, water level, and water temperature graphs for stations within the project can be selected for the most recent 30 or 90 days of available data. These intervals allow for a better understanding of what is happening at each CWPPRA project location.



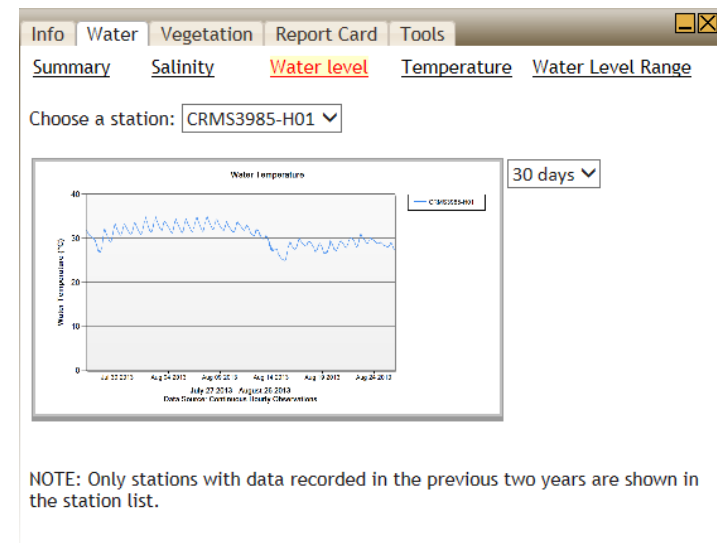
If there is a CRMS site within the project boundary, the station number(s) will appear and the data that was collected will be displayed along with project specific data described.

Click on each of the subheadings to explore the data related to the water parameters.

2013	Mean Annual Salinity	Salinity 10%	Salinity 90%	% Time Flooded	Tide Range (ft)
CRMS3985-H01	1.4	0.3	2.7	63.3	--
Project Mean	1.4	0.3	2.7	63.3	--
Reference Mean	N/A	N/A	N/A	N/A	--

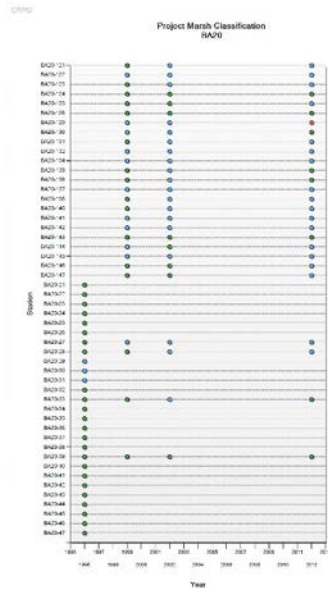
<70% - The available data covers less than seventy percent of the entire water year (Oct. 1 - Sept. 30).
Salinity 10%: 90% of all hourly salinity records for the given water year exceed the value for salinity 10%.
Salinity 90%: 10% of all hourly salinity records for the given water year exceed the value for salinity 90%.

Single click on the graph and the image will increase in size and a “Download Data” link will appear in the lower left corner.

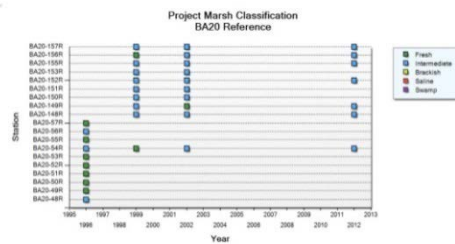


VEGETATION TAB

The **Vegetation** tab includes three subheaders: **marsh classification**, **project/ref FQI**, and **side-by-side**.

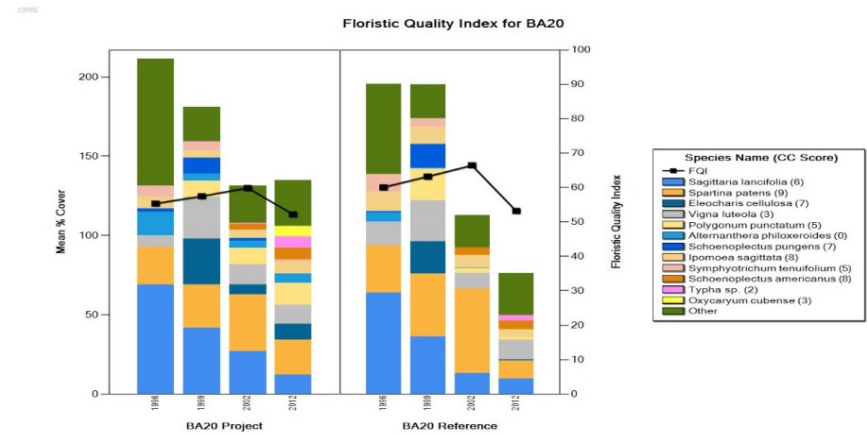


The **Marsh Classification** subheading pulls up two different graphs, one for the project and one for the reference sites. These graphs contain information about marsh type based on plant composition and are classified into fresh, intermediate, brackish, saline, and swamp for project or reference stations.



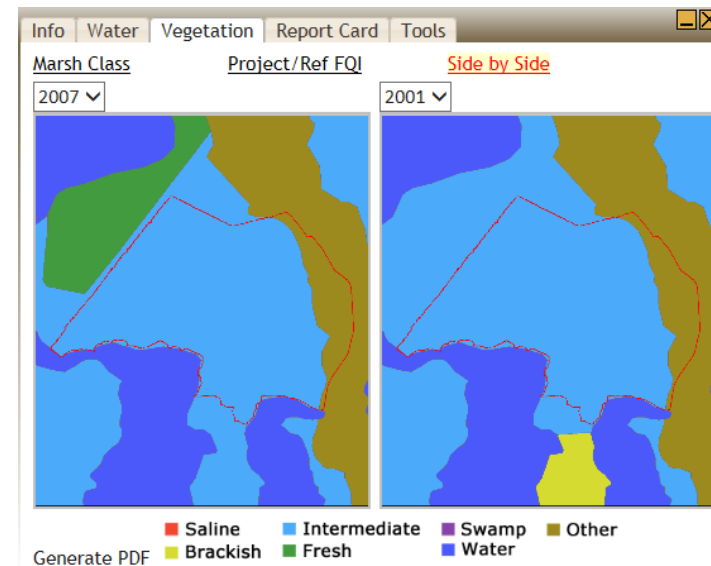
The **Project/Ref FQI** subheading also pulls up a graph of percent cover by species composition, reference stations and FQI scores. The term **FQI** stands for the Floristic Quality Index. The Floristic Quality Index (FQI) was developed for coastal Louisiana, similarly to other regions of the U.S., to determine the quality of a wetland based on its species composition. The FQI is scored from 0 - 100 which can be calculated at the CRMS site and project scale. On the right side of the graph there is a legend that includes a list of the dominate species that were identified during a field survey.

Single click on the graph and the image will increase in size and a “Download Data” link will appear in the lower left corner.



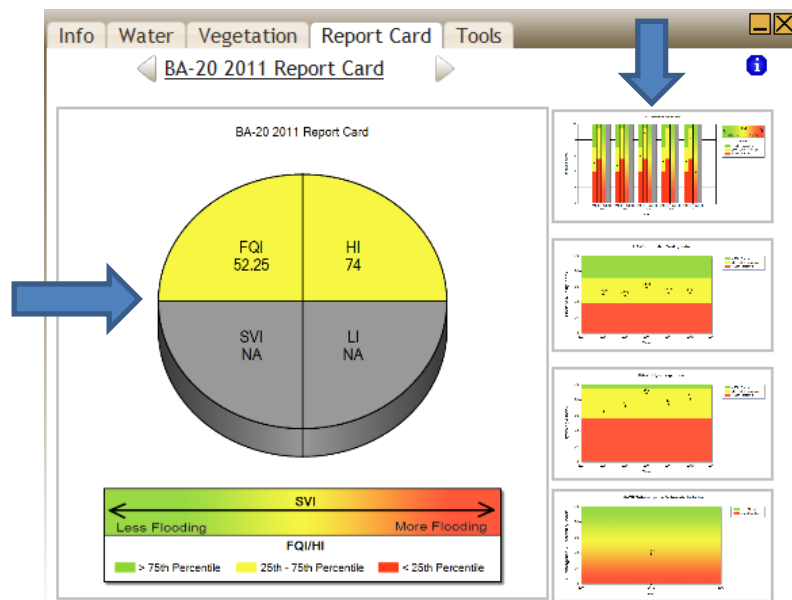
[Download Data](#)

The **Side-by-Side** subheading allows users to compare a project’s marsh classification across multiple years.



The PROJECT LEVEL Report Card

As evidenced by the review of just one CWPPRA project BA-20, monitoring data for numerous ecological parameters are available. Data have been summarized in a “Report Card.” Using CRMS data, unique indices have been developed by the CWPPRA program to create an interactive report card. The report card summarizes information and displays scores and detailed information for individual CRMS sites, restoration projects, hydrologic basins and the entire Louisiana coast. The report creates pie charts and graphs for a variety of indices.

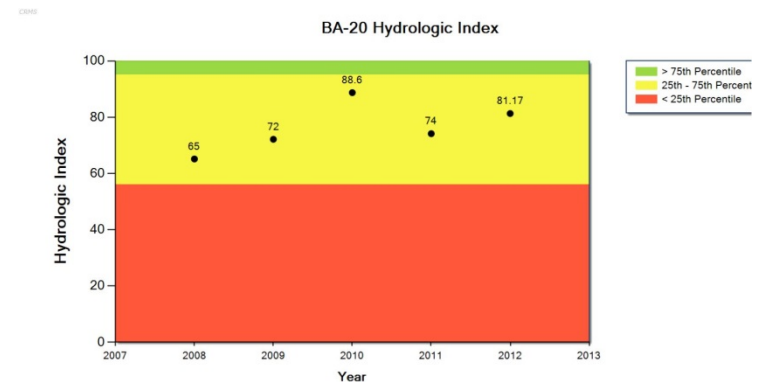


A detailed description of what information is in the report card and what that information actually represents can be found by clicking on the Report Card link at the top of each Report Card tab. Clicking the arrows to the left and right will cycle through report cards available for other years. The graphs available on the Report Card tab are meant to

give a brief overview of how the site is performing without having to read the entire report card. Report cards are created for the project level as sufficient data are available.

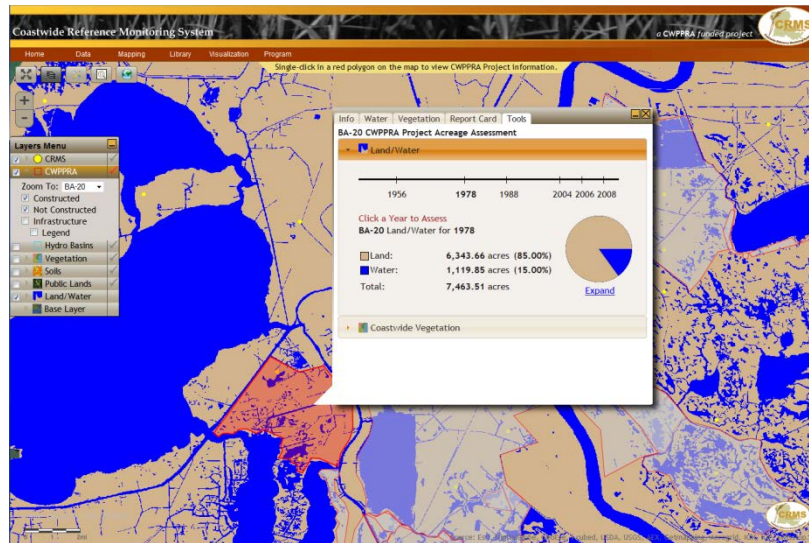
Observe that each index helps explain the conditions of a particular aspect of the coastal wetlands ecosystem. By comparing indices at various times and spatial scales, managers can understand the overall condition of coastal wetlands in Louisiana.

Because no regulatory thresholds currently exist for the ecological parameters of interest in the CRMS program, it was not possible to assess index scores based on previously defined values that would indicate an acceptable or unacceptable score. The report card was designed to help resource managers evaluate the ecological conditions and trajectories of condition changes of a site, a restoration project (s), or even hydrologic basin.



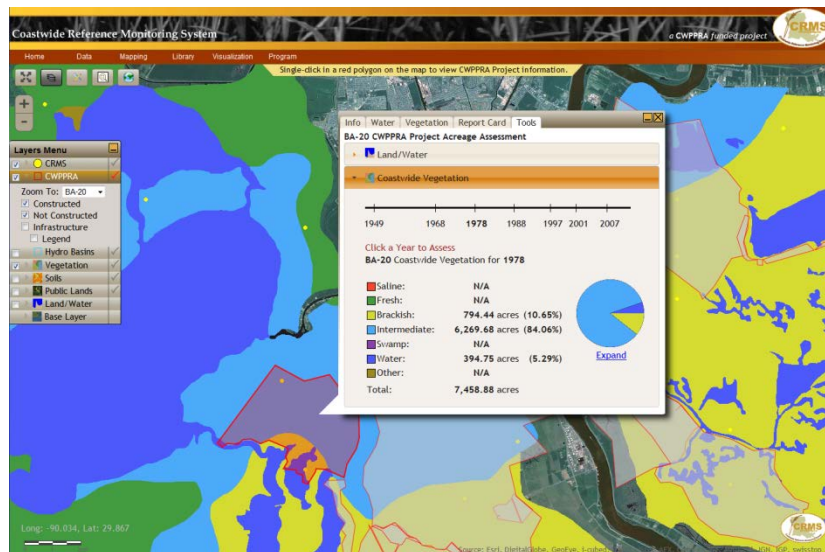
There is also a small “i” button on the top left of the report card page. If you click that “i,” it will give a description of how the CRMS team assessed indices for the report card. The breaks for good, fair, and poor are based on the distribution of index scores across all CRMS sites. Much like a student report card, the values are given in percentile.

TOOLS



The **Tools** tab is the final tab on each CWPPRA project. It includes information on land and water changes as well as vegetation over a period of time. Simply click on the year to access the information.

Under **Land/Water** the data is shared in both acres and percentage with a pie graph to accompany the data. The map behind the information box also changes to display the land/water map for the year that is chosen. Note: The map to the left is for 1978.

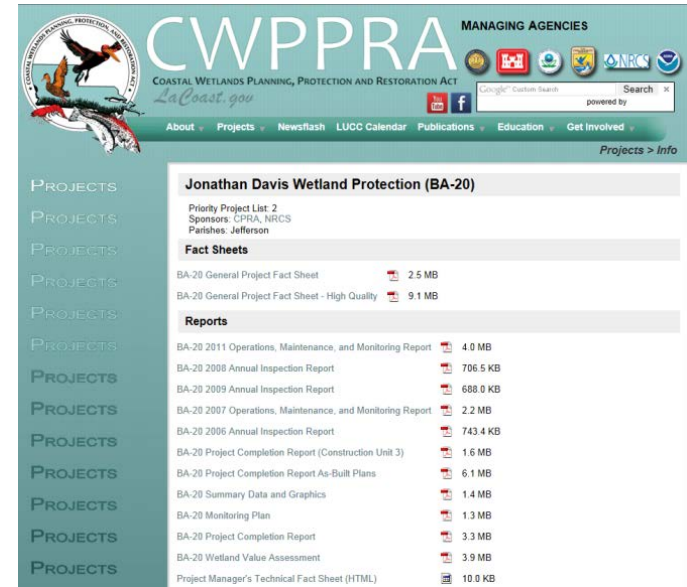
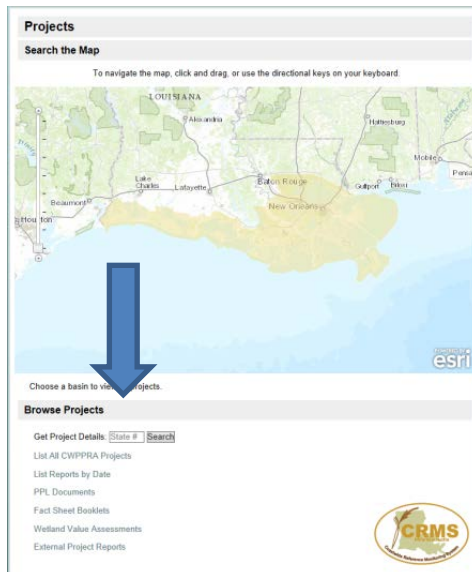


Under **Coastwise Vegetation**, each of the habitat types is identified and both the acres of each type and a pie chart of the habitat types is available. The map behind the information box also changes to display the Coastwise Vegetation for the year that is chosen. Note: The map to the left is for 1978.

