



Florida Department of Environmental Protection Charlotte Harbor Aquatic Preserves

Long-term Water Quality Monitoring within Matlacha Pass Aquatic Preserve

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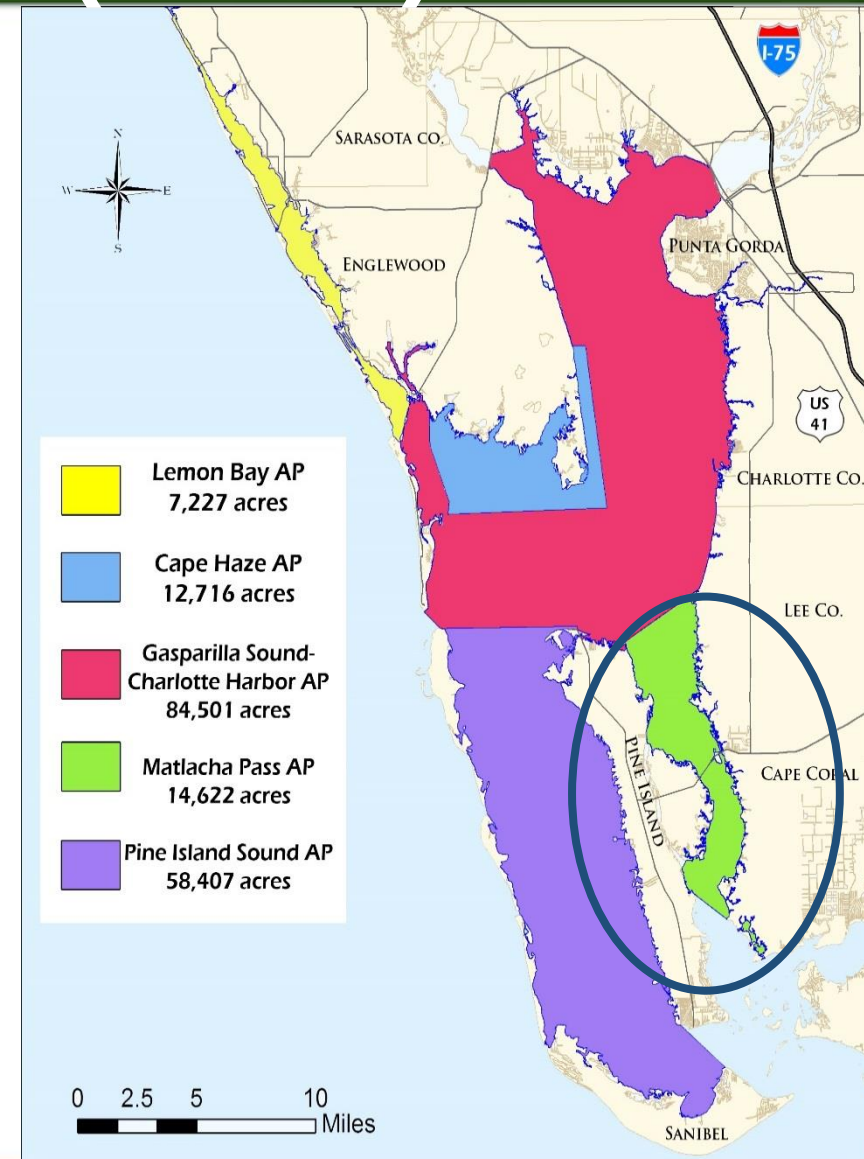
March 28, 2017





Charlotte Harbor Aquatic Preserves (CHAP)

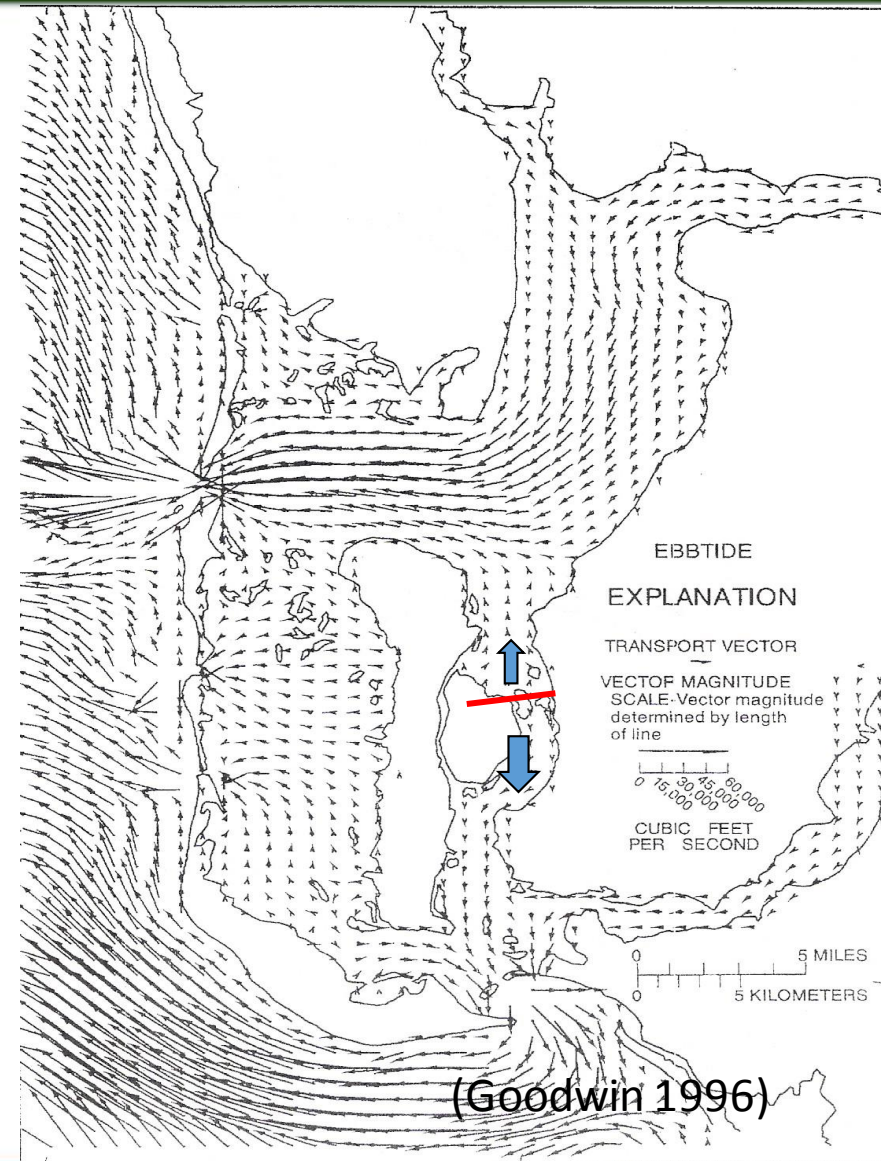
- 41 Aquatic Preserves in state, CHAP manages five
- Consists of 177,471 acres of sovereign submerged lands
- *Aquatic Preserves were “set aside forever as aquatic preserves or sanctuaries for the benefit of future generations” due to “exceptional biological, aesthetic, and scientific value” (Florida Aquatic Preserves Act of 1975)*





Matlacha Pass Aquatic Preserve (est. 1972)

- One of the five Aquatic Preserves Charlotte Harbor Aquatic Preserves manages
- Totals 14,622 acres of sovereign submerged lands
- Freshwater influences includes Caloosahatchee River and adjacent land (Cape Coral, Pine Island)
- Saltwater influences depend on location: greater Charlotte Harbor or San Carlos Bay/Gulf of Mexico





Program Overview- CHEVWQMN

- Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network (CHEVWQMN) established in 1998
- Volunteers attend initial training, followed by two quality assurance sessions annually
- Nineteen field and water quality parameters are collected monthly (0.5m below surface) to capture snapshot
- Data QA'd and stored in house. Uploaded to STORET and Water Atlas
- Three sites use YSI Professional Plus (since 2014) and one site uses Hanna dissolved oxygen and Hanna multi-parameter (pH and temperature)



Photo credit: Bob Bristol (MPV001)



Program Overview - Datasondes

- Two sites established in 2005 (north and south), one established in 2009 (bridge)
- Program goals: to track continuous water quality conditions, in addition to capturing irregular events (i.e. hurricanes, cold fronts) effect on water quality
- Collects eight parameters every 15 minutes; monthly swap of instruments includes staff collecting water samples: chlorophyll *a*, NOX, nitrites, nitrates, total phosphorous and harmful algal blooms
- Samples collected .5 meters off the bottom





Data Exploration

- Comparison of CHEVWQMN and datasonde (monthly averages) by certain parameters
- Monthly one time samples of nutrients and chlorophyll *a*
- Seasonal averages
- Considering the trendline
- Example of event data (El Nino, winter 2016)





Overview of data - North Matlacha Pass

Averages from September 2005- July 2016		MPV001 (volunteer, surface)		MP1A (YSI 6600, 0.5m off bottom)	
Salinity (ppt)		Mean: 27.41 Standard deviation (SD): 7.46	Max: 38.90 Min: 9.93 N:84	Mean: 27.45 SD: 5.51	Max: 37.37 Min: 13.11 N: 127
Dissolved oxygen (mg/L)		Mean: 5.87 SD: 1.5428	Max: 11.8 Min: 1.9 N :84	Mean: 6.43 SD: 1.353	Max: 14.9 Min: 4.0 N: 127
pH		Mean: 7.98 SD: 0.3521	Max: 8.6 Min: 7.0 N :84	Mean: 8.019 SD: 0.1599	Max: 8.5 Min: 7.6 N: 127
Chlorophyll a		Mean: 4.98 SD: 3.27	Max: 19 Min: 1 N:84	Mean: 8.48 SD: 5.46	Max: 29.0 Min: 0.95 N: 127
Total nitrogen		Mean: 0.76 SD: 0.24	Max: 1.51 Min: 0 N: 84	Mean: 0.715 SD: 0.16	Max: 1.404 Min: 0.42 n: 127
Total phosphorus		Mean: 0.058 SD: 0.0199	Max: 0.15 Min: 0.033 N: 84	Mean: 0.063 SD: 0.022	Max: 0.14 Min: 0.028 N: 127



