The SWMPrats website and the Widgets

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Objectives for the session (1:15 - 2:00)

- Overview of the website
- Overview of the widgets
  - SWMP summary - evaluate trends of a single parameter at a single site
  - SWMP trends - compare trends of a single parameter within and between reserves using a map
  - SWMP aggregate - compare aggregated trends of different parameters within and between reserves

Interactive portion

We will use the widgets on the website or follow on my screen

Following along as we go:

- flash drive
- online: swmprats.net 2016 workshop tab

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You will run examples whenever you see this guy:

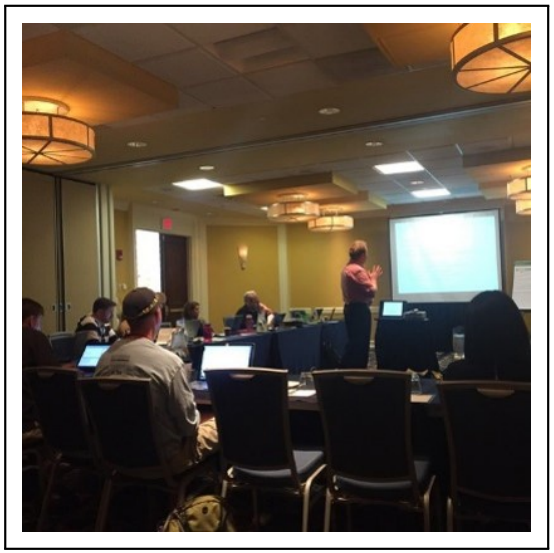
SWMPrats.net

System-***W***ide ***M***onitoring ***P***rogram
Resources for the ***A***nalysis of ***T***ime ***S***eries

SWMPrats.net

An ad hoc group formed to develop and expand the capacity of the NERRS program to more effectively use SWMP data

1) Training workshops 2014, 2015, today



SWMPrats.net

2) SWMPr is an open-source R package described on the website, v2.1.7

```
# install/load from R
install.packages('SWMPr')
library(SWMPR)
```

SWMPrats.net

3) SWMPrats.net (#swmprats) is our base of operations...

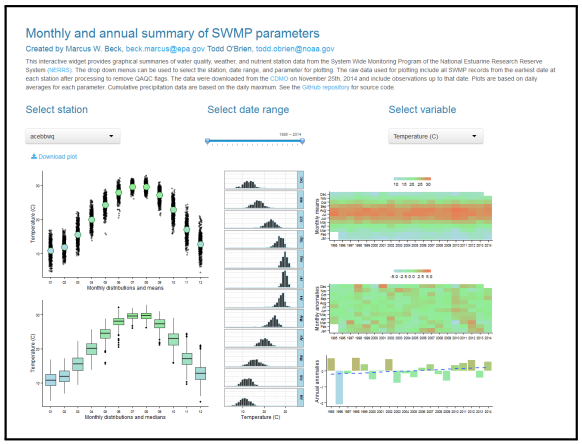
- Training materials
- SWMPr cookbook
- Forum (POTM)
- Widgets

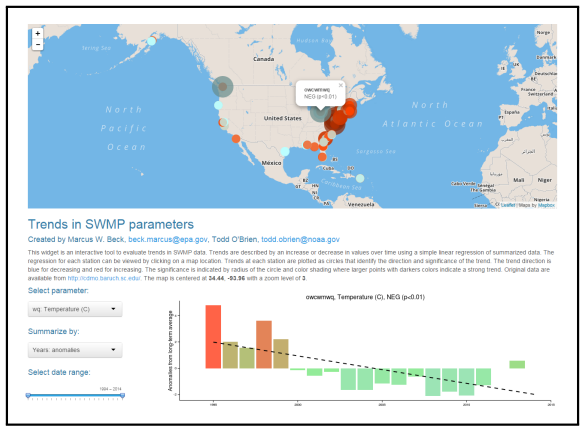
Widgets of SWMPrats.net

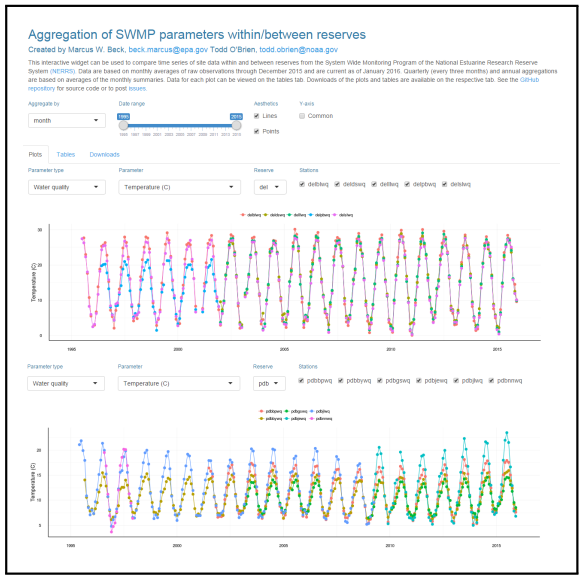
Improved data integration and accessibility with a point-and-click approach