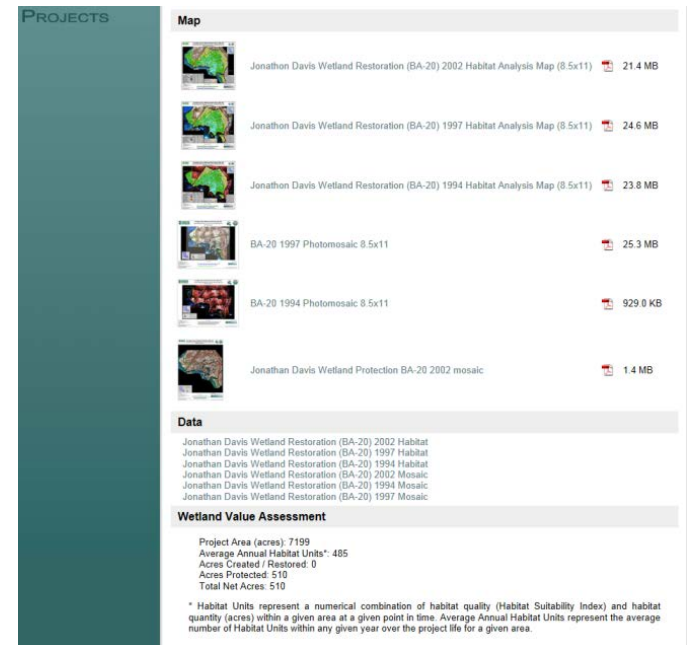
Additional CWPPRA Project Monitoring

Additional information is available on LaCoast.gov.

To learn more about CWPPRA projects and project specific monitoring, visit the web at LaCoast.gov. Click the Projects button or find a location on the map. For example, type in “BA-20” in the Get Project Details line and a list of fact sheets, reports and maps will become available.



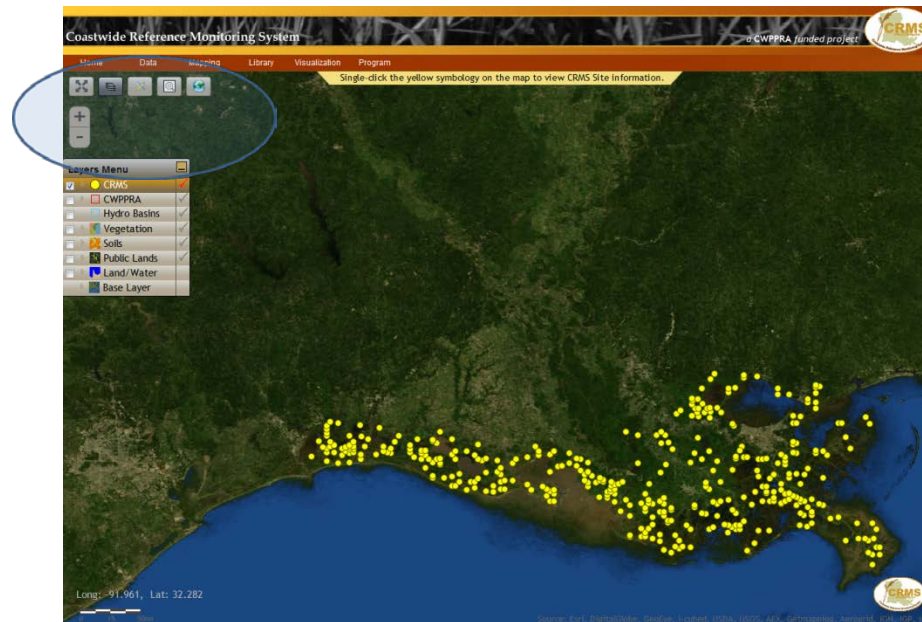
Click on the title of the report and a “.pdf” file will open with the information.



ADDITIONAL CRMS MAPPING TOOLS

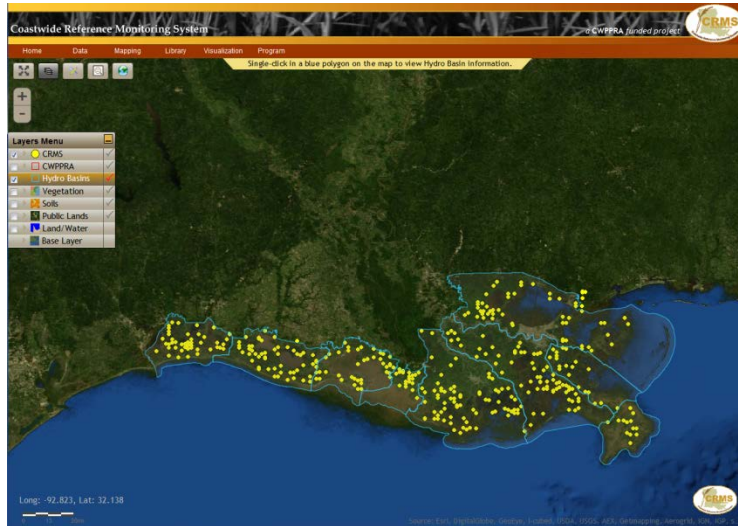
Located near the top left of the page are six additional tools. From left to right:

1. The icon with four arrows removes the CRMS heading and allows the map to take up more of the browser window. The tool can change the map size simply by clicking once on the icon.
2. The second icon, which looks like sheets of paper, is the **Layers Menu** which will visually add or remove the layers menu by clicking once on the icon. **REMEMBER The layer will be visually displayed but to access the data you must click on the red check on the right side of the Layer Menu to activate the data layer or for the data to become active. NOTE: You can only have one RED CHECK active at a time!**
3. The third icon, which looks like a pencil and a ruler, will load the **Tools**. By single clicking on the icon the **Tools Menu** will appear. Two layers appear under the **Tools** tab: **Classify** and **Assessment**. More on that later!
4. The fourth icon that looks like a magnifying glass is a **Zoom Tool**. Click once on the **Zoom Tool** and the scroll wheel on a mouse (or third mouse button) will help you zoom in or out on the map.
5. The fifth icon, which looks like a globe, is the “zoom to full extent” tool. This tool will bring the map zoom level and position back to the default setting. In other words, the viewer can see the entire coast of Louisiana and the edges of the Texas, Mississippi and Alabama coasts.
6. The plus and minus symbols zoom in and out on the map one zoom level at time.



ADDITIONAL LAYERS MENU

The additional layers on the CRMS site can be used to view different types of data. Clicking any of the check boxes to the left of the layer item will display the data relevant to that layer.



Hydro Basins

Hydrologic basins in Louisiana include the area of land where surface water from rain and tributaries drain into the Gulf of Mexico.

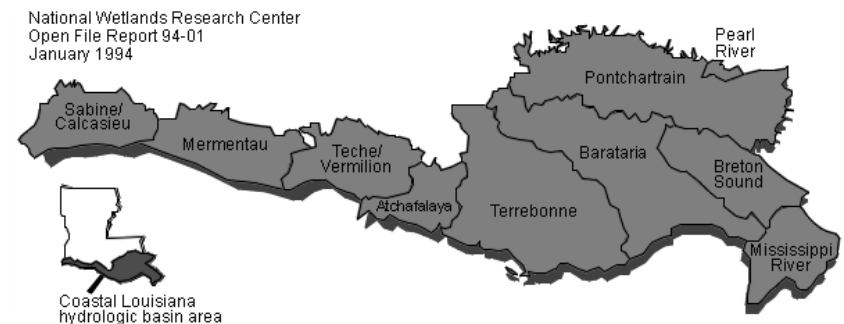
Clicking the gray check to the right of the Hydro Basin layer text will make that the current active layer. This will display the hydrologic basins for the Louisiana coast in blue with a gray transparency. Clicking on the map inside any of the blue areas will load an information window with information about the chosen hydrologic basin. The map

above shows both the CRMS sites in yellow and the CWPPRA hydrologic basins outlined in blue.

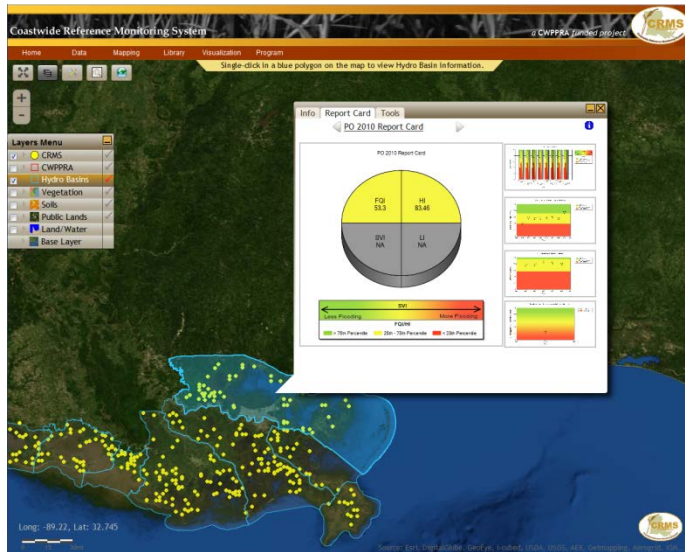
The basins from west to east and north to south are:

- Calcasieu/Sabine (CS),
- Mermentau (ME),
- Teche/Vermilion (TV),
- Atchafalaya (AT),
- Terrebonne (TE),
- Barataria (BA),
- Pontchartrain and Pearl River (PO),
- Breton Sound (BS),
- and the Mississippi River (MR).

The map below, created by the USGS National Wetlands Research Center in 1994, identifies the major hydrologic basins along the Louisiana gulf coast.



In the example below, the Pontchartrain Basin is highlighted. The information window includes three tabs containing general information (Info), a Report Card, and Tools similar to the tabs discussed in previous sections.



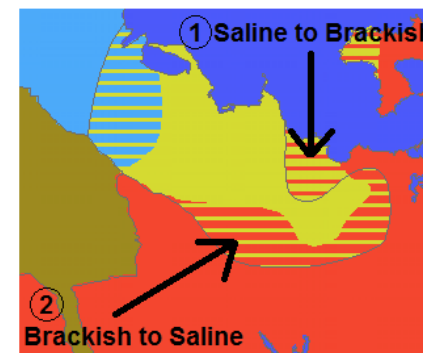
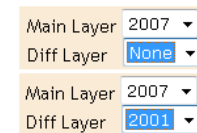
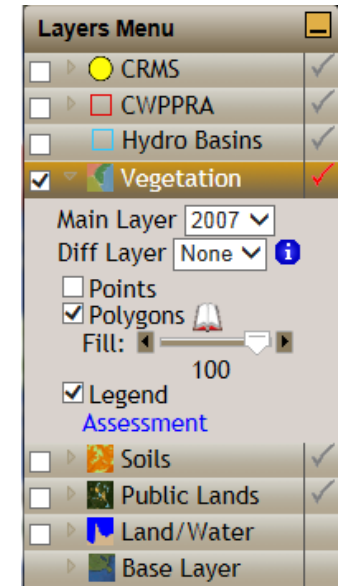
To leave this information window simply click on the X in the upper right corner.

Vegetation

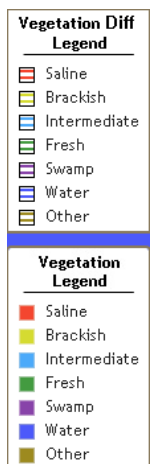
The next item on the **Layers Menu** is **Vegetation**. This layer contains information about the various plants that occur in the wetlands. These data come from point information that is gathered from coastal helicopter surveys or flyovers. The point data were interpolated into polygons delineating vegetation types coastwide such as fresh, intermediate, brackish, saline, and swamp. There are several pieces of information that can be accessed here.

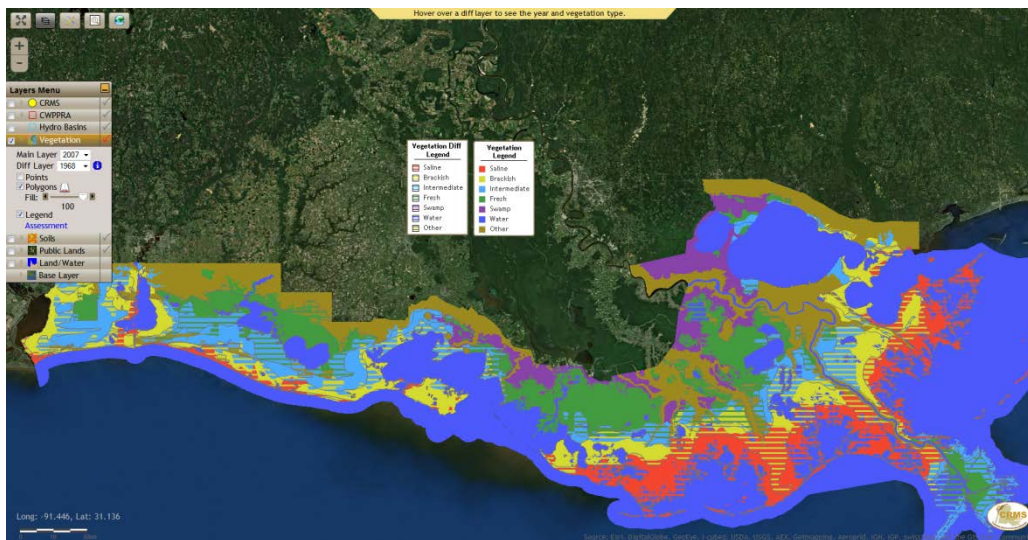
Again, click the right and left boxes next to the word “Vegetation.” The vegetation layer will be visualized on the map and the data associated with this map will be accessible. Choose a year in the “Main Layer” to identify which year you want to see.

You will also notice that there is a “Main Layer” and a “Diff Layer.” These two layers allow the user to compare vegetation over time. To use the vegetative difference layer, (“Diff Layer”) start by selecting a vegetative difference year and turning on the vegetative polygon by clicking on the box marked “Polygons.” Solid colors indicate areas where there has been no change between the selected years and striped colors indicate changes in vegetation between years.



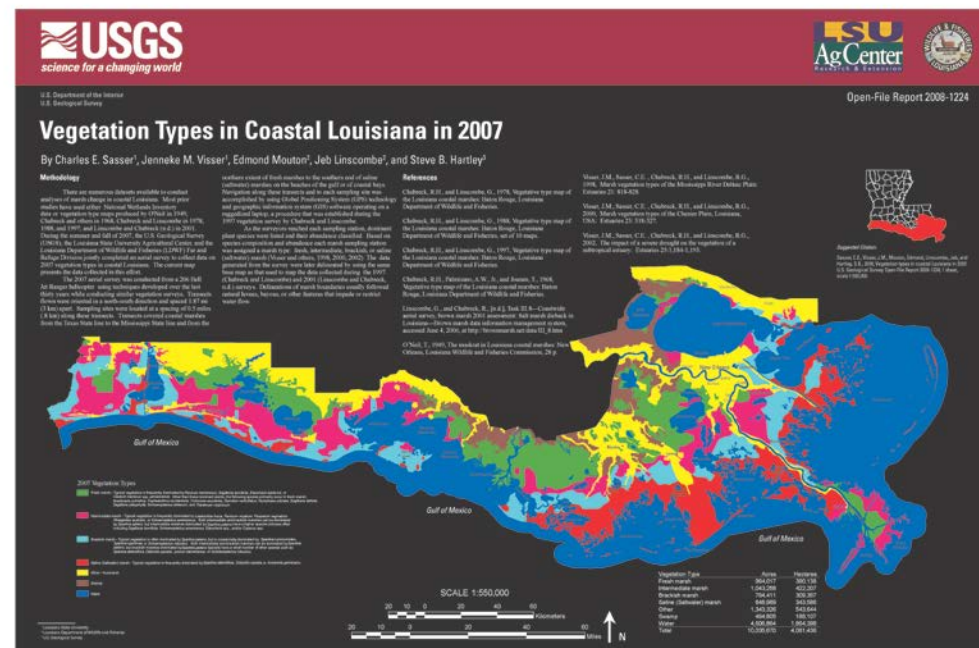
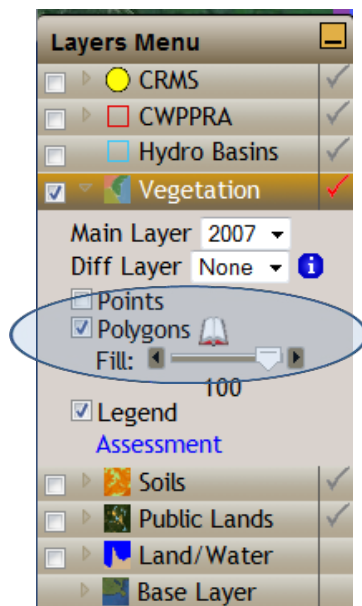
You can use the increase resolution (+/_) or wheel on the mouse to get a closer look at the map. Also, be sure to turn the legend on in order to know what the colors represent in both of the years. Hovering the mouse over the map will create a call out box that identifies the areas of change.