Overview of data- Central Matlacha Pass

Averages from March 2009- May 2016

Averages from February 2009- July 2016	MPV002 (volunteer, surface)		MP3C (YSI 6600, 0.5m off bottom)	
Salinity (ppt)	Mean: 24.33 Standard deviation (SD): 6.52	Max: 38.40 Min: 10.30 N: 54	Mean: 22.84 SD: 6.39	Max: 33.85 Min: 6.74 N: 70
Dissolved oxygen (mg/L) 	Mean: 4.86 SD: 1.6154	Max: 8.90 Min: 1.70 N: 54	Mean: 5.3118 SD: 0.78387	Max: 8.18 Min: 3.51 N: 70
pH 	Mean: 7.86 SD: 0.212	Max: 8.60 Min: 7.20 N: 54	Mean: 7.90 SD: 0.177	Max: 8.23 Min: 6.97 N: 70
Chlorophyll a 	Mean: 5.31 SD: 5.39	Max: 36.00 Min: 0.55 N :54	Mean: 9.21 SD:8.88	Max: 69.00 Min: 1.70 N: 70
Total nitrogen 	Mean: 0.6978 SD: 0.28822	Max: 1.51 Min: 0.00 N: 54	Mean: 0.7195 SD: 0.16041	Max: 1.39 Min: 0.36 N: 70
Total phosphorus	Mean: 0.0489 SD: 0.022	Max: 0.12 Min: 0.00 N: 54	Mean: 0.0506 SD: 0.01573	Max: 0.14 Min: 0.03 N: 70



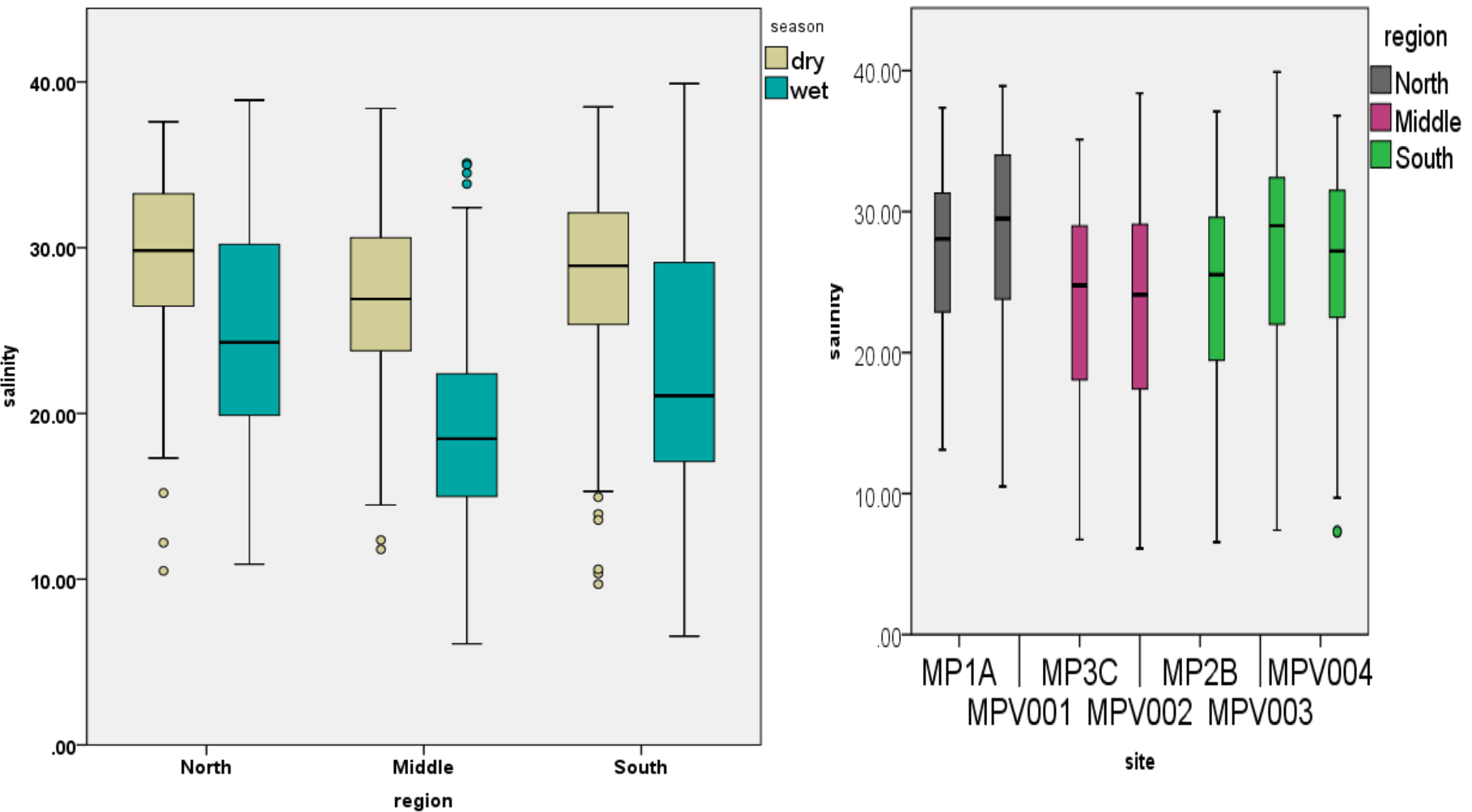
Overview of data- South Matlacha Pass

Averages from November 2005-May 2016

Averages from May 2005-July 2016	MPV003 (volunteer, surface)		MPV004 (volunteer, surface)		MP2B (YSI 6600, 0.5m off bottom)	
Salinity (ppt) 	Mean: 26.92 Standard deviation (SD): 7.26	Max: 39.9 Min: 7.40 N: 89	Mean: 26.60 SD: 6.745	Max: 36.8 Min: 7.30 N: 104	Mean: 24.65 SD: 6.98	Max: 37.11 Min: 6.56 N: 102
Dissolved oxygen (mg/L) 	Mean: 6.07 SD: 0.903	Max: 8.20 Min: 3.70 N: 65	Mean: 6.23 SD: 0.809	Max: 9.11 Min: 3.90 N: 104	Mean: 6.37 SD: 0.903	Max: 8.56 Min: 4.53 N: 102
pH 	Mean: 8.02 SD: 0.329	Max: 8.60 Min: 6.97 N: 65	Mean: 7.91 SD: 0.303	Max: 8.43 Min: 6.98 N: 104	Mean: 7.99 SD: 0.136	Max: 8.24 Min: 7.55 N: 102
Chlorophyll a	Mean: 3.12 SD: 3.63	Max: 20.0 Min: 0.69 N: 65	Mean: 2.67 SD: 2.296	Max: 15.0 Min: 0.55 N: 104	Mean: 3.84 SD: 4.62	Max: 41.0 Min: 0.64 N: 102
Total nitrogen 	Mean: 0.686 SD: 0.27	Max: 1.67 Min: 0.0 N: 65	Mean: 0.701 SD: .322	Max: 2.01 Min: 0.0 N: 104	Mean: 0.687 SD: 0.237	Max: 1.93 Min: 0.24 N: 102
Total phosphorus 	Mean: 0.593 SD: 0.031	Max: 0.19 Min: 0.00 N: 65	Mean: 0.536 SD: 0.279	Max: 0.21 Min: 0.00 N: 104	Mean: 0.563 SD: 0.282	Max: 0.22 Min: 0.03 N: 102



Regional salinity (ppt)



