

Update on the Buffalo Creek Volunteer Monitoring Program

11 Years of Data

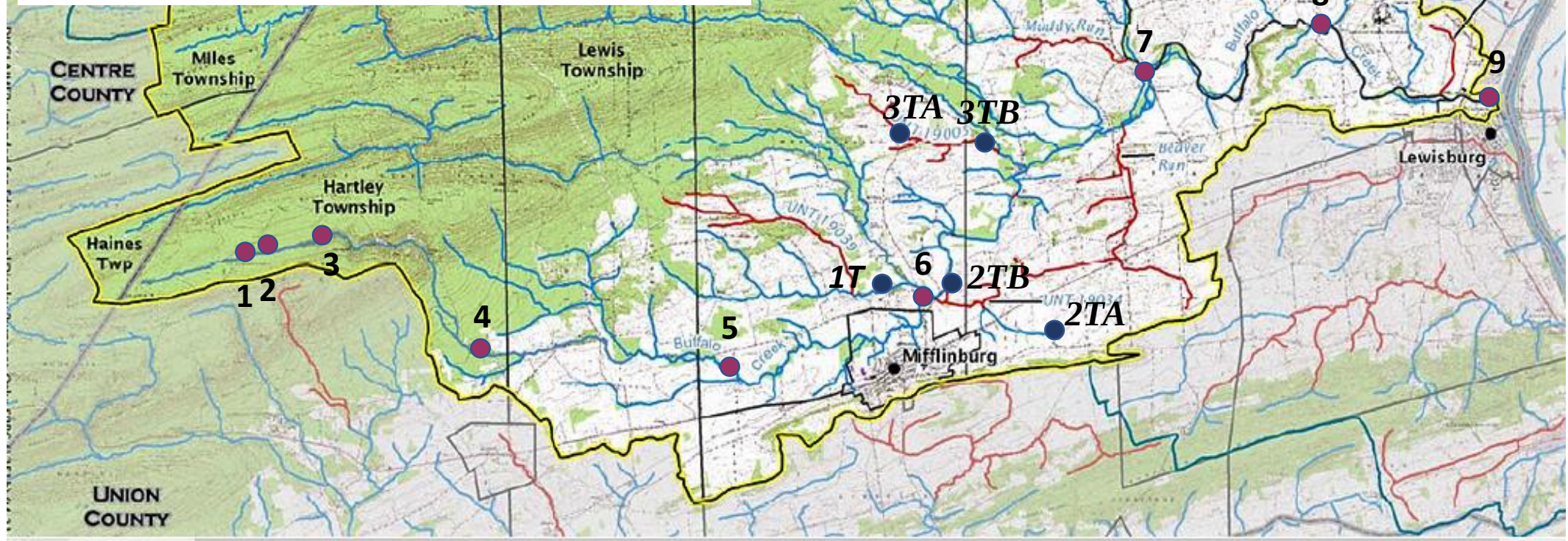
(Dec 2007 to Dec 2018)

Graphs as a function of time

With thanks to Thom Fantaskey, David Pearson,
and Matt McTammany

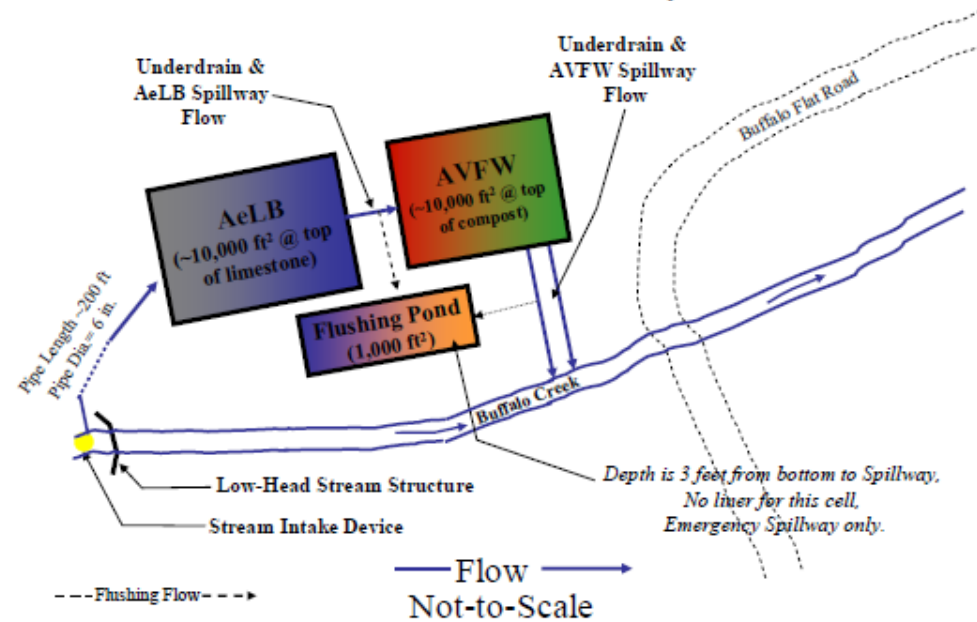
Monitor Site Map

- Mainstem 1, 2, ...
- Tributary 1T, 2TA, ...

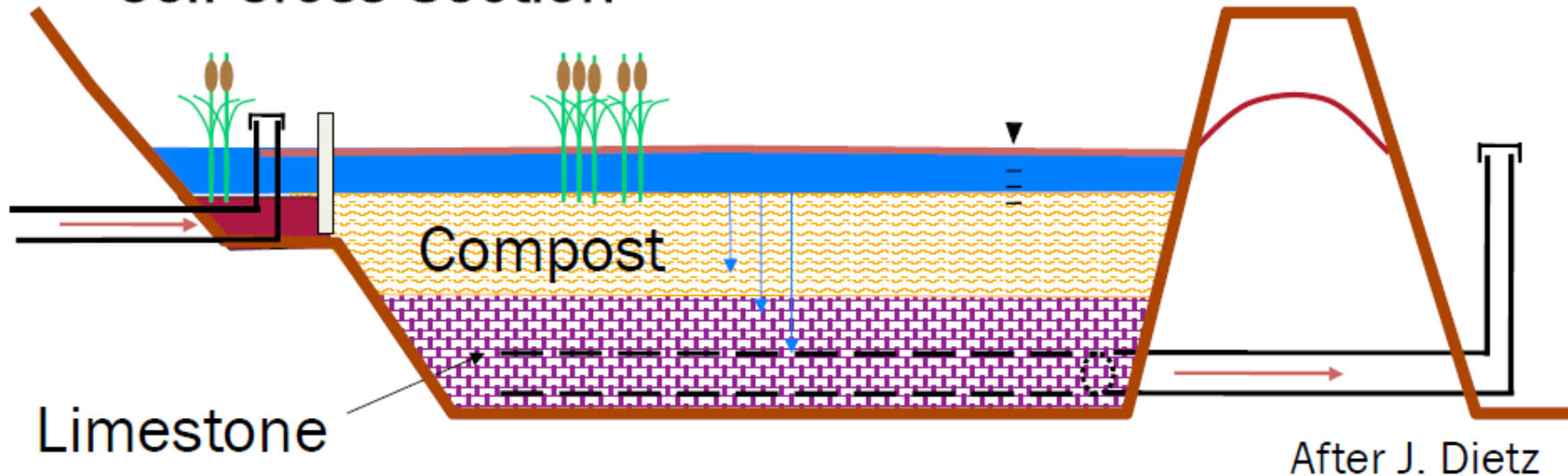


Passive Treatment Acid Remediation System

Conceptual Design for Buffalo Creek @ Buffalo Flat Road Aerobic Limestone Basin (AeLB)/Anaerobic Vertical Flow Wetland (AVFW) Combination Passive Treatment System



Vertical Flow Wetland Cell Cross Section



From Matt
McTammany
Presentation
2013

Monitors and Sites

1M	Thom Fantaskey	Remediation Site Intake	
2M	Thom Fantaskey	Buffalo Flat Road	
3M	Thom Fantaskey	Frederick Trail	
4M	David Pearson, Bill Simpson	Aikey Road	
5M	Sue Mitchell	Hoover Road (Covered Bridge)	
6M	David Pearson, Bill Simpson	Forest Hill Road	
7M	Steve Quarels, Bob Lamparter	Johnson Mill Road	
8M	Tom Duck	Strawbridge Road	
9M	Brad Catherman	St Anthony Street	
1Trib	David Pearson, Bill Simpson	Coal Run at Johnstown Road	
2ATrib	Chuck Lebo	Upstream Grove Rd. Trib at Furnace Road*	*Grove Road before 9/7/2013
2BTrib	Chuck Lebo	Downstream Grove Rd. Trib at Green Ridge Rd.	
3ATrib	David Staebler	Upstream Conley Run at Forest Hill Road	
3BTrib	David Staebler	Downstream Conley Run at Buffalo Road	
4Trib	Mike Wilson	Little Buffalo Creek*	*Future

Other Monitors (previous regulars and/or substitutes)*

B. Auman	DA Pearson
Edwena Eger	John Peeler
Dick Ellis	C. Root
Geoff Goodenow	Rob Smith
Janet Marsh	Brandi Spotts
Tim Marsh	Tonzetich
Larry Mitchell	Wallace
R Morrison	Westfall
Newlin	
	* From the data files

Process

David Pearson organizes monitor tests at the sites, 4 times a year (First Saturday of March, June, September, December*) *Sunday

Monitors also collect a one liter sample that goes to Matt McTammany, Biology Professor at Bucknell, for lab data.

All data is sent to Thom Fantaskey who keeps an Excel file.

History

- Phase 1 Started 2007, monitor visits every month, mainstream plus one tributary (Coal Run) –Acid Remediation Site started working in Sept 2009
- Phase 2 Started 2010, tests every quarter
- Grove Road Tributary added in 2010 (Upstream and Downstream)
- Conley Run Tributary added 2015 (Up and Down)
- Approximately 600 total monitor visits

Monitor Data

Temperature (glass thermometer)

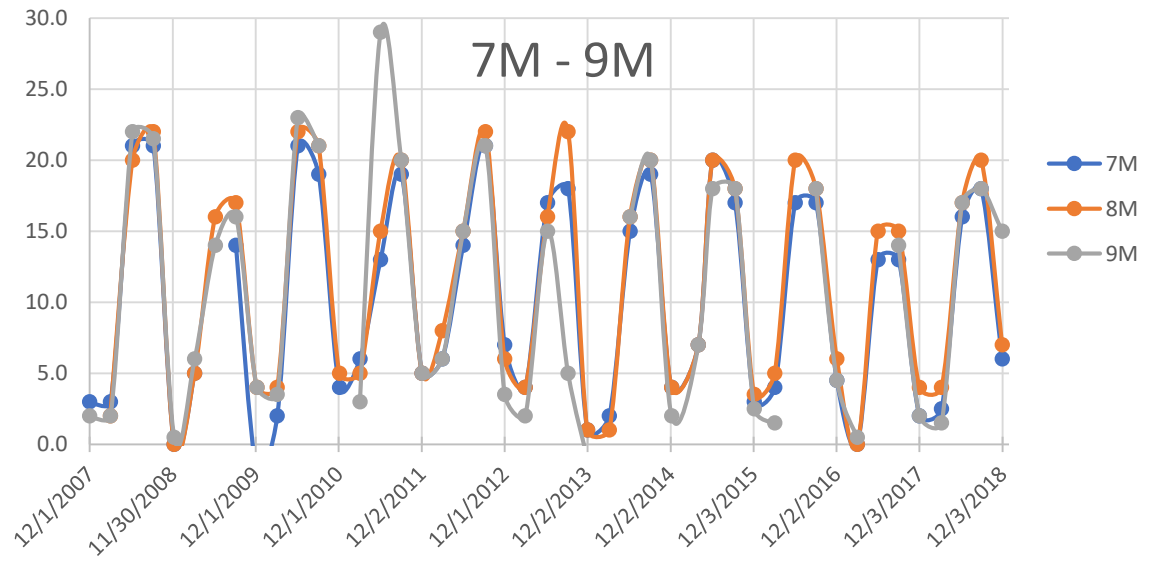
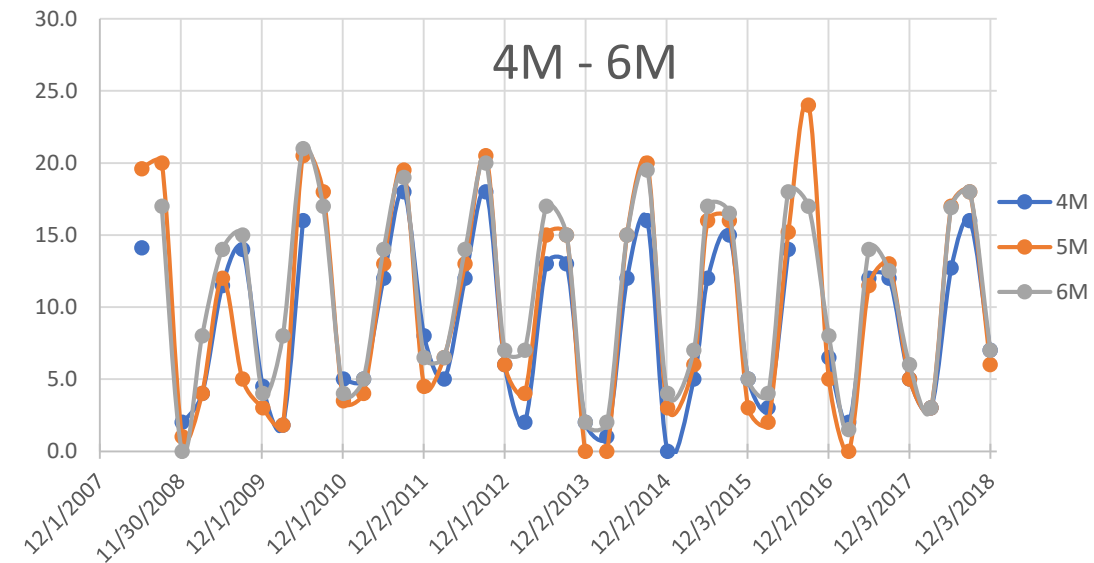
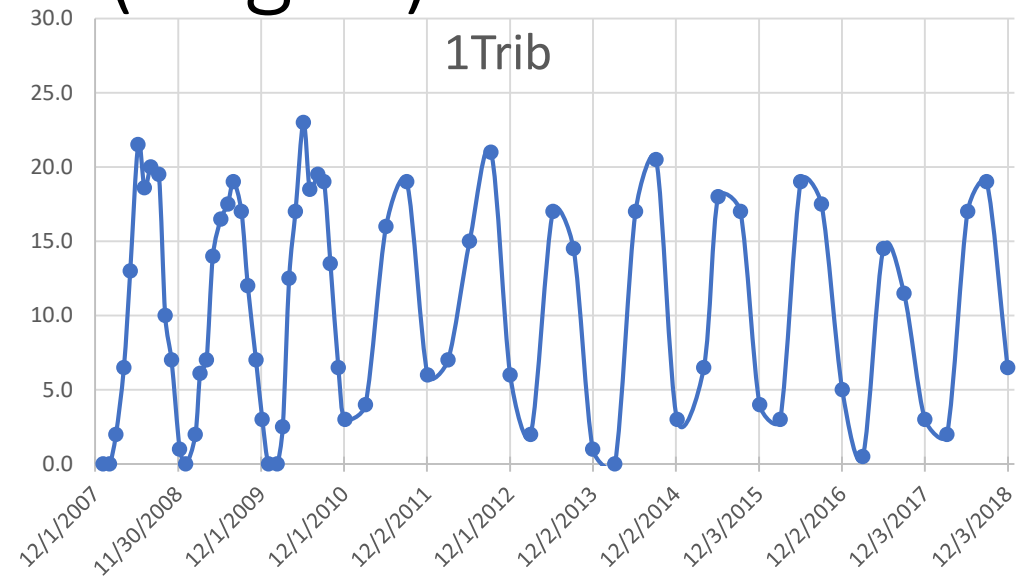
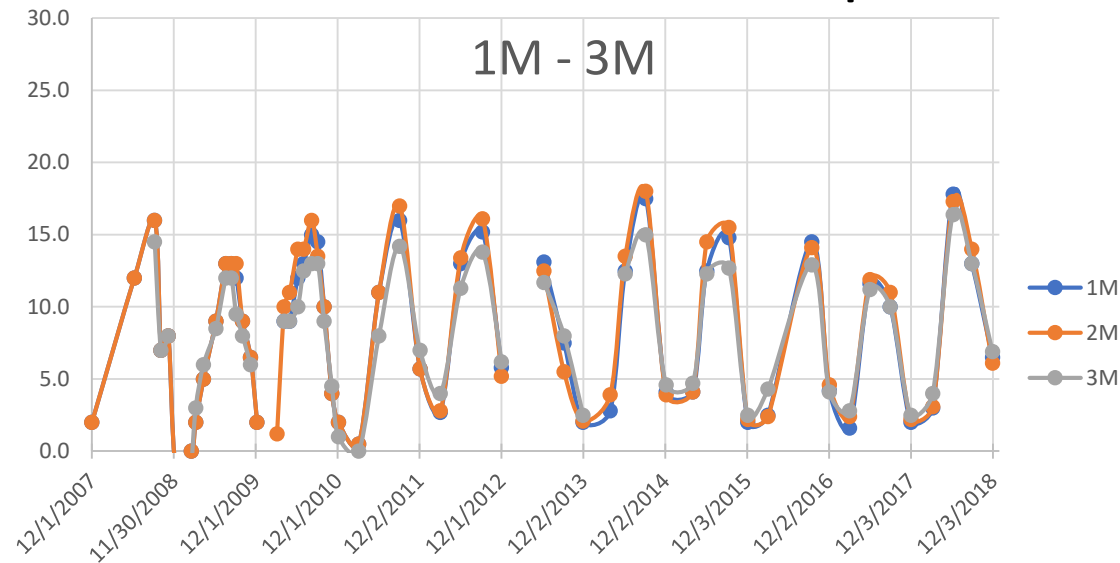
Alkalinity (LaMotte kit):