A coastwide map showing vegetation change would look similar to the one on the left.

An interesting addition to this layer is a small book icon that you see after the word “Polygons.” This book icon will lead you to a list of references and a report about the *“Vegetation Types in Coastal Louisiana in 2007.”* This USGS publication can also be found online at pubs.usgs.gov/of/2008/1224/

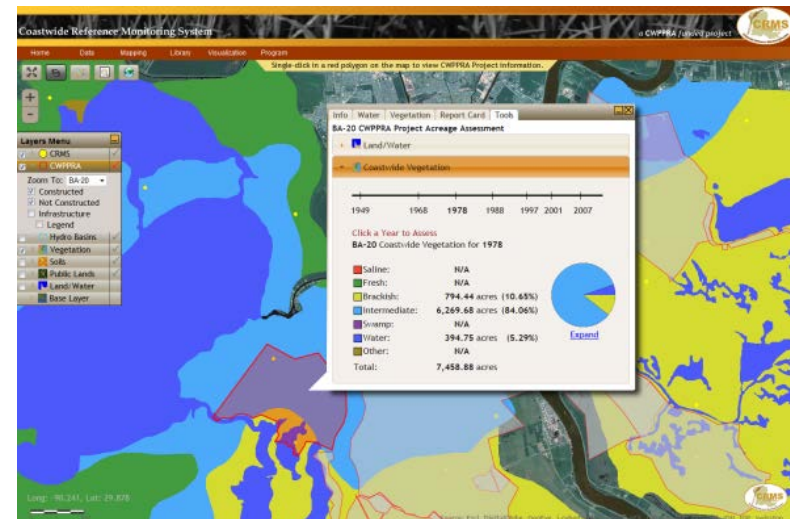


The final item under **Vegetation** is an **Assessment Tool**. When you click on the word **Assessment** in blue, the **Tools Menu** allows you to select either **Coastwide Vegetation** or the **Land/Water** layer to assess.



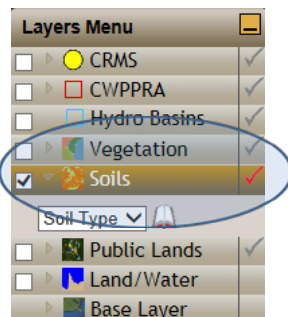
When you click on **Coastwide Vegetation Layer** and choose **Hydro Basins** as the **Bounding polygon layer**, **Pontchartrain (PO)** as the **Bounding polygon**, and **2001** as the **Year to assess**, the map will change to the Pontchartrain Basin and the information window displays the vegetation type and acreage for that basin in 2001. Compare the changes over time by selecting different years.

The **Vegetation** assessment tool can be used to visualize the vegetation types both in acres and percentages. Select **CWPPRA project** as the bounding polygon layer. **BA-20** is project selected as the bounding polygon and **1978** as the year to assess.



Soils

To view the many different soils in Louisiana's coastal zone, click the gray check box to the right of the **Soils** text to make that layer active and display the layer of data.

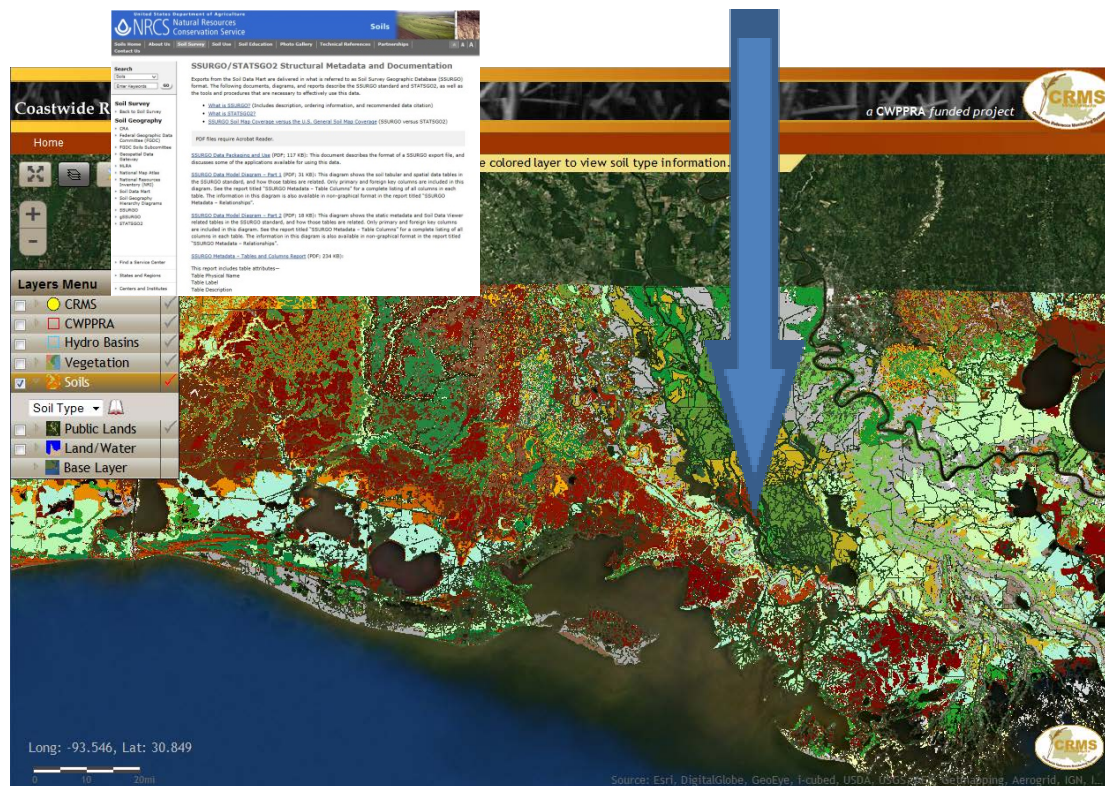


There are hundreds of different soils in coastal Louisiana. Soil types are recorded in soil surveys. These soil surveys are then used by farmers, real estate agents, land use planners, engineers, and others who need information about soil resources.

In coastal restoration, soils are important in understanding: how an area's substrate will work for a restoration project, or as water purifiers, or in flood regulation. Soil surveys are also important in identifying which soils support which plants.

The information about various soils can be accessed by clicking on the little book icon next to the word **"Soil Type"** which appears as a drop down list. This will link you to the USDA/NRCS website containing all the information about the SSURGO soils data.

soils.usda.gov/survey/geography/ssurgo/



Once the soil layer is active, the mouse will act as an interface for the soil type. Move or roll the mouse over the area of your interest and left click the mouse. The name of the soil will appear in an information box.

For example, the soils in green in Lafourche Parish, identified by the arrow above are "Dowling soils" and are frequently flooded.

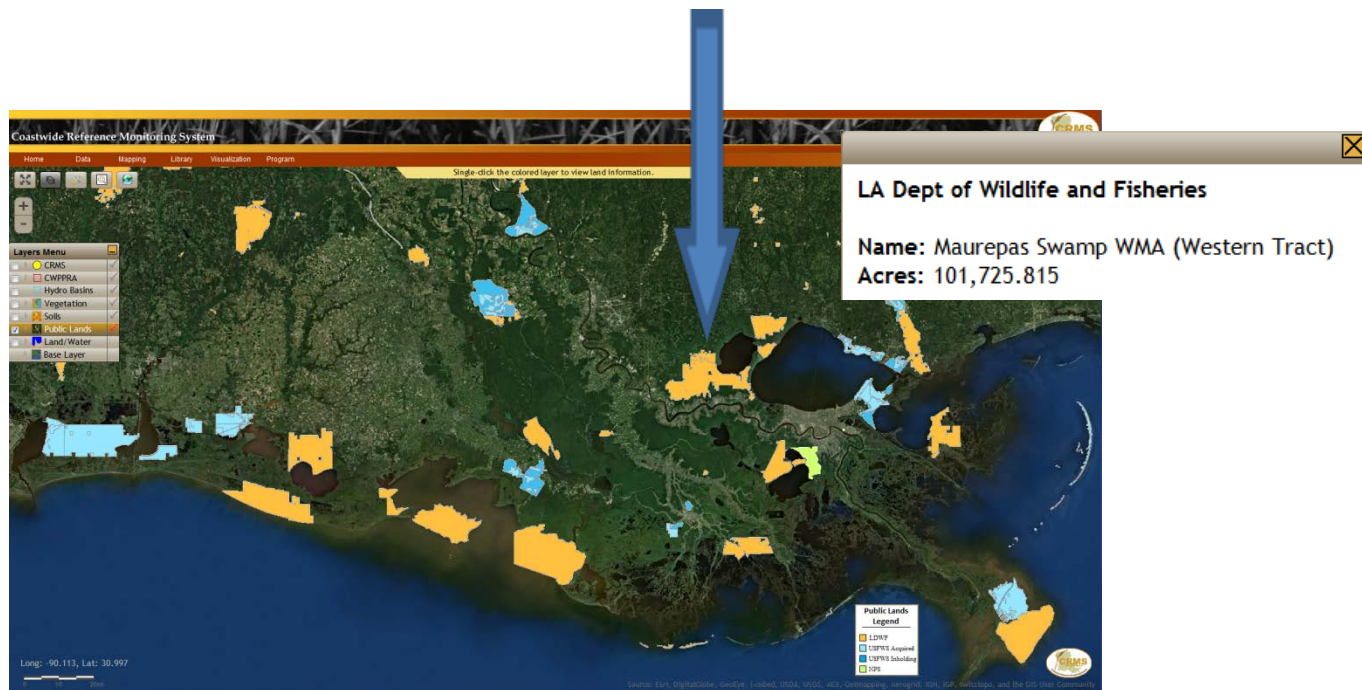


Public Lands

The **Public Lands** layer identifies those lands that are in the public domain. The legend at the bottom right indicates land owned by:

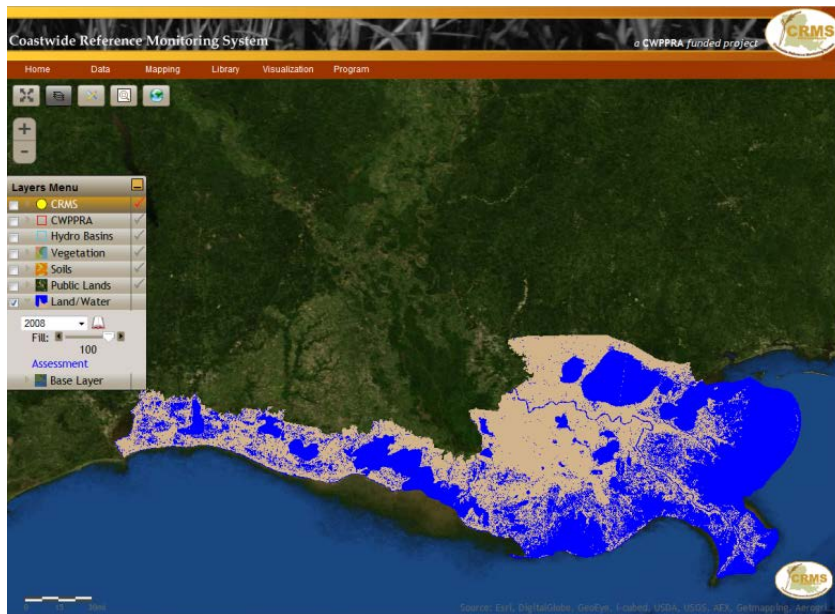
- LDWF – the Louisiana Department of Wildlife and Fisheries (State of Louisiana property),
- USFWS Acquired – the U.S. Fish and Wildlife Service (federal land that is acquired),
- USFWS Inholding – the U.S. Fish and Wildlife Service (federal land that is inholding), and
- NPS – the National Park Service (federal lands)

By left clicking on the colored polygons with the public lands layer active the name of the location will appear.



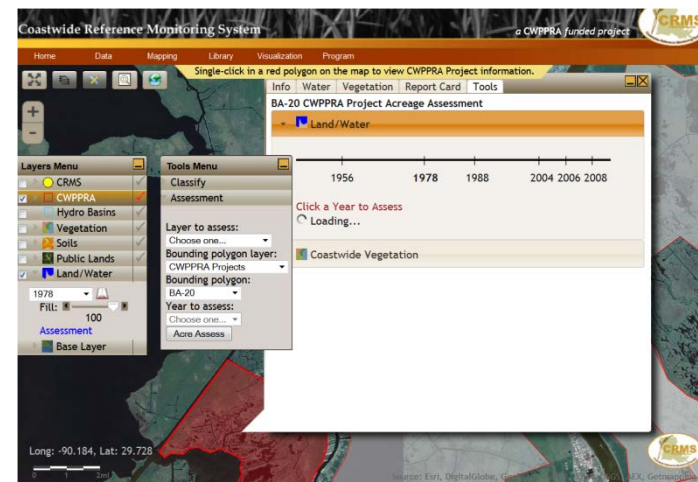
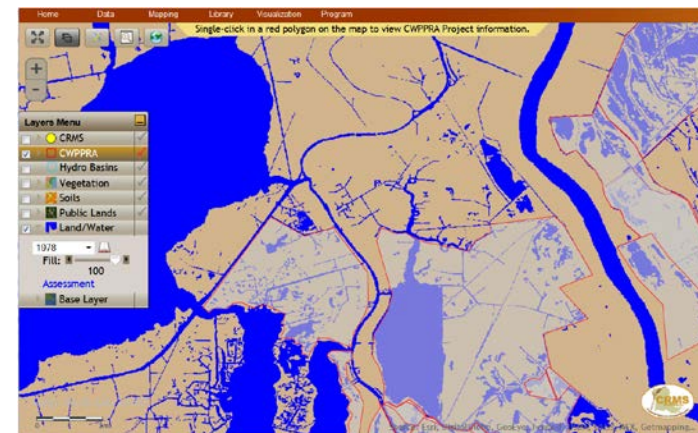
Land/Water

The **Land/Water** layer provides historical information about the changing Louisiana coast. The light brown represents the land and the blue represents the water area. Click on the bar marked Land/Water and a drop down menu appears. Click on the year you would like to review and the map refreshes. As a reminder, be sure the box to the left is checked.



Additionally, this layer has an Assessment Tool that can be accessed by clicking on the term assessment at the bottom of the box. This tool allows you to visualize land/water through time as was described on page 16 and 21.

The **Land/Water** assessment tool can be used to visualize the land to water ratios both in acres and percentages. As an example, select **CWPPRA Project** as the bounding polygon layer. **BA-20** is the project selected as the bounding polygon and **1978** as the year to assess.



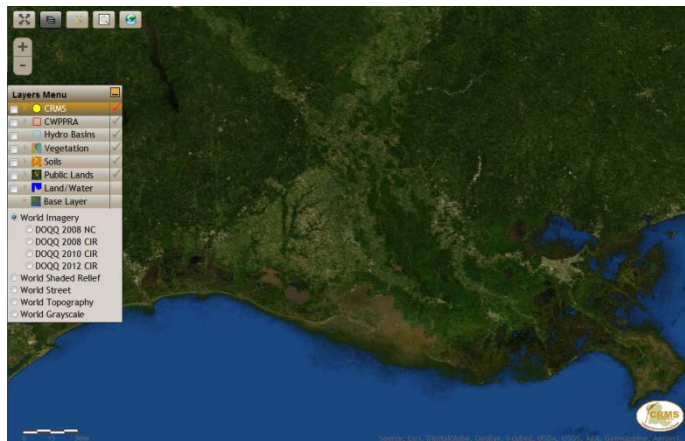
Base Layer

The **Base Layer** allows the user to choose the background map that will appear. Please note there are five general maps to choose from when creating a background map for the viewer.

Note: You can only pick one layer at a time.

The layers include:

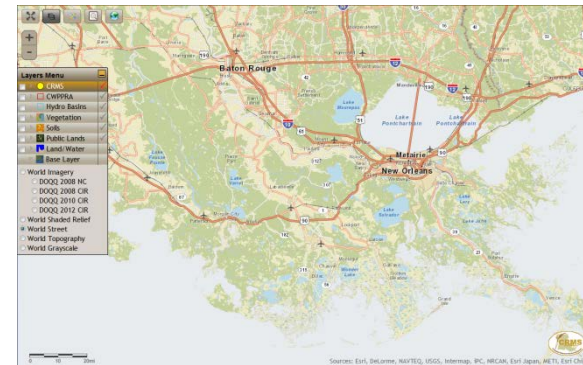
- **World Imagery (ESRI created world imagery layer)**
Layers labeled as DOQQ stand for Digital Orthophoto Quarter Quad (digital aerial images produced by the USGS) and can be overlaid on top of the world imagery.
NC is natural color.
CIR is color infrared.



