



State of Louisiana

**Coastal Protection and
Restoration Authority
of Louisiana (CPRA)**

**Coastal Information Monitoring
System (CIMS)**



Data Descriptions

May 2017

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INTRODUCTION

As part of the overall effort to evaluate the effectiveness of coastal restoration projects, the Coastal Protection and Restoration Authority of Louisiana (CPRA) collects a variety of ecological, hydrological, and climatological data. This document briefly describes these data using the column headings contained within the data files as a guide.

For a more detailed explanation of data collection activities performed by the CPRA, please refer to the report titled:

Todd M. Folse, Leigh A. Sharp, Jonathan L. West, Melissa K. Hymel, John P. Troutman, Thomas E. McGinnis, Dona Weifenbach, William M. Boshart, Laurie B. Rodrigue, Danielle C. Richardi, W. Bernard Wood, and C. Mike Miller. 2008, revised 2014. A Standard Operating Procedures Manual for the Coastwide Reference Monitoring System-Wetlands: Methods for Site Establishment, Data Collection, and Quality Assurance/Quality Control. Louisiana Coastal Protection and Restoration Authority. Baton Rouge, LA. 228 pp.

which can be found at the following address:

<http://cims.coastal.louisiana.gov/DocLibrary/FileDownload.aspx?Root=0&id=11504>

Disclaimer: Any of our data records that are labeled "Raw" (example: "Raw Water Level") can potentially contain uncorrected errors. For analytical purposes, data that are labeled "Adjusted" (Example: "Adjusted Water Level") should be used whenever available.

Accretion Data

Accretion data can be downloaded by project, CRMS site, or by station number. These data are collected from specific locations within herbaceous marsh areas and forested swamp/bottomland hardwood areas, and are collected at 6 months and 12 months after monitoring station establishment. Accretion measurements show rates of soil accretion or soil erosion at a location.

Station ID:	Alphanumeric value assigned to a station by CPRA used for identification purposes.
Group:	A classification given to a group of stations that share a common characteristic.
Sample Date (mm/dd/yyyy):	Month, day, and year that the data were collected.
Sample Time (hh:mm):	Time the data were collected
Establishment Date (mm/dd/yyyy):	Date the station was established.
Establishment Time (hh:mm):	Time the station was established.
Time Zone (CST):	Time zone in Central Standard Time (CST).
Core X:Y:	Coordinates at station where core is taken.
Accretion Measurement 1 (mm):	Within a soil core sample, this measurement is the thickness of the soil layer that has been deposited above the Marker Horizon layer (consisting of feldspar or another insoluble powder) in the time that has passed since the Marker Horizon was placed at the site. Each core is measured four times: once each at four equal intervals (90° intervals) around the circumference of the core. This is the first of the four measurements.
Accretion Measurement 2 (mm):	Within a soil core sample, this measurement is the thickness of the soil layer that has been deposited above the Marker Horizon layer (consisting of feldspar or another insoluble powder) in the time that has passed since the Marker Horizon was placed at the site. Each core is measured four times: once each at four equal intervals (90° intervals) around the circumference of the core. This is the second of the four measurements.

Accretion Data (cont'd)

Accretion Measurement 3 (mm):	Within a soil core sample, this measurement is the thickness of the soil layer that has been deposited above the Marker Horizon layer (consisting of feldspar or another insoluble powder) in the time that has passed since the Marker Horizon was placed at the site. Each core is measured four times: once each at four equal intervals (90° intervals) around the circumference of the core. This is the third of the four measurements.
Accretion Measurement 4 (mm):	Within a soil core sample, this measurement is the thickness of the soil layer that has been deposited above the Marker Horizon layer (consisting of feldspar or another insoluble powder) in the time that has passed since the Marker Horizon was placed at the site. Each core is measured four times: once each at four equal intervals (90° intervals) around the circumference of the core. This is the fourth of the four measurements.
Core Conditions:	The condition of the frozen core sample, as well as the condition of the feldspar marker horizon within the core sample.
Organization:	Agency that collected the data.
Personnel:	Names of personnel that collected the data.
Notes:	Additional notes regarding Sediment Accretion data.

Soil Properties Data

Soil Properties data can be downloaded either by project or by station number. For CRMS stations, these data are collected one time: when the station is established. Parameters sampled include wet & dry soil pH, soil specific conductance, soil salinity, soil moisture content, bulk density, percent organic matter, and wet & dry volume.