Buffer for pH, freshwater typical is 20 to 200 mg CaCO_3 /L

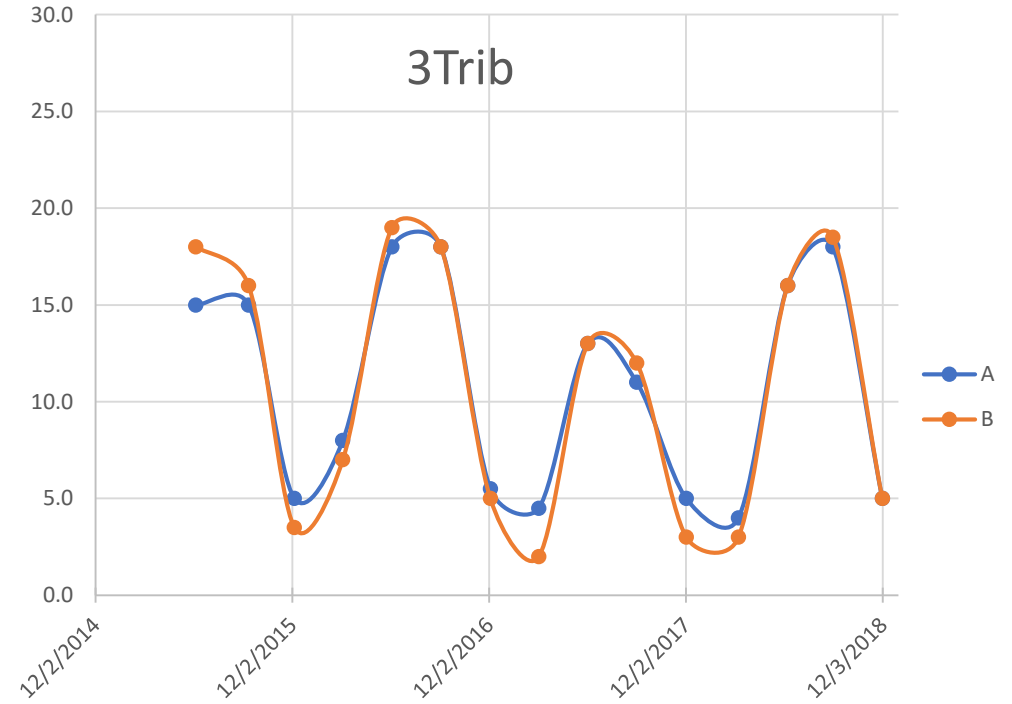
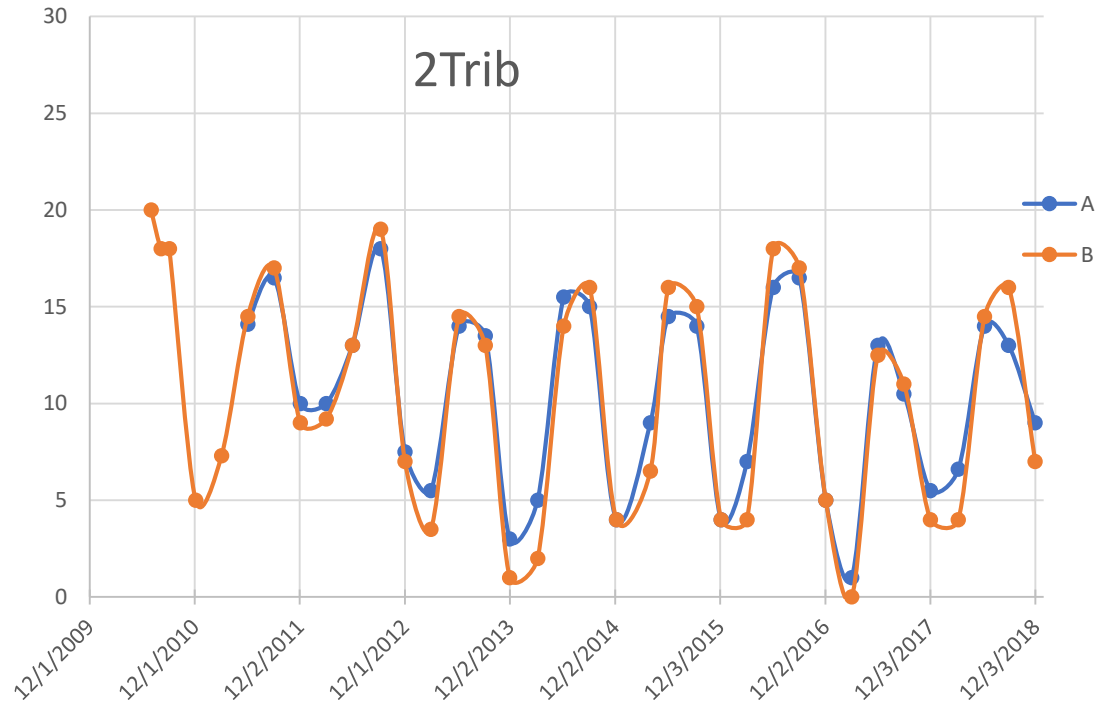
pH (Oakton meters- replaced March 2017): 5 to 9 supports life

Dissolved Oxygen (LaMotte kit): 5 mg/L or above supports life

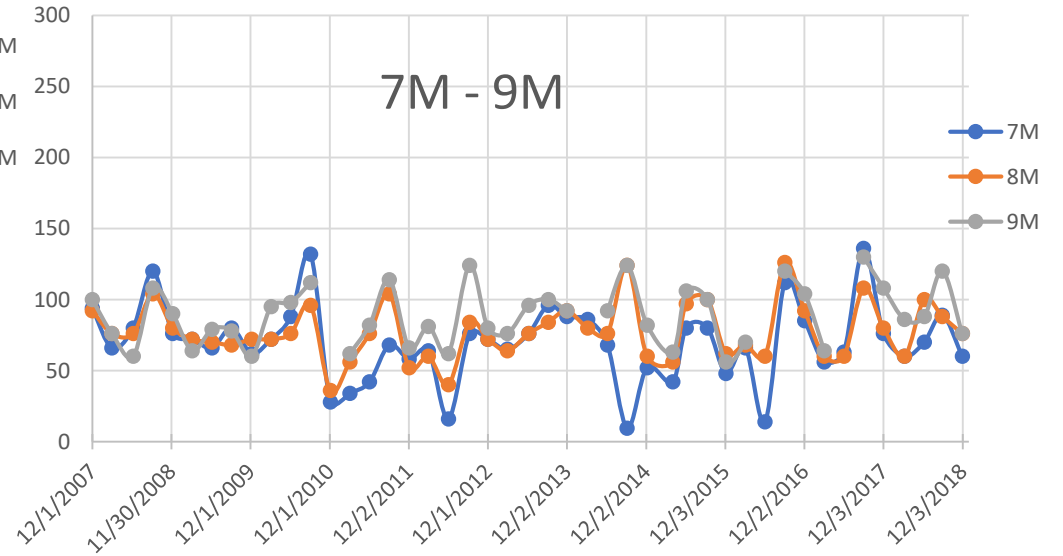
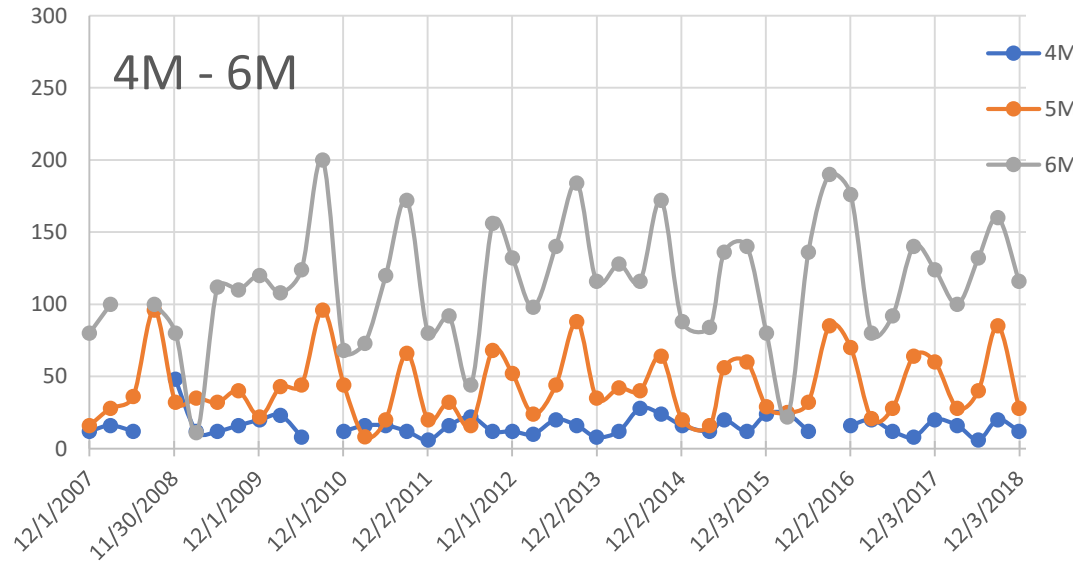
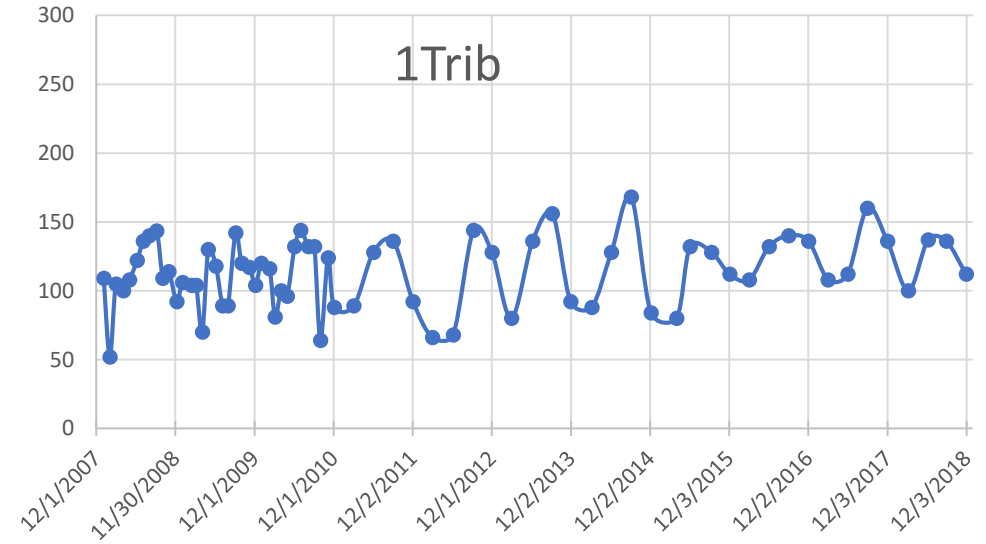
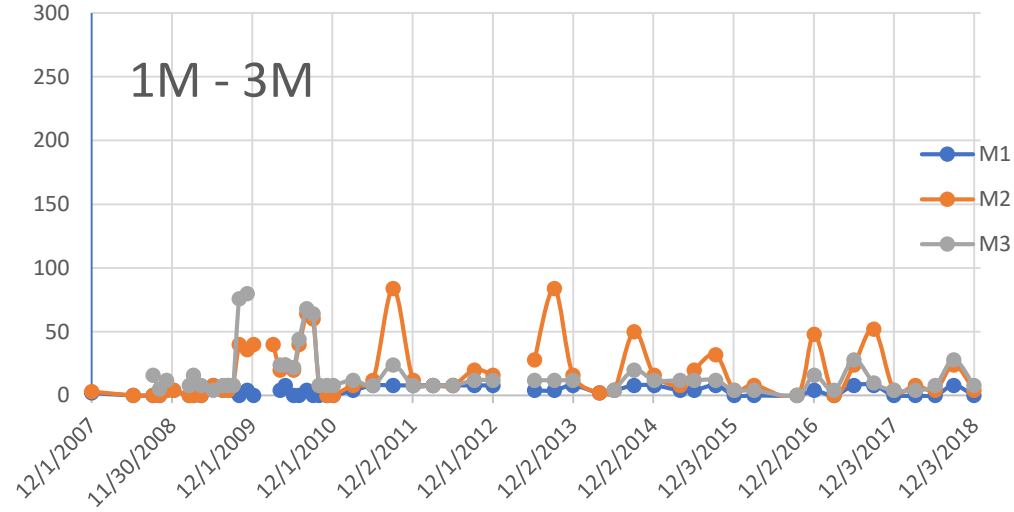
Temperature (deg. C)



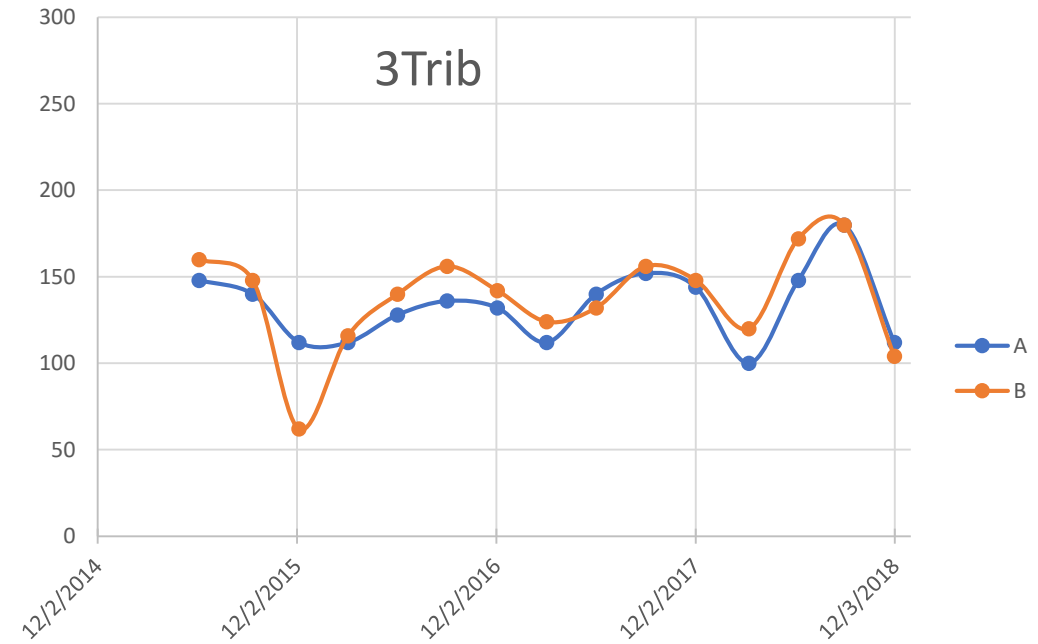
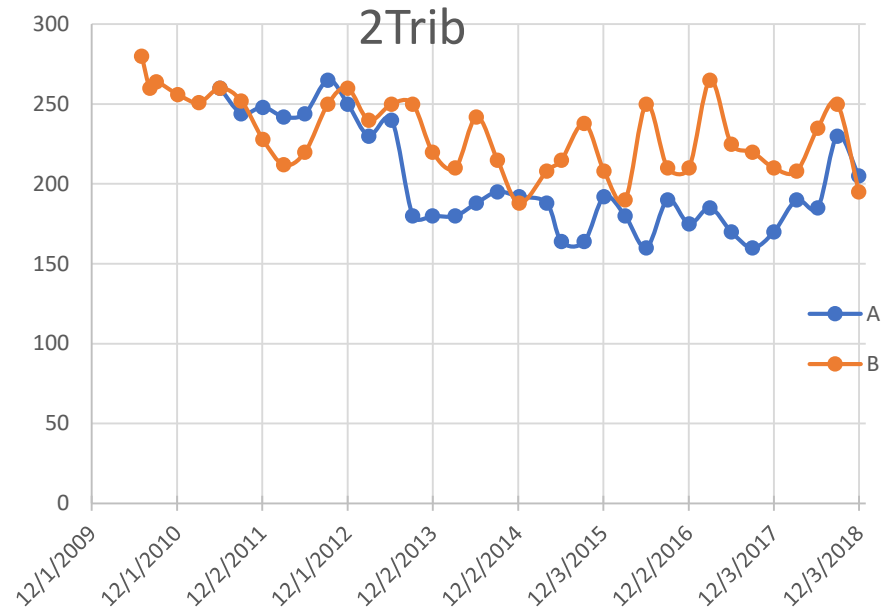
Temperature (deg. C)



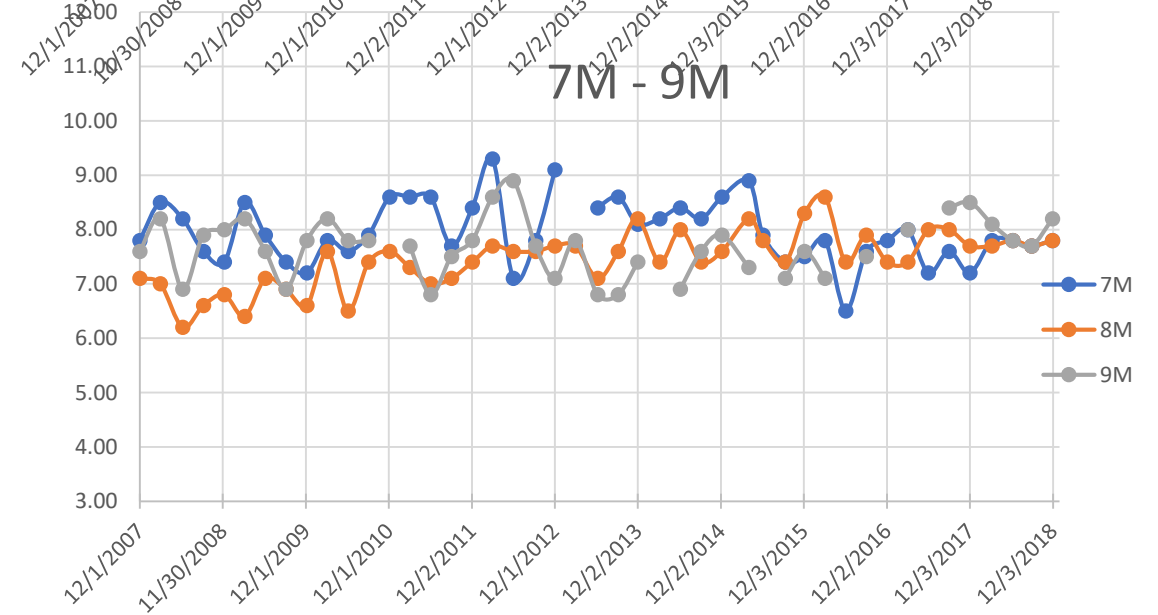
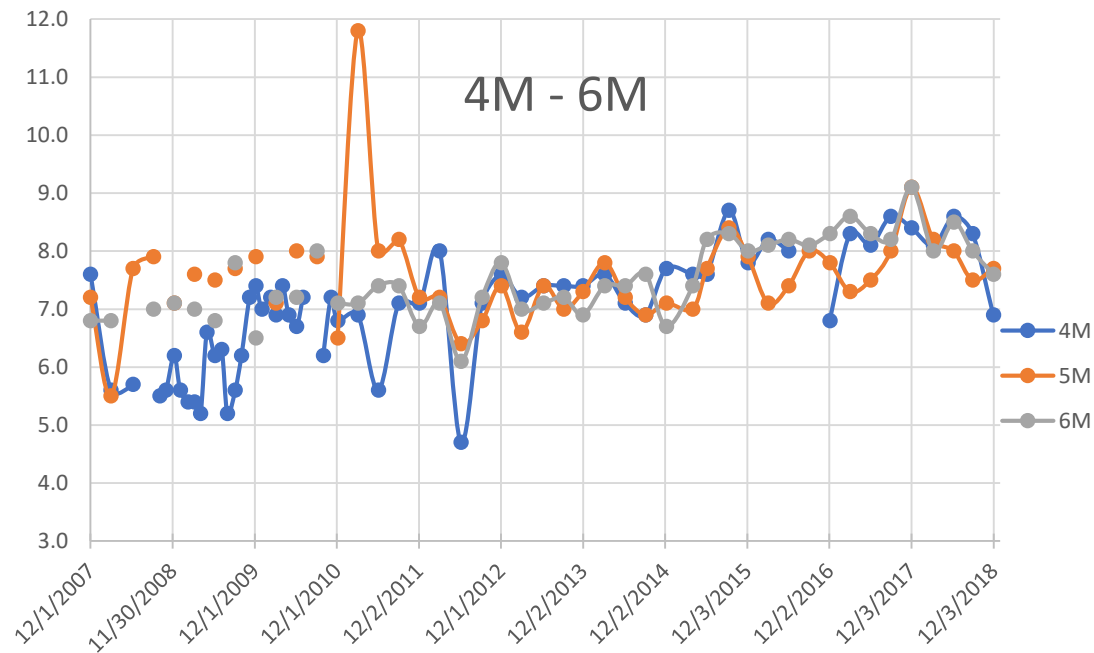
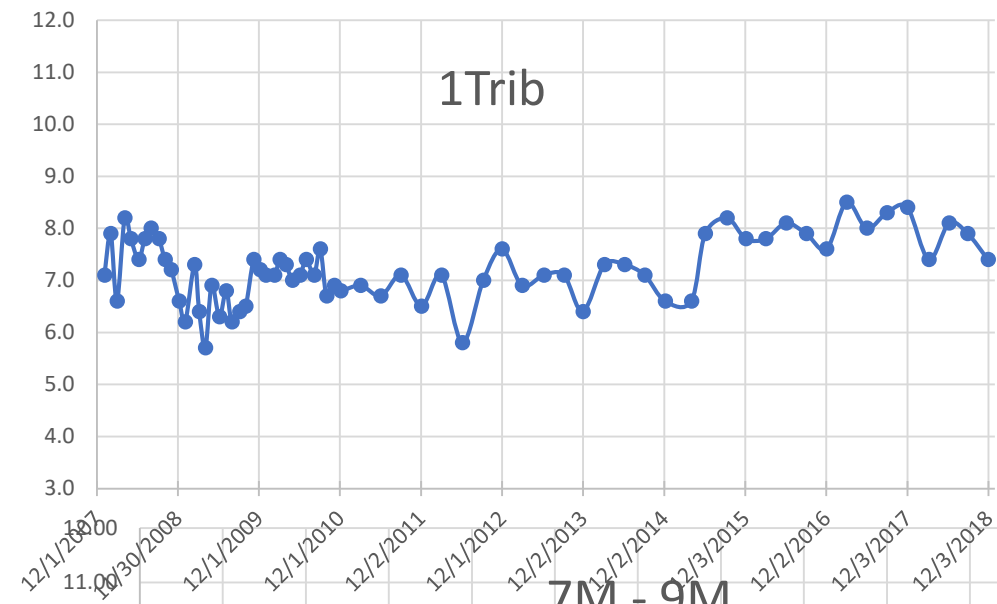
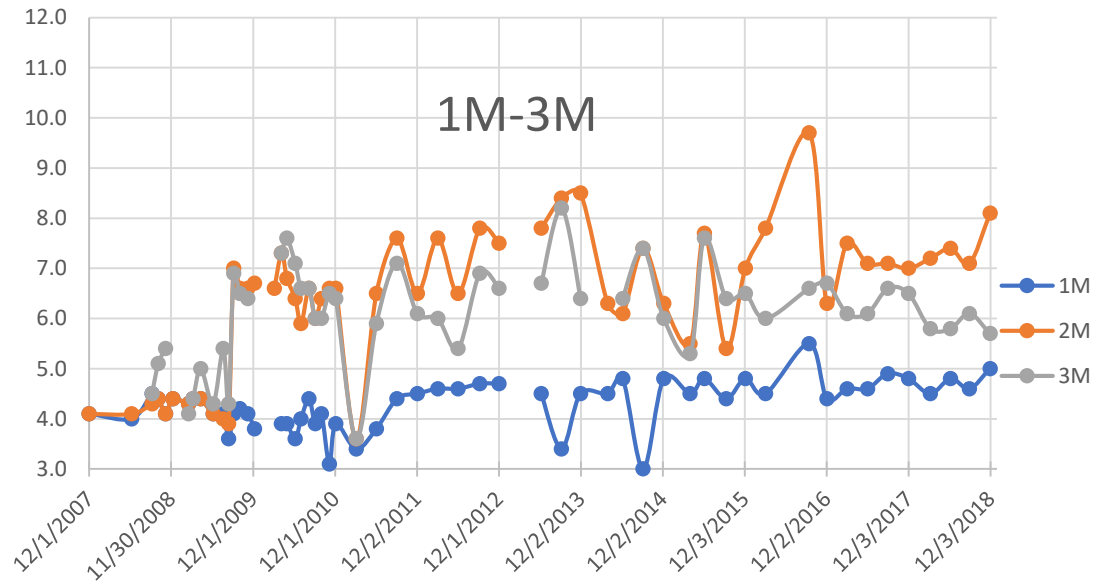
Alkalinity (mg CaCO₃ /L) 20 -200