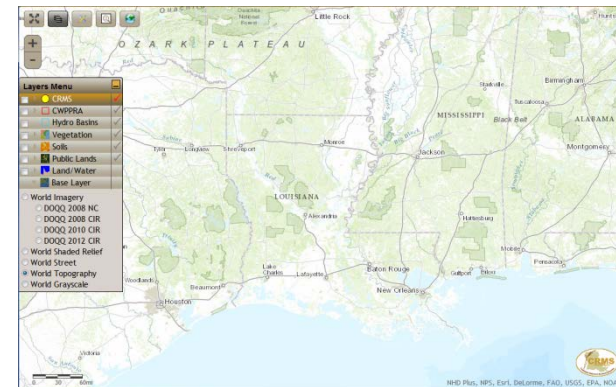
- **World Shaded Relief**



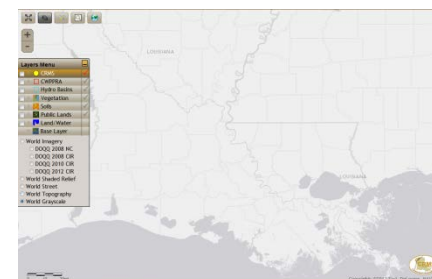
- **World Street**



- **World Topography**



- **World Greyscale**

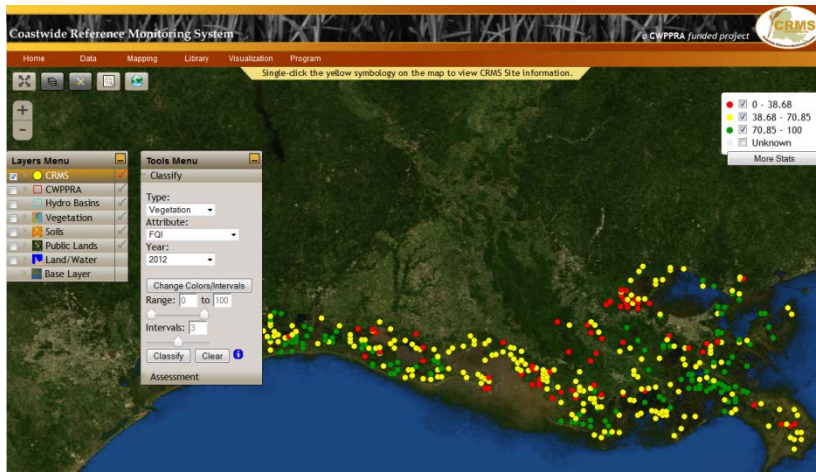


CLASSIFY TOOL

The **Classify Tool** is a useful tool to show a large scale picture of how CRMS sites are classified coastwide. You can visualize all CRMS sites using the same classification so that sites can be compared against each other. Within the **Tools Menu**, **Classify** subheading, the user can select the type of classification to perform, define an attribute, and a year.

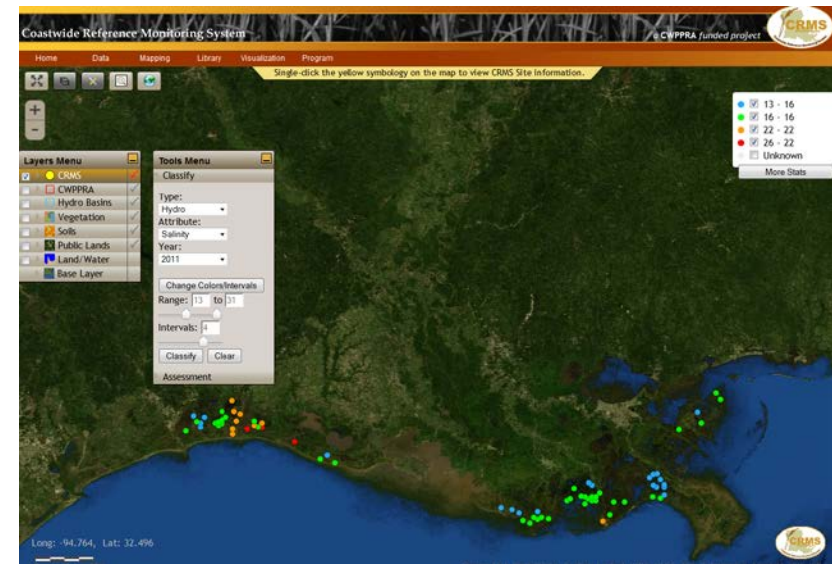
For example, visualize all CRMS sites for a particular CRMS index such as the Floristic Quality Index (FQI).

- Activate the Tools Menu by clicking on the tools icon.
- For Type, choose Vegetation.
- For Attribute, choose FQI.
- For Year, choose 2012.
- Click on Classify.



The map will change and all sites will be classified by the FQI based on field observations of species composition from 2012.

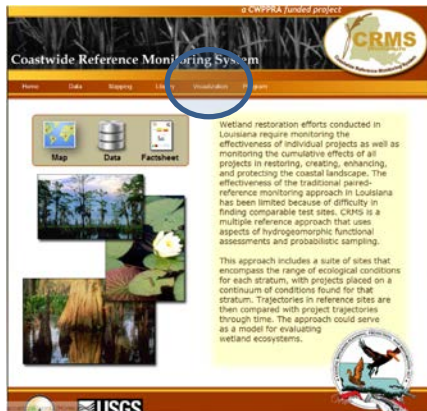
This tool also helps if you are interested in investigating only a particular range of scores or values for a particular attribute. For example, you could identify sites with high salinities (i.e. salt marsh) by selecting a small range and you can define how many intervals (or break points) are within the range.



New attributes within this tool will become available as the program evolves.

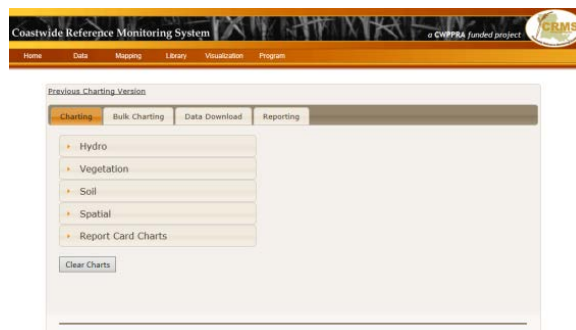
VISUALIZATION

The **Visualization** menu at the top of the CRMS website homepage has three tabs: Charting, Bulk Charting, and Conceptual Models. These tools allow users to look at graphs and compare information over time or between projects and/or areas.



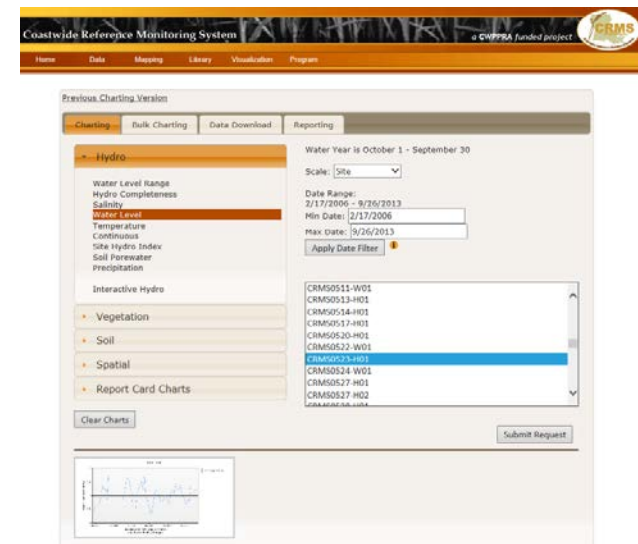
Charting

When you click on the **Charting** tab, data categories appear including: hydro, vegetation, soil, spatial, and report card. Clicking on any of the data categories will expand it to display available charts. If you hover the mouse cursor over any of the chart headings, an example thumbnail of what the chart looks like will be displayed to the right. The charting interface works the same way for each parameter.

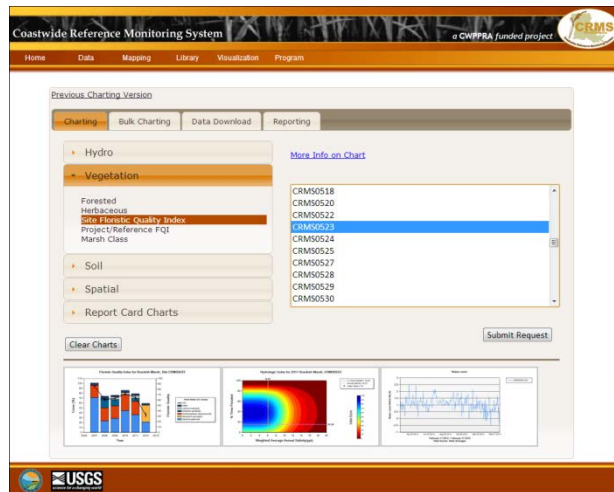


Follow the example below, to walk through the charting sequence.

- Click on **Hydro**. A dropdown menu will appear.
- Choose **Water Level**.
- **Scale: Select a Scale** will appear.
- Click the down arrow.
- Pick **Site**.
- Select the dates of your choice and click on **Apply Date Filter**.
- A box will appear with a list of sites that have data for the selected variable and date range. Choose **CRMS0523-HO1** (Note: See Appendix 1 for more information on station naming conventions.)
- Click on **Submit Request**.
- The graph will appear at the bottom of the page.
- Single click on the graph to enlarge.



As graphs are generated, they will appear at the bottom of the page. The chart gallery enables the user to compare multiple charts for a CRMS site or charts for multiple CRMS sites simultaneously.



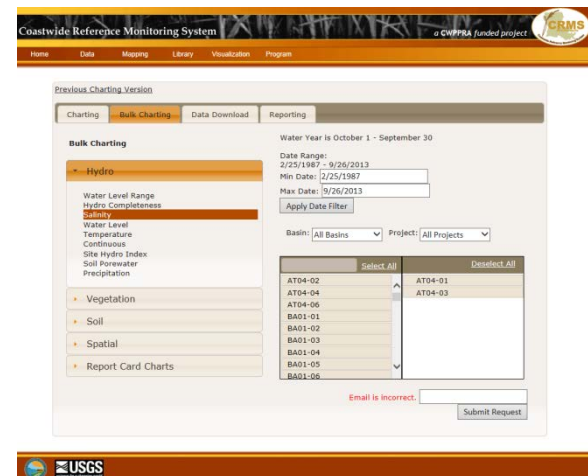
BULK CHARTING

From charting, clicking on the tab labeled “Bulk Charting” will load the bulk charting interface. Bulk charting allows the user to gather data on a variety of locations and have the data emailed directly to an active email address. The user can select multiple CRMS sites, set up graphs with consistent color ramps (ex. vegetation, site floristic quality index chart) and have large sets of charts generated and emailed. The user receives a “. zip” file with the user defined charts and the data used to generate the charts.

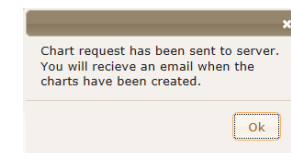
Follow the example below, to walk through the bulk charting sequence.

- Choose **Hydro**.
- Choose **Salinity**.





- Select the dates of your choice and click **Apply Date Filter**.
- Choose the project(s) of your choice **AT04-01** and **AT04-03**.
- Type your email in the **white box at the bottom right**.
- If you type in an incorrect email the message, “Email is incorrect.” will pop up.
- Click on **Submit Request**.



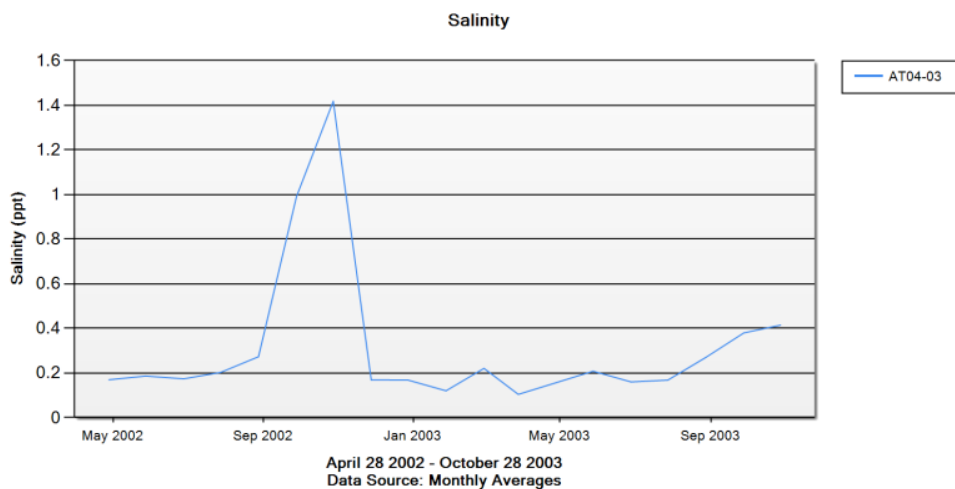
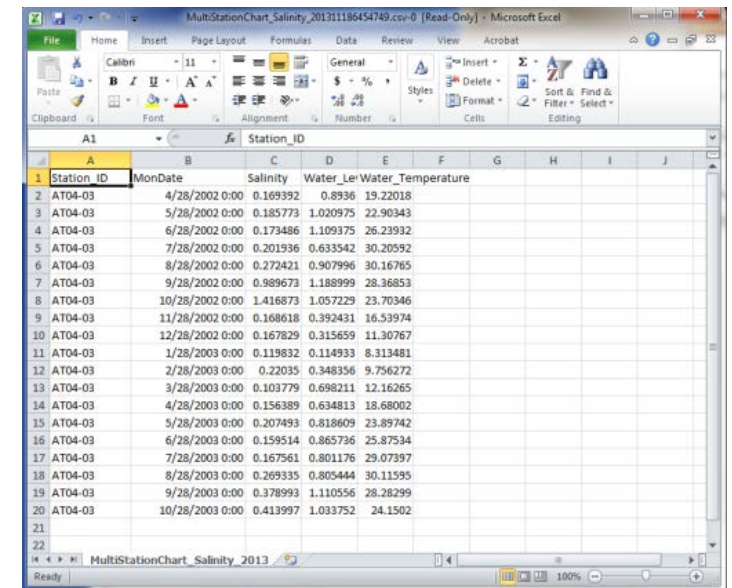
Upon clicking **Submit Request** you should receive a message that states, “Chart request has been sent to server. You will receive an email when the charts have been created.” It usually takes just minutes to receive the email.



The data will arrive in your email as “.zip” files. The files can be downloaded to your computer.

Name	Type	Compressed size	Password ...	Size	Ratio	Date modified
 MultiStationChart_Salinity_2013111...	PNG image	37 KB	No	55 KB	34%	11/18/2013 6:45 AM
 MultiStationChart_Salinity_2013111...	Compressed (zipped) Fol...	1 KB	No	1 KB	19%	11/18/2013 6:45 AM
 MultiStationChart_Salinity_2013111...	PNG image	46 KB	No	61 KB	25%	11/18/2013 6:45 AM
 MultiStationChart_Salinity_2013111...	Compressed (zipped) Fol...	1 KB	No	1 KB	15%	11/18/2013 6:45 AM

The information you receive may be both graphs and data on an Excel spreadsheet. Once you have downloaded the files you may work with them on your own computer.