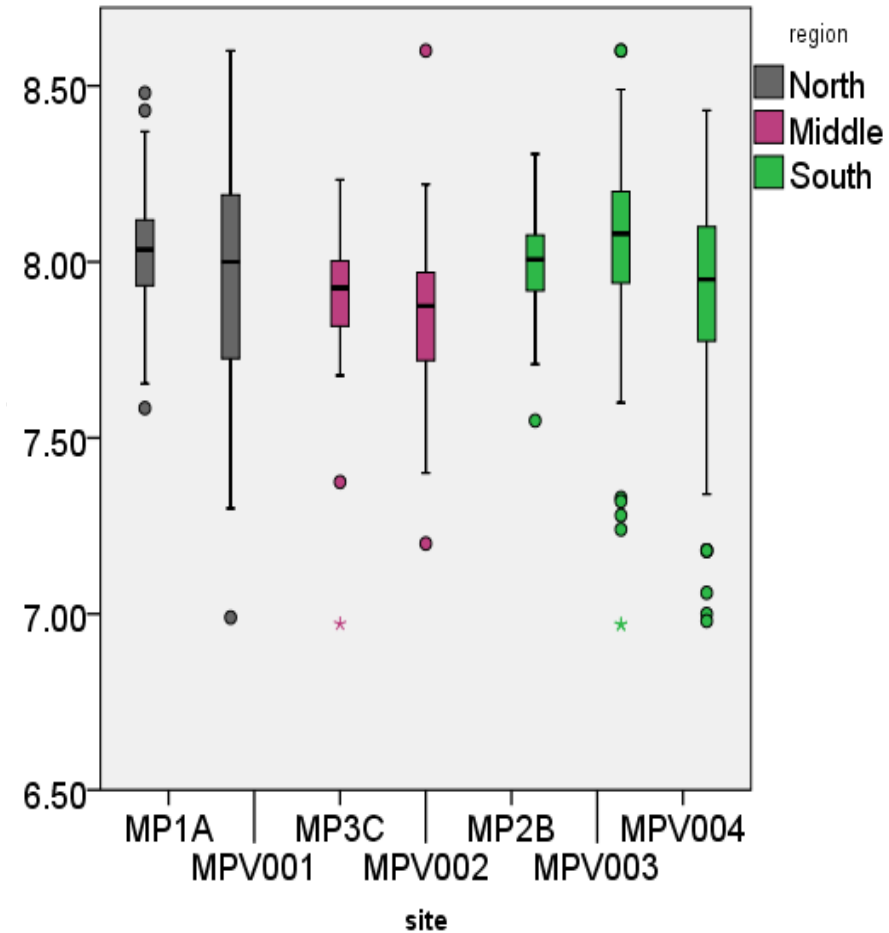
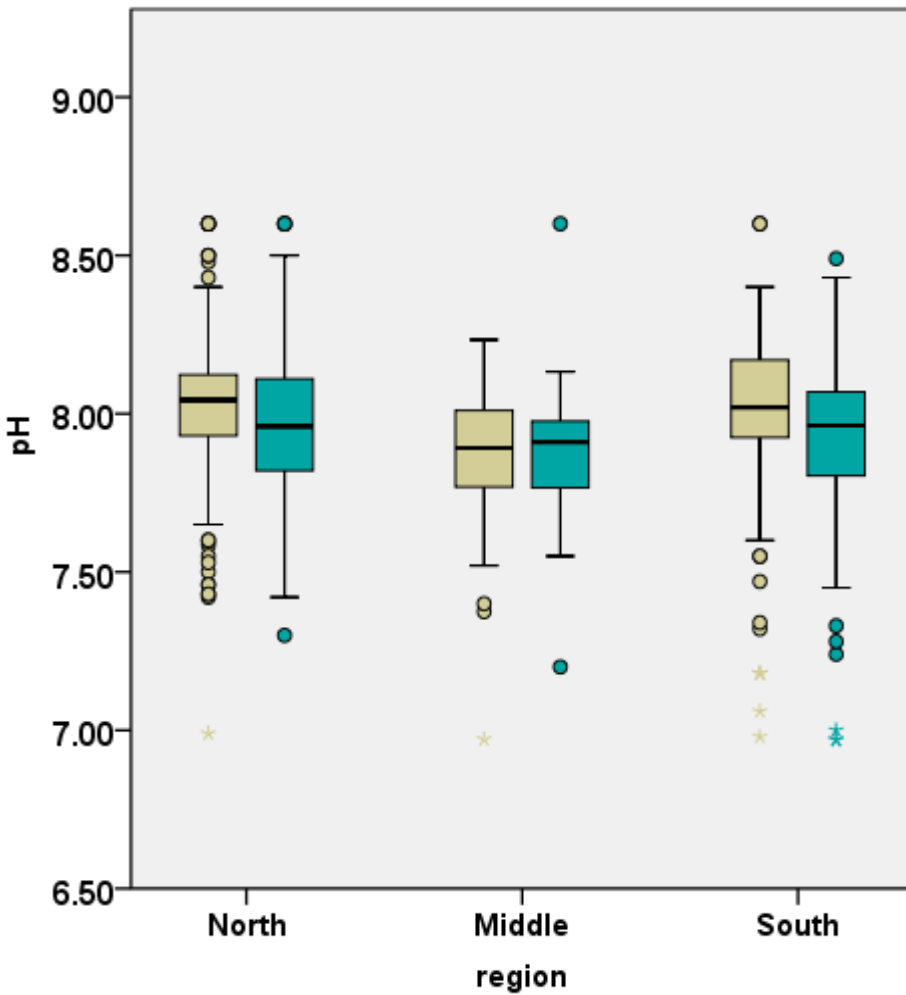
North average: 27.62 ppt
Standard deviation: 6.41

Middle average: 23.28 ppt
Standard deviation: 6.21

South average: 25.93 ppt
Standard deviation: 7.08



Regional pH



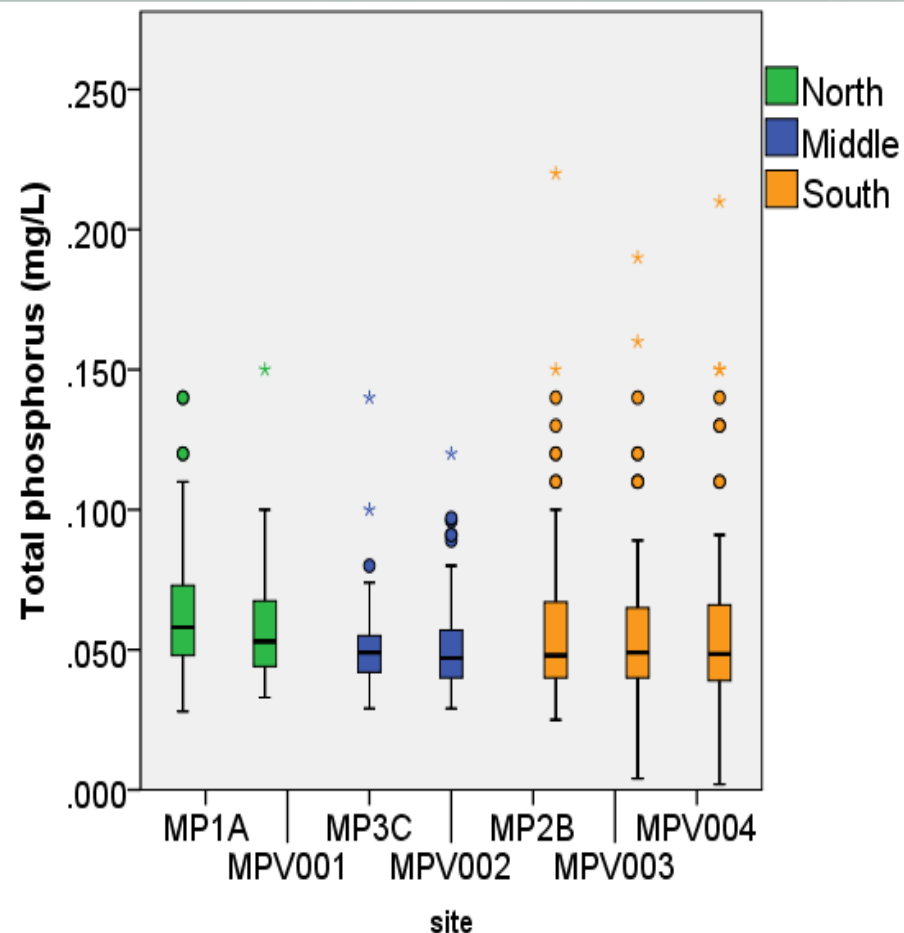
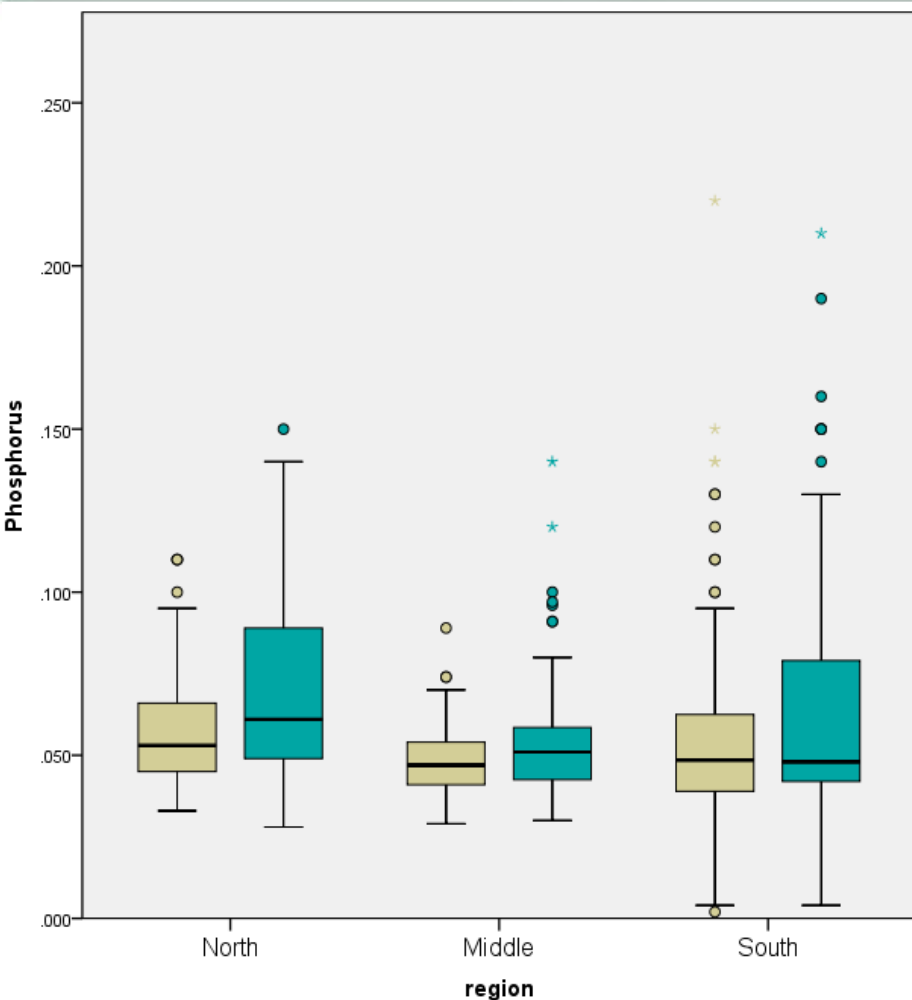
North average: 8.00
Standard deviation: 0.270

Middle average: 7.90
Standard deviation: 0.181

South average: 7.96
Standard deviation: 0.268



Regional Total Phosphorus (mg/L)