Alkalinity (mg/L CaCO₃) 20-200

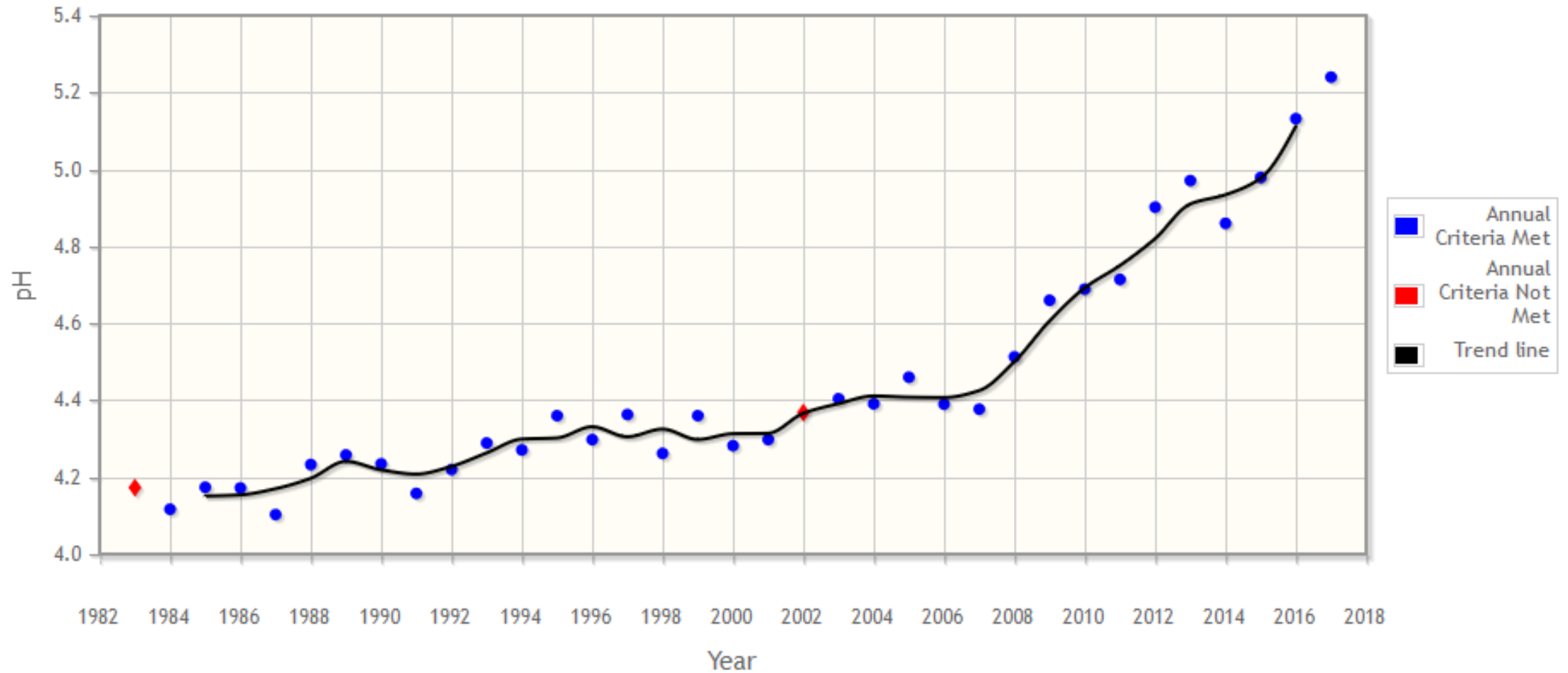


pH 5-9



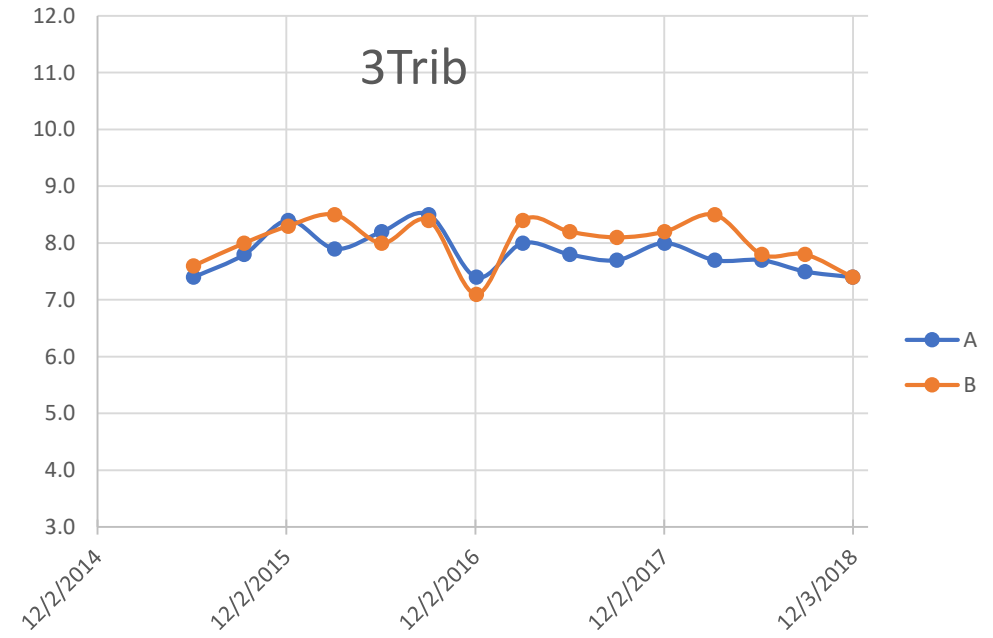
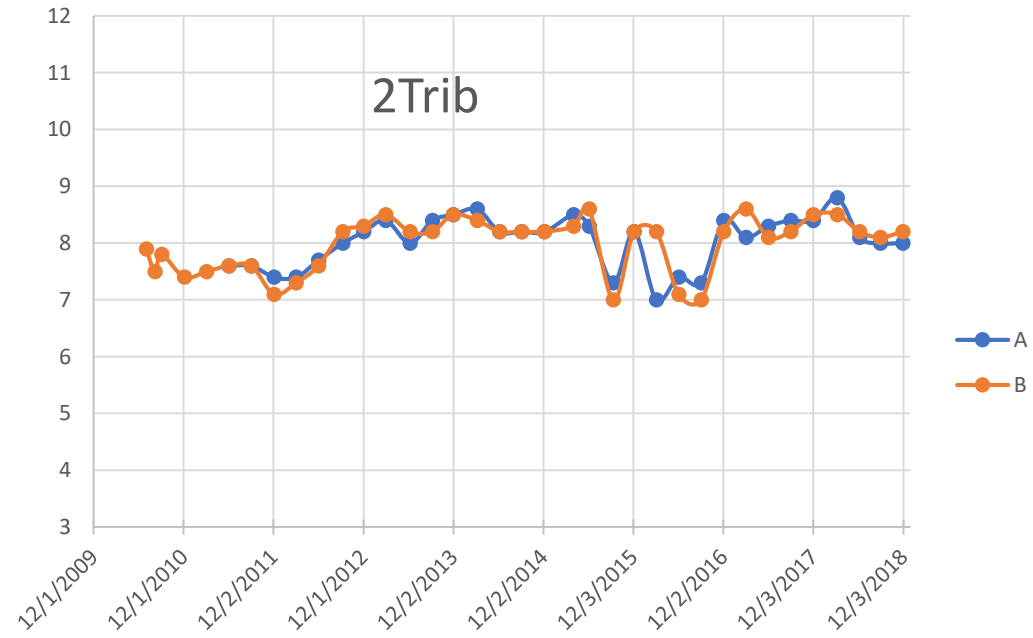


NTN Site PA15

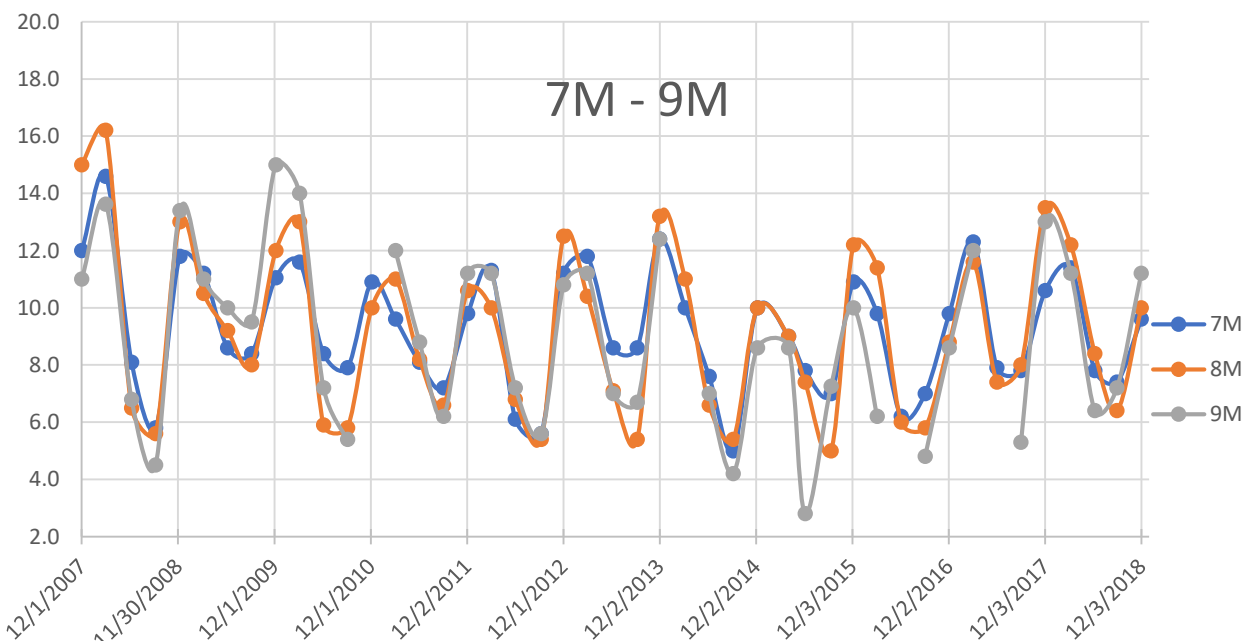
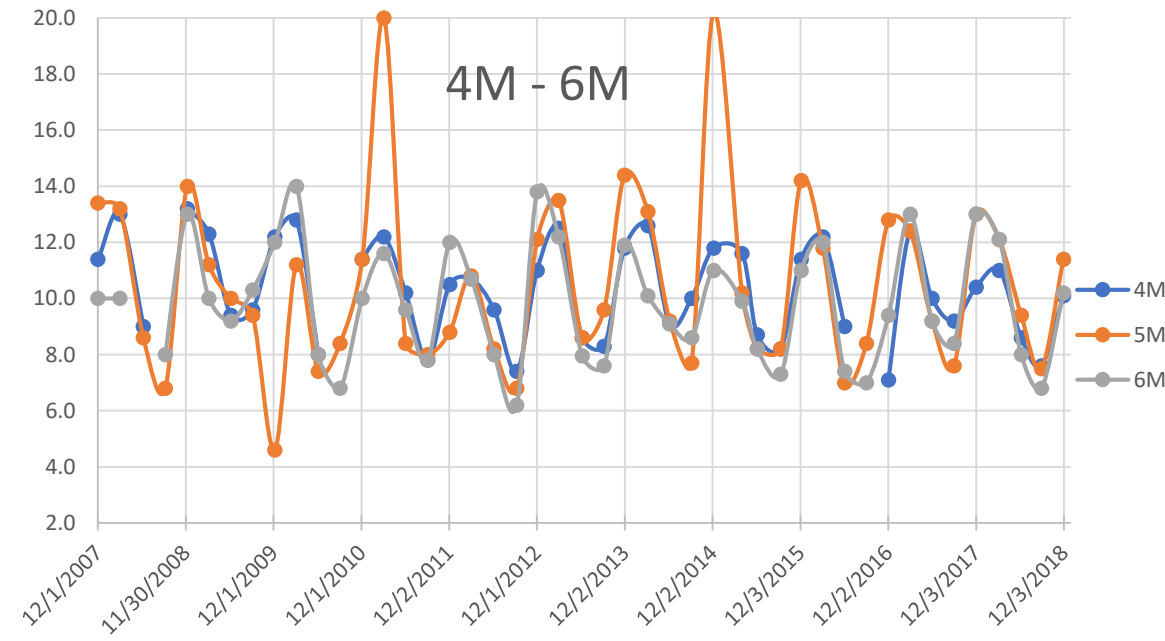
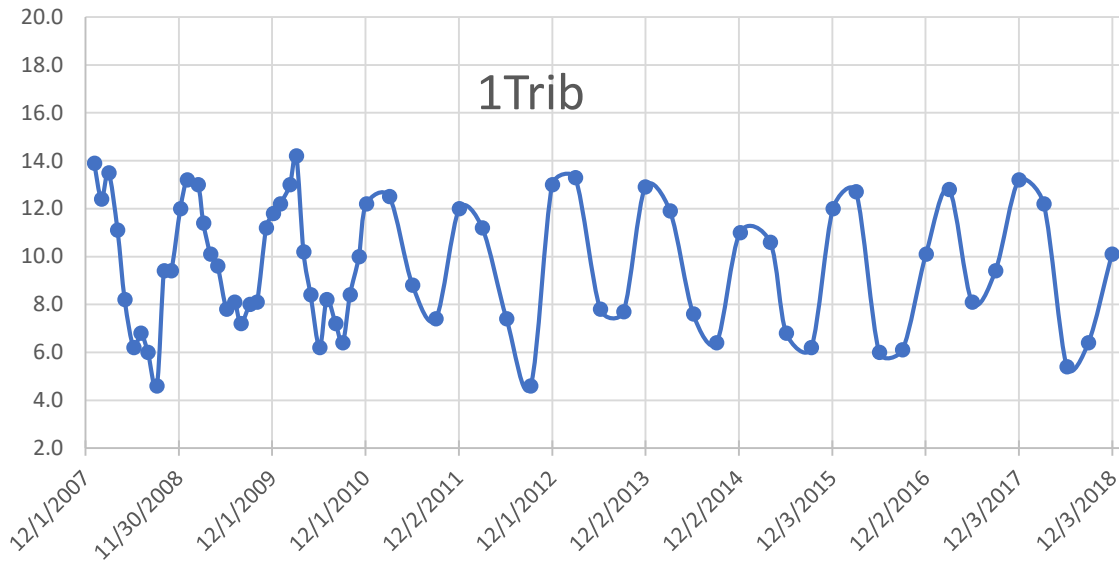
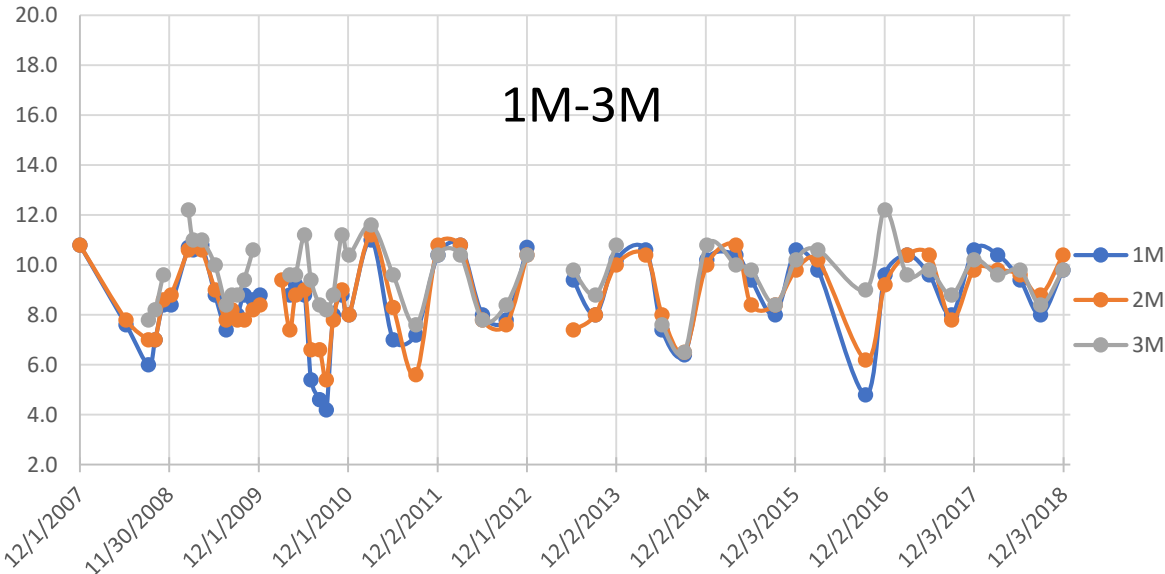