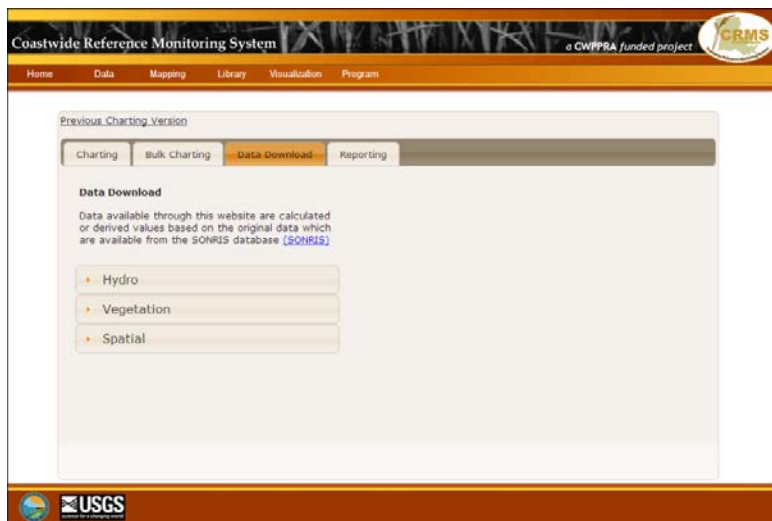



Station_ID	MonDate	Salinity	Water_Level/Water_Temperature
AT04-03	4/28/2002 0:00	0.169392	0.8936 19.22018
AT04-03	5/28/2002 0:00	0.185773	1.020975 22.90343
AT04-03	6/28/2002 0:00	0.173486	1.109375 26.23932
AT04-03	7/28/2002 0:00	0.201936	0.633542 30.20592
AT04-03	8/28/2002 0:00	0.272421	0.907996 30.16765
AT04-03	9/28/2002 0:00	0.989673	1.188999 28.36853
AT04-03	10/28/2002 0:00	1.416873	1.057229 23.70346
AT04-03	11/28/2002 0:00	0.168618	0.392431 16.53974
AT04-03	12/28/2002 0:00	0.167829	0.315659 11.30767
AT04-03	1/28/2003 0:00	0.119832	0.114933 8.313481
AT04-03	2/28/2003 0:00	0.22035	0.348356 9.756272
AT04-03	3/28/2003 0:00	0.103779	0.698211 12.16265
AT04-03	4/28/2003 0:00	0.156389	0.634813 18.68002
AT04-03	5/28/2003 0:00	0.207493	0.818609 23.89742
AT04-03	6/28/2003 0:00	0.159514	0.865736 25.87534
AT04-03	7/28/2003 0:00	0.167561	0.801176 29.07397
AT04-03	8/28/2003 0:00	0.269335	0.805444 30.11595
AT04-03	9/28/2003 0:00	0.378993	1.110556 28.28299
AT04-03	10/28/2003 0:00	0.413997	1.033752 24.1502

Note: Depending on your email server you may want to download in batches to avoid overloading your email.

DATA DOWNLOAD

Clicking the tab labeled “Data Download” will load the Data Download interface. The CRMS project allows users to download hydrologic, vegetation, and spatial data. It should be noted that the data available through this website are calculated or derived values based on the original data which are available from the SONRIS database (Sonris.com).

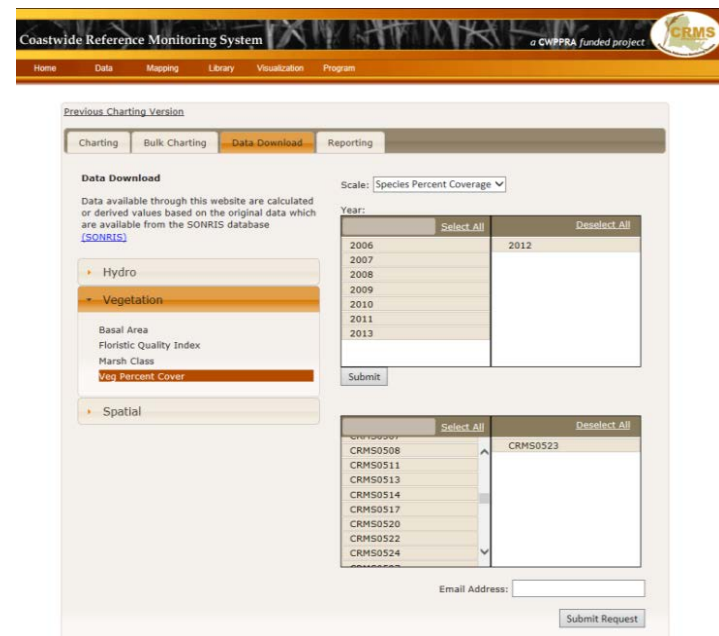


To use this feature, click on the arrow for the parameter you wish to learn about.

Use the example below to practice using this Data Download tool.

- Click **Vegetation**.
- Choose **Veg Percent Cover**.
- **Scale: Select a coverage** will appear.

- Click the down arrow and choose **Species Percent Coverage**.
- Pick **2012** by single clicking on 2012. It will move to the right selection box.
- Click **Submit**.
- Pick **CRMS0523**.
- Type in your email address.
- Click **Submit Request**.

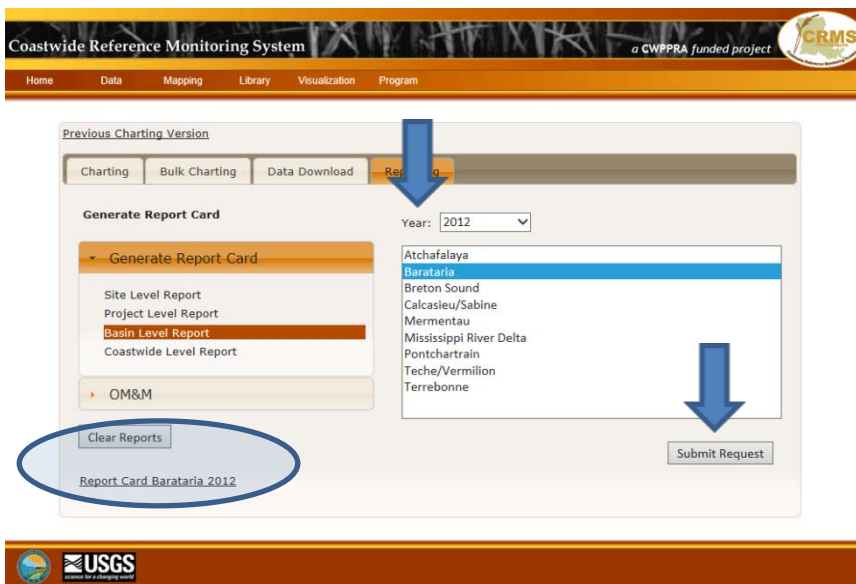


Again, the data will arrive in your email as a “. zip” file. The file can be downloaded to your computer and used as described in the bulk charting section of this booklet.

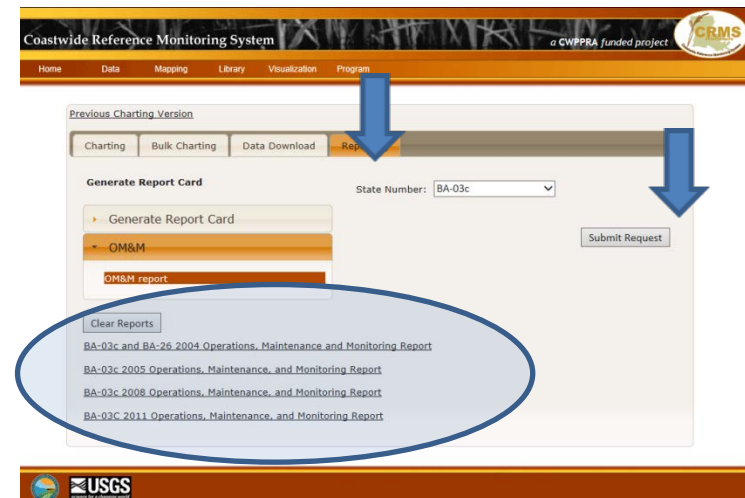
REPORTING

The final section in the Visualization section of the CRMS website is **Reporting**. Reporting allows the user to **Generate Report Cards** for sites, projects, basins, or the entire Louisiana coast. You can also view Operations, Maintenance, and Monitoring (**OM&M**) reports for individual CWPPRA coastal restoration projects.

To **Generate Report Cards** simply click on the arrow and a list of Report Card types will be provided. Once a report card type is selected, **Year** will appear. Click the down arrow and choose the year. From the list that pops up choose the report you would like to view. Then click the **Submit Request**. The report cards are generated on-the-fly when the user makes selections so that the most up to date data is reported upon. Once the report is generated a link will appear in the lower left corner. Click on the link to open the document.



To access **OM&M** reports for each of the CWPPRA coastal restoration projects first click the down arrow next to the words “State Number” and select a project number. Remember, CWPPRA project names that correspond to the numbers can be found at LACoast.gov/new/Projects/List.aspx.



BRIEF SYNOPSIS

There are several additional tools on the CRMS website and patrons are invited to continue to explore the additional resources the site has to offer that were not covered in this manual. The **Library** menu heading includes additional maps, presentations, Louisiana Department of Natural Resources (LDNR) reports, and CRMS reports. Additionally, within the **Visualization** menu, users may find the **Conceptual Models** of delta building and wetland productivity useful. Within the **Program** menu, there are also scientific reports about the **Data Descriptions and Limitations** available for all of the parameters monitored through the CRMS database.

The CRMS program is as dynamic as the coastal habitats it monitors. The program continues to develop new products and assessment tools while providing data for model improvement and scientific research. The CRMS website is the current dissemination mechanism for all activities related to the CRMS program.

The value of the CRMS website approach is that it gathers information from a suite of sites that encompass a range of ecological conditions and is designed to be a one-stop shop for CRMS information, products, and data. The ecological data available through the Website are linked to the official Louisiana Coastal Protection and Restoration Authority (CPRA) database, which houses all CWPPRA monitoring data, on topics such as the following: hydrology, herbaceous marsh vegetation, forested swamp vegetation, soil properties, soil accretion, and surface elevation. Data provided by the Louisiana CPRA are also available for downloading at coastal.la.gov (Search: Monitoring Data). Data can be selected by project name, CRMS site, or station number.

*The CRMS network is currently funded through CWPPRA and the State of Louisiana.
CRMS is providing data for a variety of user groups including: resource managers, academics, landowners, researchers, educators and students.*



SAMPLE PROBLEMS

1. The camp that my family owns just south of Point a la Hache (on the west bank of the Mississippi River south of New Orleans along Hwy 23) is surrounded by water now. My father told me there was marsh around it when he was my age. How can I learn what it looked like before? How can I look up information to show me what happened? *Hint to find your answer:* Consider using historical land/water trends and historical vegetation trends
2. I like to go fishing in Cameron Parish near the Cameron Prairie National Wildlife Refuge. That area was closed for a while because it was hit hard by Hurricane Rita in 2005, and again by Hurricane Ike in 2008, and it looks really different now. Is there something on the website that will show me how the marsh was affected? *Hint to find your answer:* Check on vegetation change or FQI. Consider looking at the reports of the CWPPRA projects in the watershed, such as CS-17.
3. There is a CWPPRA project near the town that I live in, Cameron, and it is called East Mud Lake. How do I find out how the project is doing? *Hint to find your answer:* Select the project CS-20 East Mud Lake Marsh Management. View all of the data and reports on the project. Make your assessment.
4. I heard that there is an old CWPPRA project outside of New Orleans that you can see as you drive down Interstate 10 and that it is working really well. All I see is a lot of grass. How can I find out the details? *Hint to find the answer:* Select CWPPRA projects on the map. Then identify the project in the area you are looking for – Bayou LaBranche, PO-17 and read the documents. Share your details.



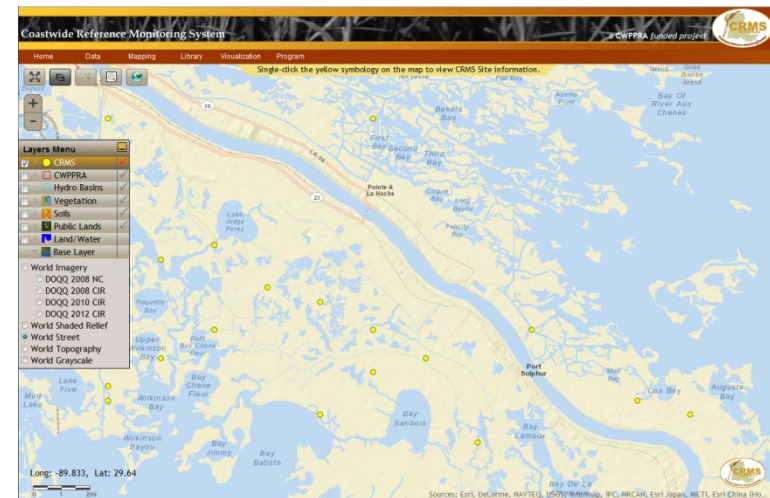
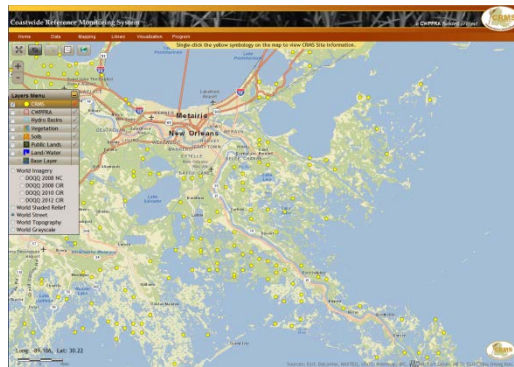
5. I read about diversions in the papers all the time. How can I learn about them myself?
6. The land area in the southern part of St. Mary Parish near the Wax Lake Outlet is growing. I'd like to investigate the area. Which part of the CRMS website should I use? Which tools tell me the most about the land change?
7. For my class in school, I have to write a report on Rockefeller Wildlife Refuge. Is there something on the website that will help me? Are there CRMS sites in the Refuge?

Sample #1 Problem Solution

1. The camp that my family owns just south of Point a la Hache (on the west bank of the Mississippi River south of New Orleans along Hwy 23) is surrounded by water now. My father told me there was marsh around it when he was my age. How can I learn what it looked like before and how can I look up information to show me what happened? *Hint to find your answer:* Consider using historical land/water trends and historical vegetation trends.

ANSWER: You may choose to use the base layer as the “**World Street**” view to find Point a la Hache which is about 25 miles south of New Orleans along the Mississippi River.

Click the CRMS sites on the map or activate the layers menu. Find **Point a la Hache** on the map. Use the + /- bar to zoom into the map. Use Port Sulphur as a reference point to find Pointe a la Hache. Port Sulphur is south of Pointe a la Hache adjacent to the Mississippi River. Port Sulphur can also be seen by zooming out a lot, thus making it a good reference point to find Pointe a la Hache. Return the map to “**World Imagery**” view for easier view of yellow CRMS dots. Note the yellow dots indicate active CRMS sites.



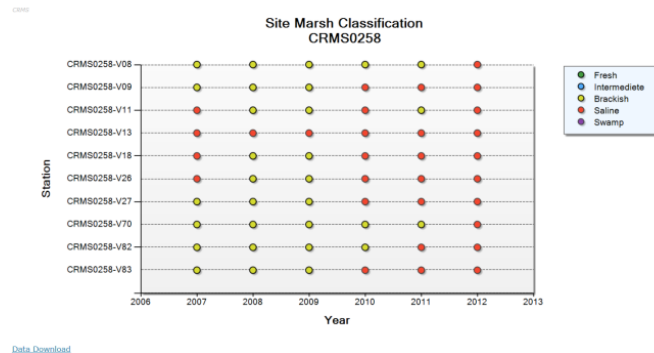
CRMS sites are indicated with yellow dots and blue arrows in the map to the left.

Notice there are three (3) CRMS sites on the map just southwest of the Mississippi River near Point a la Hache. The sites are CRMS0258, CRMS3680 and CRMS0282 and are identified with blue arrows on the map on the previous page.

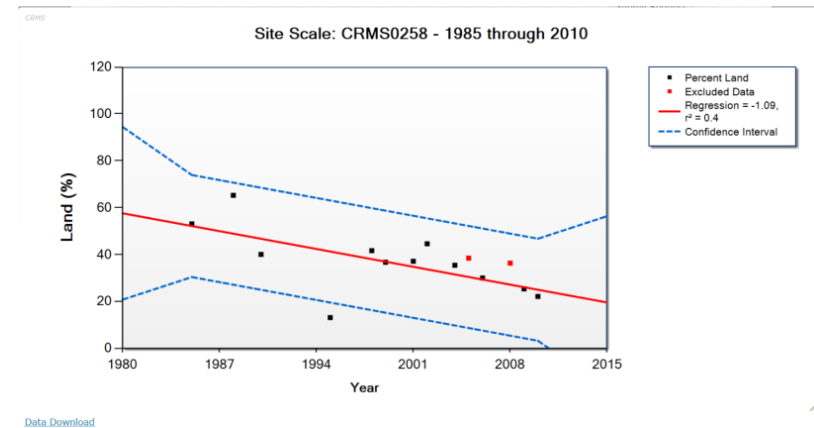
To choose **CRMS0258**, click on the northern most dot or click **CRMS** in the layer menu and choose **CRMS0258** from the drop down menu. The site information box will appear.