Station ID:	Alphanumeric value assigned to a station by CPRA used for identification purposes.
Group:	A classification given to a group of stations that share a common characteristic.
Sample Date (mm/dd/yyyy):	Month, day, and year that the data were collected.
Core # (1-3):	Number given to core. Three cores will be taken at each station.
Sample Depth (cm):	Depth at which the core was taken.
Wet Soil pH (pH units):	pH of the wet soil core.
Dry Soil pH (pH units):	pH of the soil core after being dried.
Soil Specific Conductance ($\mu\text{S}/\text{cm}$):	Specific conductance in microsiemens per centimeter.
Soil Salinity (ppt):	Salinity in parts per thousand.
Soil Moisture Content (%):	Soil moisture content as calculated by taking the wet sample weight minus the dry sample weight divided by the wet sample weight, all multiplied by 100.
Bulk Density (g/cm^3):	Density of sample before being dried.
Organic Matter (%):	Percent organic matter in sample; proportion of organic matter per 100 parts.
Wet Volume (cm^3):	Wet volume of sediment core in cubic centimeters.
Dry Volume (cm^3):	Dry volume of sediment core in cubic centimeters.
Organization:	Agency that collected the data.

Soil Properties Data (cont'd)

Personnel:	Names of personnel that collected the data.
Comments:	Additional comments regarding Soil Properties Data.

Surface Elevation Data

Surface Elevation data can be downloaded by project, CRMS site, or by station number. These data are collected at specific locations within herbaceous marsh areas and forested swamp/bottomland hardwood areas, and are collected at various time intervals ranging from every 6 months to every two 2-3 years. The sampling parameters consist of several sediment elevation measurements taken relative to a fixed sub-surface datum at each location.

Station ID:	Alphanumeric value assigned to a station by CPRA used for identification purposes.
Group:	A classification given to a group of stations that share a common characteristic.
Sample Date (mm/dd/yyyy):	Month, day, and year that the data were collected.
Sample Time (hh:mm):	Time the data were collected.
Establishment Date (mm/dd/yyyy):	Date the station was established.
Establishment Time (hh:mm):	Time the station was established.
Time Zone (CST):	Time zone in Central Standard Time (CST).
Direction (Collar Number):	Direction of the Surface Elevation Data by collar number. The collar provides a constant horizontal reference plane and direction is given as a positive whole number ranging from 1 to 4.
Direction (Compass Degrees):	Compass direction of the Surface Elevation Data in degrees.
Pin Number:	Any given station will have nine (9) individual Pin measurements at each of four (4) compass directions for a total for 36 measurements.
Observed Pin Height (mm):	Sediment position relative to the Surface Elevation apparatus, as measured in millimeters above the surface, using one stainless steel or fiberglass rod (Pin).
Verified Pin Height (mm):	Observed Pin Height (mm) measurement after having undergone quality-control (QC) checks. Verified Pin Height is the measurement that should be used for data analysis.

Surface Elevation Data (cont'd)

SET ID:	Unique identification number assigned to a specific SET instrument and its accompanying hardware.
Organization:	Agency that collected the data.
Personnel:	Names of personnel that collected the data.
Observation Comments:	Field comments that explain where and how the Surface Elevation pin was resting on the substrate when the measurement was taken.
Verification Comments:	Comments that explain why an individual Surface Elevation measurement is kept or discarded following the quality-control (QC) process. These comments are generated after the field data are examined for errors and/or after they have been compared to pre-existing data.
Site Conditions:	Comments (weather, water level related to marsh surface, dominant plant species, etc.) about site conditions at the station.

Continuous Hydrographic and DCP Data

Continuous (hourly) hydrographic data may be downloaded by project, CRMS site, or by station number, but it should be noted that these files are much larger than the discrete (monthly) files. For example, since one year of hourly sampling will yield approximately 8,760 records, a file for a project collecting data at 3 stations for a period of 5 years will contain approximately 131,400 records. For this reason, we recommend that hourly data be downloaded by station and not by project. The term “Raw” in the variable descriptions below indicates that data within that column are listed as reported by the data-collection instrument and have not been adjusted or corrected. The term “Adjusted” indicates that the raw data have been corrected for biofouling, instrument drift, and/or instrument malfunction.