Acid Rain Data for State College

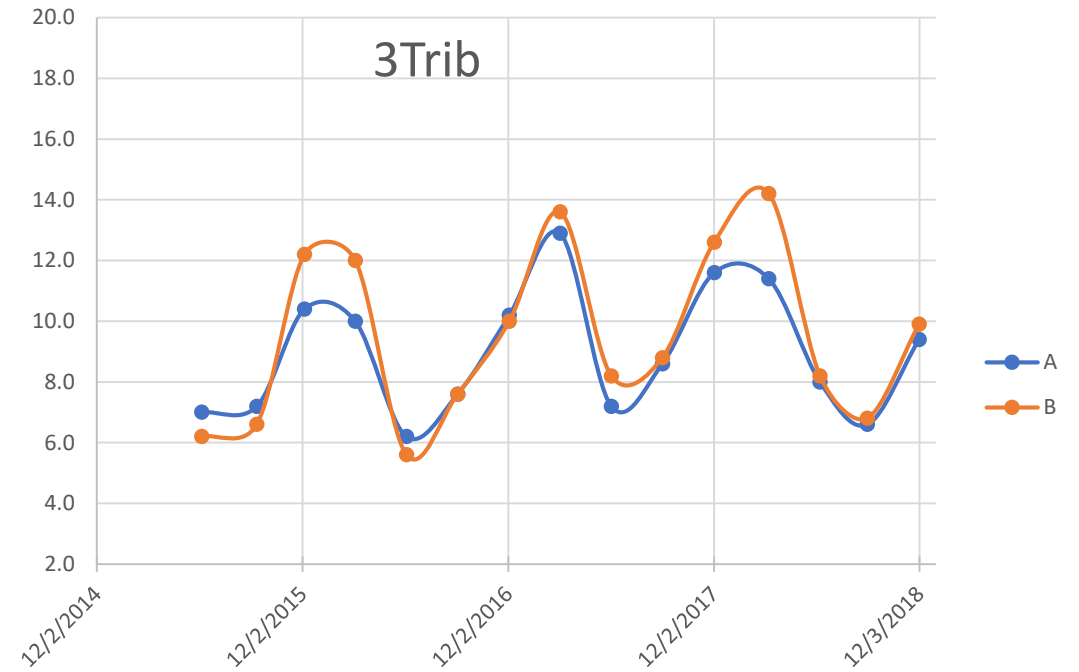
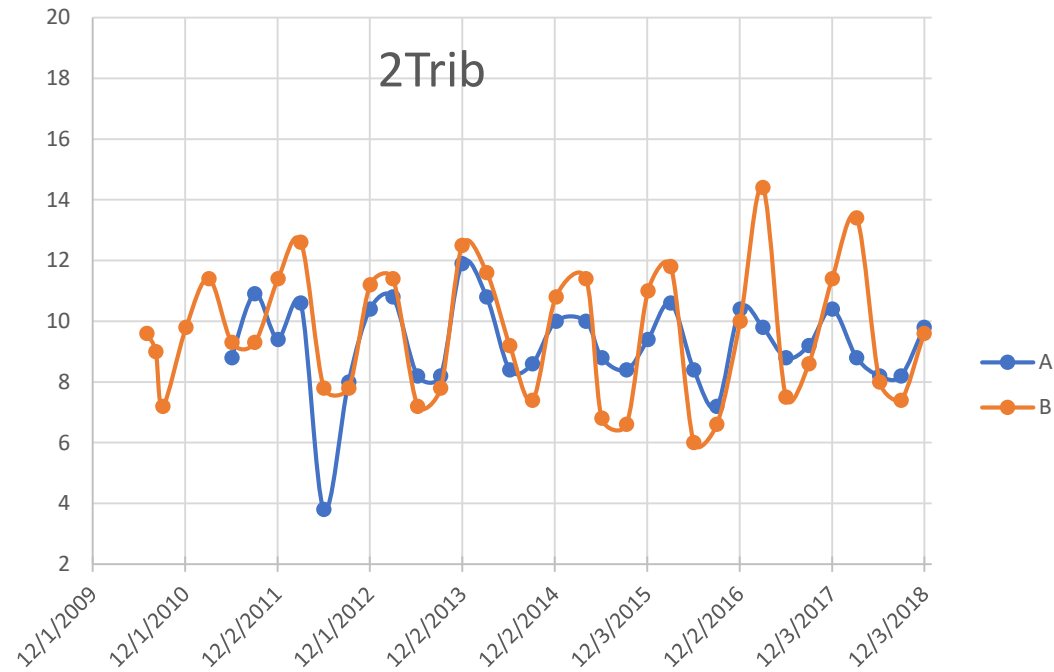
pH 5-9



Dissolved Oxygen (mg/L) 5 or over



Dissolved Oxygen (mg/L) 5 or over



LAB DATA

Geological:

Calcium (Ca^{2+}) and Magnesium (Mg^{2+}) (*Plus Alkalinity and pH from field data*)

Human Development:

Sodium (Na^{1+}), Chloride (Cl^{1-}), and Sulfate (SO_4^{2-})

Agriculture/Fertilizer [NPK]:

Nitrogen (as NH_4^{1+}), Nitrate (NO_3^{1-}); Phosphorous (as P); and Potassium (K^{1+})

Total Suspended Solids: TSS

Typical values (from publications)

Calcium (Ca^{2+}): 15 mg/L Magnesium (Mg^{2+}): 4 mg/L

Sodium (Na^{1+}): 6 mg/L Chloride (Cl^{1-}): 7 mg/L Sulfate (SO_4^{2-}): 11 mg/L

Nitrogen (as NH_4^{1+}): 0.1 mg/L Nitrate (NO_3^{1-}): 2mg/L Potassium (K^{1+}): 3 mg/L

Phosphorus (as P): 0.3 mg/L(urban/agriculture)

TTL: over 40mg/L appears cloudy

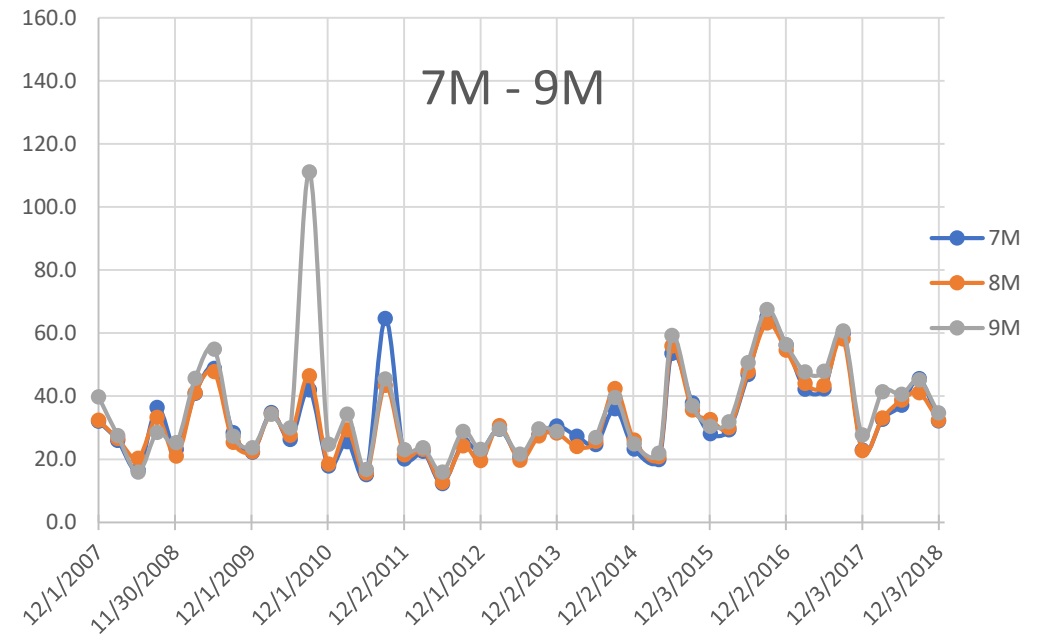
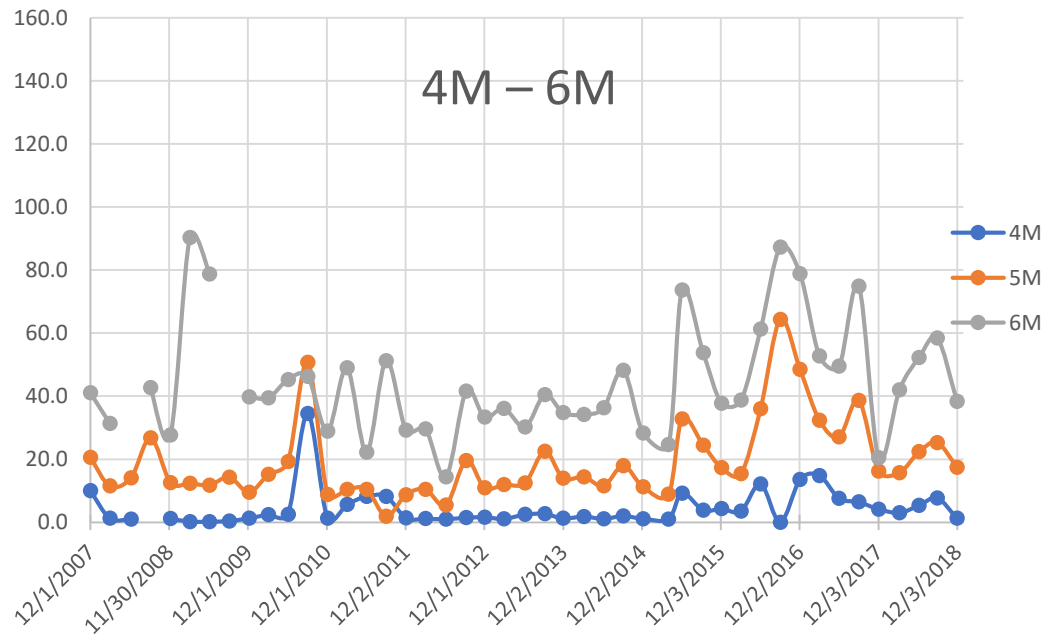
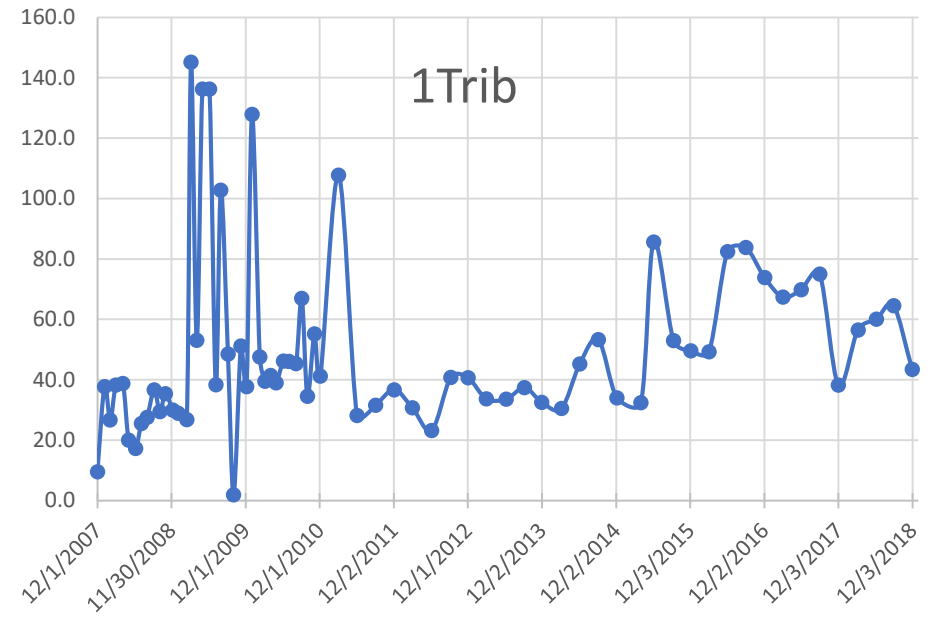
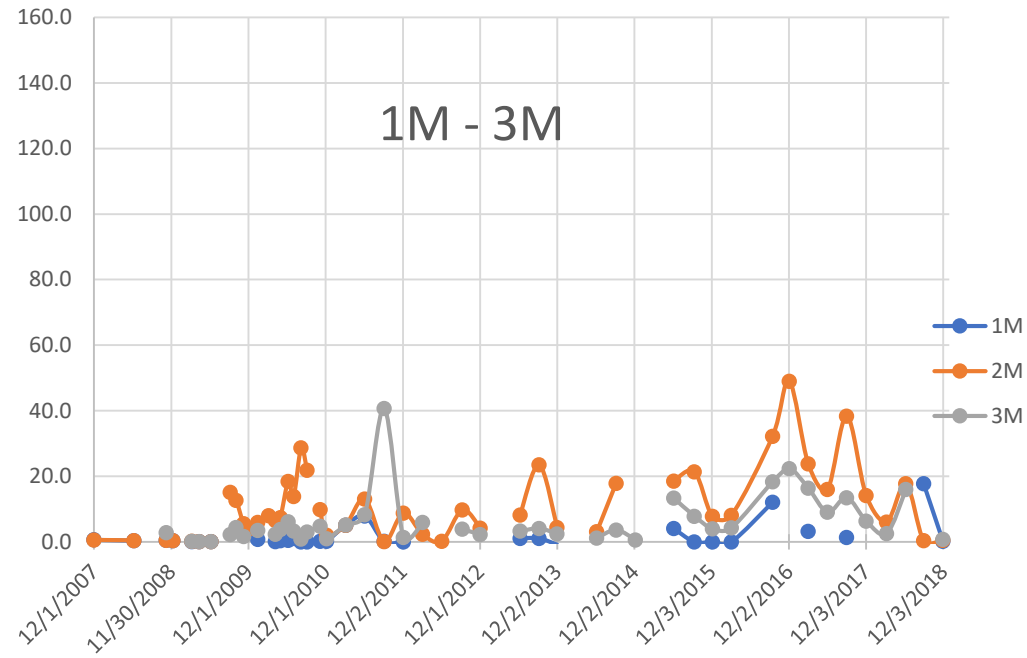
<http://science.jrank.org/pages/2857/Freshwater.html>

<https://pubs.usgs.gov/circ/circ1225/pdf/nutrients.pdf>

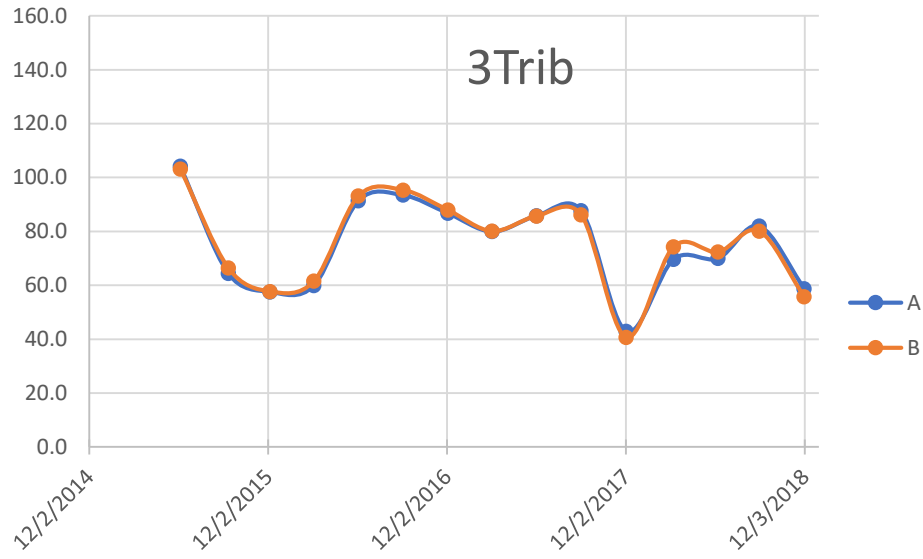
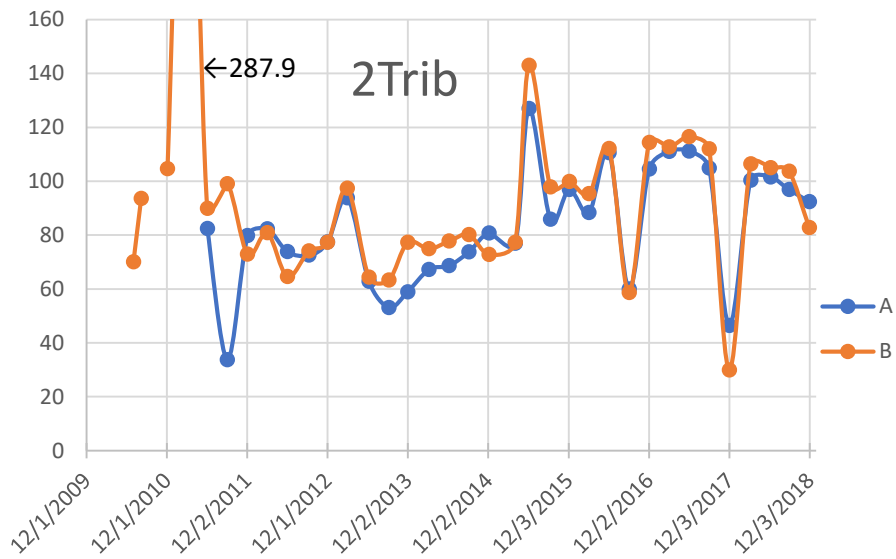
<https://www.fondriest.com/environmental-measurements/parameters/water-quality/turbidity-total-suspended-solids-water-clarity/#Turbid22>

Geological

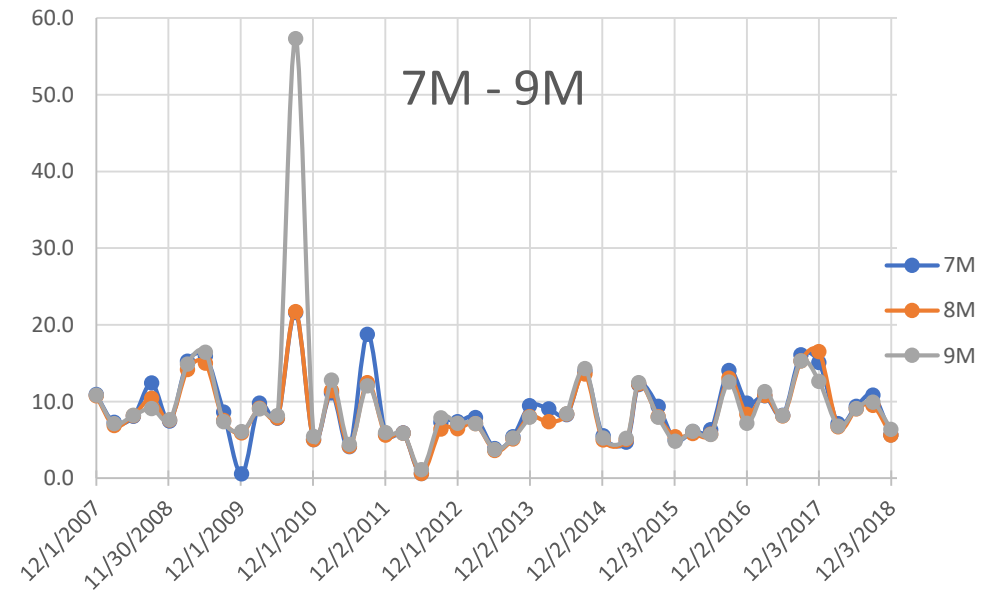
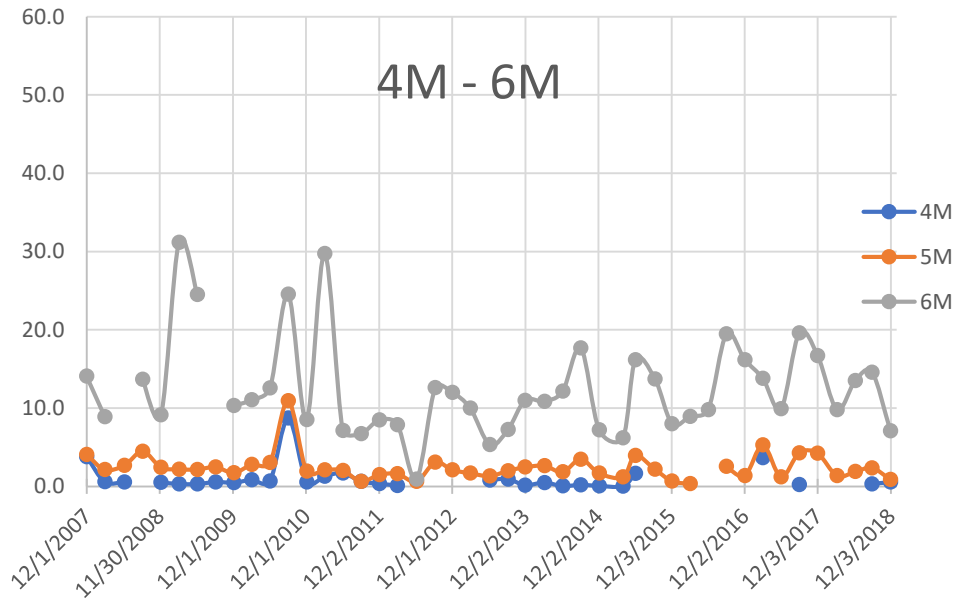
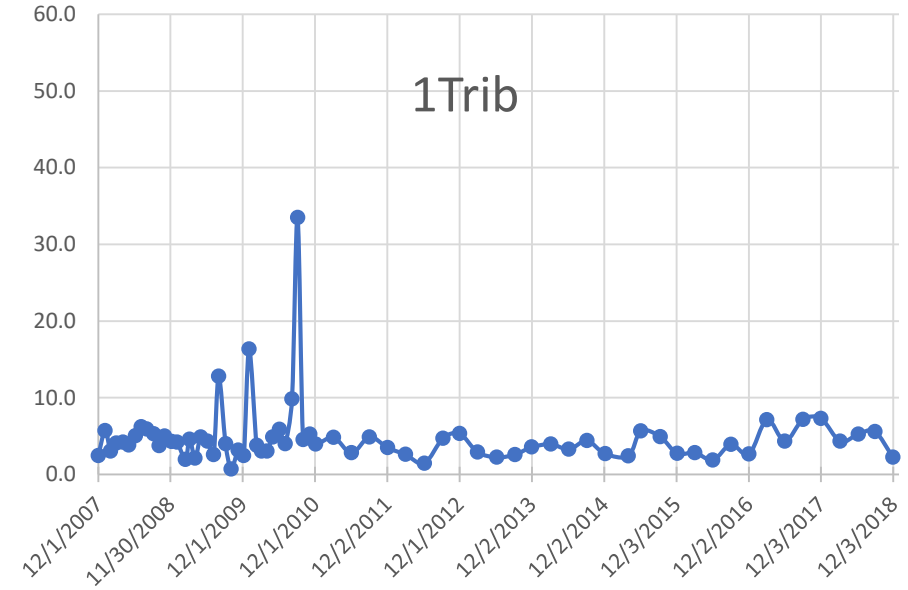
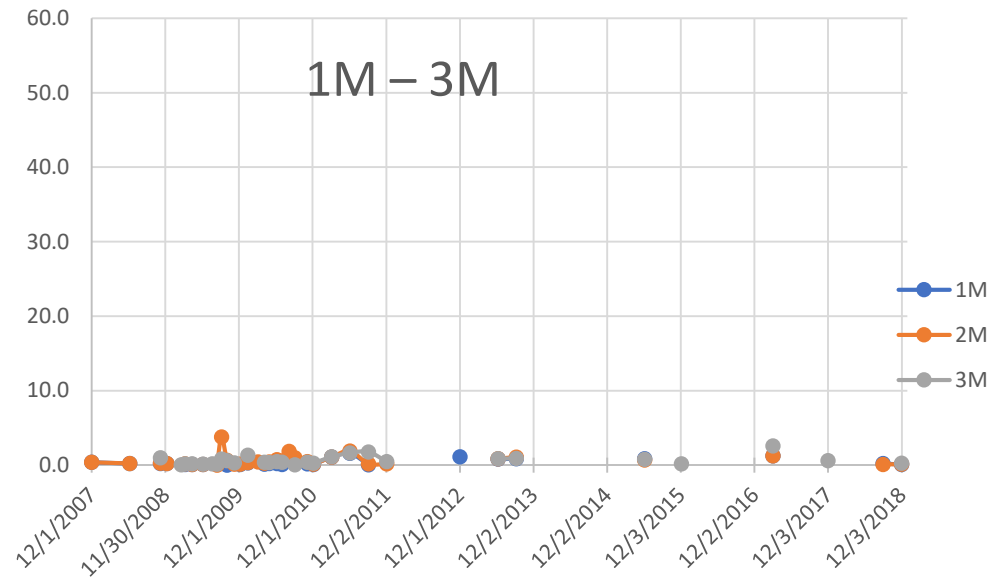
Calcium (mg/L) ¹⁵