Three Shiny applications allow users to visualize trends in SWMP data

These apps allow 'reactive' use of SWMPr functions







Widgets of SWMPrats.net

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- Focus is on a single reserve or comparisons between reserves

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- They are for exploration - results or trends are not absolute
- Data have been processed a particular way - there are possible errors
- Data are static - hosted directly with app or on private site after processing, updated once a year or catastrophic error...

Widgets of SWMPrats.net: SWMP summary

For summarizing trends at one site and one parameter

Monthly and annual summary of SWMP parameters

Created by Marcus W. Beck, beck.marcus@epa.gov Todd O'Brien, todd.obrien@noaa.gov

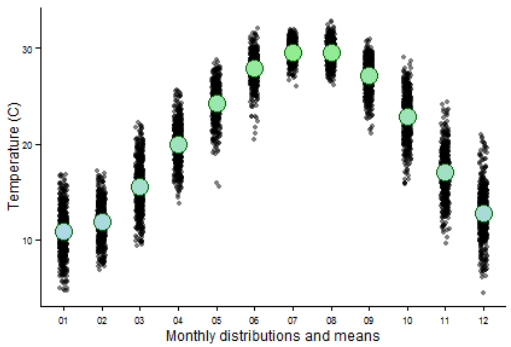
This interactive widget provides graphical summaries of water quality, weather, and nutrient station data from the System Wide Monitoring Program of the National Estuarine Research Reserve System (NERRS). The drop down menus can be used to select the station, date range, and parameter for plotting. The raw data used for plotting include all SWMP records from the earliest date at each station after processing to remove QAQC flags. The data were downloaded from the CDMO on November 25th, 2014 and include observations up to that date. Plots are based on daily averages for each parameter. Cumulative precipitation data are based on the daily maximum. See the GitHub repository for source code.

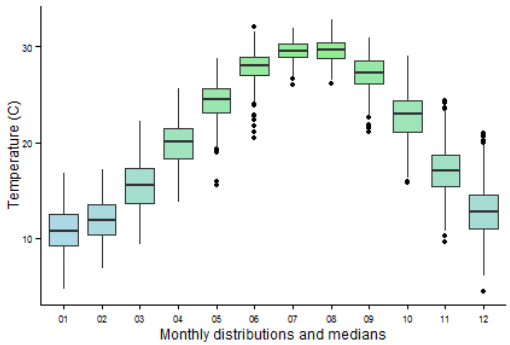
Select station: acebbwq

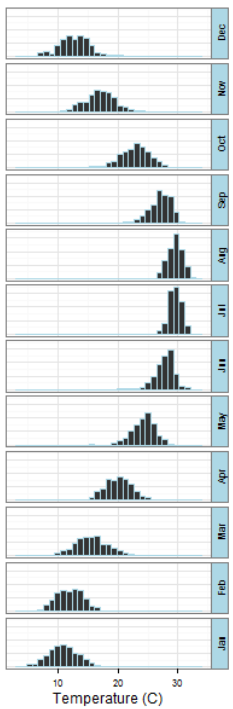
Select date range: 1995 – 2014

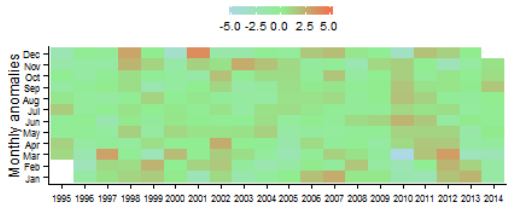
Select variable: Temperature (C)

Download plot









Widgets of SWMPrats.net: SWMP summary

For a given ***site***, ***date range***, and ***variable***, it shows:

- Monthly distribution with means (top left)
- Monthly distributions by boxplots (bottom left)
- Histogram frequency by month (center)
- Monthly means by years (top right)
- Monthly anomalies by year (center right)
- Annual anomalies and trend (bottom right)