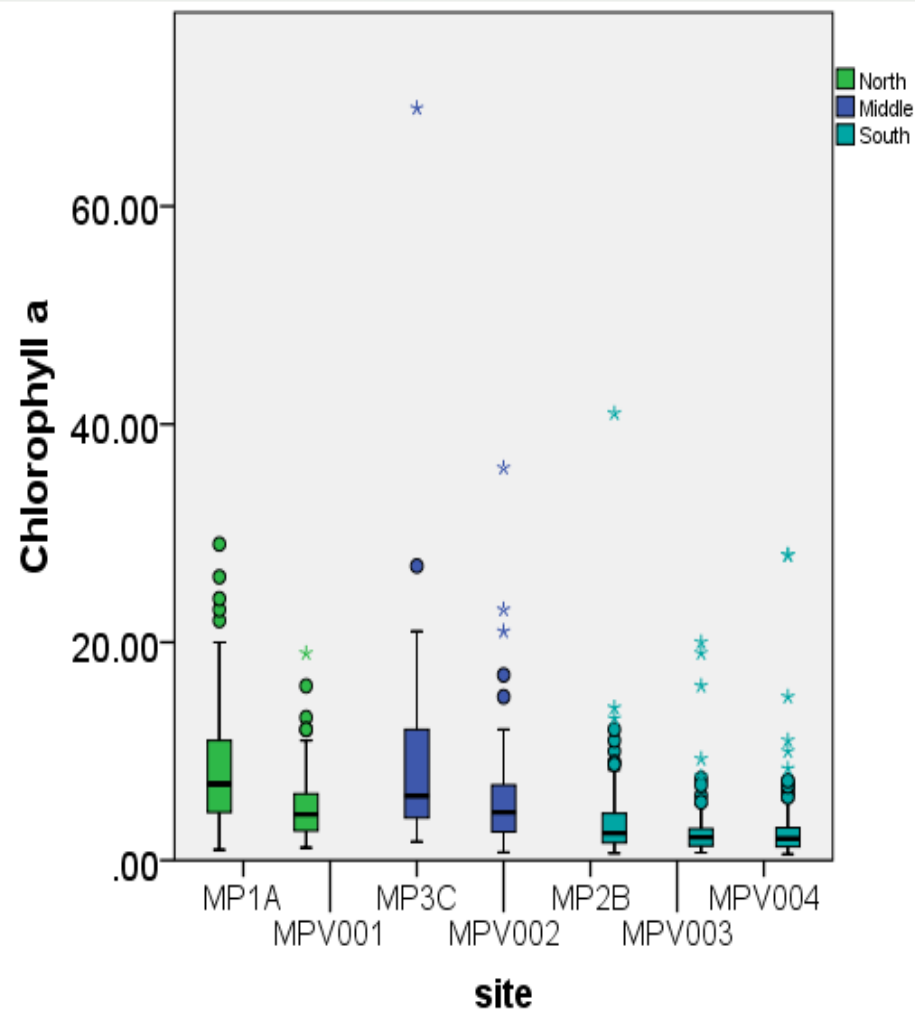
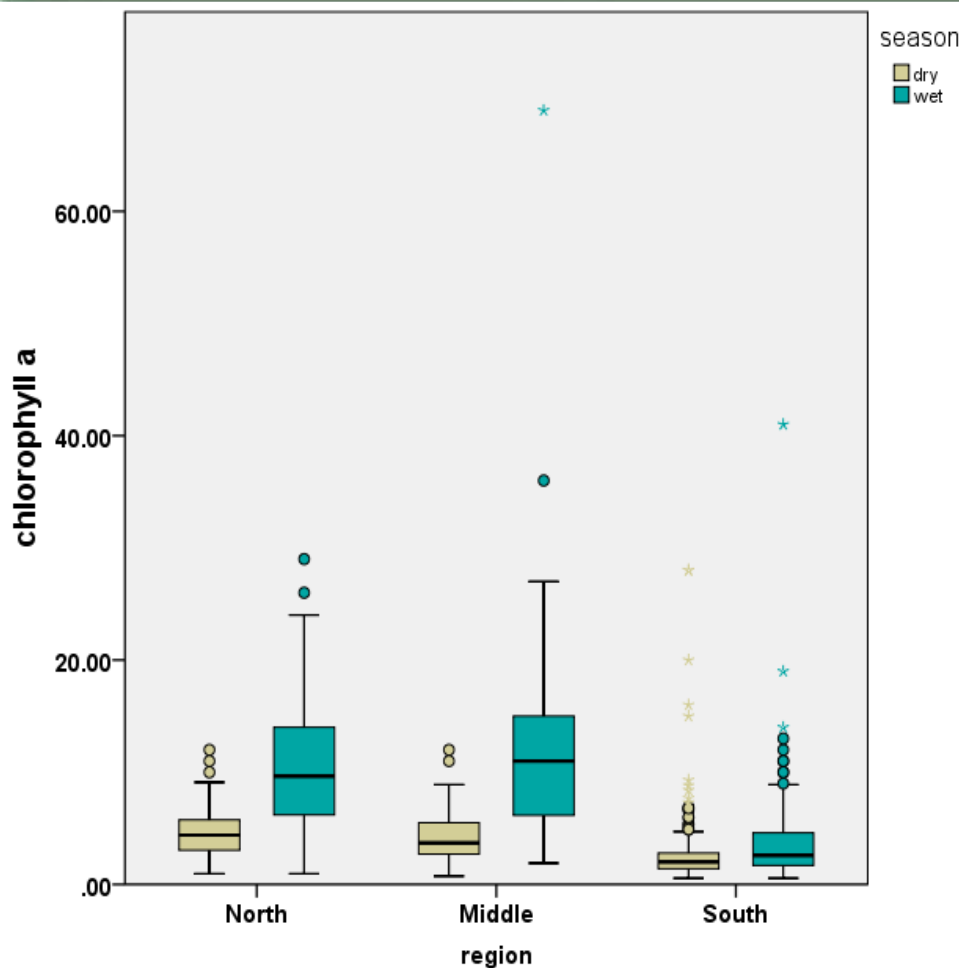
North average: 0.059
Standard deviation: 0.020

Middle average: 0.049
Standard deviation: .014

South average: 0.055
Standard deviation: 0.029



Regional Chlorophyll *a* ($\mu\text{g/L}$)



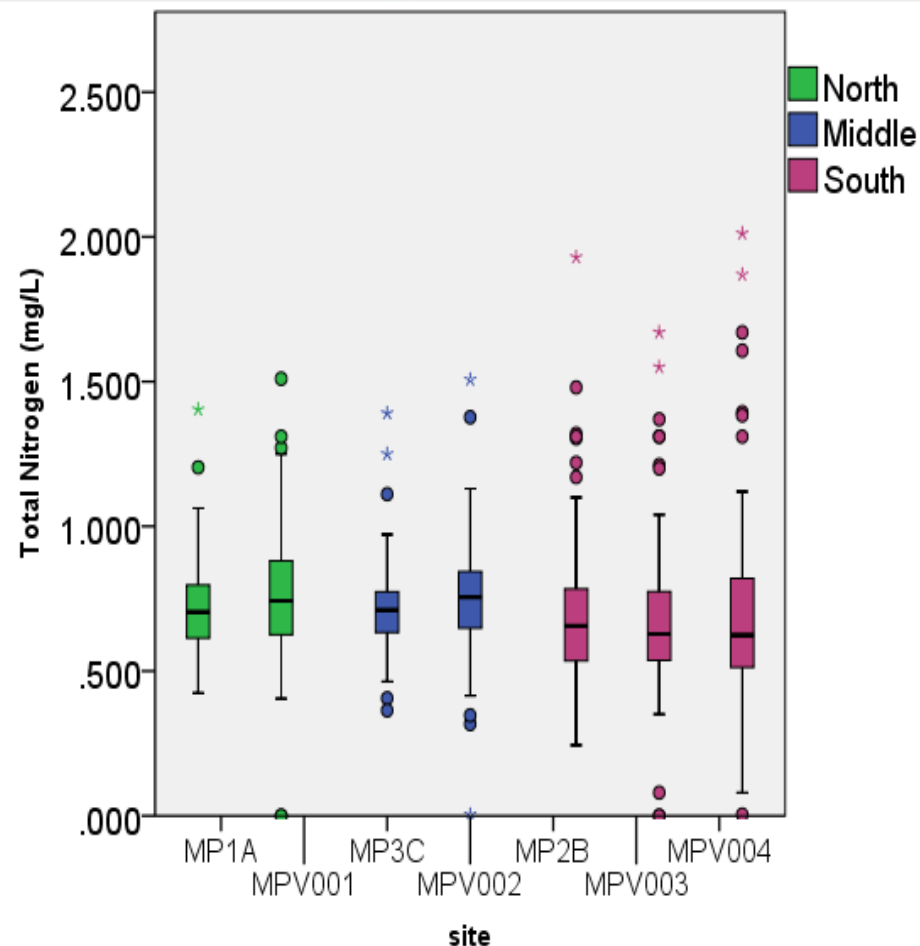
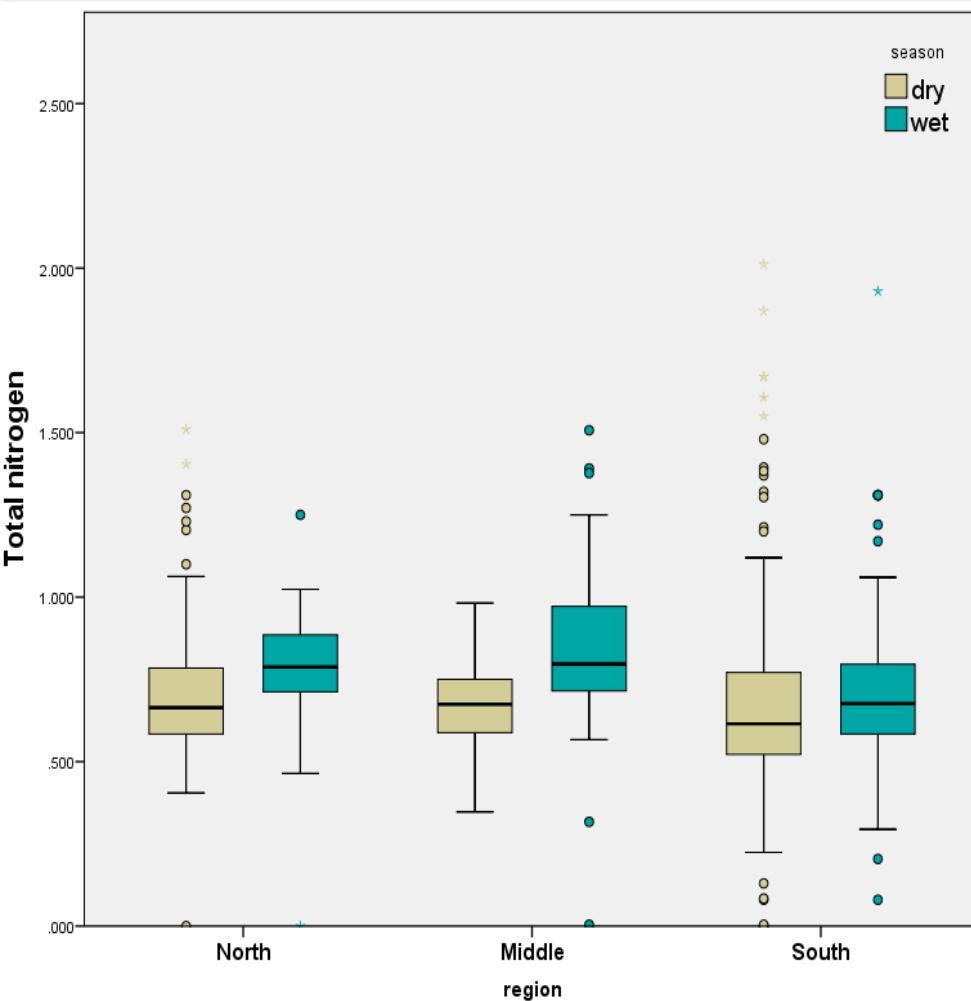
North average: 6.81
Standard deviation: 4.89