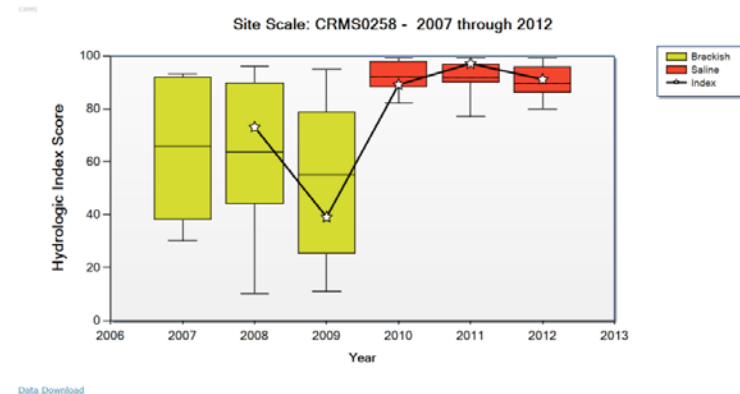
Click on the **Vegetation Tab\Marsh Classification** subheading to see how the vegetation has been changing through time. Notice how the marsh classification changed from brackish to saline between 2007 and 2012 which indicates more saltwater in the area.



Another tool to use is **Charting**. Charting can be found under the word **Visualization** on the main CRMS home page menu. Under **Spatial** select the percent land chart. Then you **MUST** select a site under the **Scale** drop down menu. Choose Site then CRMS0258 and submit the request. A **Percent Land Graph** will be created for that site. This graph shows a marked decline in percent land from 1985 to 2010.

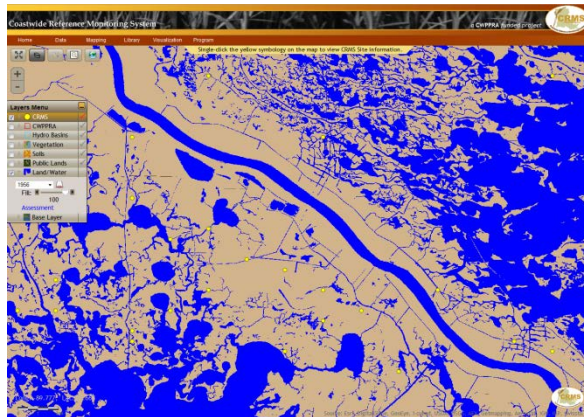


One of the quickest things to do is to look at the **Report Card Charts**. Highlight the **Site Index** and **Marsh Type Box Plot**. Choose HI for the Hydrologic Index, select **CRMS0258**, and click **Submit Request**. The graph below will appear. Again, you can see that the marsh has changed from brackish to saline which indicates more saltwater in the area.

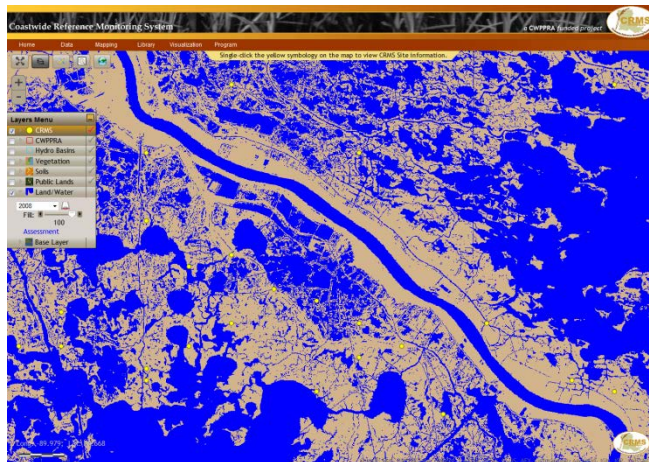


Another interesting thing to do is to compare the Land/Water spatial data over a longer period of time. Using the **Land/Water** layer click on the left check box to highlight the information

1956



2008

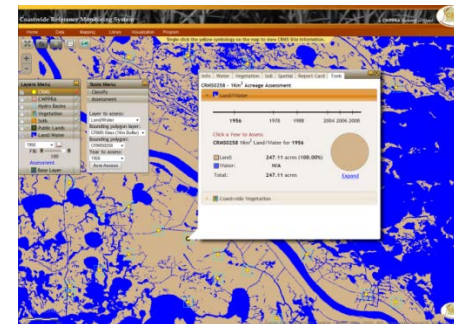


A quick visual comparison will show the land lost in the area of the three identified CRMS sites.

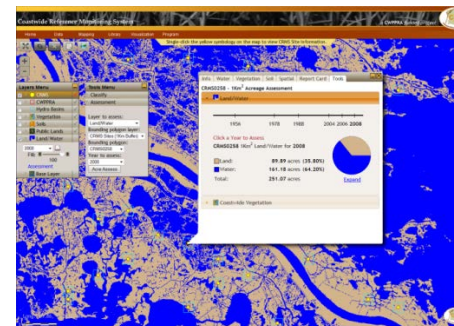
By clicking on **Assessment** and selecting the two years you would like to compare, you can get a graph to show you the changes in land and water.

Or by clicking on Assessment and selecting CRMS sites for the bounding polygon layer, and CRMS0258 for the bounding polygon you can get an information box to describe land and water in a particular year. Just click on the years of interest in the timeline within the information box.

1956



2008



Notice that in 1956, 100% of the area was land but by 2008, only 35% is still land with the remaining 64% converted to water.

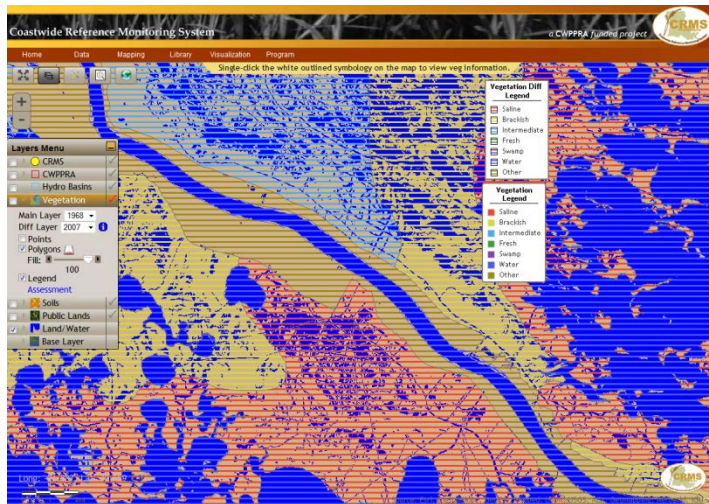
Another way to see the change visually is to use the **Vegetation** layer on the layers menu.

Click on the check boxes, **both the right and left** of the **Vegetation** layer. Click on the bar next to the word **Vegetation** on the layers menu.

A drop down box will appear. For the **Main Layer** choose **1968** and for the **Diff Layer** choose **2007**. Click to put a **check mark** in “Polygon box.” (Note: Checks may automatically be there for points, polygons, and legend. In that case, remove the **Points** checkmark.) Click the check box to highlight the **Legend**.

In 1968 the area was considered a brackish marsh; in 2007 it was considered a saline marsh. This indicates more saltwater is in the area.

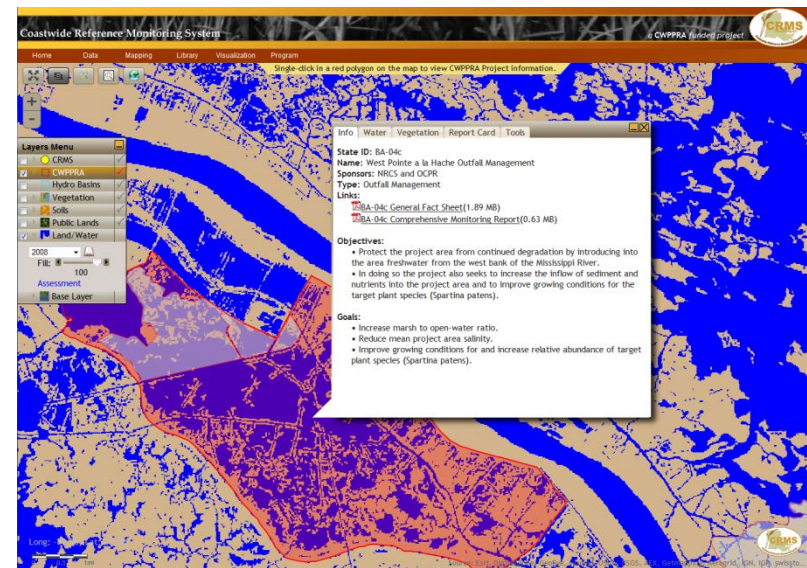
Don't forget to hover over the **Diff Layer** on the map to see the year and vegetation type



ANSWER to PROBLEM #1

In many areas near the “camp” the land has been converted to water. As plants die and the landscape becomes open water, the soil in the area is exported out of the marsh by high tides and storm surges. The water is also more saline than it has been in the past. The plants have changed too. The plants have changed from tolerant of brackish to tolerant of saline waters. However, the change in salinity has been hard for the plant community to adapt to during this short time.

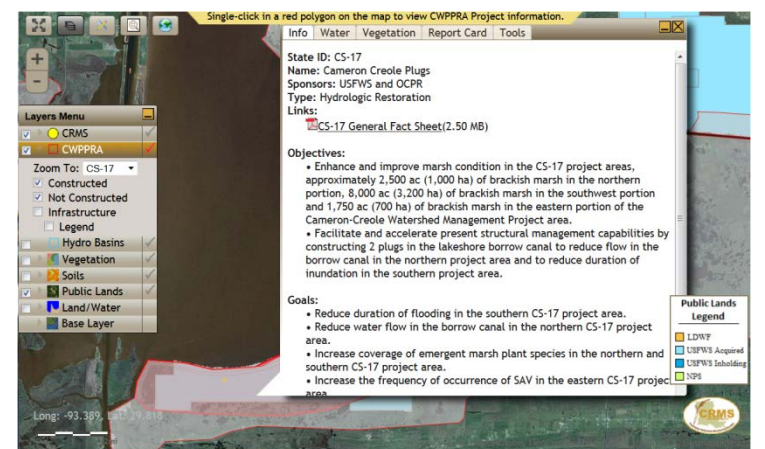
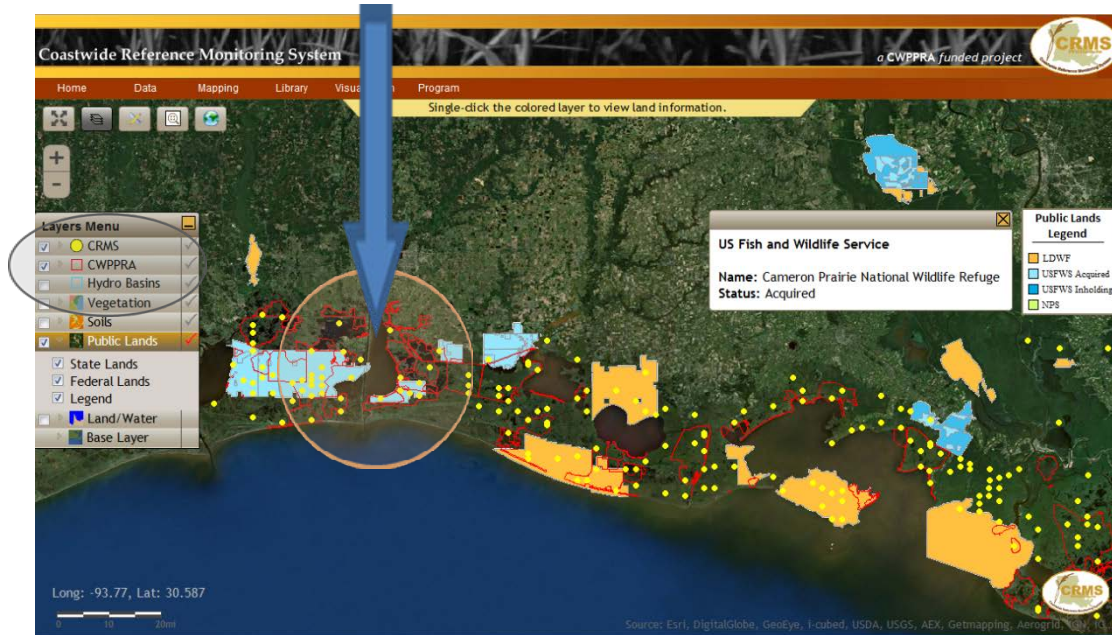
Note: The CWPPRA West Point a la Hache Outfall project is proposed for the area. It is currently in the engineering and design phase. Click on the check boxes to the right and left of CWPPRA layers menu to view the project and links to the associated fact sheet and comprehensive monitoring report.



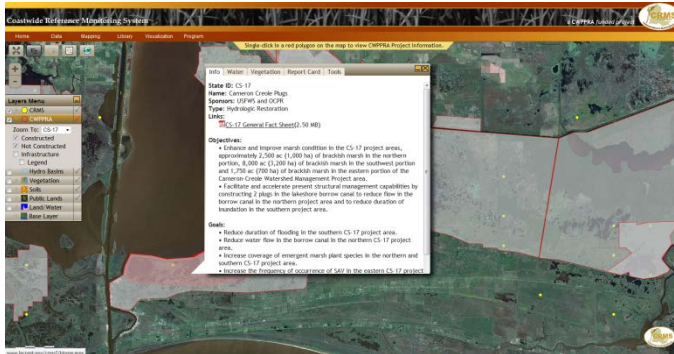
Sample #2 Problem Solution

2. I like to go fishing in Cameron Parish near the Cameron Prairie National Wildlife Refuge. That area was closed for a while because it was hit hard by Hurricane Rita in 2005, and again by Hurricane Ike in 2008, and it looks really different now. Is there something on the website that will show me how the marsh was affected? *Hint to find your answer:* Check on vegetation change or FQI. Consider looking at the reports of the CWPPRA projects in the watershed, such as CS-17.

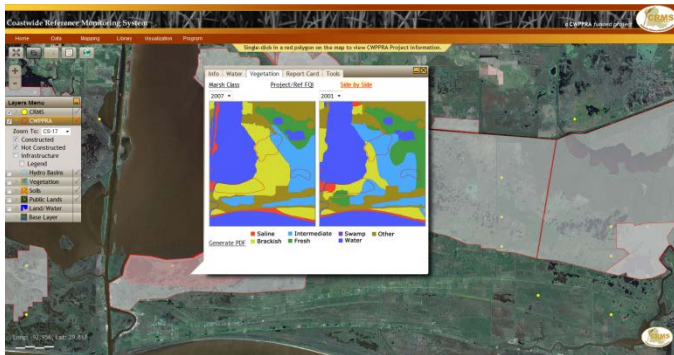
ANSWER: Start this problem by bringing up two layers on the map. Be sure to click the box to the left of the **CRMS** bar and also the box to the left of the **Public Lands**. You may also want to add the layer with the CWPPRA projects. This will add additional red lines to the image. Now the CWPPRA project layer is active by checking the box to the *right* of **CWPPRA**. Choose **CS-17 Cameron Creole Plugs** from the CWPPRA Project drop down list.



The CS-17 Cameron Creole Plug project has several pieces of information that help you answer your question. Under the **Vegetation** tab there is a subheading marked **Side-by-Side**.

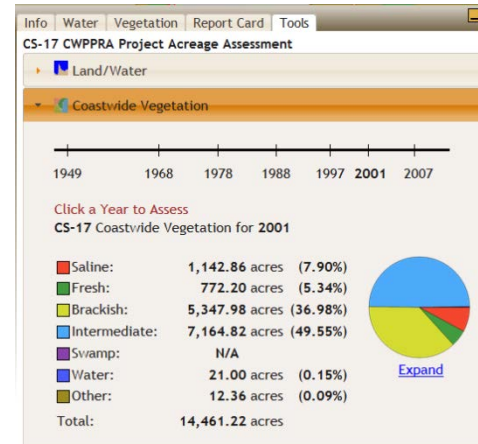


The **Side-by-Side** classification that pops up is 2007 and 2001.

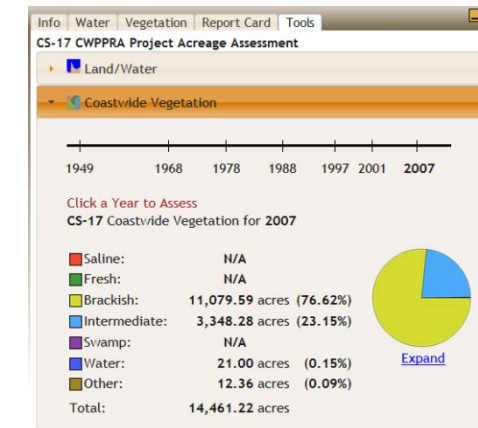


From this quick look you can see that in 2007 the amount of brackish marsh in the project area has increased since 2001.

