

# SWMPrats: A community of practice for NERRS data analysis

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- The genesis of SWMPrats.net
- Features of SWMPrats.net
  - ▶ SWMP<sub>r</sub>
  - ▶ widgets
  - ▶ forum
- Continuing work and engaging the larger community



As of April 30th, > 58 million SWMP data records are available

An invaluable data source but...

- No recent comparative analyses between systems
- No simple tools for trend analysis at individual sites

These needs were identified in 2013 annual meeting, led to a workshop at the 2014 meeting to focus on time series analysis



One-day training workshop at 2014 annual meeting

- Attended by over 70 NERRS staff, representing 19 of 28 reserves
- General focus on time series analysis, simple applications with SWMP data
- Pre/post workshop materials, including an R package for SWMP




A working group was formed from this meeting

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

SWMPrats.net is our base of operations...



## A time series and data analysis information and tool resource




### SWMPPrats.net

- ★ **SWMPPrats.net**
- ★ **SWMP Widgets**
  - Trends Maps
  - Summary Plots
- ★ **All about SWMPr**
- ★ **2014 Workshop**
- ★ **Forum**

### SWMPPrats.net

The SWMPPrats.net web pages serve as a time series and data analysis information and tool resource for the National Estuarine Research Reserve System (NERRS) System-wide Monitoring Program (SWMP).



#### Trends in SWMP parameters

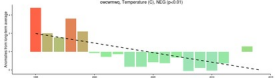
Created by Marcus W. Beck, [beck.marcus@epa.gov](mailto:beck.marcus@epa.gov), Todd O'Brien, [todd.obrien@noaa.gov](mailto:todd.obrien@noaa.gov)

This widget is an interactive tool to evaluate trends in SWMP data. Trends are described by an increase or decrease in values over time using a simple linear regression of summarized data. The regression for each station can be viewed by clicking on a map location. Trends at each station are plotted as circles that identify the direction and significance of the trend. The trend direction is blue for decreasing and red for increasing. The significance is indicated by the radius of the circle and color shading where larger points with darker colors indicate a strong trend. Original data are available from <http://nerrs.beacons.noaa.gov>. The map is centered at 34.44, -93.98 with a zoom level of 8.

Select parameter:  
eq. Temperature (C)

Summarize by:  
Years, anomalies

Select date range:  
1980 - 2015





# SWMPrats.net: The SWMP<sub>r</sub> package



SWMP<sub>r</sub> is an open-source R package described on the website, v2.0.0 is now available

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

Currently working on a manuscript to describe the package in detail



# SWMPPrats.net: The SWMPPr package

The software addresses the tedious but necessary challenges of analyzing time series, specific to SWMP

What are some challenges?

- Dealing with ‘bad’ data
- Subsetting by date ranges, parameters
- Combining data from different sites
- Standardizing time steps
- ...and analysis





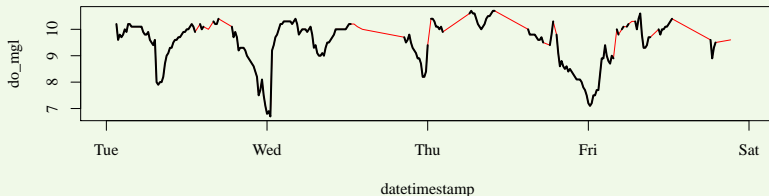
Proof of concept, import and combine wq and weather data from Apalachicola Bay

```
> # import data
> met <- import_remote('apaebmet')
> wq <- import_remote('apacpwq')
>
> # combine, two hours time step
> # only overlapping date ranges
> dat <- comb(met, wq, timestep = 120,
+   method = 'intersect')
```

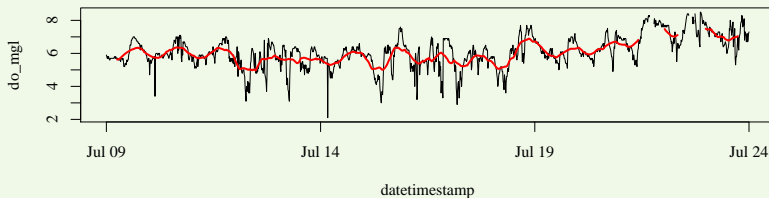
Try this with Excel...