Station ID:	Alphanumeric value assigned to a station by CPRA used for identification purposes.
Date (mm/dd/yyyy):	Month, day, and year that the data were collected.
Time (hh:mm:ss):	Time that the data were collected.
Time Zone (CST):	Time zone in Central Standard Time (CST).
Sensor Environment:	Flotant Marsh, Surface Water, or Marsh Well.
Raw Water Temperature (° C):	Water temperature in degrees Celsius as reported by data recorder.
Adjusted Water Temperature (° C):	“Raw Water Temperature” with erroneous data values removed.
Raw Specific Conductance (µS/cm):	Specific conductance in microsiemens per centimeter as reported by the data recorder.
Adjusted Specific Conductance (µS/cm):	“Raw Specific Conductance” corrected for biofouling and instrument drift, with erroneous data values removed.
Raw Salinity (ppt):	Salinity in parts per thousand as calculated from “Raw Specific Conductance”.
Adjusted Salinity (ppt):	Salinity in parts per thousand as calculated from “Adjusted Specific Conductance”, with erroneous data removed.

Continuous Hydrographic and DCP Data (cont'd)

Raw Water Level (ft):	Water level as recorded in feet relative to the instrument sensor. This variable is not comparable through time at any given station nor is it comparable between or among other stations. Use "Adjusted Water Elevation to Datum" for water elevation comparisons.
Adjusted Water Level (ft):	"Raw Water Level" corrected for biofouling and instrument drift, with erroneous data removed. This variable is not comparable through time at any given station nor is it comparable between or among other stations. Use "Adjusted Water Elevation to Datum" for water elevation comparisons.
Raw Water Elevation to Marsh (ft):	"Raw Water Elevation to Datum" shifted relative to average marsh elevation in the immediate vicinity of the data recorder.
Adjusted Water Elevation to Marsh (ft):	"Adjusted Water Elevation to Datum" shifted relative to average marsh elevation in the immediate vicinity of the data recorder. Used for evaluating marsh flooding.
Raw Water Elevation to Datum (ft):	"Raw Water Level" converted to the North American Vertical Datum 1988 (NAVD88).
Adjusted Water Elevation to Datum (ft):	"Adjusted Water Level" converted to the North American Vertical Datum 1988 (NAVD88).
Raw Marsh Mat Elevation (ft):	Marsh Mat Elevation relative to North American Vertical Datum 1988 (NAVD 1988).
Adjusted Marsh Mat Elevation to Datum (ft):	"Raw Marsh Mat Elevation" with erroneous data values removed
Geoid:	Geoid model used to survey/calculate "Adjusted Water Elevation to Datum" (e.g., Geoid99, Geoid12A).
Raw Battery (V):	Battery voltage as reported by the data recorder.

Continuous Hydrographic and DCP Data (cont'd)

Adjusted Battery (V):	“Raw Battery” with erroneous data values removed.
Raw Wind Speed (mph):	Wind speed in miles per hour as reported by anemometer.
Adjusted Wind Speed (mph):	“Raw Wind Speed” with erroneous data values removed.
Raw Wind Direction (degrees):	Wind direction in radian degrees as reported by anemometer.
Adjusted Wind Direction (degrees):	“Raw Wind Direction” with erroneous data values removed.
Raw Velocity (ft/sec):	Water current velocity in feet per second as reported by the data recorder.
Adjusted Velocity (ft/sec):	“Raw Velocity” with erroneous data values removed.
Raw Precipitation (tips/hour):	Cumulative number of tips of “tipping bucket” type rain gauge.
Adjusted Precipitation (inches):	Calculated precipitation in inches, with erroneous data values removed.
Raw Air Pressure (mm of Hg):	Air pressure in millimeters of mercury as reported by barometer.
Adjusted Air Pressure (mm of Hg):	“Raw Air Pressure” with erroneous data values removed.
Raw Total Chlorophyll (micrograms/L):	Total chlorophyll in micrograms per liter as recorded by the data recorder.
Adjusted Total Chlorophyll (micrograms/L):	“Raw Total Chlorophyll” in micrograms per liter with erroneous data values removed.
Raw Dissolved Oxygen (milligrams/L):	Dissolved oxygen in milligrams per liter.
Adjusted Dissolved Oxygen (milligrams/L):	“Raw Dissolved Oxygen” in milligrams per liter with erroneous data values removed.
Raw pH (pH units):	pH in pH units.