You might also choose to go to the **Tools** and choose **Coastwide Vegetation**. Click on the years **2001** and **2007** to get the data.



This is a more quantitative way to look at the data. Notice in 2001, the project area had fresh, intermediate, brackish, and saline habitats with brackish marsh composing 37% of the project. Also, water covered less than 1% of the area.



In 2007, the project area was brackish and intermediate habitats with brackish marsh composing 77% of the area. The good news is that in 2007 water did not increase from 2001.

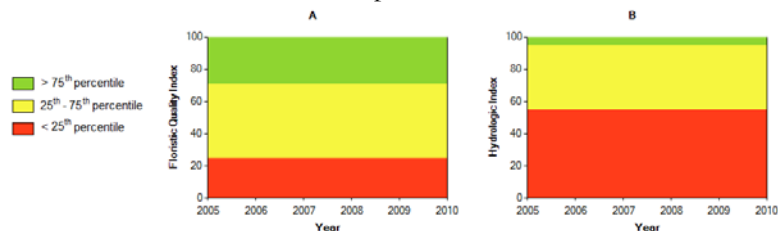
This lets us know that between 2001 and 2007 land was not being lost.

The area was changing vegetation and should be monitored and maintained to watch for additional land loss.

You may also choose to look at the **Report Card** for this project. The CRMS data on this project only goes back to 2006.

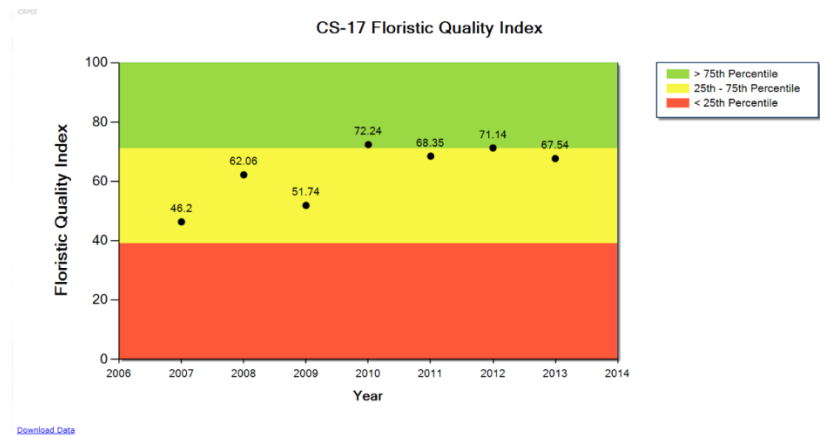
Remember the **Report Card** includes both Floristic Quality (FQI) and Hydrologic (HI) Indices that have been created based on the suite of parameters available from the 2006 to 2009 CRMS data set.

The FQI and the HI assessments were made relative to a baseline distribution of the index scores derived from 2006 to 2009 data at CRMS sites across the Louisiana coast. Because ideal thresholds were not available for the FQI and HI, scores were classified as 'good' (green) if they exceeded the 75th percentile of index scores calculated for all CRMS sites during the baseline period, 'poor' (red) if they did not exceed the 25th percentile, or 'fair' (yellow) if they were intermediate to the 25th and 75th percentiles.



With that in mind, looking at 2006 we see the FQI in the low end of the fair range with improvements in the subsequent years. The improvements are interesting but the type of marsh has certainly changed over time as indicated by the coastwide vegetation layer.

The marsh is largely brackish habitat and the condition of the vegetation is improving as shown by the FQI. The projects in the area may be helping to reduce land loss rates.



Viewers may choose to look at the CWPPRA fact sheet to learn more about what is being done.

Louisiana Coastal Wetlands Conservation and Restoration Task Force
October 2002
Cost figures as of December 2011

Cameron-Creole Plugs (CS-17)

Project Status
Approved Date: 1991 Project Area: 20,392 acres
Approved Funds: \$1.14 M Total Est. Cost: \$1.25 M
Net Benefit After 20 Years: 865 acres
Status: Completed January 1997
Project Type: Hydrologic Restoration
FPL #1

Location
This project is located approximately 6 miles northeast of Cameron in Cameron Parish, Louisiana. It encompasses 14,471 acres of intermediate-to-brackish marsh dominated by marshay cordgrass (*Spartina patens*).

Problems
High rates of marsh loss have resulted from subsurface intrusion from the Gulf of Mexico via the Calcasieu Ship Channel and Calcasieu Lake.

Excessive salt water pooling from hydrologic alterations in the southern end of the project area has caused vegetation death.

Shoreline erosion from wind-driven waves action threatens fragile, broken marsh in the eastern project area.

Restoration Strategy
In 1989, a levee and five water control structures were constructed along the east shore of Calcasieu Lake as part of the Cameron-Creole Watershed Management Project. In the current project (CS-17), two plugs were installed in the Lakeshore Borrow Canal to moderate water circulation and flow, as well as reduce the duration of inundation in the southern project area.

Project effectiveness will be determined by monitoring salinity, water flow, water level, and vegetation in the project area and reference area.

Progress to Date
Based on emergent vegetation surveys, the total percent of vegetative cover was highest in the reference area at 96% in 1996, increasing to 98% in 1997 and to 99% in 2000. Cover in the northern project area increased from 92% in 1996 to 96% in 1997 before decreasing slightly to 92% in 2000. The southern project area experienced a slight decrease in cover from 83% in 1996 to 78% in 1997, followed by a slight increase to 81% in 2000.

The frequency of occurrence of submerged aquatic vegetation decreased dramatically in both the project and reference areas. In the project area, it declined from 69% in 1996 to 18% in 2000; in the reference area, the frequency decline was from 86% to 23% across the same period. There was a change in species composition over all three sampling years (1996, 1997, and 2000) caused by drought-induced changes in water level and salinity. *Valoniopsis* (*Shapiroa maritima*) dominated in 1996 and 2000 when lowered water level increased salinity; however, *Valoniopsis* (*Shapiroa americana*) dominated in 1997 when water levels were higher and salinities remained low.

The project and reference areas are within the boundaries of the Cameron-Creole Watershed Management Project, which was funded by the Natural Resources Conservation Service's Small Watershed Program.

This project is on Priority Project List 1.

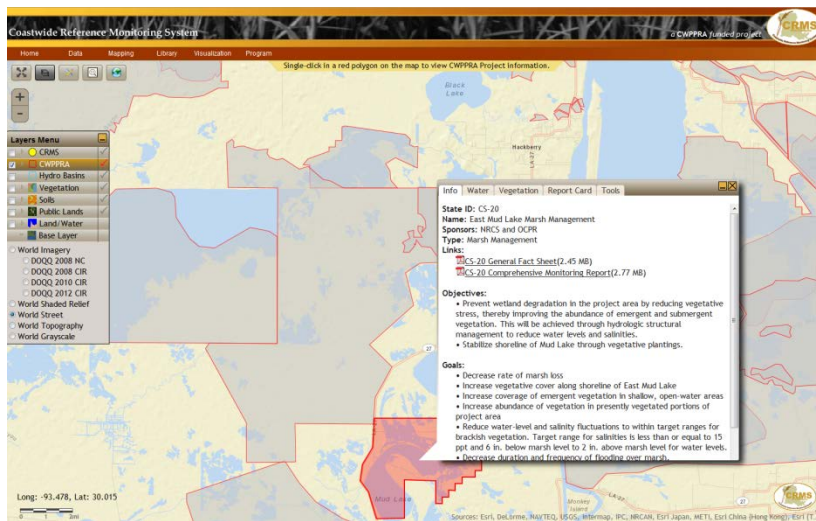
For more project information, please contact:
Federal Sponsor: U.S. Fish and Wildlife Service
Lafayette, LA (337) 291-3100
Local Sponsor: Coastal Protection and Restoration Authority
Baton Rouge, LA (225) 342-4736

www.LaCoast.gov

Sample #3 Problem Solution

3. There is a CWPPRA project near the town that I live in, let's say Cameron, and it is called East Mud Lake. How do I find out how the project is doing? *Hint to find your answer:* Select the project **CS-20 East Mud Lake Marsh Management** and view all of the data and reports on the project. Make your assessment.

ANSWER: If this is a project near your home, you will probably know where it is on the map. In the event that you are not really sure, you may choose to use the base layer as the “World Street” view to find the area which is about 35 miles southwest of Lake Charles. Click on the **East Mud Lake Marsh Management Project**. Return the map to “World Imagery” view.



First click on the **General Fact Sheet** and read about the restoration project. Record that the project was completed in 1997.

The restoration strategy for the project was designed to stabilize salinity and water levels while ensuring the movement of commercial fish species into and out of the project area.

Earthen plugs, flap gated culverts, variable crest culverts, and gated culverts were constructed and can be used to manage the flow of water into and out of the project area. In treatment unit 1, the structures have slots allowing ingress and egress of commercial fish species.

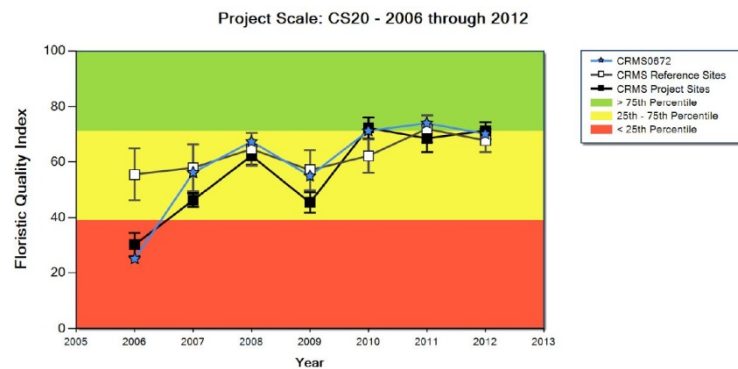


The treatment unit structures have drawdown capabilities, encouraging shallow water areas to revert to emergent vegetation. The structures are closed when salinities exceed 15 parts per thousand (ppt).

Smooth cordgrass (*Spartina alterniflora*) was planted to stabilize canal shorelines and encourage marsh regeneration. A reference area was chosen, and project area success will be determined by monitoring and comparing both before and after construction, land-to-water ratios, vegetation planting success, existing vegetation, soil bulk density, water quality, vertical accretion, surface elevation, and fisheries.

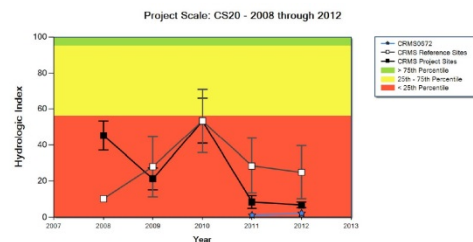
The best way to evaluate this project would be to look at the information prior to 1997 and to look at the information in the most current time frame.

After reviewing each of the tabs associated with CS-20 East Mud Lake Marsh Management you might choose to open the **Report Card**. On page 6 of the **Report Card**, the FQI (floristic quality index) score appears.



The FQI is moving from red to green between 2006 and 2012, which is positive.

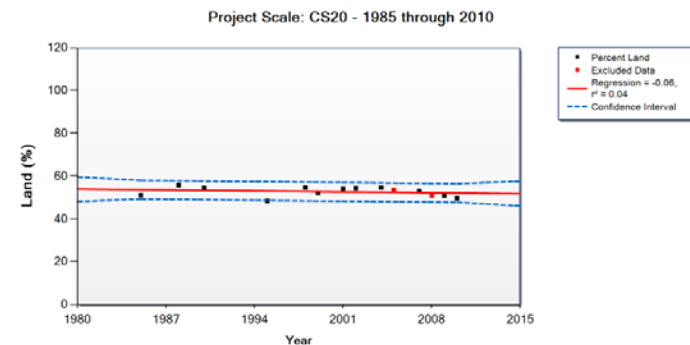
But this is not the only indicator of the project success or failure, other parameters should be examined. By continuing to look at the **Report Card** you will notice the HI score. The HI score appears to be static from 2011 and 2012 and in the poor category.



Another quick indicator under the **Report Card** is the **Project Scale Assessment: CS-20 Percent Land Change** information. For this project information is shown from 1985 to 2010.

Project Scale Assessment: CS-20 Percent Land Change

Percent land trends were calculated using Landsat Thematic Mapper (TM) data for 1985 - 2010. Linear regressions were calculated for the period of record excluding the 2005 and 2008 dates. Post-hurricane images do not represent average conditions and exclusion was an effort to reduce the influence of transitory storm effects. The variability in percent land data points around the slope illustrates the influence of various sources of environmental variance or classification error. Positive slopes indicate increasing percent land or historical land gain and negative slopes indicate decreasing percent land or historical land loss (Couvillion et al., 2011).



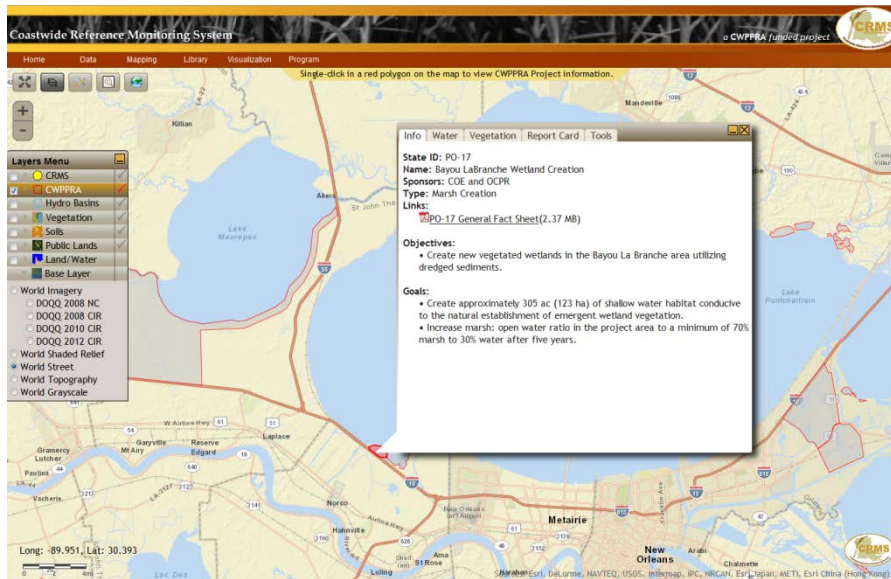
You may also want to investigate the project scale **Submergence Vulnerability Index (SVI)**.

Use your judgment to determine if the project is working to protect this area.

Sample #4 Problem Solution

4. I heard that there is an old CWPPRA project outside of New Orleans that you can see as you drive down Interstate 10 and that it is working really well. All I see is a lot of grass. How can I find out the details? *Hint to find the answer:* Select **CWPPRA projects** on the map. Then identify the project in the area you are looking for – **Bayou LaBranche, PO-17** and read the documents. Share your details.

ANSWER: Find New Orleans on the map. Use the + /- bar to zoom into the area. You may choose to use the base layer as the “World Street” view to find New Orleans between Lake Pontchartrain and the Mississippi River. Click on **Layers Menu** and choose **CWPPRA**. Click **both the right and left check boxes** to show the CWPPRA project area image and make the CWPPRA data available. You will notice two red polygons just west of New Orleans and north of Interstate 10. The two polygons represent projects PO-17 Bayou LaBranche Wetland Creation and PO-75 LaBranche East Marsh Creation. The smaller the ID number is the older the CWPPRA project. PO-17 was one of the first CWPPRA projects and was approved in 1991. PO-75 was approved in 2010. Click on the **polygon highlighting PO-17** to learn more about the “old” CWPPRA project that was actually part of the first Priority Project List (PPL). You may choose to return the map to “World Imagery” view for easier viewing.



Click on each of the tabs in the information box to learn more about the project.

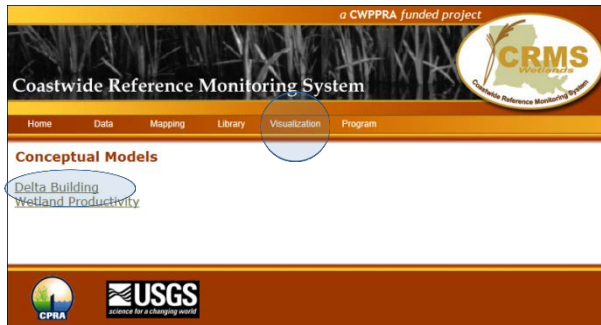
According to the fact sheet:

Construction of Interstate 10 (with its associated construction access canals), the Illinois Central Railroad, and an abandoned agricultural development resulted in altered hydrology and increased salinity. The primary cause of wetland loss in the area was the failure of agricultural impoundments and subsequent flooding. An unnamed hurricane in 1915 and Hurricane Betsy (1965) caused salt water to overflow the banks of Lake Pontchartrain and flow unchecked through canals. This overflow resulted in excessive salt water in the project area marsh and a subsequent loss of intermediate marsh vegetation. The project's goal was to create an area of 70% land and 30% water within 5 years of construction. Depositing 2.7 million cubic yards of sediments dredged from Lake Pontchartrain within an earthen containment berm created new, emergent marsh in what had formerly been an open water area.

