

NERRS / SWMP

Training Workshop: *R*, *SWMPPr*, *SWMPPrats*

Williamsburg, VA, Nov 13, 2016

The SWMPPrats website and the Widgets

Marcus W. Beck¹

¹USEPA NHEERL Gulf Ecology Division
Email: beck.marcus@epa.gov

Objectives for the session (2:00 - 2:30)

- Overview of the website
- Overview of the widgets
 - ▶ SWMP summary
 - ▶ SWMP trends
 - ▶ SWMP aggregate

Interactive portion

There are no materials for this module, pull up the website or follow on my screen

Other modules:

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

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You will run examples whenever you see this guy:

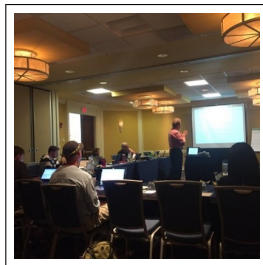




*S*ystem- *W*ide *M*onitoring *P*rogram
*R*esources for the *A*nalysis of *T*ime *S*eries

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





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

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



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

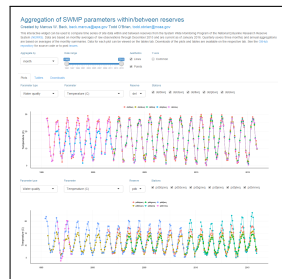
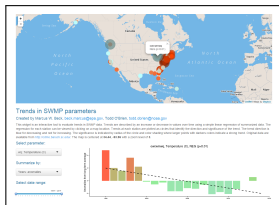
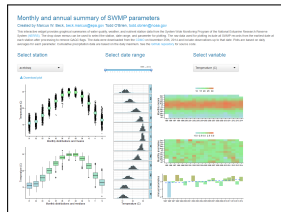
- Training materials
- SWMPPr cookbook
- Forum (POTM)
- Widgets

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

When using the widgets, understand...

- Focus is on a single reserve or comparisons between reserves

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Widgets of SWMPrats.net

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- 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 QA/QC 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

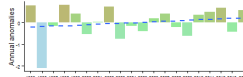
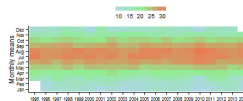
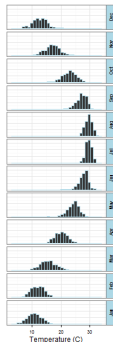
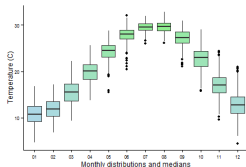
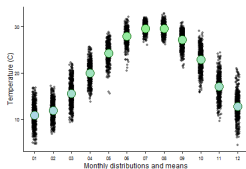
Download plot

Select date range

1995 - 2014

Select variable

Temperature (C)



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 SWMP_r 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 individual plots
plots <- plot_summary(dat, param = 'chla_n', years = c(2007, 2013),
  plt_sep = TRUE)

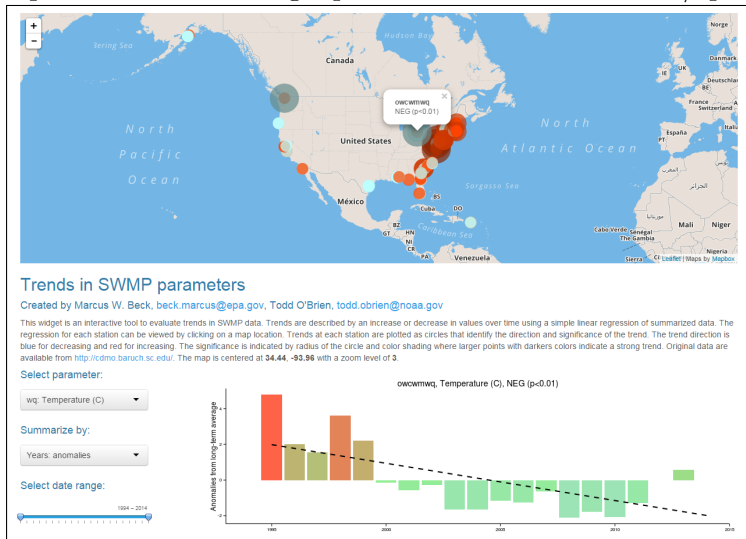
plots[[1]] # top left
plots[[3]] # middle
plots[[6]] # bottom right

## 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



Widgets of SWMPrats.net: SWMP compare

For a *given parameter* and *date range*, at all sites:

- Evaluate annual or monthly changes

Widgets of SWMPrats.net: SWMP compare

For a *given parameter* and *date range*, at all sites:

- Evaluate annual or monthly changes
- Evaluate anomalies (difference from grand mean) or observed

Widgets of SWMPrats.net: SWMP compare

For a *given parameter* and *date range*, at all sites:

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

Widgets of SWMPrats.net: SWMP compare

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- Significance (based on simple regression) is shown as size of point

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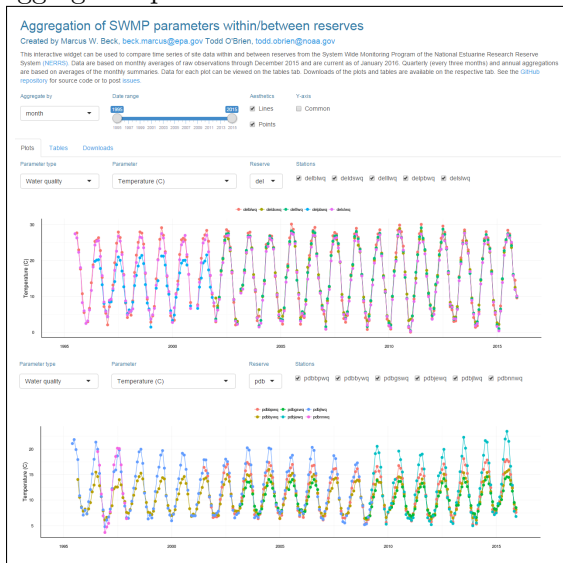
All trends are relative (*compare*)...

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

Widgets of SWMPrats.net: SWMP summary

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- Same or different parameters

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This app allows multiple comparisons:

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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

NERRS / SWMP

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

Questions??