Example: fill missing data with `na.approx`

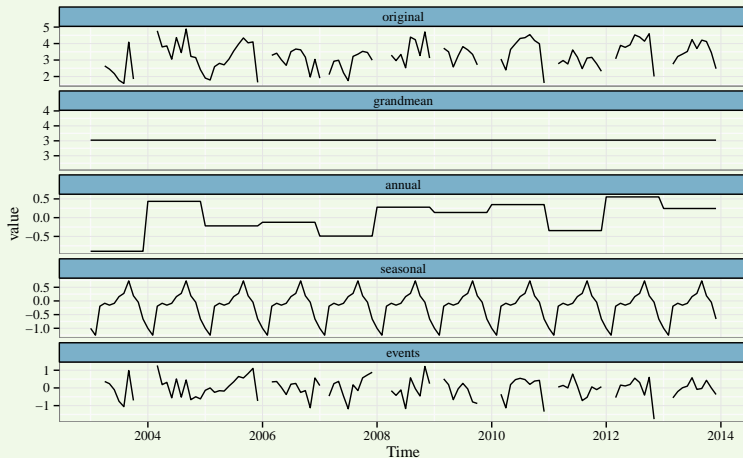


Example: smooth data with `smoother`



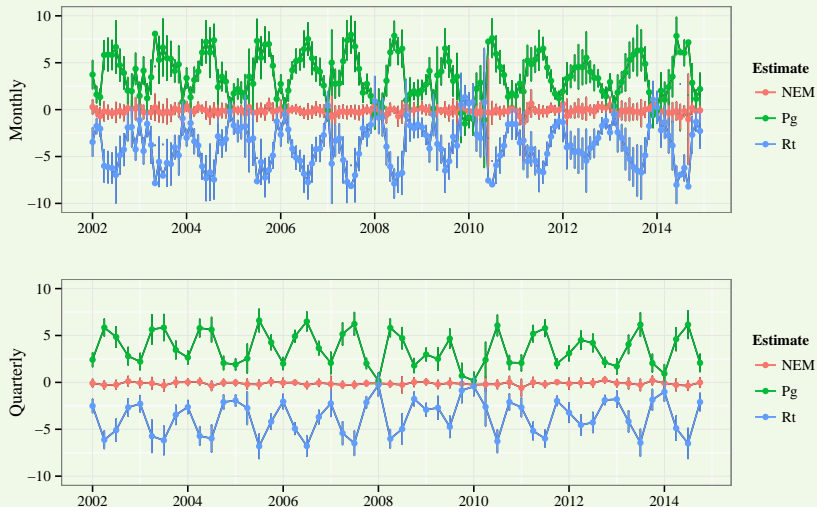


Example: time series decomposition with `decomp_cj` (chl-a at cbmocnut)





Example: estimate ecosystem metabolism with `ecometab` (apadbwq)





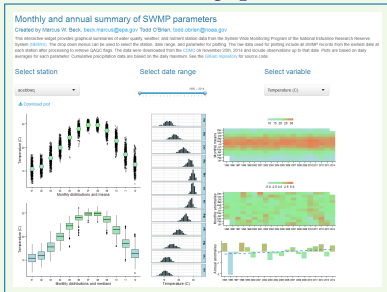
# SWMPPrats.net: Widgets

The most common question - what is the change over time at my site?

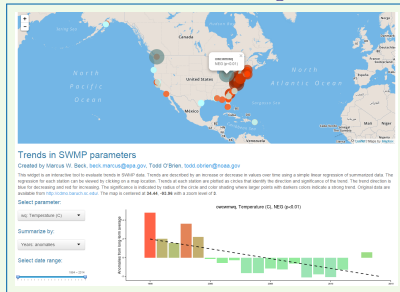
The functions in SWMPPr can help, but it's easier to interact!

Two apps on SWMPPrats.net can help visualize trends

## Summary plots



## Trends map





Last but not least, a discussion forum for all things analytical

The screenshot shows the SWMPrats.net forum interface. At the top is a banner image with two capybaras in a field, overlaid with the text 'SWMPrats.net' and a bar chart. Below the banner is a navigation bar with 'Index', 'Recent Topics', and 'Search' tabs. The main content area is divided into a left sidebar and a right main section. The sidebar contains links to 'SWMPrats.net', 'SWMP Widgets' (with sub-links 'Trends Maps' and 'Summary Plots'), 'All about SWMPr', '2014 Workshop', and 'Forum'. The main section has a login form with fields for 'Username' (containing 'marcus') and 'Password' (containing '\*\*\*\*\*'), a 'Remember me' checkbox, and a 'Login' button. Below the login form are links for 'Forgot your password?' and 'Forgot your username?'. The 'Recent Topics' section shows '0 Topics' and a 'Month' dropdown. The 'Recent Discussions' section shows 'There are no topics to display.' and '0 Topics'. The 'Who Is Online' section shows 'Total users online: 0 Members and 1 Guest Online' and a legend for roles: Site Administrator, Global Moderator, Moderator, Banned, User, and Guest.

SWMPrats.net

★ **SWMPrats.net**

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Index Recent Topics Search

Welcome, **Guest**

Username:  Password:  Remember me ☐

[Login](#)

[Forgot your password?](#) [Forgot your username?](#)

■ Forum ▸ Recent Topics

0 Topics

**Recent Discussions**

There are no topics to display.

0 Topics

**Who Is Online**

Total users online: 0 Members and 1 Guest Online

Legend: Site Administrator, Global Moderator, Moderator, Banned, User, Guest

# Continuing work and engagement

SWMPrats.net is in its infancy but already seeing heavy use

- SWMPPr downloaded 306 times from R network (as of April 30)
- Apps have been used 347 hours (as of April 30)

Continuing development of packages/apps - submit suggestions/bug reports via email or on [GitHub](#) (preferred)

Plan for greater engagement with the forum - soliciting moderators, suggested topics

Additional training workshops??

# Continuing work and engagement



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To get this presentation: [https://github.com/fawda123/swmprats\\_pres](https://github.com/fawda123/swmprats_pres)

Summary app: <http://swmprats.net/swmp-widgets/summary-plots>

Trends map app: <http://swmprats.net/swmp-widgets/trends-maps>

Visit the development site for the most recent version of SWMPr:  
<https://github.com/fawda123/SWMPr>