Middle average: 7.28
Standard deviation: 4.19

South average: 3.35
Standard deviation: 4.19



Regional Total Nitrogen (mg/L)



North average: 0.731
Standard deviation: 0.196

Middle average: 0.716
Standard deviation: 0.168

South average: 0.685
Standard deviation: 0.292



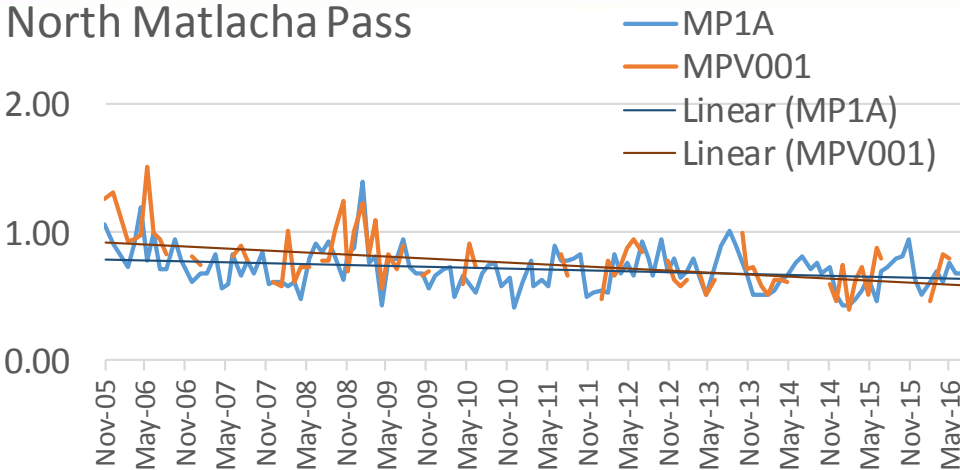
Graph Break



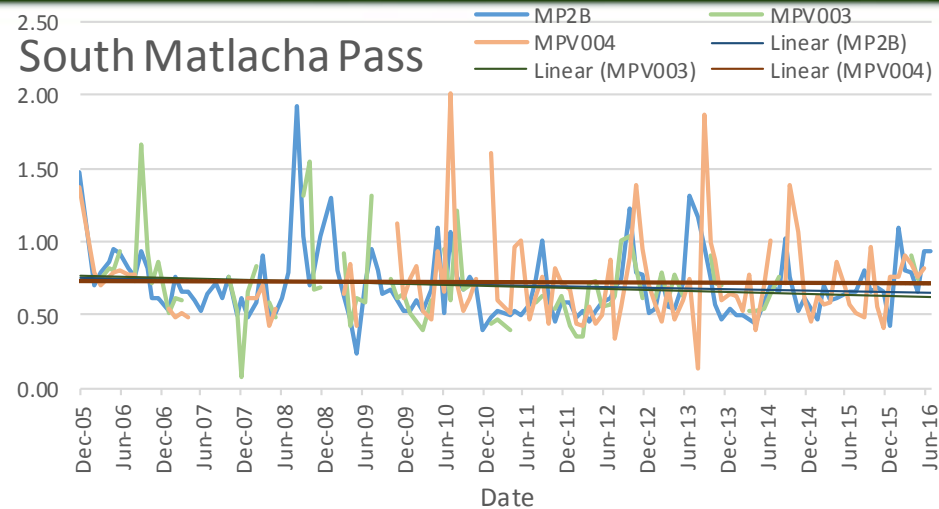