Continuous Hydrographic and DCP Data (cont'd)

Adjusted pH (pH units):	“Raw pH” with erroneous data values removed.
Raw Turbidity (NTU):	Turbidity in Nephelometric Turbidity Units.
Adjusted Turbidity (NTU):	“Raw Turbidity” in Nephelometric Turbidity Units with erroneous data values removed.
Raw Discharge (cubic ft/sec):	Discharge in cubic feet per second.
Adjusted Discharge (cubic ft/sec):	“Raw Discharge” in cubic feet per second, with erroneous data values removed.
Organization Name:	Agency that collected the data.
Comments:	Additional comments regarding Continuous Hydrographic and DCP Data.

Discrete Hydrographic and Soil Porewater Data

Discrete (monthly) Hydrographic and Soil Porewater data can be downloaded by project, CRMS site, or station ID for any range of dates that data are available. These files are relatively small as there are only approximately 12 records per station per year. In general, there is a much larger spatial distribution of stations where monthly data are collected than where hourly data are collected.

CPRA Station ID:	Alphanumeric value assigned to a station by CPRA and used for identification purposes.
Original Collector Station ID:	Alphanumeric value assigned to a station by the original collector other than CPRA and used for identification purposes.
Date (mm/dd/yyyy):	Month, day, and year that the data were collected.
Time (hh:mm):	Time that the data were collected.
Time Zone (CST):	Time zone in Central Standard Time (CST).
Staff Gauge (ft):	Water level in feet as measured by visual inspection of a vertical graduated staff gauge usually surveyed to a known datum.
Geoid:	Geoid model used to survey Staff Gauge (e.g., Geoid99, Geoid12A).
Station Depth (ft):	Water depth at a station in feet, where the measurements were taken; used mainly to verify stratification.
Measurement Depth (ft):	Water depth in feet at which the measurements were taken.
Water Temperature (° C):	Water temperature in degrees Celsius measured at depth given in measurement depth column.
Specific Conductance (µS/cm):	Specific conductance in microsiemens per centimeter measured at depth given in measurement depth column.
Salinity (ppt):	Salinity in parts per thousand calculated from “Bottom Specific Conductance” at depth given in measurement depth column.

Discrete Hydrographic and Soil Porewater Data (cont'd)

Dissolved Oxygen (milligrams/L):	Dissolved oxygen in milligrams per liter measured at depth given in measurement depth column.
pH (pH units):	pH measured at depth given in measurement depth column.
Velocity (ft/sec):	Water velocity in feet per second measured at depth given in measurement depth column.
Soil Porewater Temperature (° C):	Soil porewater temperatures measured at depth given in measurement depth column.
Soil Porewater Specific Conductance (µS/cm):	Soil porewater specific conductance in microsiemens measured at depth given in measurement depth column.
Soil Porewater Salinity (ppt):	Soil porewater salinities in the field measured at depth given in measurement depth column with the use of a sipper probe to aid in extracting interstitial water into the salinity column and measuring salinity of extracted water with a handheld salinity meter.
Turbidity (NTU):	Turbidity measured at depth given in measurement depth column in Nephelometric Turbidity Units.
Chlorophyll a (ug/L):	Chlorophyll a measured at depth given in measurement depth column in micro grams per liter.
Total Nitrogen (mg/L):	Total nitrogen measured at depth given in measurement depth column in milligrams per liter.
Total Kjeldahl Nitrogen (mg/L):	Total Kjeldahl nitrogen measured at depth given in measurement depth column in milligrams per liter.
Nitrate as N (mg/L):	Nitrate as N measured at depth given in measurement depth column in milligrams per liter.
Nitrite as N (mg/L):	Nitrite as N measured at depth given in measurement depth column in milligrams per liter.
Nitrate+Nitrite as N (mg/L):	Nitrate+Nitrite as N measured at depth given in measurement depth column in milligrams per liter.