Options for tabular data and saving plots/tables

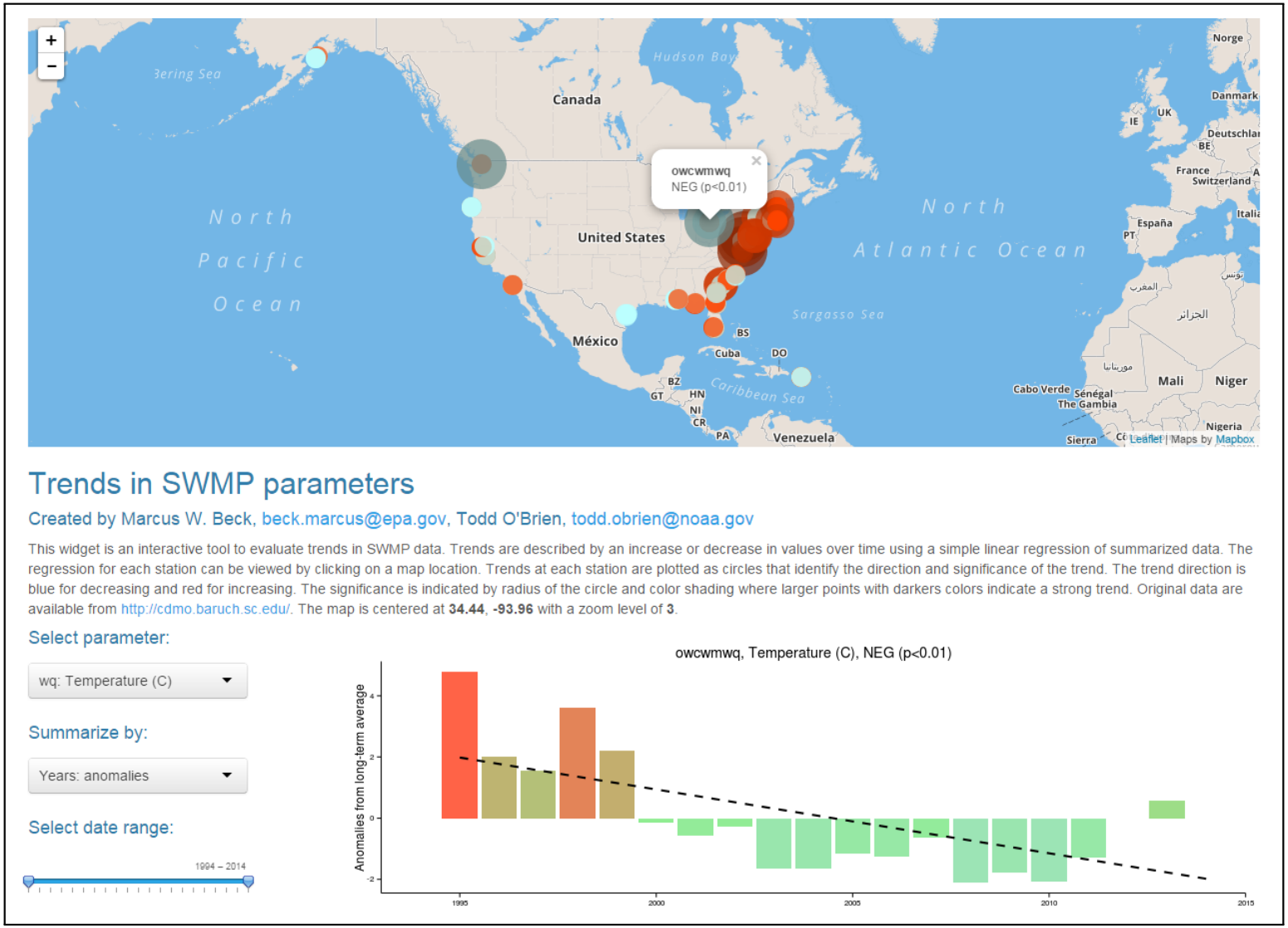
Widgets of SWMPrats.net: SWMP summary

Note: The `plot_summary` function in SWMPr is used to create the plots.

```
library(SWMPr)

## import data
data(apacpnut)
dat <- qaqc(apacpnut)

## plot
plot_summary(dat, param = 'chla_n', years = c(2007, 2013))

## get individaul plots
plots <- plot_summary(dat, param = 'chla_n', years = c(2007, 2013),
  plt_sep = TRUE)

plots[[1]] # top left
plots[[3]] # middle
plots[[6]] # bottom right

## get summary data
plot_summary(dat, param = 'chla_n', year = c(2007, 2013), sum_out = TRUE)
```

Widgets of SWMPrats.net: SWMP compare

Compare trends for a single parameter between reserves/space



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- Evaluate annual or monthly changes