Total Nitrogen (mg/L) Over Time

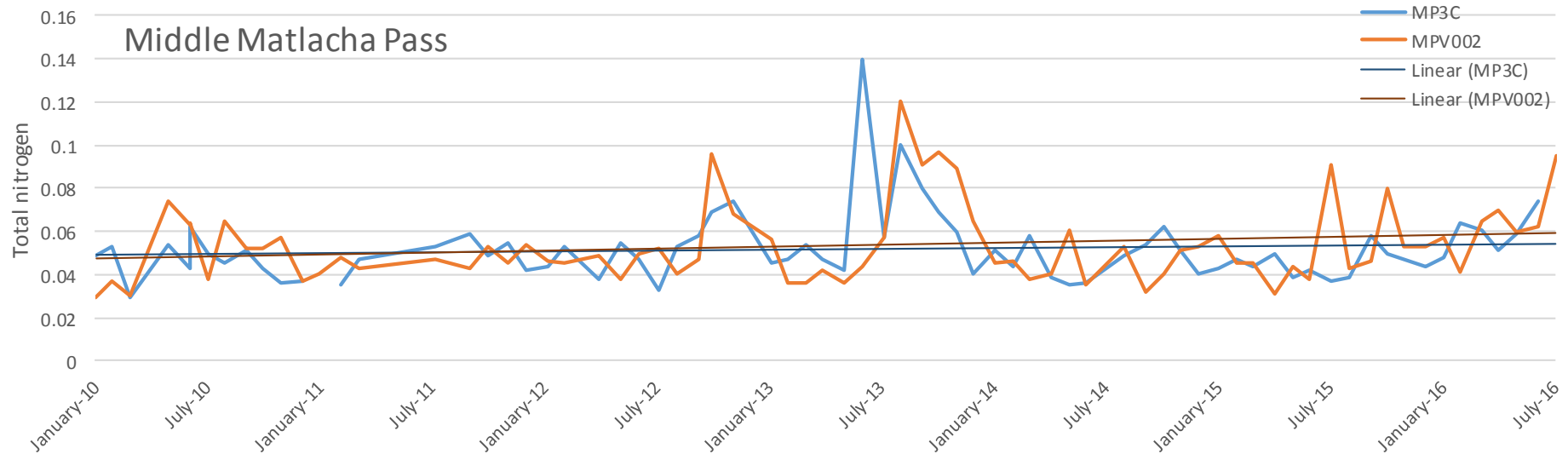
North Matlacha Pass



South Matlacha Pass

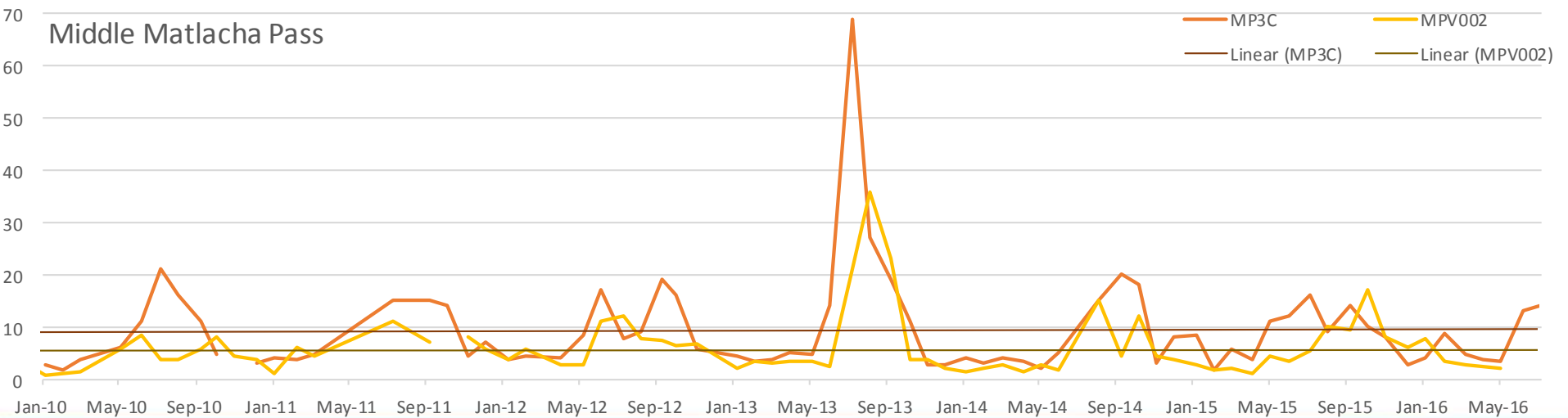
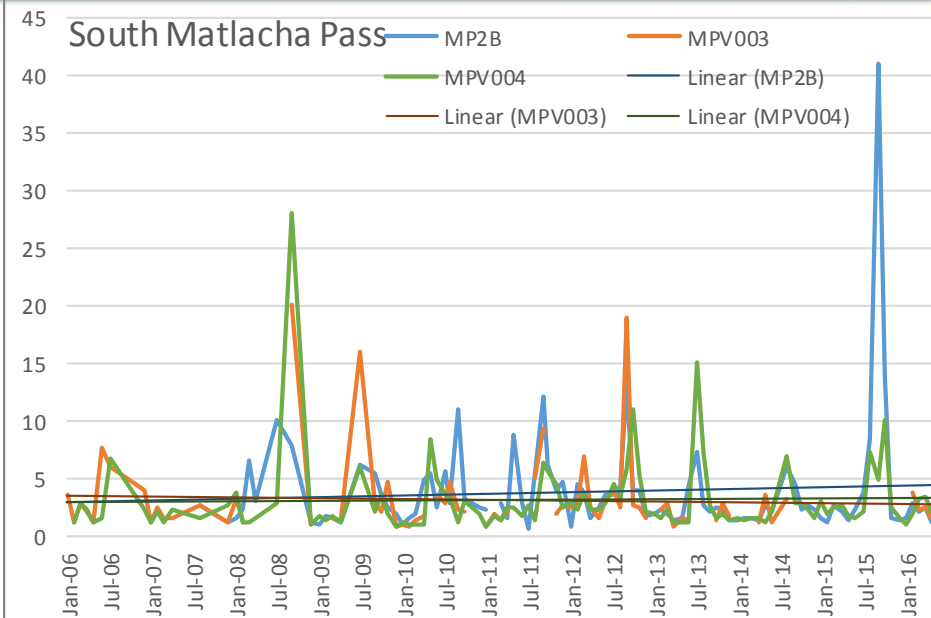
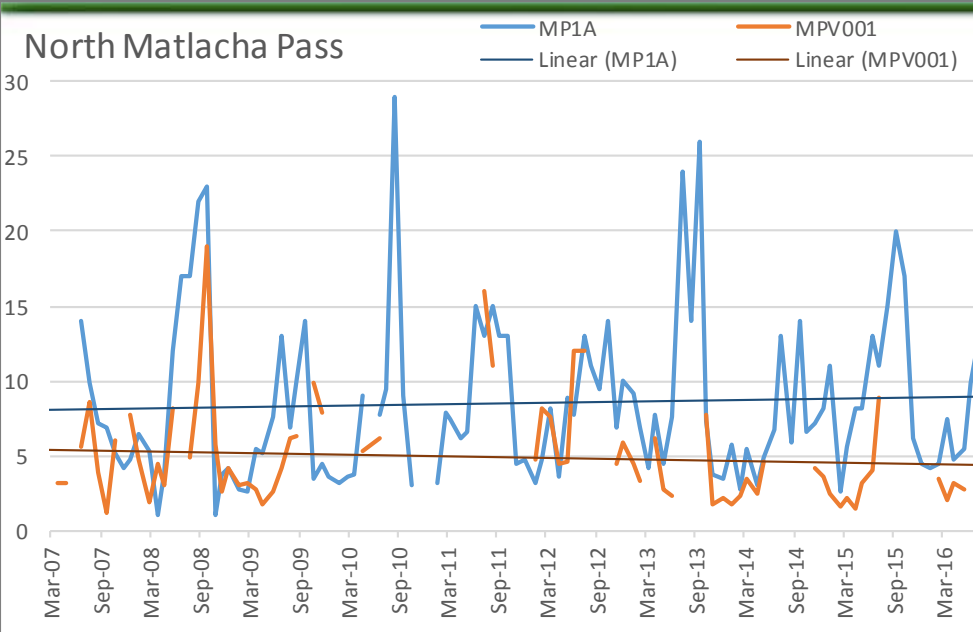


Middle Matlacha Pass



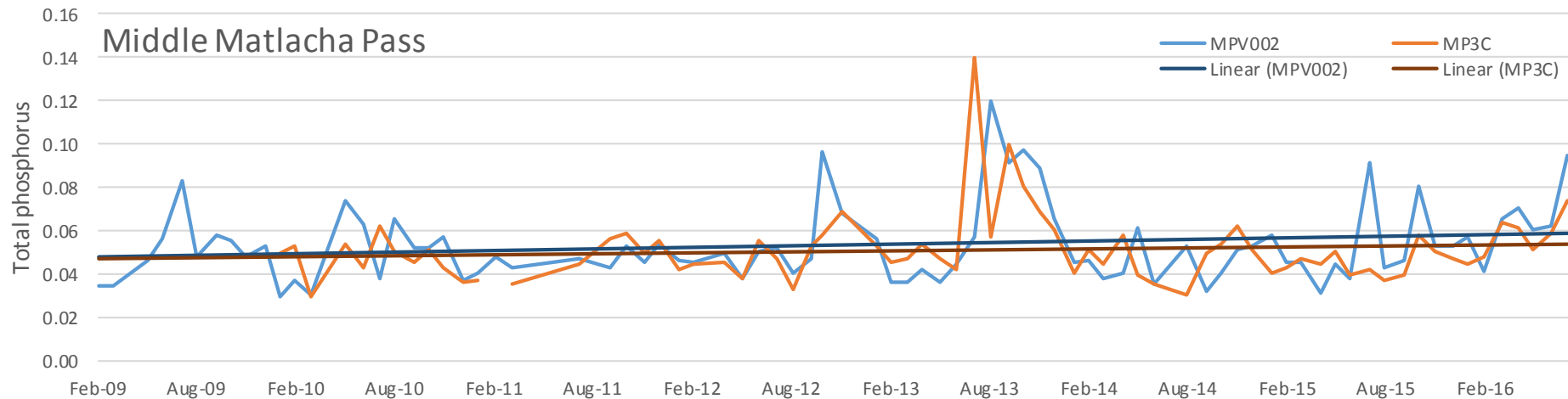
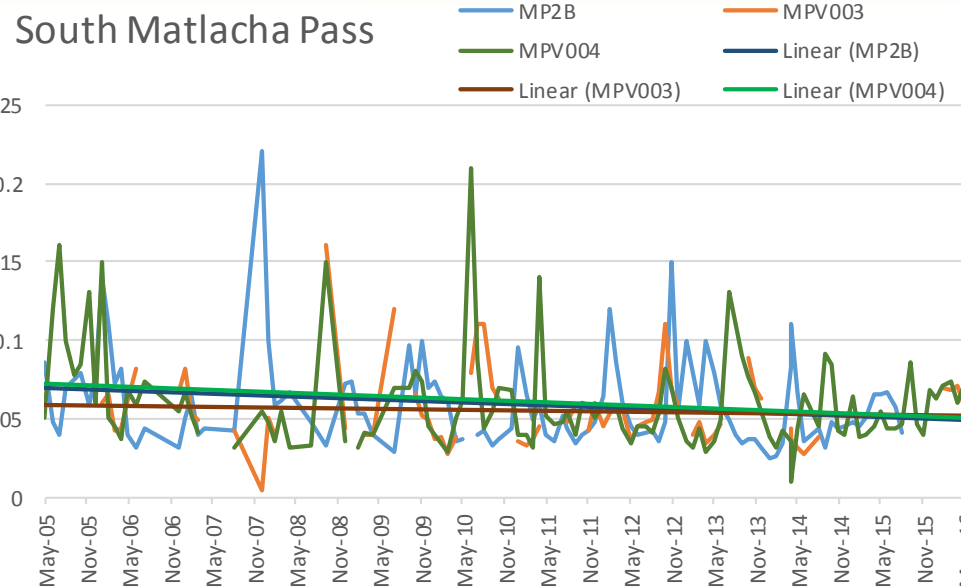
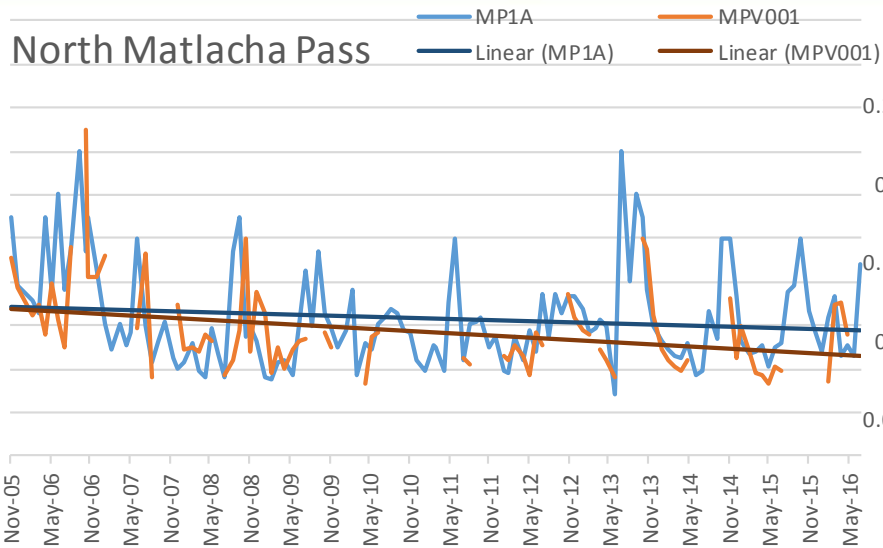