Discrete Hydrographic and Soil Porewater Data (cont'd)

Ammonium as N (mg/L):	Ammonium as N measured at depth given in measurement depth column in milligrams per liter.
Total Phosphorous (mg/L):	Total phosphorous measured at depth given in measurement depth column in milligrams per liter.
Orthophosphate as P (mg/L):	Orthophosphate as P measured at depth given in measurement depth column in milligrams per liter.
Silica (mg/L):	Silica measured at depth given in measurement depth column in milligrams per liter.
Total Suspended Solids (mg/L):	Total suspended solids measured at depth given in measurement depth column in milligrams per liter.
Volatile Suspended Solids (mg/L):	Volatile suspended solids measured at depth given in measurement depth column in milligrams per liter.
Secchi (ft):	Measure of water transparency in feet.
Fecal Coliform (MPN/100ml):	Measure of fecal coliform bacteria in “Most Probable Number per 100 milliliters” at depth given in measurement depth column. Used as an indicator of potential overall contamination.
Organization Name:	Agency that collected the data.
Comments:	Additional comments regarding Discrete Hydrographic and Soil Porewater Data.

Forested Swamp Vegetation Data

Forested Swamp Vegetation data can be downloaded by project, CRMS site, or by station number. These data are collected from stations that are usually either distributed randomly or along transects within a project area. Data are collected at various time intervals ranging from seasonally to every 2-3 years.

Station ID:	Alphanumeric value assigned to a station by CPRA used for identification purposes.
Forest Layer:	Layer of forest being sampled (e. g. overstory, understory, herbaceous).
Group:	A classification given to a group of stations that share a common characteristic.
Plot Size (m ²):	Size of sample plot.
Collection Date (mm/dd/yyyy):	Month, day, and year that the data were collected.
Community:	Plant community type where station is located.
Sample Type:	Method used to distribute stations: random, stratified random, or along transects.
Densiometer Reading - North:	Percent canopy cover as measured with a convex densiometer. This reading is taken facing North.
Densiometer Reading - South:	Percent canopy cover as measured with a convex densiometer. This reading is taken facing South.
Densiometer Reading - East:	Percent canopy cover as measured with a convex densiometer. This reading is taken facing East.
Densiometer Reading - West:	Percent canopy cover as measured with a convex densiometer. This reading is taken facing West.
Average Densiometer Reading:	Average of densiometer readings 1-4.
Canopy Cover (%):	Percent of ground covered by the forest canopy as determined through the use of a densiometer.
Tree Number:	Number assigned during data collection to a tree greater than 5 cm in DBH

Forested Swamp Vegetation Data (cont'd)

Scientific Name as Originally Observed*:	The unique genus & species name in use for the plant at the time the plant was observed.
Common Name as Originally Observed*:	The non-unique, non-scientific name in use for the plant at the time the plant was observed.
Scientific Name as Currently Recognized*:	The most current officially-recognized unique genus & species name in use for the plant.
Common Name as Currently Recognized*:	The most current officially-recognized, but non-unique & non-scientific, name in use for the plant.
Understory Growth Form:	Growth form for understory trees (e.g. multi-stem, single stem)
Overstory Layer Tree Diameter (cm):	Diameter of overstory layer tree, in cm.
Overstory Tree DBH Distance Aboveground (cm):	Height in cm above forest floor, at which tree diameter was measured. Standard "Breast Height" is 137 cm above the forest floor.
Total Number of Stems:	Total number of stems counted.
Understory Plant Diameter (cm) At Breast Height 1:	Diameter of first understory tree, in cm, as measured at Breast Height (DBH). Standard "Breast Height" is 137 cm above the forest floor.
Understory Plant Diameter (cm) At Breast Height 2:	Diameter of second understory tree, in cm, as measured at Breast Height (DBH). Standard "Breast Height" is 137 cm above the forest floor.
Understory Plant Diameter (cm) At Breast Height 3:	Diameter of third understory tree, in cm, as measured at Breast Height (DBH). Standard "Breast Height" is 137 cm above the forest floor.
Understory Plant Height (cm):	Height, in cm, of understory plant.
Additional Species Description:	Miscellaneous comments pertaining to species.
Organization:	Agency that collected the data.

Forested Swamp Vegetation Data (cont'd)

Personnel: Names of personnel that collected the data.

Comments: Additional comments regarding Forested Swamp Vegetation Data.

* All scientific and common names follow the nomenclature defined in the USDA NRCS Plants database and are cited as follows:

USDA, NRCS. 2015. The PLANTS Database (<http://plants.usda.gov>), Louisiana state list downloaded April 2017. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Explanation of symbols used in Forested Swamp Vegetation plant species names:

1) An asterisk (*) in a plant name signifies that the plant is a hybrid species.