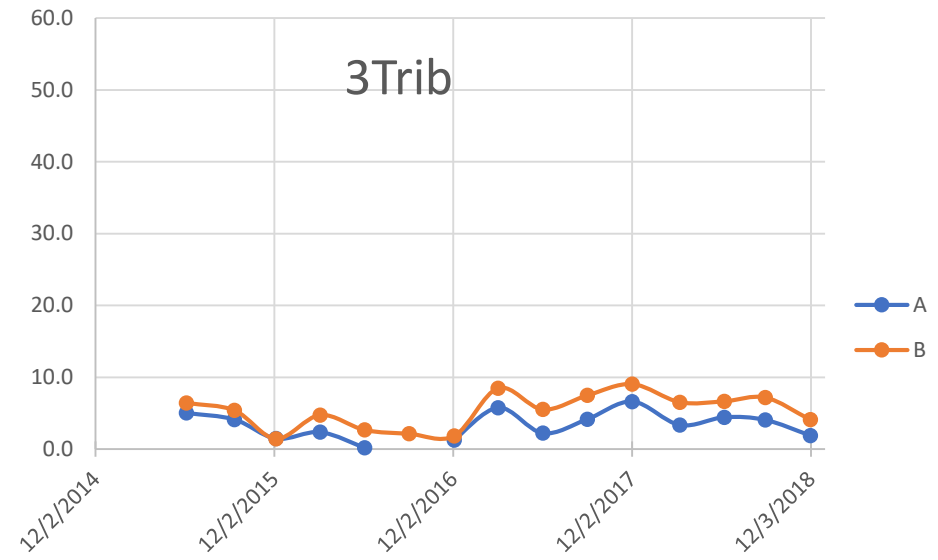
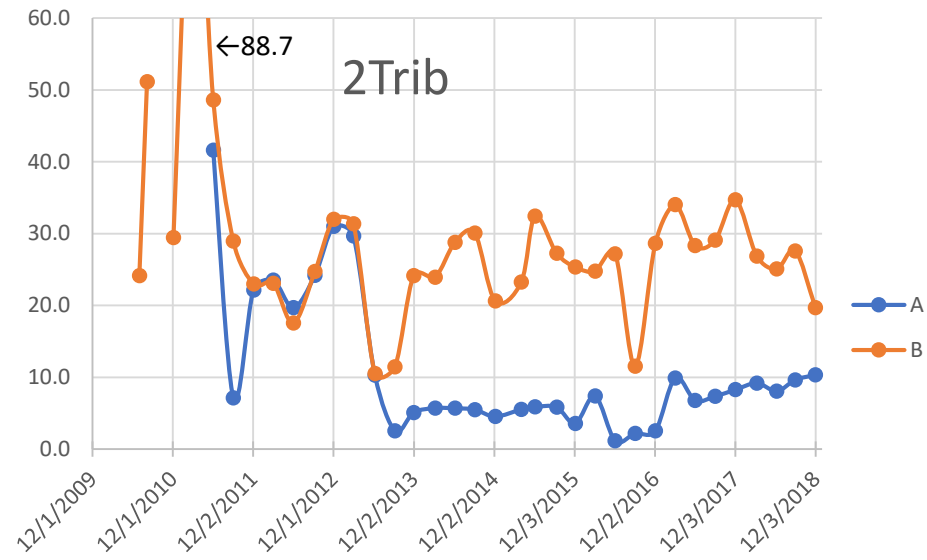
Calcium (mg/L) ¹⁵



Magnesium (mg/L) ₄

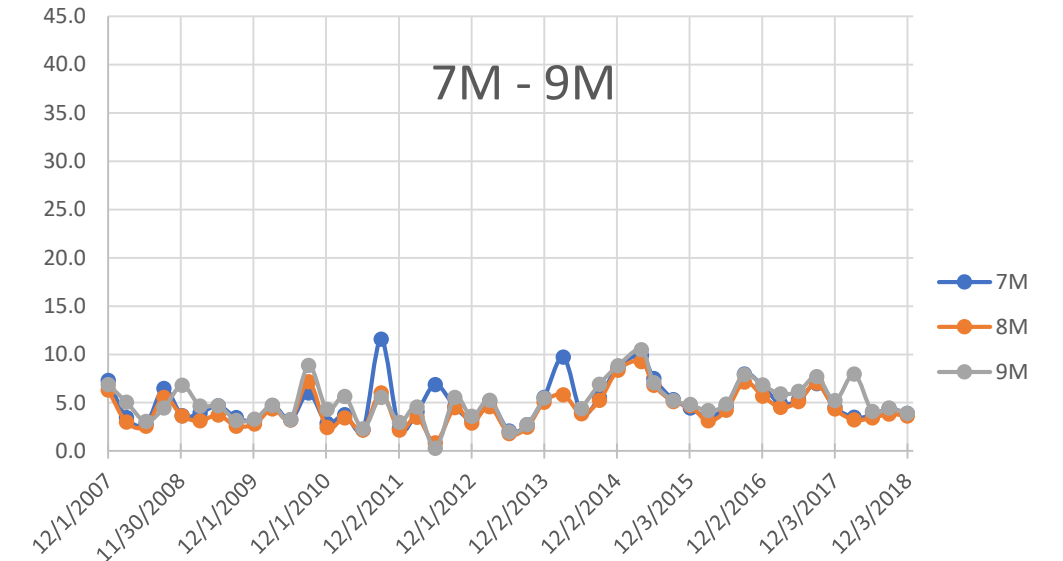
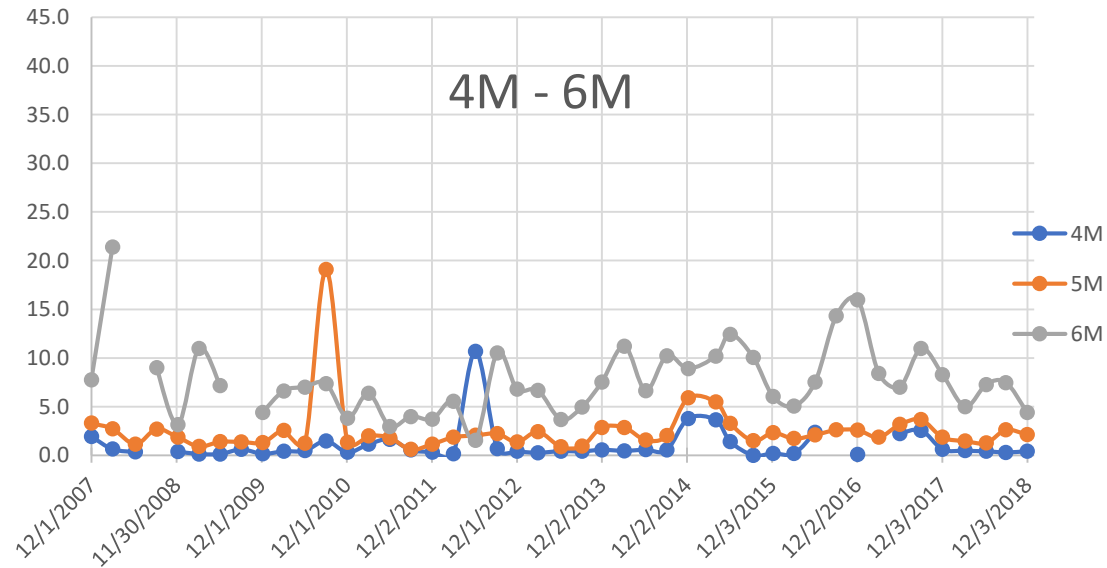
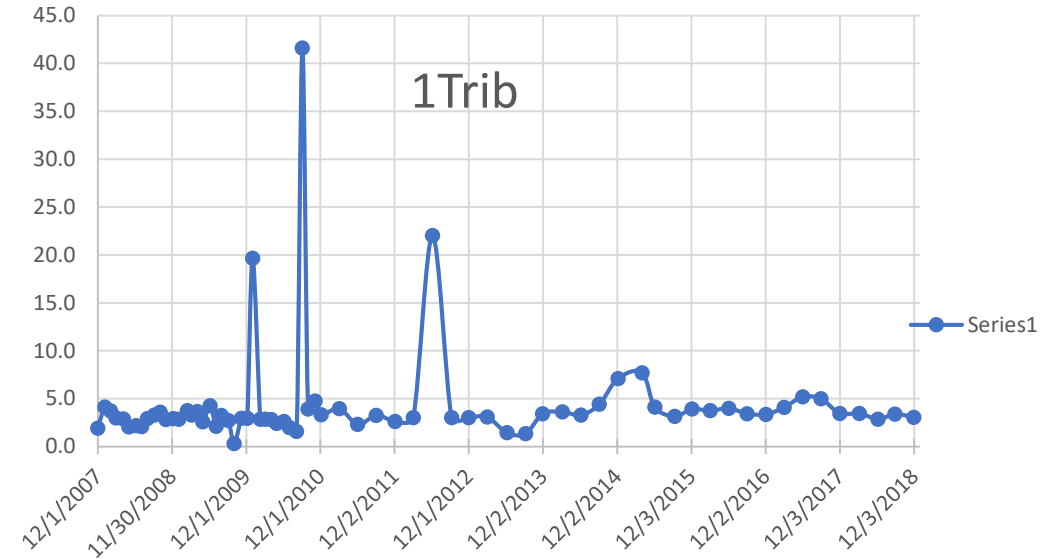
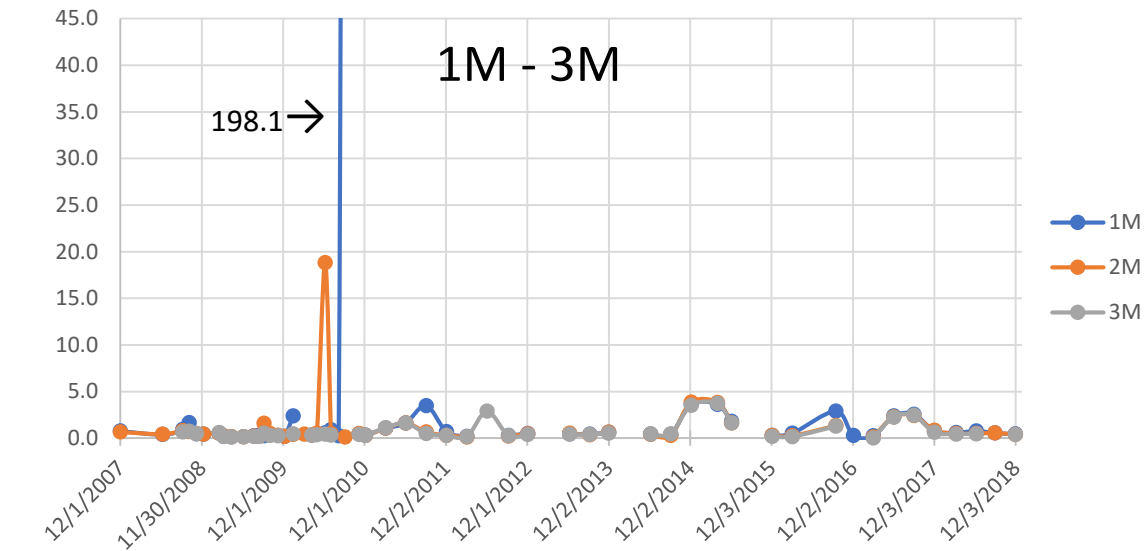


Magnesium (mg/L) ₄

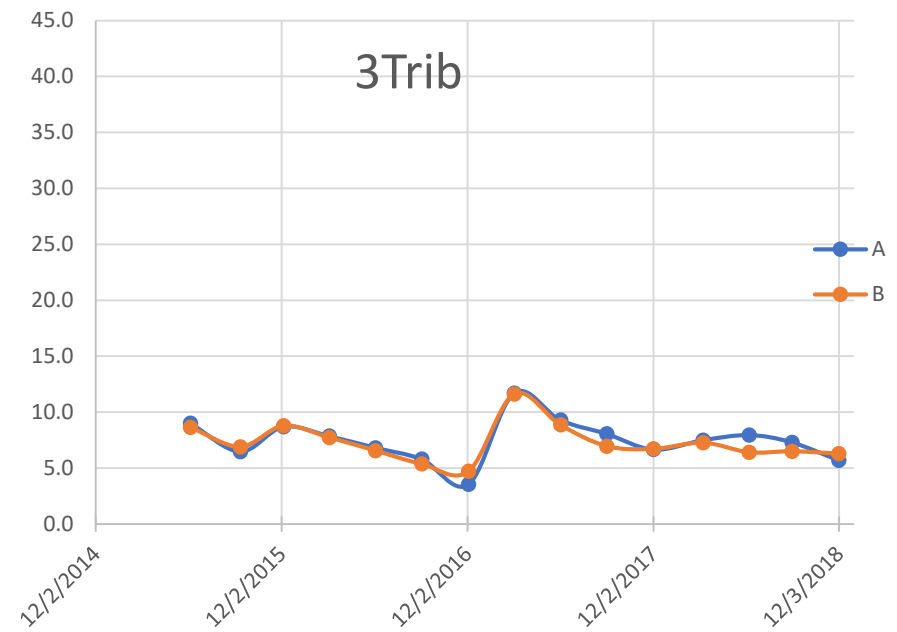
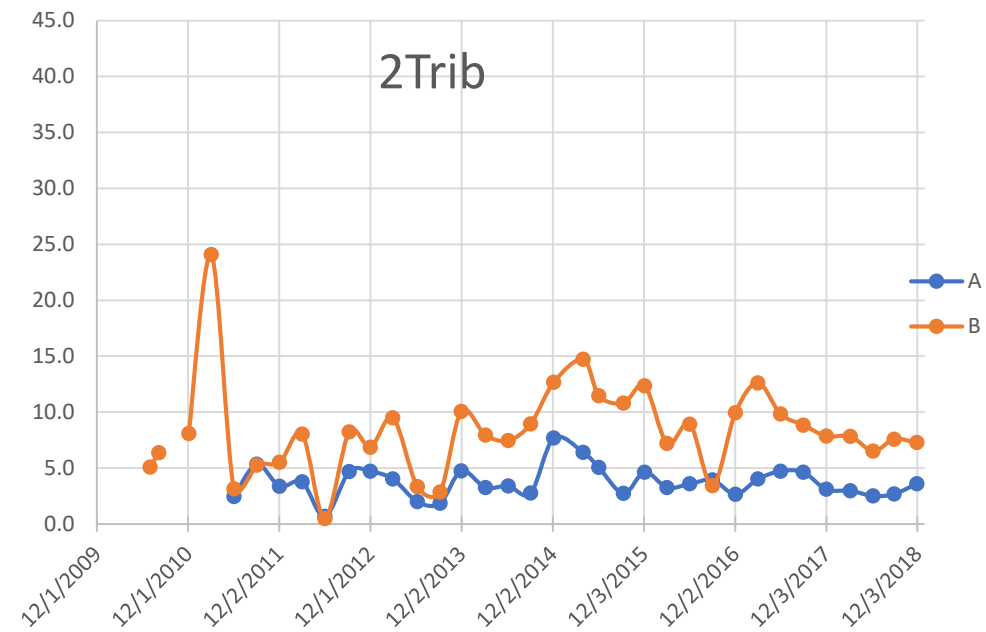