Chlorophyll a ($\mu\text{g/L}$) Over Time





Total Phosphorus (mg/L) Over Time





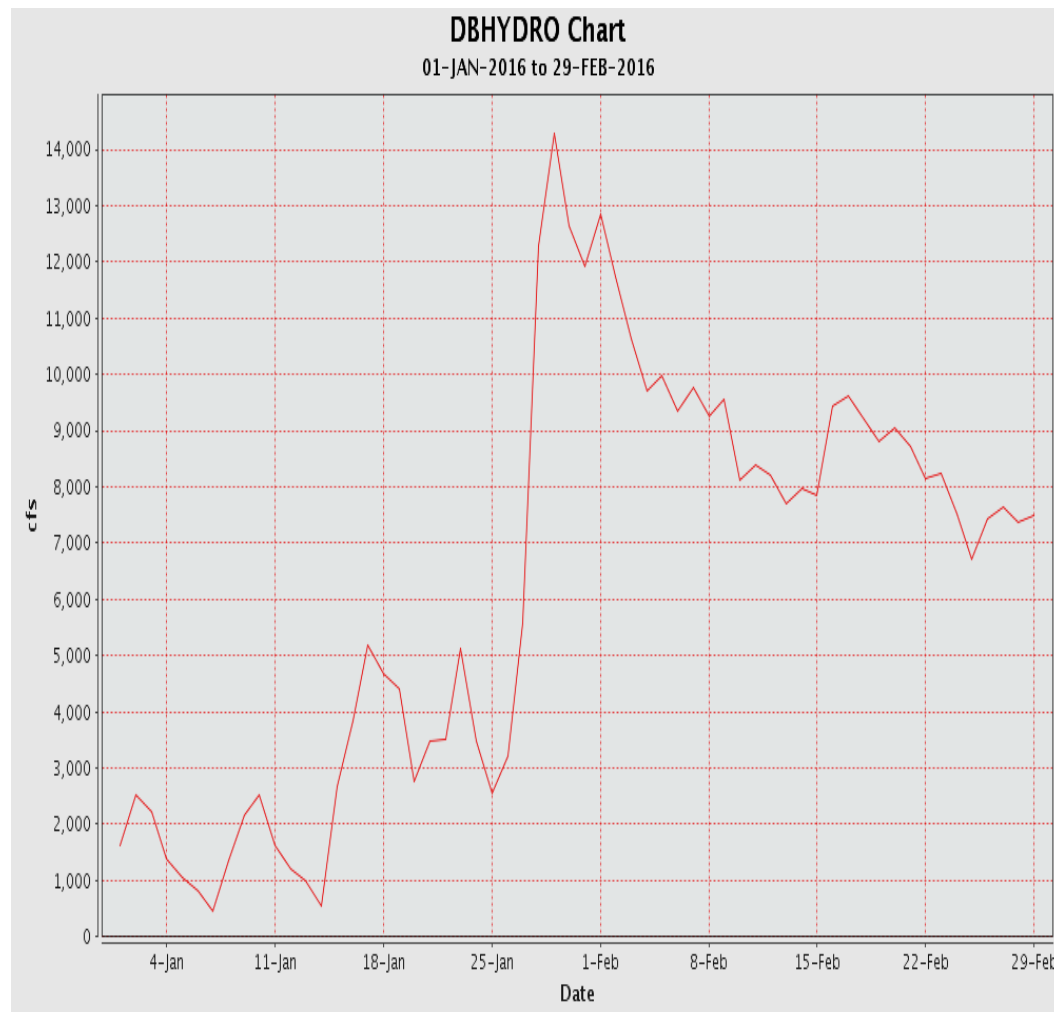
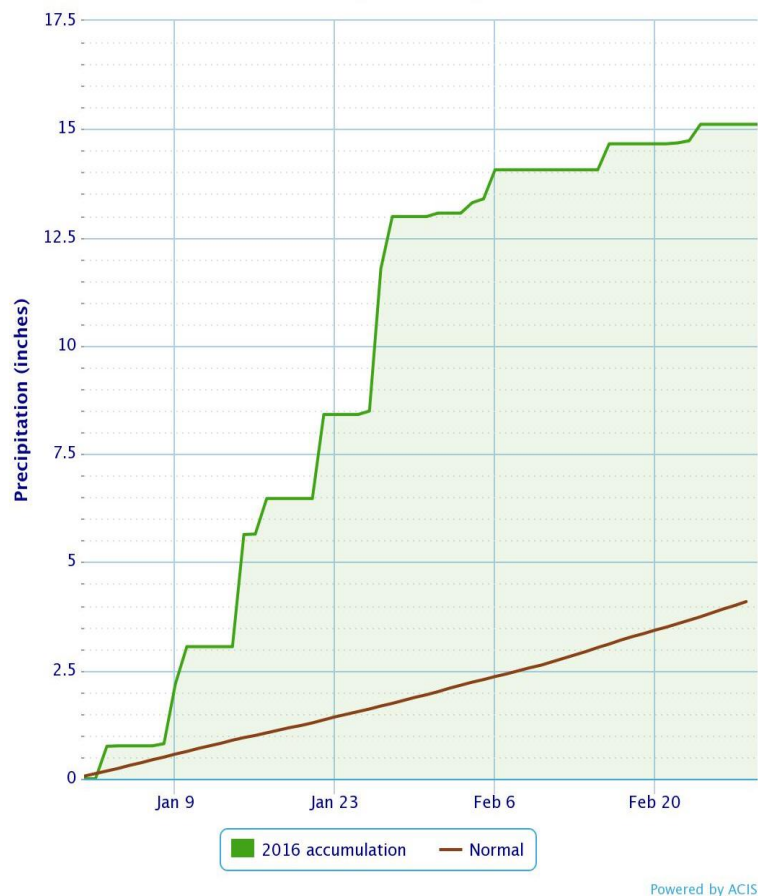
Graph Break