- if the asterisk occurs **before the genus name**, then the plant is a cross between two plants of different genera

- if the asterisk occurs **between the genus and the species names**, then the plant is a hybrid of two plants belonging to the same genus but two different species

2) Brackets ([]) used in a plant name enclose two different species or genera that are crossed to produce a hybrid. An "x" is always listed between the two and is the symbol used to represent the cross.

3) A question mark (?) in a plant name signifies that the validity of the name is in dispute within the botanical community.

Herbaceous Marsh Vegetation Data

Herbaceous Marsh Vegetation data can be downloaded by project, CRMS site, or by station number. These data are collected from stations that are usually either distributed randomly or along transects within a project area. Data are collected at various time intervals ranging from seasonally to every 2-3 years.

Station ID:	Alphanumeric value assigned to a station by CPRA used for identification purposes.
Group:	A classification given to a group of stations that share a common characteristic.
Plot size (m ²):	Size of sample plot.
Collection Date (mm/dd/yyyy):	Month, day, and year that the data were collected.
Community:	Marsh type where station is located.
Sample Type:	Method used to distribute stations: random, stratified random, or along transects.
Vegetation Type:	Describes whether sampled vegetation was either naturally occurring or planted.
% Cover Total:	Percent cover of all emergent vegetation present in sample plot.
% Cover Tree:	Percent cover of tree layer in sample plot.
% Cover Shrub:	Percent cover of shrub layer in sample plot.
% Cover Herb:	Percent cover of herbaceous layer in sample plot.
% Cover Carpet:	Percent cover of carpet layer in sample plot.
Average Height Dominant (cm):	Average height of dominant (by percent cover) vegetation species in sample plot in centimeters.
Average Height Tree (cm):	Average height of tree layer in centimeters.
Average Height Shrub (cm):	Average height of shrub layer in centimeters.

Herbaceous Marsh Vegetation Data (cont'd)

Average Height Herb (cm):	Average height of herbaceous layer in centimeters.
Average Height Carpet (cm):	Average height of carpet layer in centimeters.
Scientific Name as Originally Observed*:	The unique genus & species name in use for the plant at the time the plant was observed.
Common Name as Originally Observed*:	The non-unique, non-scientific name in use for the plant at the time the plant was observed.
Scientific Name as Currently Recognized*:	The most current officially-recognized unique genus & species name in use for the plant.
Common Name as Currently Recognized*:	The most current officially-recognized, but non-unique & non-scientific, name in use for the plant.
% Cover:	Percent cover of indicated vegetation species within the sample plot.
Braun-Blanquet Rank:	Braun-Blanquet rank category assigned to indicated species based on the percent cover estimate.
In/Out:	Describes whether species is present inside or outside of the sample plot. If a species is present inside and outside of the sample plot, then "Both" is used. The corresponding percent cover for that species only applies to its occurrence inside of the plot as no estimates of cover are made for occurrences of a species outside of the sample plot.
Number Planted:	Number of plants initially planted in a given area.
Number Alive:	Number of plants alive at time of sample.
Additional Species Description:	Miscellaneous comments pertaining to species.
Organization:	Agency that collected the data.
Personnel:	Names of personnel that collected the data.
Comments:	Additional comments regarding Herbaceous Marsh Vegetation Data.

Herbaceous Marsh Vegetation Data (cont'd)

* All scientific and common names follow the nomenclature defined in the USDA NRCS Plants database, which should be cited as follows:

USDA, NRCS. 2015. The PLANTS Database (<http://plants.usda.gov>), Louisiana state list downloaded April 2017. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Explanation of symbols used in Herbaceous Marsh Vegetation plant species names:

1) An asterisk (*) in a plant name signifies that the plant is a hybrid species.

- if the asterisk occurs **before the genus name**, then the plant is a cross between two plants of different genera

- if the asterisk occurs **between the genus and the species names**, then the plant is a hybrid of two plants belonging to the same genus but two different species

2) Brackets ([]) used in a plant name enclose two different species or genera that are crossed to produce a hybrid. An "x" is always listed between the two and is the symbol used to represent the cross.

3) A question mark (?) in a plant name signifies that the validity of the name is in dispute within the botanical community.