Human Development

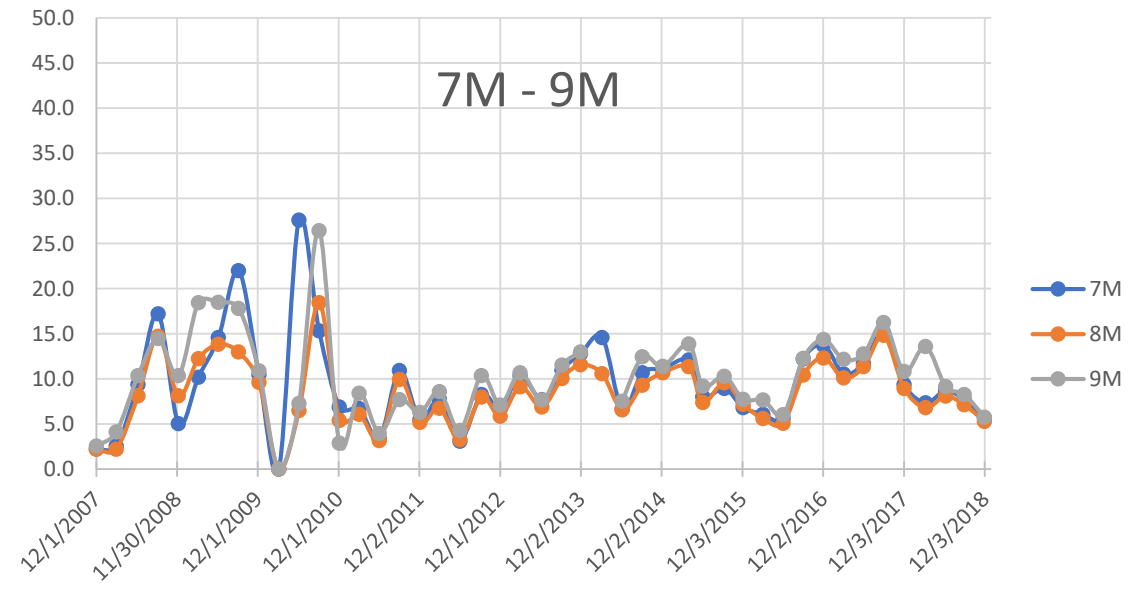
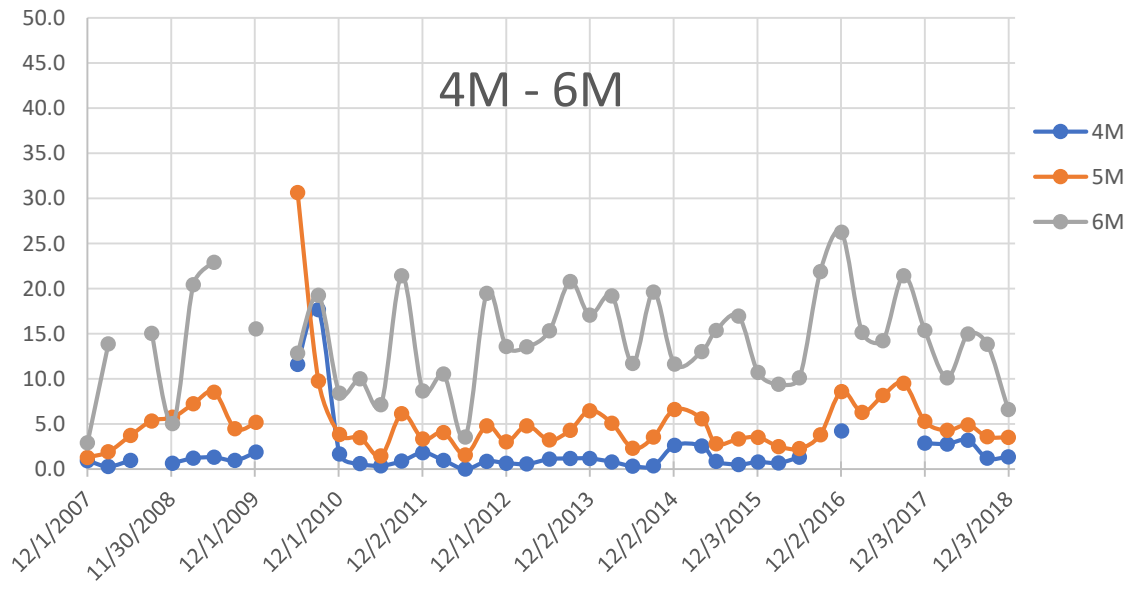
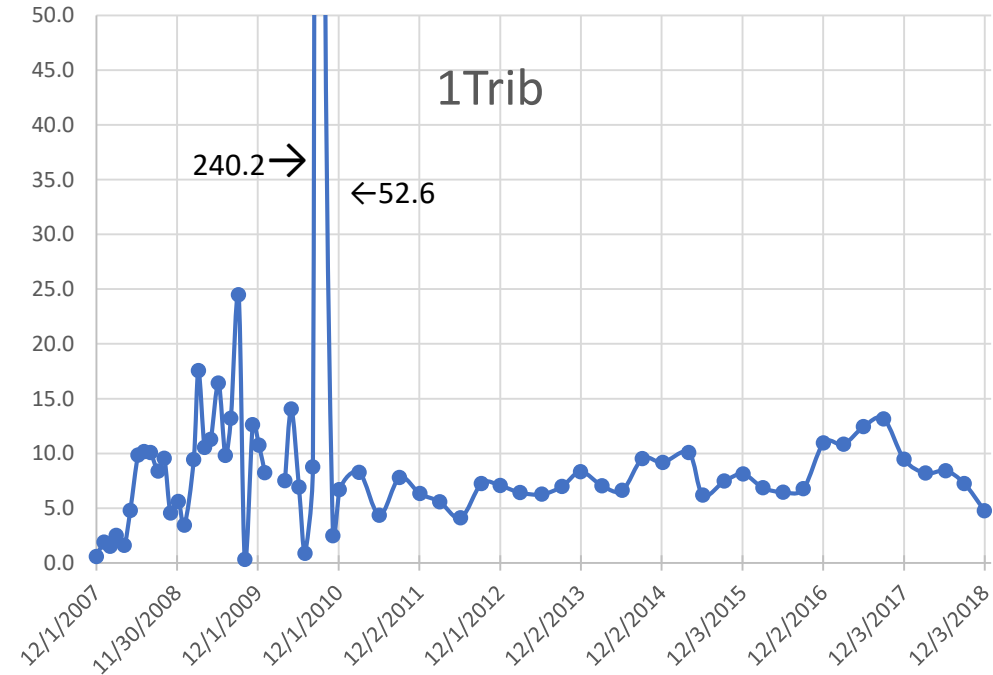
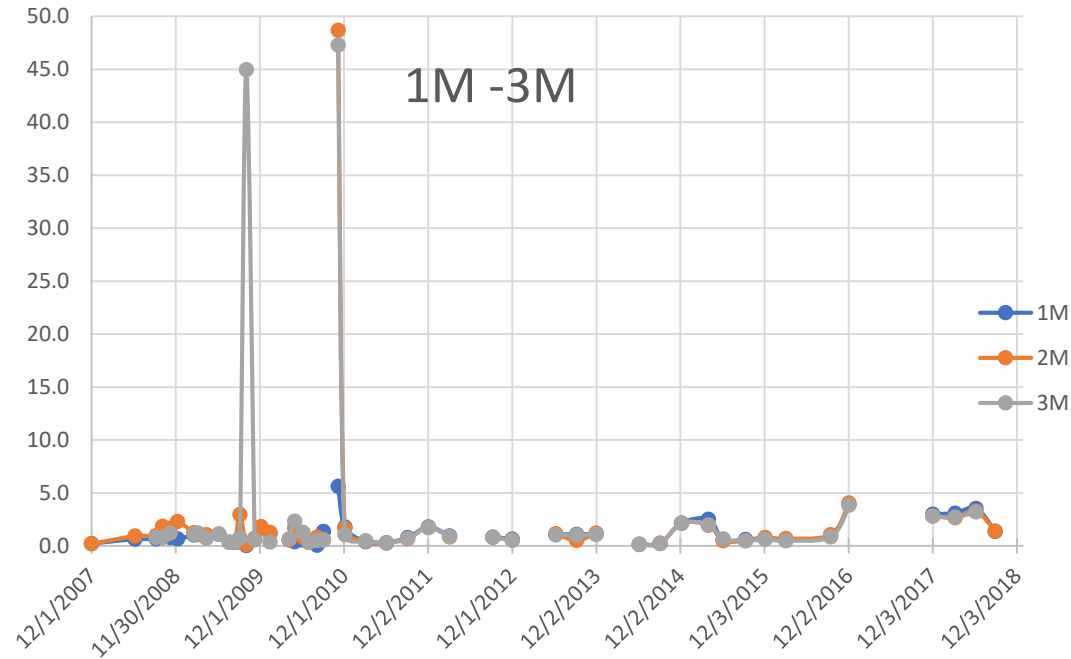
Sodium (mg/L) ₆



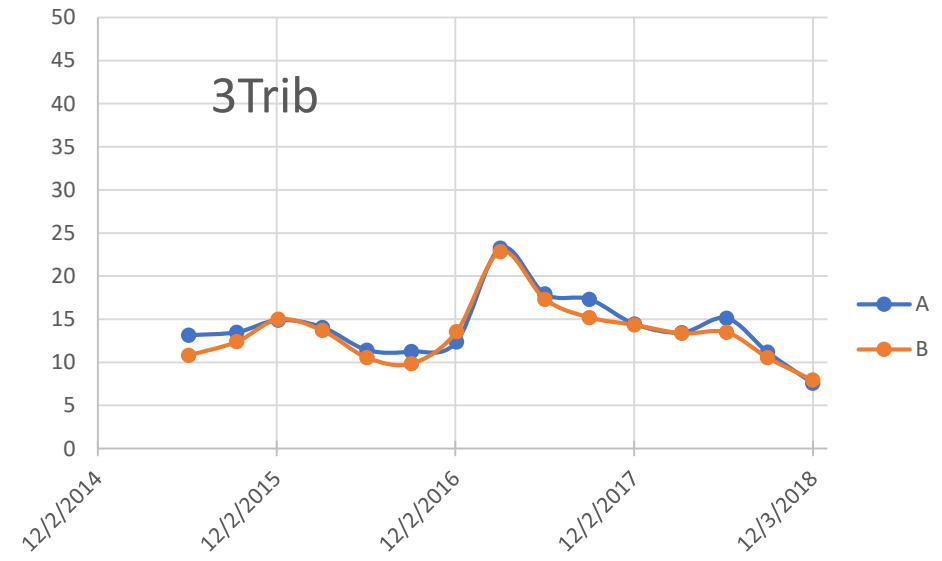
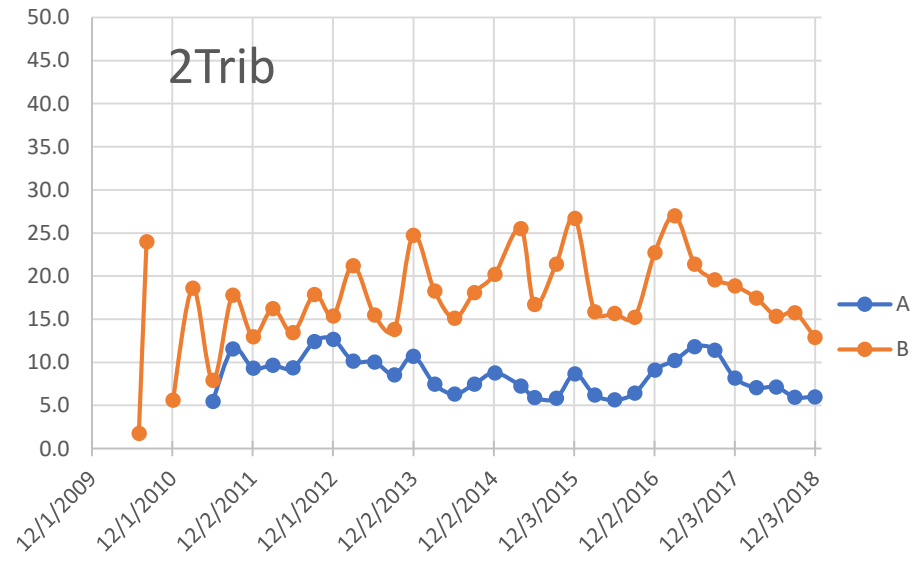
Sodium (mg/L) ⁶



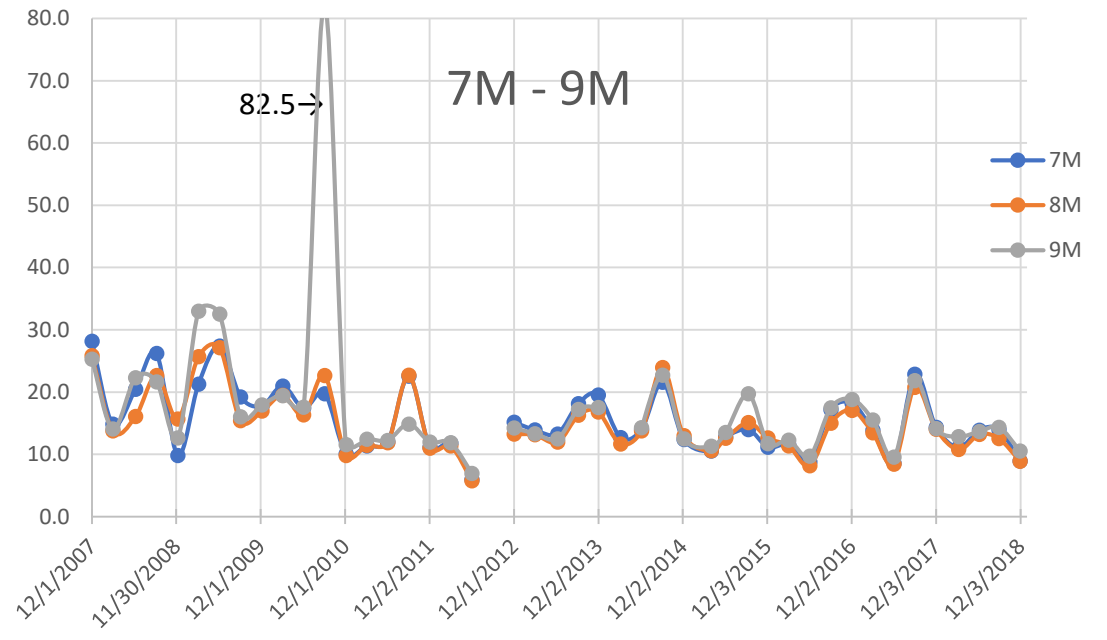
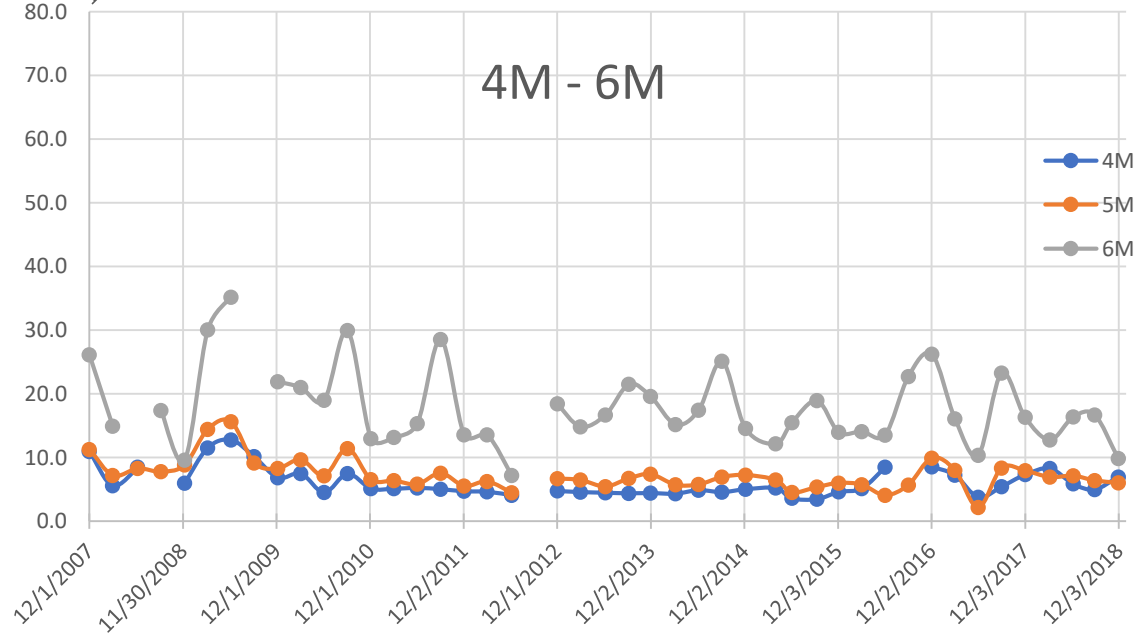
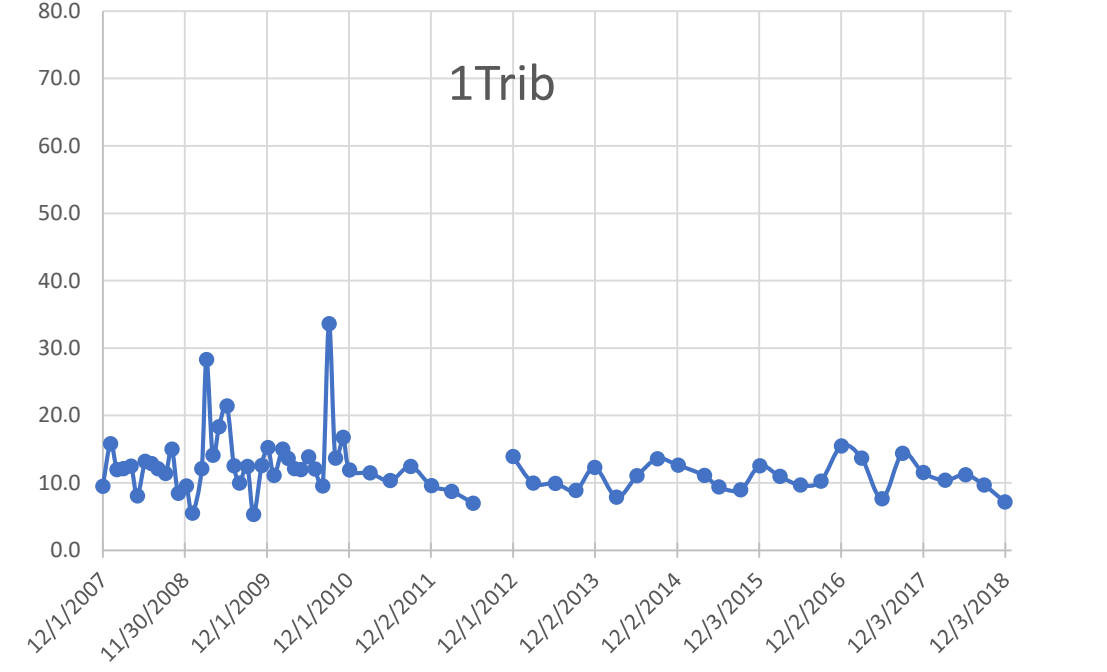
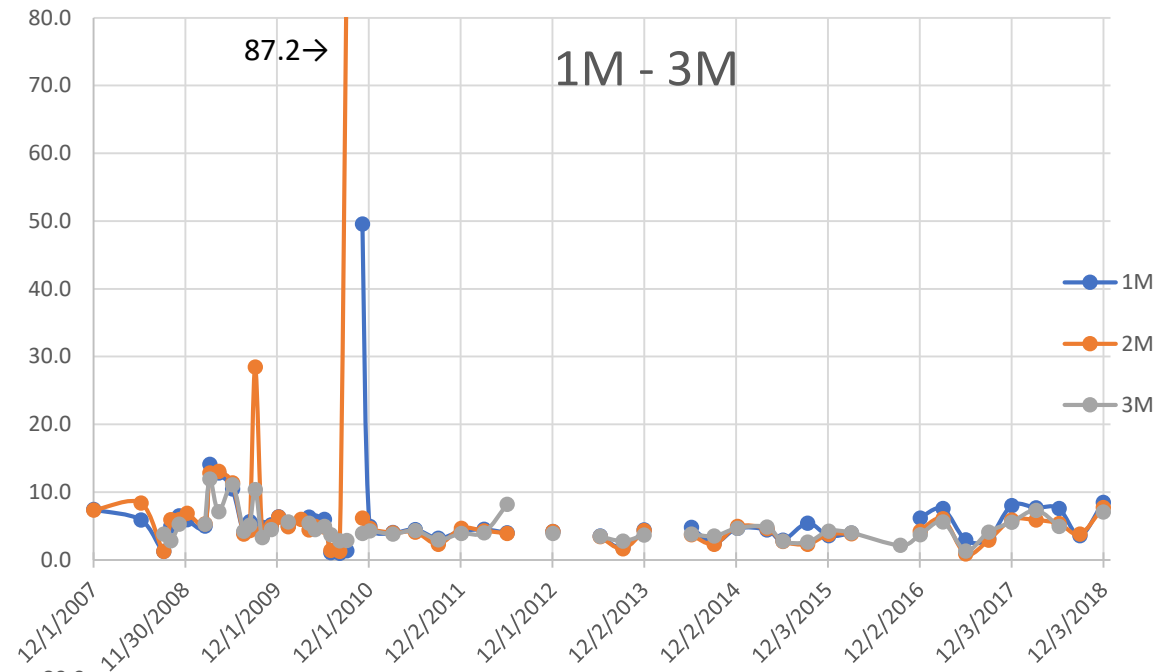
Chloride (mg/L) ₇