Read through all of the tabs to make your evaluation of the project.

Sample #5 Problem Solution

5. I read about diversions in the papers all the time. How can I learn about them myself?



ANSWER: When you go to the CRMS website homepage at LACoast.gov/crms2/home.aspx, you will notice the word **Visualization** appears at the top of the page. When you hover over the word a drop down menu appears. Choose the words **Conceptual Models** and you will be brought to the page below.

Click on **Delta Building** and a graphic representation of many of the elements that have an influence on delta building is displayed. Click on the **Key** tab to learn more about the model elements,

the importance, current understanding, and predictability of these delta building elements and how they are related.

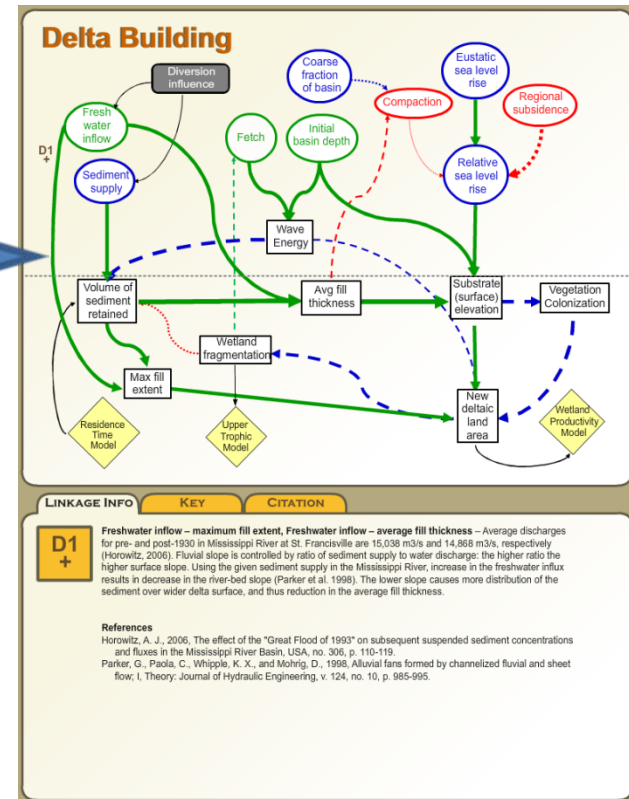
Also when clicked, each one of the solid or dotted blue, green, and red lines provide information about how these delta building elements are connected.

Additionally, under **Citation** there is a link to research reports related to the concept of using diversions to build wetlands.

Reed, D.J. and W. Kim. 2008. Conceptual Model of Delta Building in Barataria Basin, Louisiana, Appendix 1, pp 59-76. In, Nuttle, W.K, F.H. Sklar, A.B. Owens, M. Inoue, D. Justic, W. Kim, E. Melancon, J. Pahl, D. Reed, K. Rose, M. Schexnayder, G. Steyer, J. Visser and R. Twilley. 2008. Conceptual Ecological Model for River Diversions into Barataria Basin, Louisiana, Chapter 7. In, R.R. Twilley (ed.), Coastal Louisiana Ecosystem Assessment & Restoration (CLEAR) Program: A tool to support coastal restoration. Volume IV. Final Report to Department of Natural Resources, Coastal Restoration Division, Baton Rouge, LA. Contract No. 2512-06-02.

Additional links about diversions can also be found elsewhere on the web. Some of these links include: LACoast.gov/new/Projects/Info.aspx?num=ba-33, sero.nmfs.noaa.gov/habitat_conservation/hcd_headlines/homenews_fwdiversions.html, wyes.org/local/coast/, or

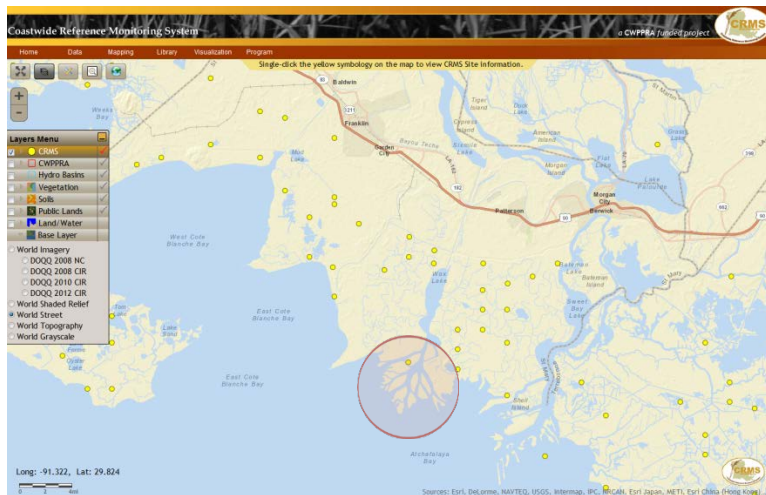
Also, consider going to the LaCoast.gov and researching the CWPPRA project Caernarvon Diversion Outfall Management, BS-03a. There is an Operations, Maintenance and Management (OM&M) report from 2011 and CRMS sites within the project boundary that can be used to learn more.



Sample #6 Problem Solution

6. The land area in the southern part of St. Mary Parish near the Wax Lake outlet is growing. I'd like to investigate the area. Which part of the CRMS site should I use? Which tools tell me the most about the land change?

ANSWER: The Wax Lake Outlet is southwest of Patterson, LA south of US Hwy 90. You may choose to use the **"World Street"** view to find the location. You will notice that there are several CRMS sites south of Patterson but the one CRMS site that is farthest south might provide the most interesting information. The site is **CRMS0479**.



Change the map back to **"World Imagery"** and take a good look at the landform. This dendritic (upside down tree) pattern is typical of distributaries off of a waterway. Click the **right and left check boxes** on the **Hydro Basin** layer and the most southern portion of the Atchafalaya Basin is highlighted in blue. This is the area of Louisiana that actually has some significant land gain.



Now click on the **Land/Water** layer and change the date to 1956. Notice that there is no land where the current CRMS site is located. During 1956 this landmass didn't exist.



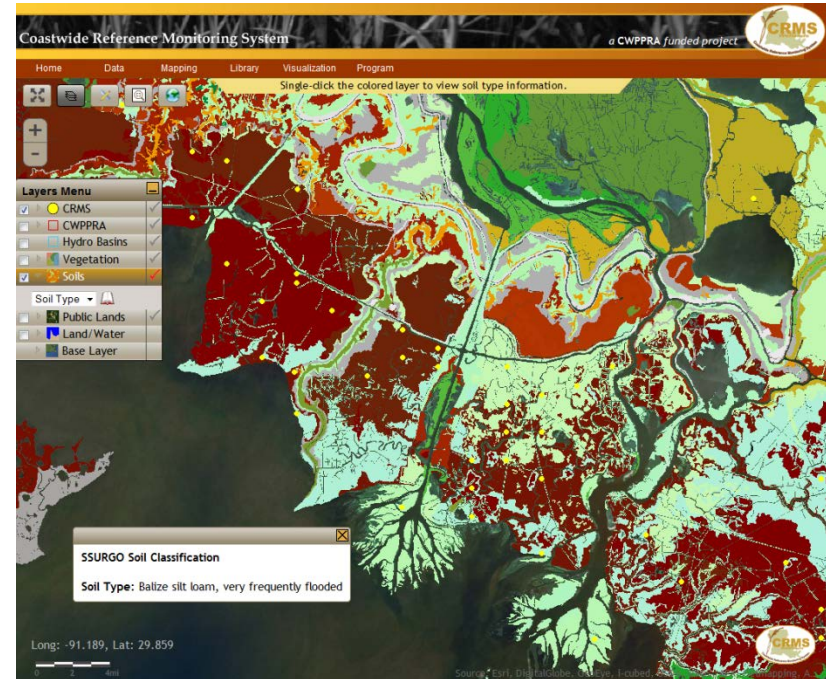
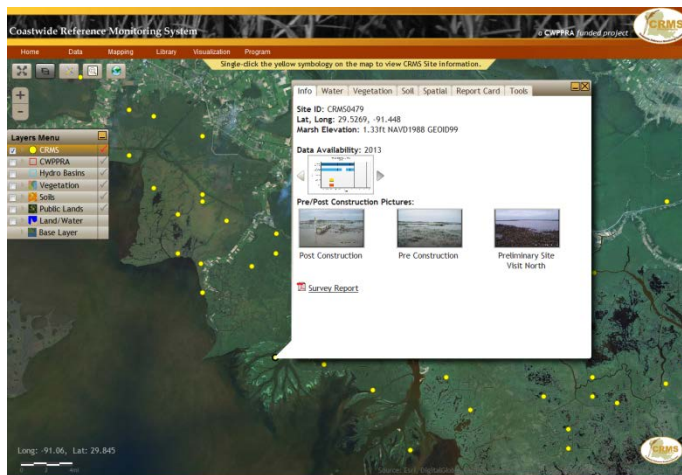
Why do you think land was built after 1956? Read about the Morganza Spillway and Old River Control Structure for more information.

Now, using the same **Land/Water** layer, click on **2008**. The new map shows the land area being built at the outlet for Wax Lake. Additional land is also being built to the east off of the Atchafalaya River.



Another interesting item to view in the Atchafalaya Basin is the soil type. This new sediment that is creating this land is being delivered through the Atchafalaya River system. The newest sediment in this system is colored light green below.

Another interesting comparison is the vegetation. Click on the **Vegetation** layer and choose **1968** for the **Main layer** and **None** for the **Diff(ERENCE)** layer. You will notice that the colors are primarily dark green and blue indicating fresh marsh and waterways.



Feel free to investigate other tabs under the **CRMS0479** information box to learn about recent changes at the monitoring site.

Sample #7 Problem Solution

7. For my class in school, I have to write a report on Rockefeller Wildlife Refuge. Is there something on the CRMS website that will help me? Are there CRMS sites in the refuge?

The CRMS website has some information about public lands. The **Public Lands** layer identifies those lands that are in the public domain. The legend at the bottom right indicates land owned by:

- LDWF – the Louisiana Department of Wildlife and Fisheries (State of Louisiana property),
- USFWS Acquired – the U.S. Fish and Wildlife Service (federal land that is acquired),
- USFWS Inholding - the U.S. Fish and Wildlife Service (federal land that is inholding), and
- NPS – the National Park Service (federal lands)



By right clicking on the **colored polygon** the name of the location will appear. The information provided includes the public land holder (example: LDWF), name of the land area, and the landholding acreage.

You can gather information about Rockefeller Wildlife Refuge by looking at the information boxes for CRMS sites and CWPPRA projects within the refuge. Also, the **Land/Water** and **Vegetation** layers will help you understand historic conditions with the refuge.

Additional information can be found by contacting the managing agency of the property the Louisiana Department of Wildlife and Fisheries (LDWF) or wlf.louisiana.gov/about-rwr.

Examples of Additional Coastal Restoration Questions to Address through CRMS:



There are certainly additional questions that can be answered using the CRMS sites. Try these on a project of your interest.

1. Did the restoration program reduce coastal wetland loss?
2. Did the restoration program sustain a diversity of vegetation types within the basins?
3. Is the restoration program effective in reducing major stressors on wetlands (i.e., flooding regime, salinity, elevation change)?
4. Which project types are the most effective in creating, restoring, protecting and enhancing wetlands?



Appendix 1: CRMS DATA COLLECTION INFORMATION AND SCHEDULE

For the standard operating procedures: LACoast.gov/reports/project/CRMS%20SOP%202012.pdf

Download data from SONRIS: coastal.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&nid=129&pnid=76&pid=92&catid=0&elid=0.

CRMS website: LACoast.gov/crms2/home.aspx.

Hydrographic: Station number (H01): Continuous hourly salinity, temperature, and water level data at most sites the data logger is in an open water body or bayou.

- Station number (W01): Continuous hourly salinity, temperature, and water level but the data logger is in a well in the marsh instead of an open water body.
- Station number (M01): Marsh mat stations are established in floating marshes where the marsh mat rises and falls with water level.

CRMS sites with *real-time* hydrologic gages: CRMS0061, 0282, 0411, 0465, 0568, 0609, 0615, 0651, 2418, 5373 --
waterdata.usgs.gov/la/nwis/current/?type=flow

Soil Porewater: Station number (P01, P02, P03): Discrete collections of porewater salinity and temperature intermittently during the year while continuous hydrographic data are downloaded. Also collected at each vegetation station during herbaceous vegetation sampling in the late summer/early fall.

Herbaceous Vegetation: Station number (V01, V02, etc.): Species composition, percent cover, and dominant height once annually (late summer/early fall) at 10 stations per CRMS site.

Vertical Accretion (Station number [A01, A02, etc.]) **and Surface Elevation** (Station number E01): Collected by cryo-coring and rod-surface elevation tables, twice annually (spring and fall).

Swamp Forest: Station name (F01):

- 1) Forestry vegetation (every 3 years)- species composition and diameter at breast height (DBH) for woody shrubs and trees > 5 cm DBH (late summer/early fall).
- 2) Canopy cover (every year)- canopy cover estimated with densiometers (late summer/early fall).
- 3) Understory vegetation (every 3 years)- species composition, height, DBH, stem density of woody shrubs and trees < 5 cm DBH (late summer/early fall).
- 4) Herbaceous vegetation (annually in the late summer/early fall)- same as for herbaceous vegetation as described above.

Soil Properties: Station number (S01, S02, etc):

Soil properties are collected upon site establishment and every 10 years in marshes and 6 years in swamps.

- pH, salinity, bulk density, soil moisture, percent organic matter, wet/dry volume

Imagery:

Coastwide satellite imagery is collected every year using Landsat Thematic Mapper (TM) multi-spectral imagery.

Aerial photography is collected every 3 to 5 years.

Acknowledgements

We would like to offer our sincere gratitude to the many individuals and members of the CWPPRA community that have made this monitoring program and publication possible. Thank you to the CWPPRA community for their ongoing support of the Coastwide Reference Monitoring System. This unique project offers a detailed look at the data that is currently being collected, recorded, and shared in relation to the Louisiana wetlands.

Special thanks to:

- The CWPPRA Task Force for their foresight in creating and funding a coast wide system to monitor the Louisiana wetlands.
- The CWPPRA Technical Committee and the CWPPRA Planning and Evaluation subcommittee for their oversight in the implementation of the CRMS project.
- The CWPPRA Monitoring Work group for their ability to take the project from idea to reality. Distinctive thanks to Dona Weifenbach, Co-Chairman of the CWPPRA Monitoring Work Group and Coastal Resources Scientist Manager for the Louisiana Coastal Protection and Restoration Authority. Ms. Weifenbach has spent countless hours sharing the project with a host of individuals and has been a guiding hand behind the creation of this document. Her foresight in creating a take away for beginners has been a generous idea. Superior thanks to Sarai Piazza Co-Chairman of the CWPPRA Monitoring Work Group and Ecologist for the U.S. Geological Survey National Wetlands Research Center . Ms. Piazza has provided technical assistance to insure that the content in this document is accurate and as up to date as possible. Ms. Piazza continues to work hard to provide accurate information to all users.
- All the individuals who work in the field to be sure that in the recorded information is an accurate representation of the Louisiana wetlands.
- The Advanced Applications Group at the U.S. Geological Survey National Wetland Research Center. Countless hours over 5 years have been spent to design, develop and implement the CRMS website. Without efforts of the entire group, and especially the expertise of Mr. Marc Comeaux, this would not be possible.
- Mr. Michael Bell who made sure all the images were as easy to view as space would allow.
- The CWPPRA Public Outreach Committee for their interest in creating a document that will help the public better access the information. Additional thanks to Mr. Cole Ruckstuhl, Ms. Kathy Ladner, and Mr. Josh Coen, members of the CWPPRA Public Outreach Committee staff. The team has provided repeated review of the materials to be sure that beginners can easily use this document. Additional thanks to Ms. Susan Testroet-Bergeron, CWPPRA Public Outreach Coordinator who worked with the CWPPRA community to create a practical document for new users.



NOTES:





COASTAL WETLANDS PLANNING, PROTECTION AND RESTORATION ACT

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USGS/ NATIONAL WETLANDS RESEARCH CENTER
700 CAJUNDOME BOULEVARD LAFAYETTE, LOUISIANA 70506
OFFICE PHONE: (337) 266-8623 OR (337) 266-8542

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