Event Example - January 2016

- El Nino event produced the wettest January in Southwest Florida on record



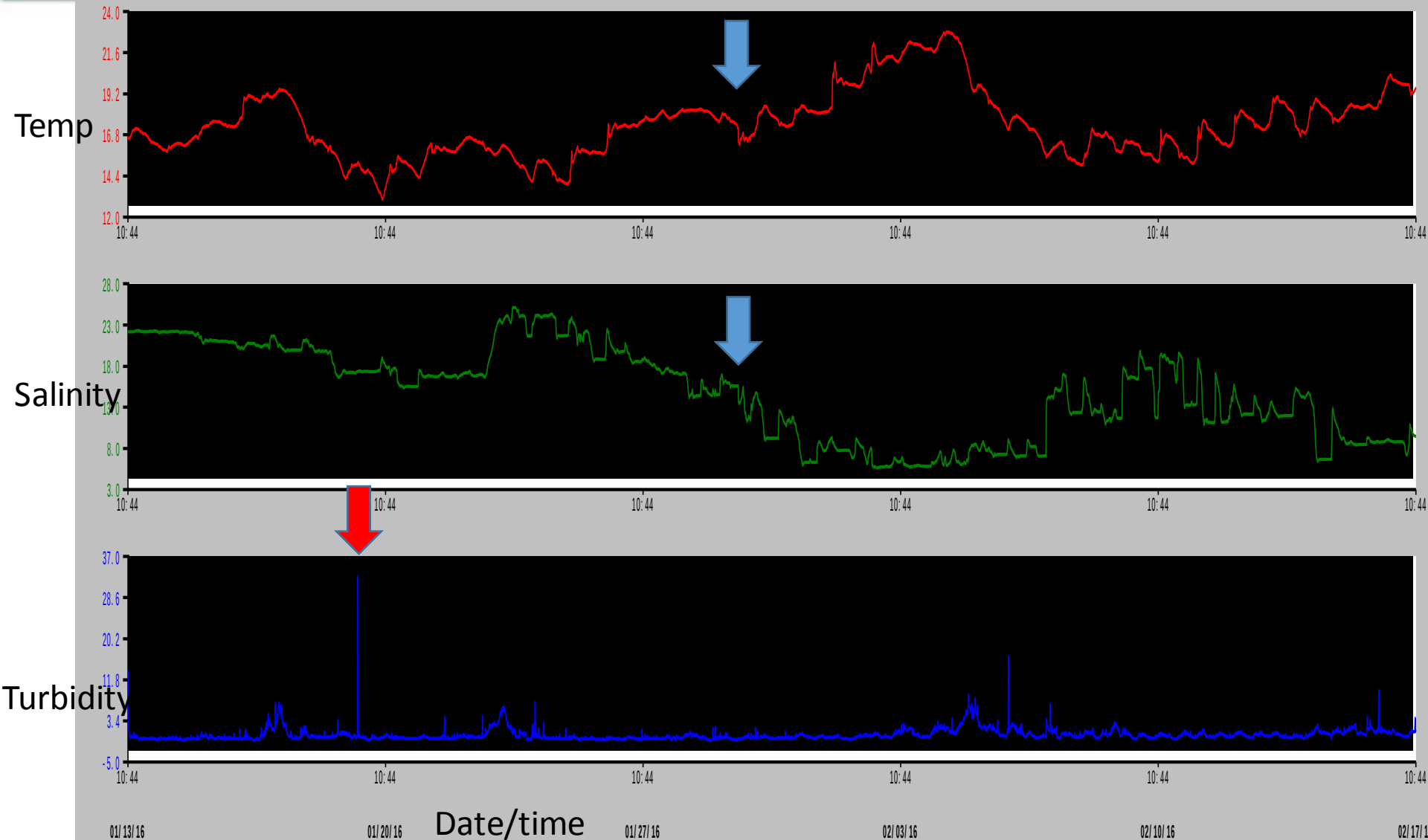
Graphed with NOAA online weather data

Data from and graphed with SFWMD- DBHYRDO S-79 releases



Event - January 2016

South Matlacha Pass

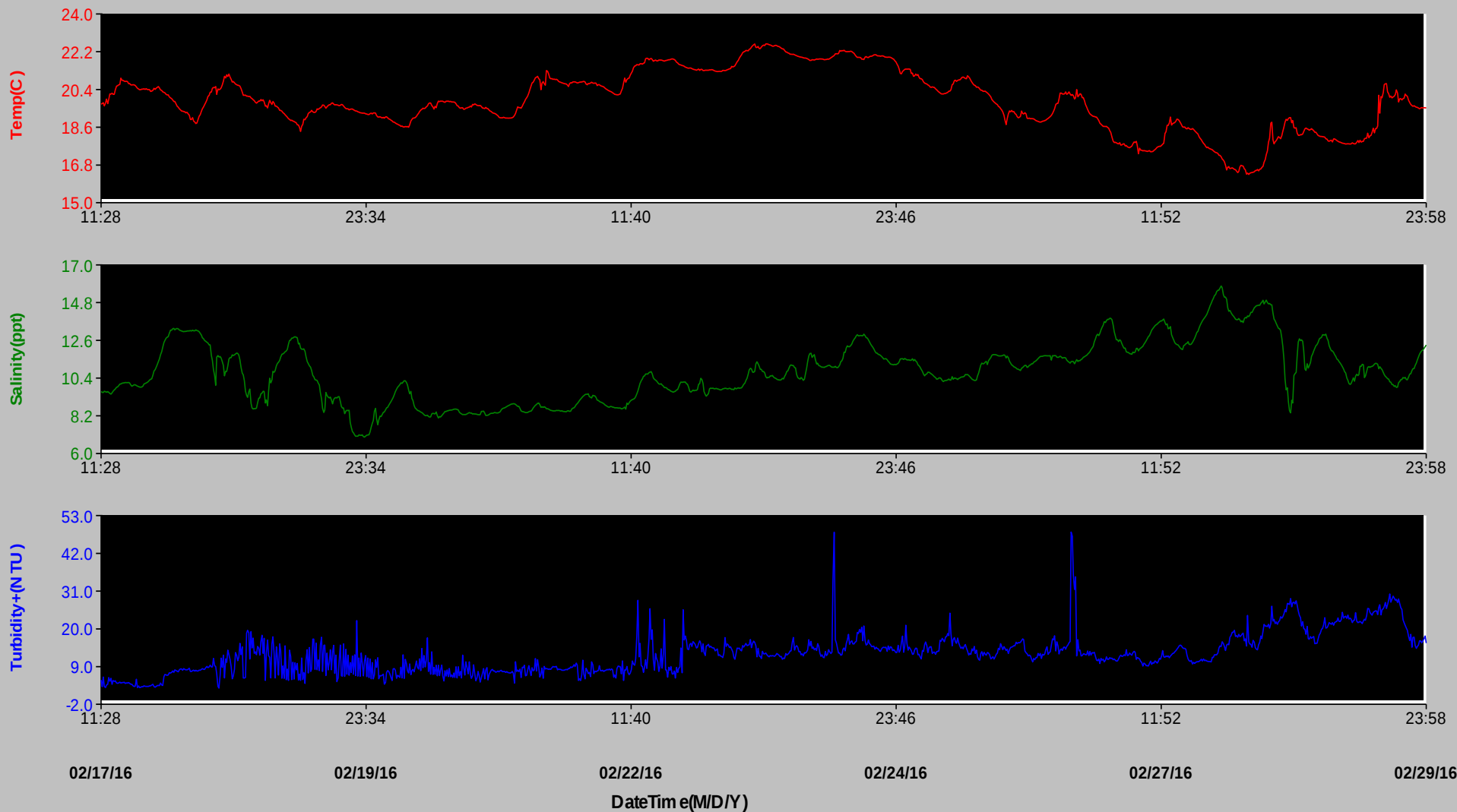




Event - February 2016

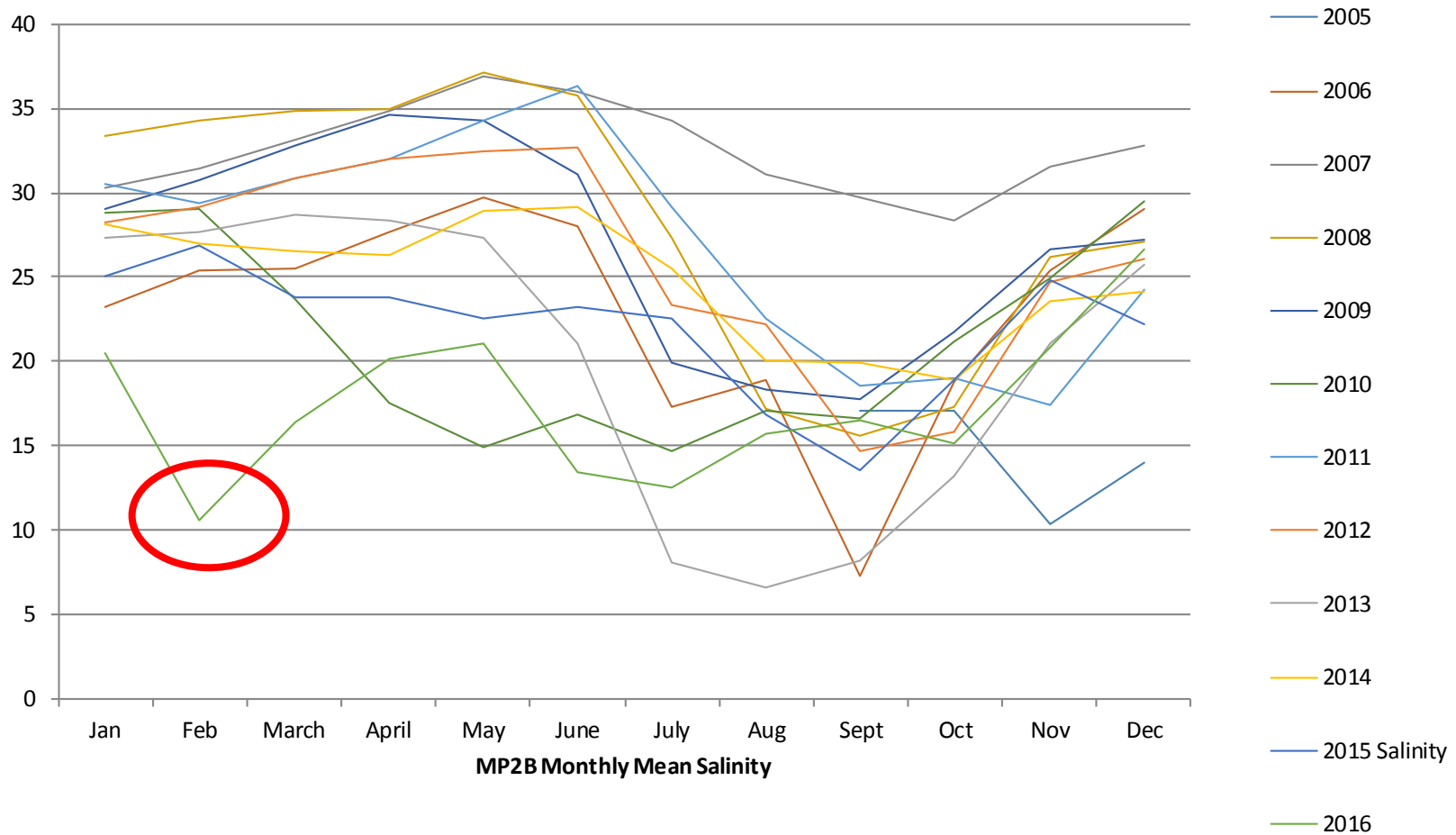
South Matlacha Pass

M2021716.DAT





Annual Salinity in Southern Matlacha Pass





Discussion/Questions

- These programs offer a complimentary look at water quality in Matlacha Pass
- What is causing the higher hits of Chlorophyll a in Northern Matlacha Pass?
- Statistical analysis needed for seasonality trends and significance
- Need to upgrade datasonde equipment and at one more CHEVWQMN site (YSI ProPlus)

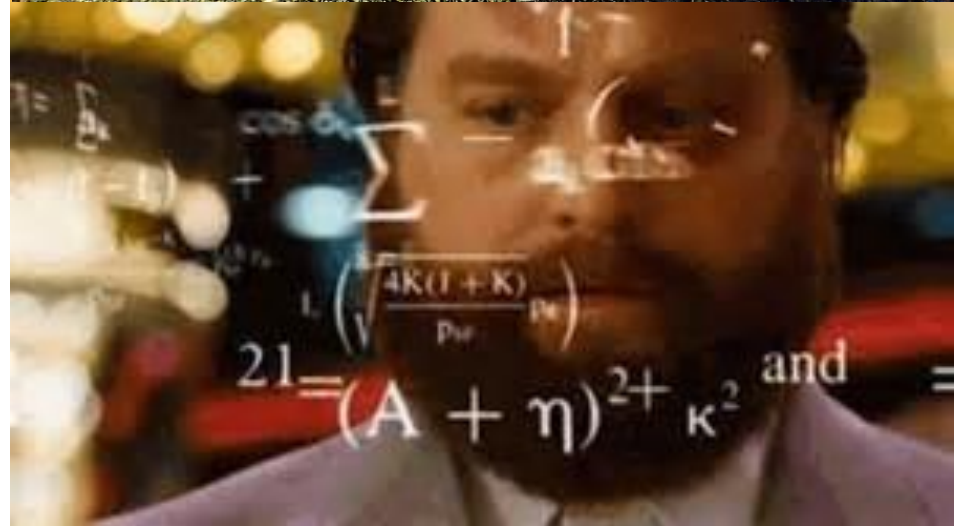


Photo source: <http://giphy.com/search/math>



Acknowledgements

Aquatic Preserves staff:

- Heather Stafford, Melynda Brown, Mary McMurray, Ally Genson, Dave Hersl

CHEVWQMN coordinators:

- Bobbi Rodgers (CHEC- Lemon Bay volunteers)
- Judy Ott (Pine Island volunteers)
- Rebecca Flynn (EBAP- Estero Bay volunteers)

All CHEVWQMN volunteers