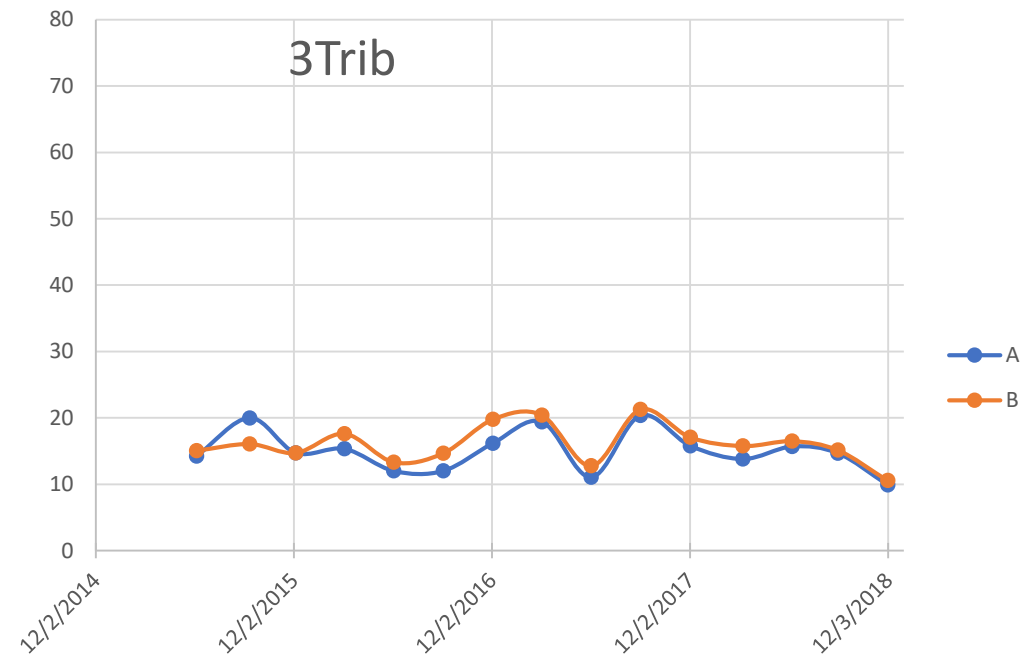
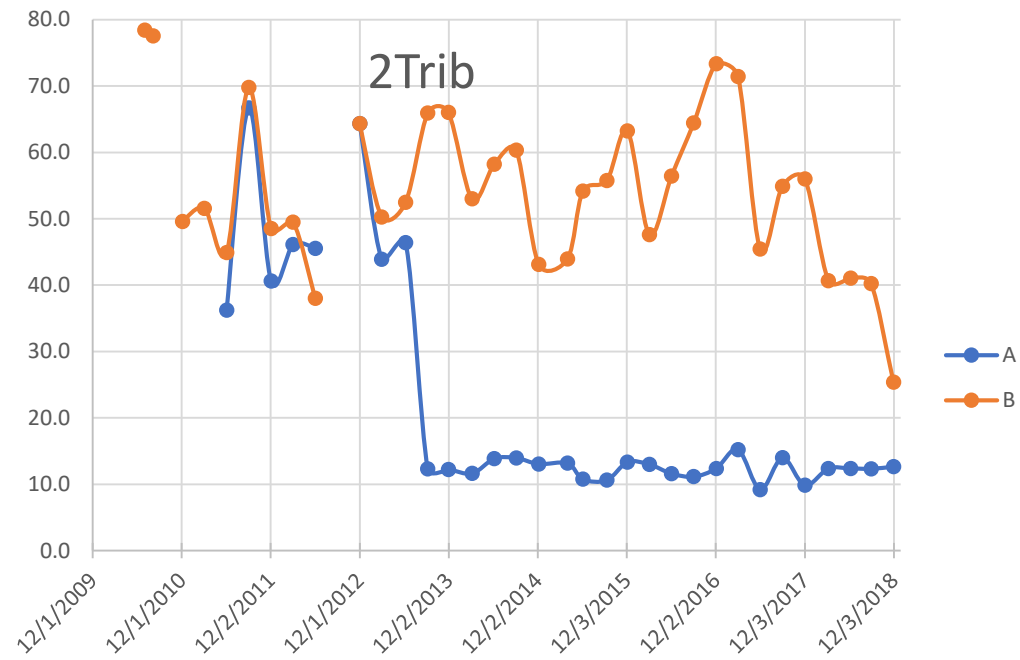
Chloride (mg/L) ₇



Sulfate (mg/L) ¹¹

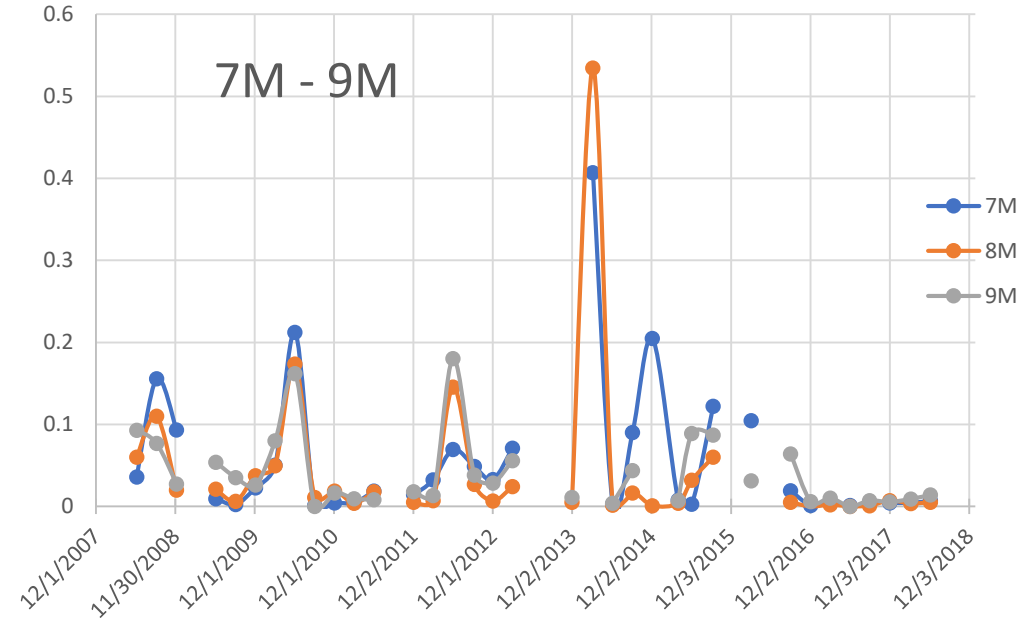
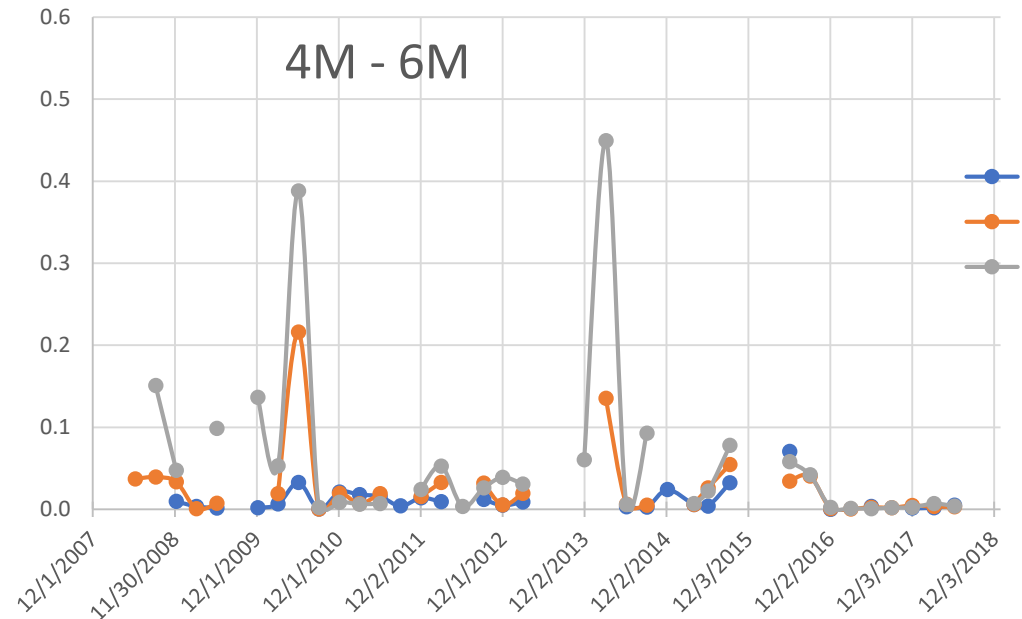
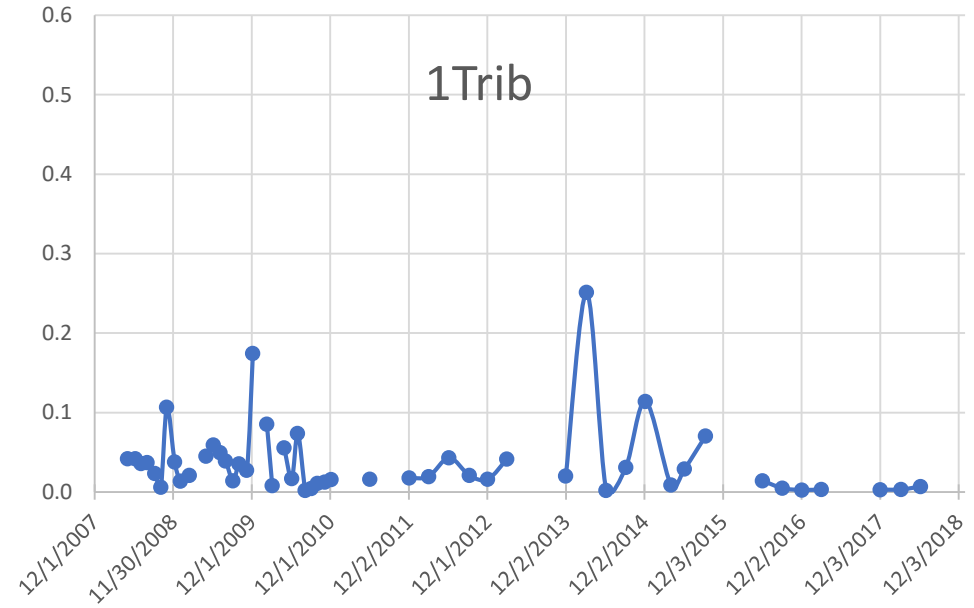
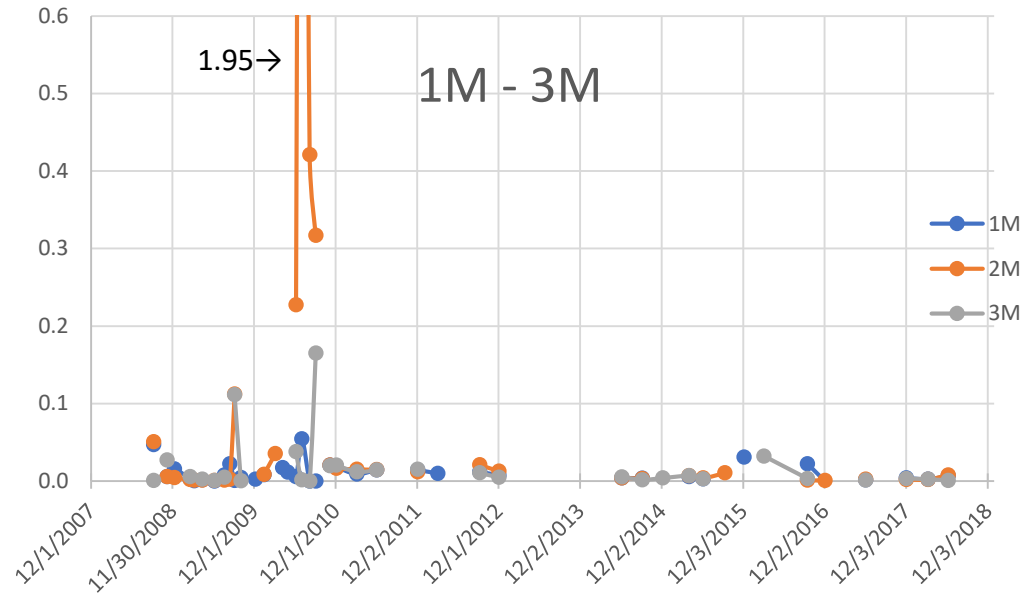


Sulfate (mg/L) ¹¹

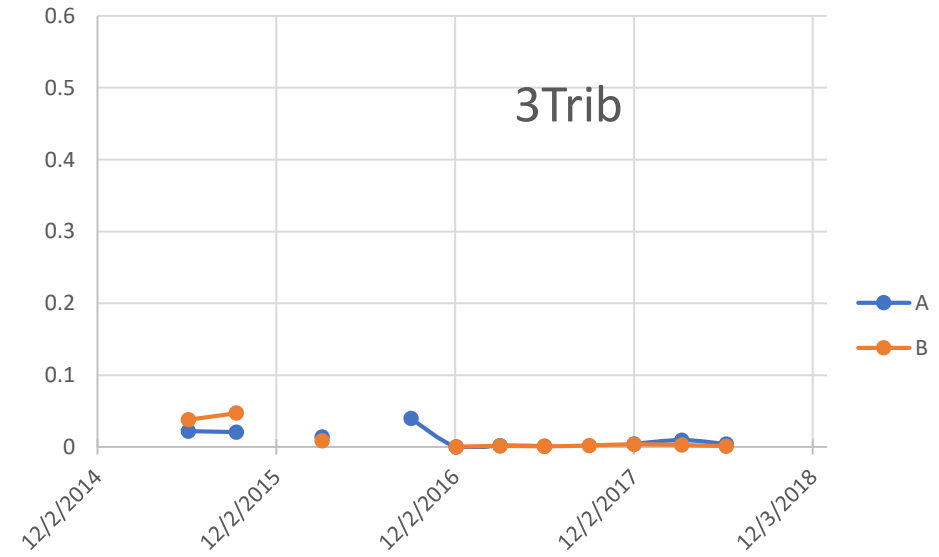
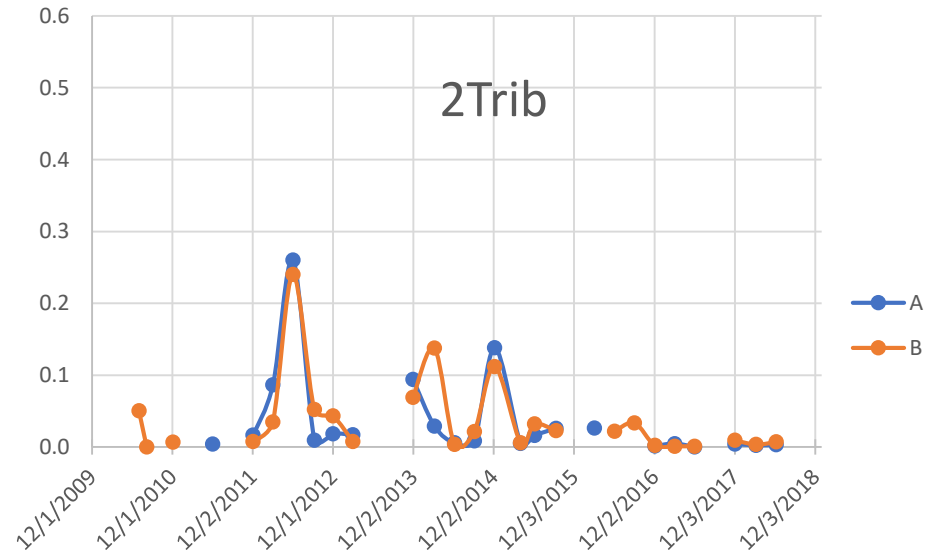


Agriculture/Fertilizer [NPK]

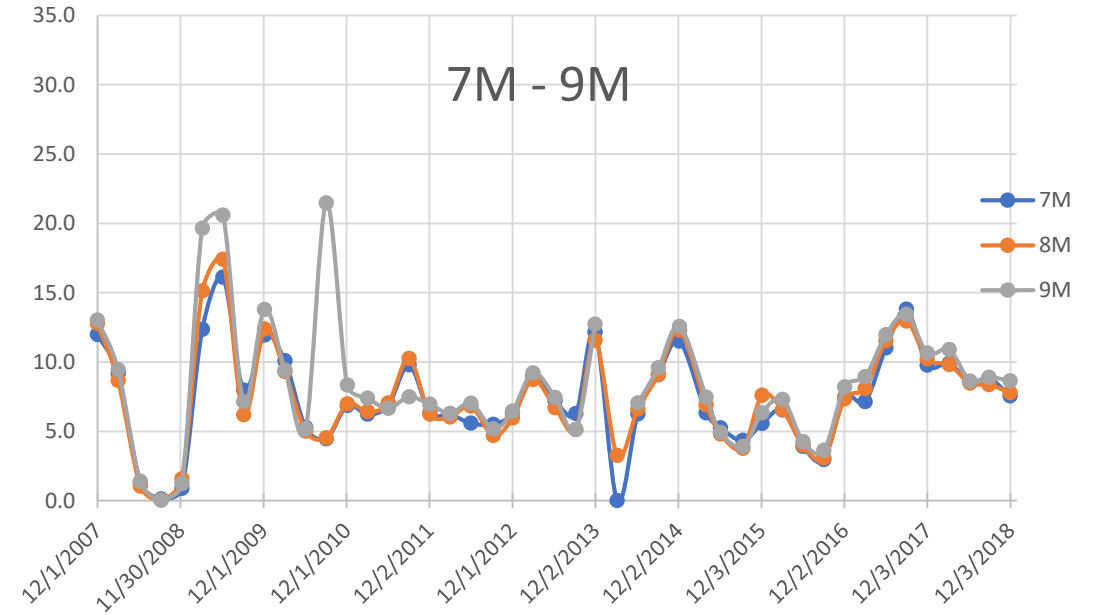
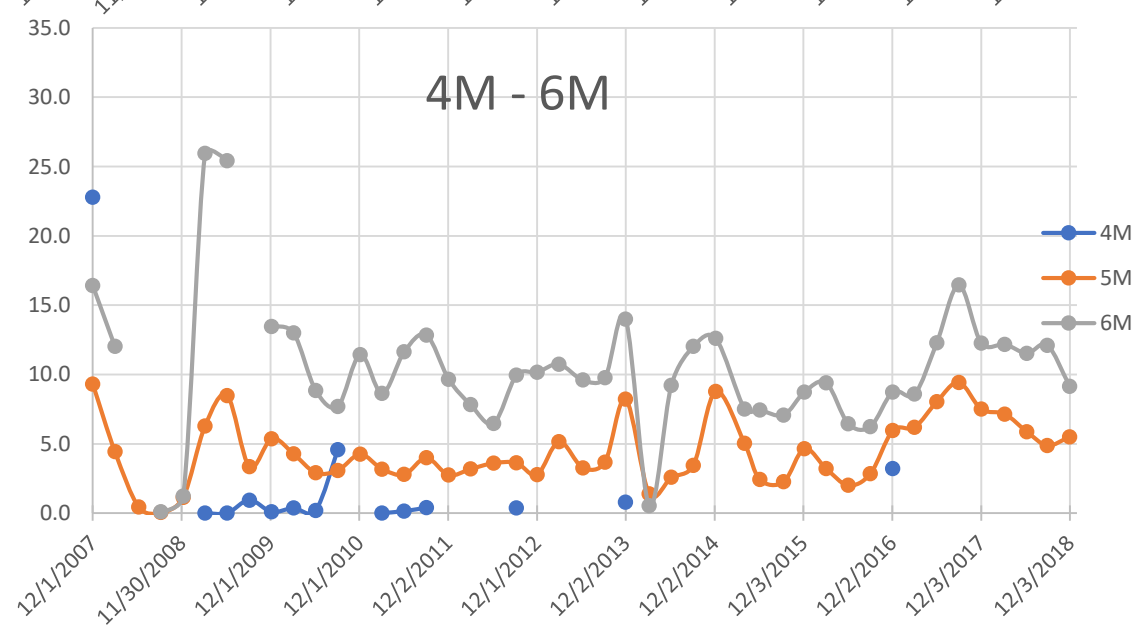
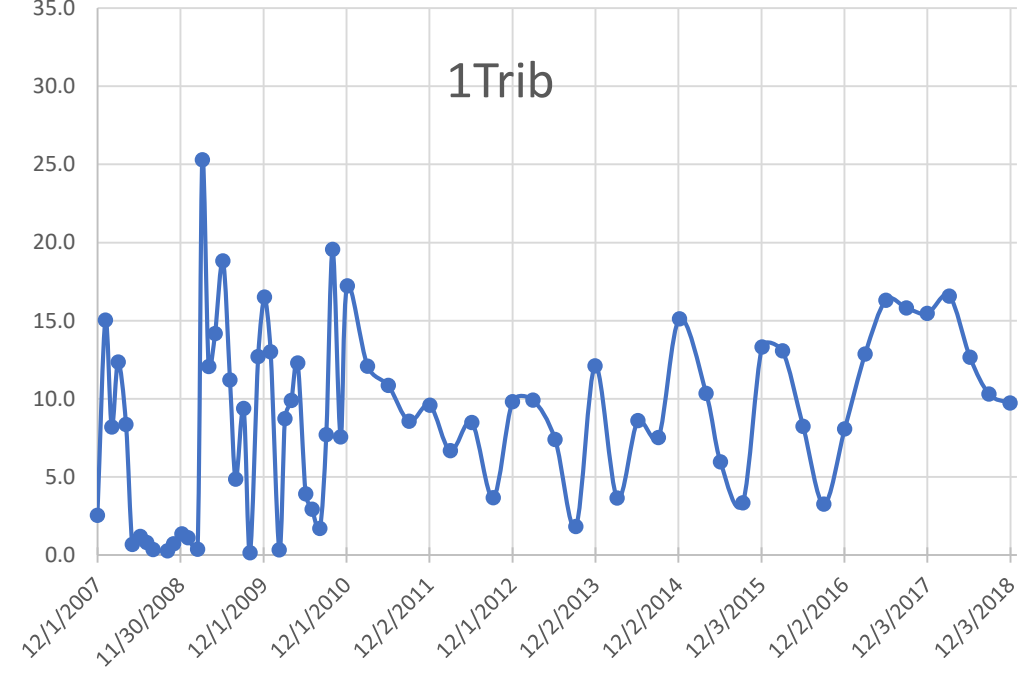
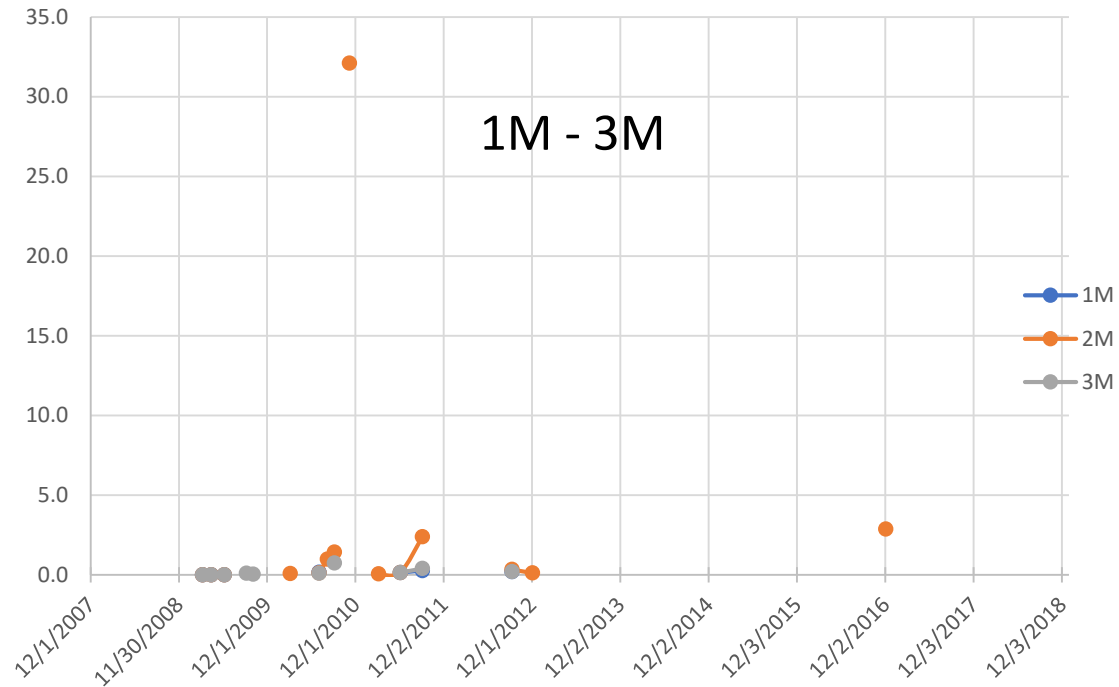
Nitrogen as NH_4^{1+} (mg/L) _{0.1}