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- Trends shown as increasing (red), decreasing (blue)

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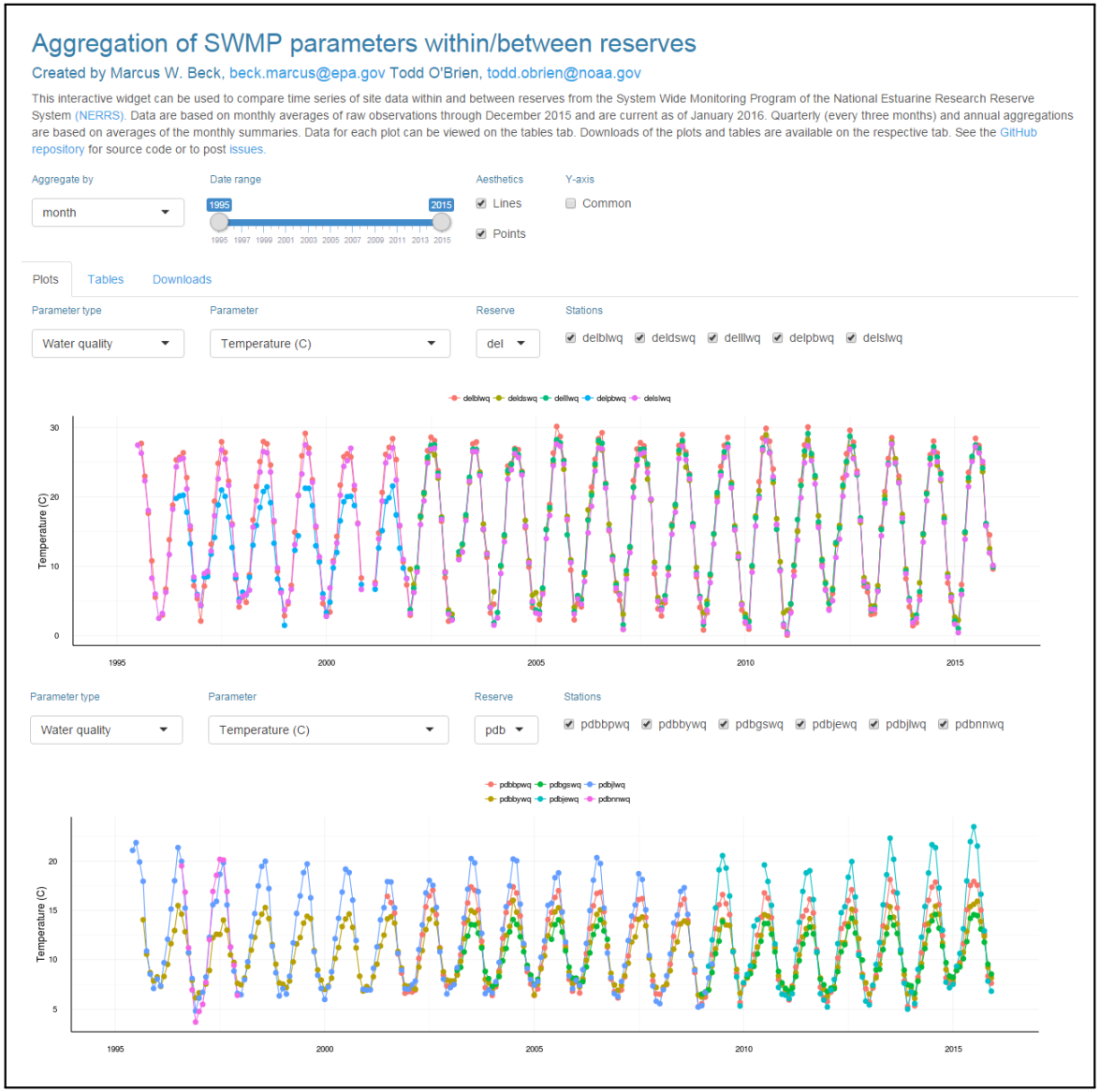
All trends are relative (***compare***)...

Zoom the map to view finer spatial scale and click to view results for single stations

Widgets of SWMPrats.net: SWMP aggregate

Compare aggregated parameters within and between reserves



Widgets of SWMPrats.net: SWMP summary

This app allows multiple comparisons:

- Within and between sites

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- Seasonal (monthly, quarterly) or annual trends

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Water and air temperature example at ACE basin.... note the common y-axis and effect of aggregating incomplete years

Up next... Time Series Topic 1: Weighted Regression

Questions??