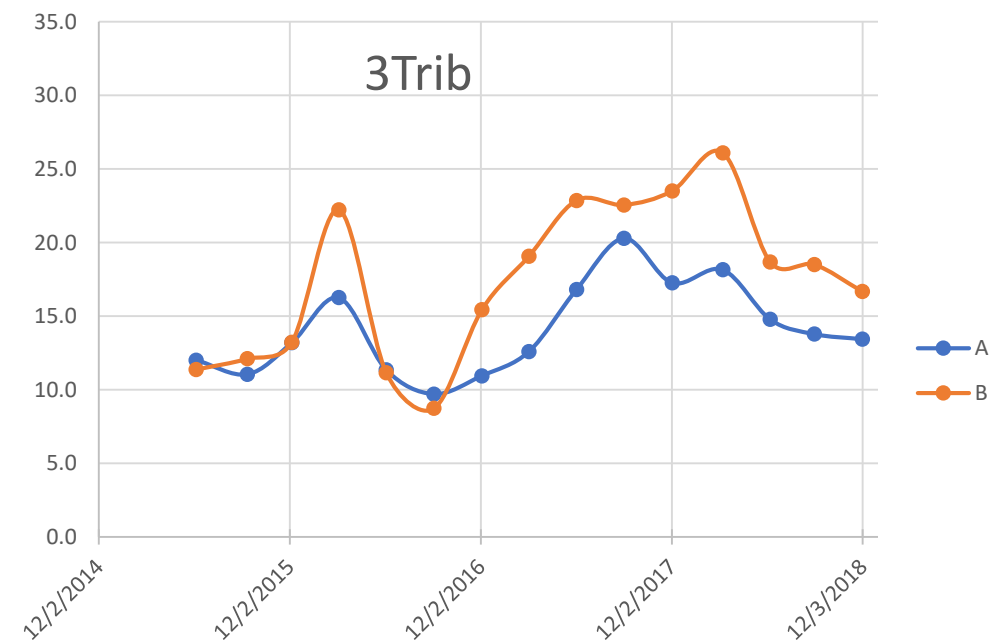
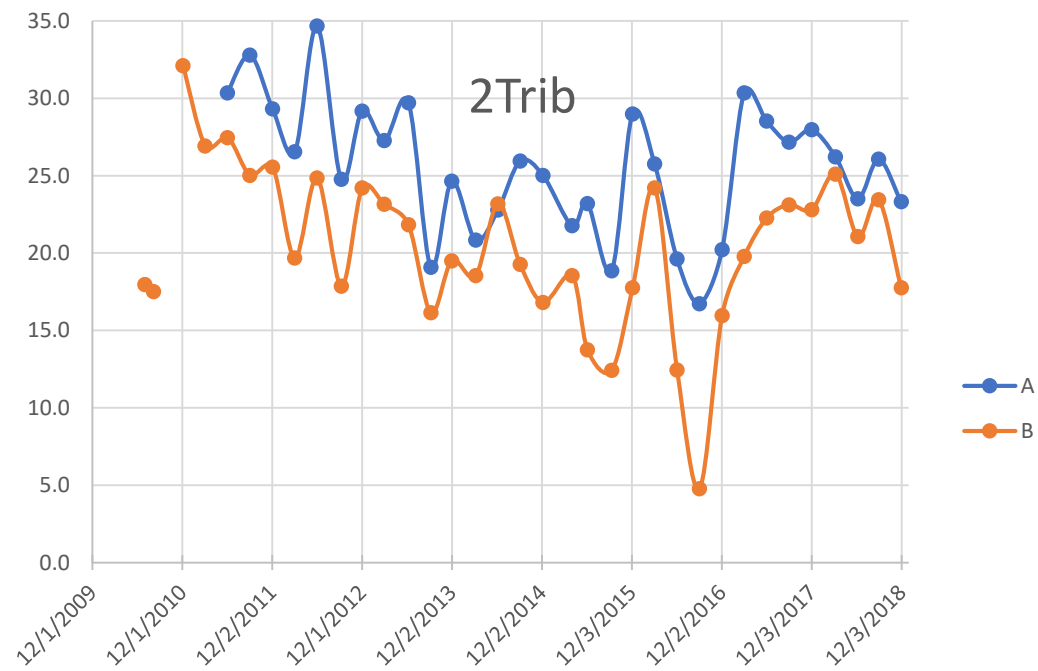
Nitrogen as NH_4^{1+} (mg/L) _{0.1}



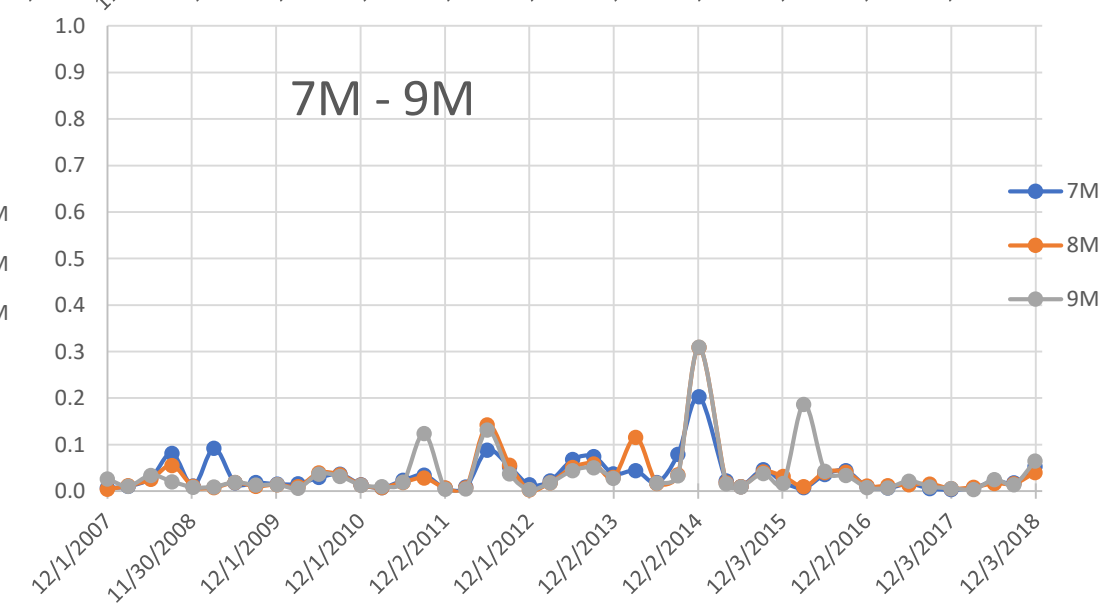
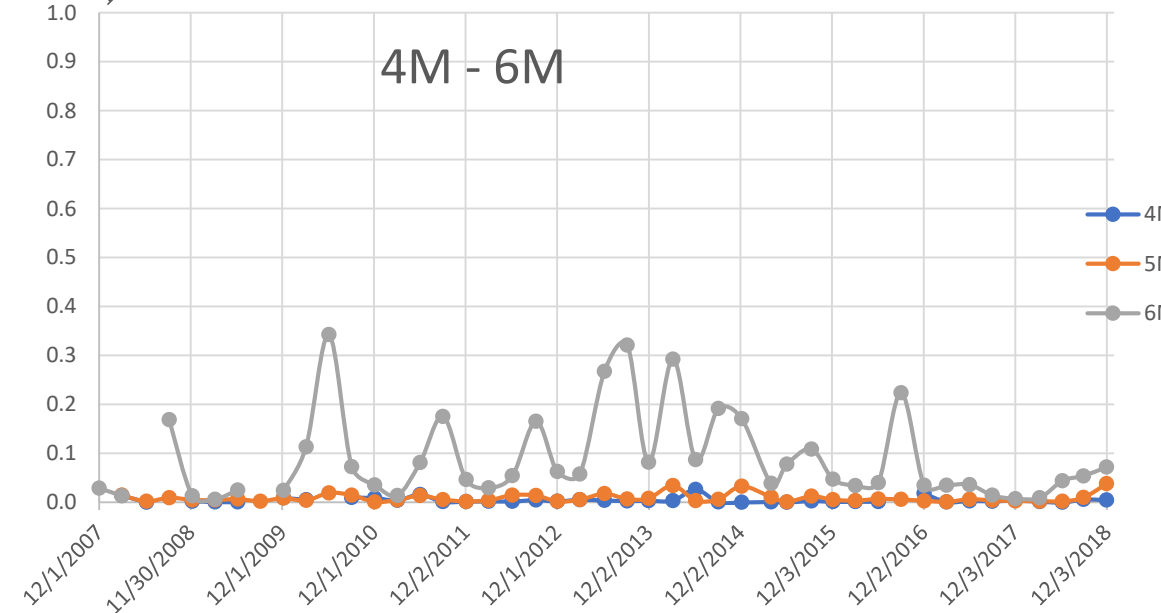
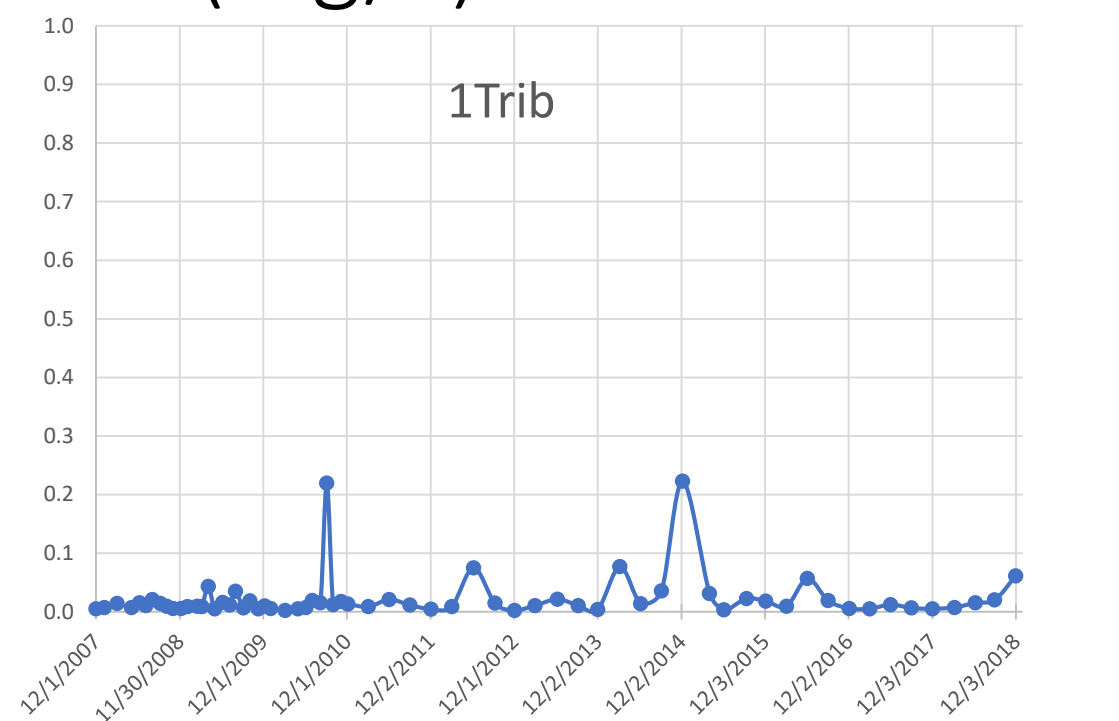
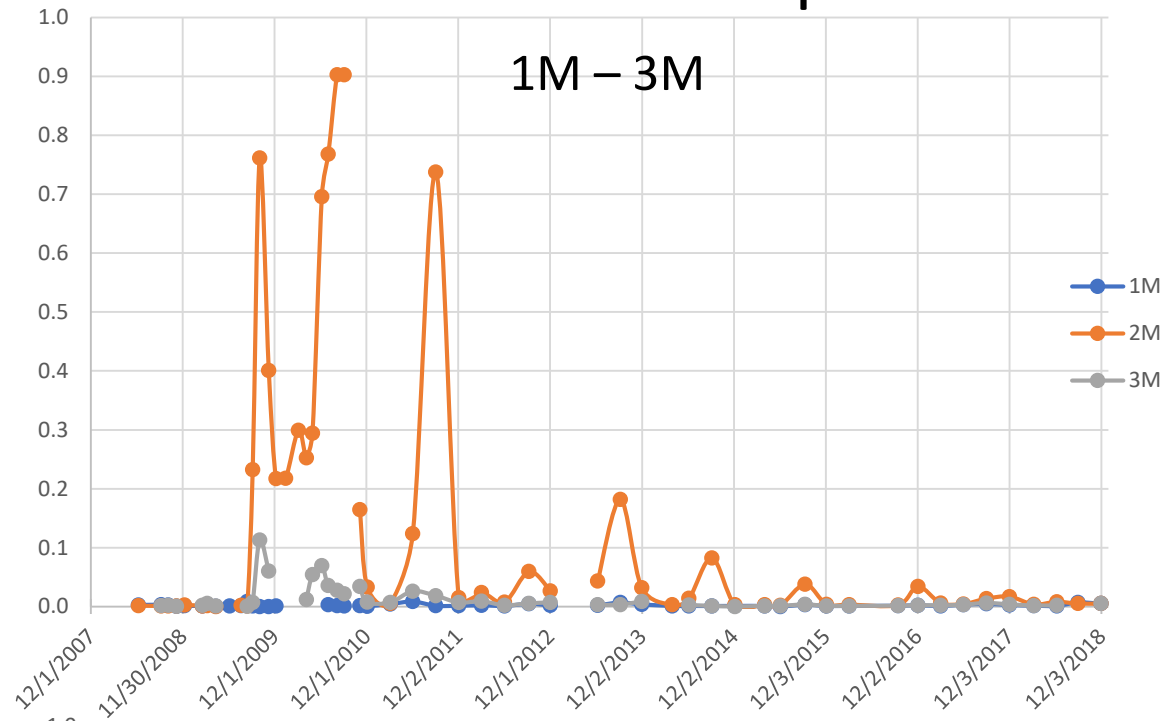
Nitrate NO_3^- (mg/L)



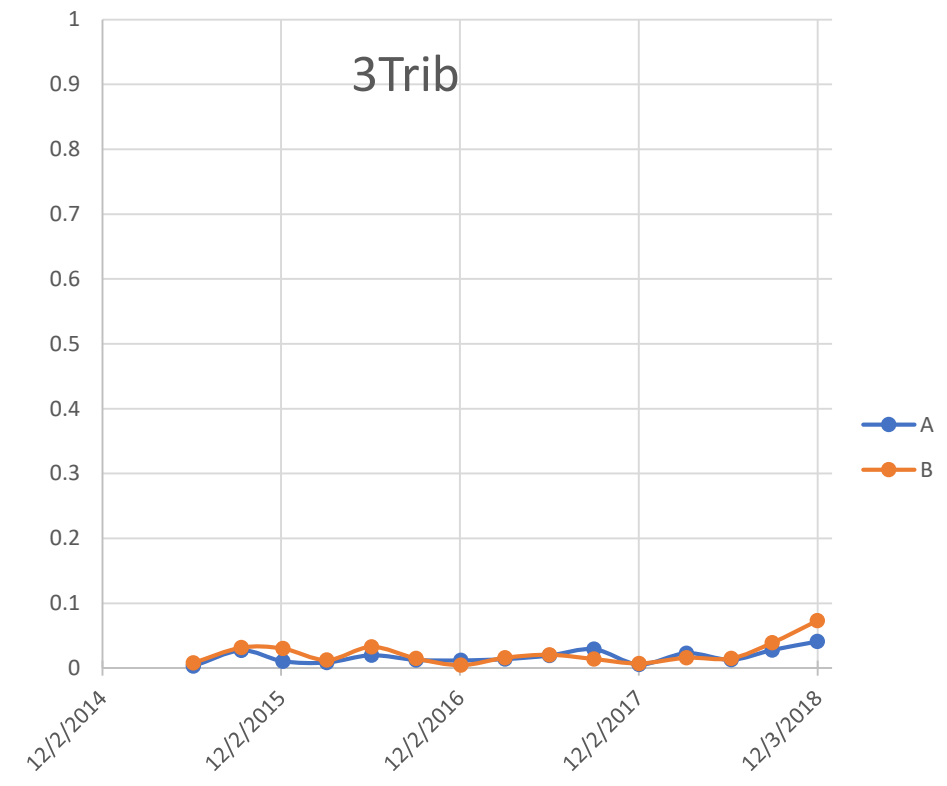
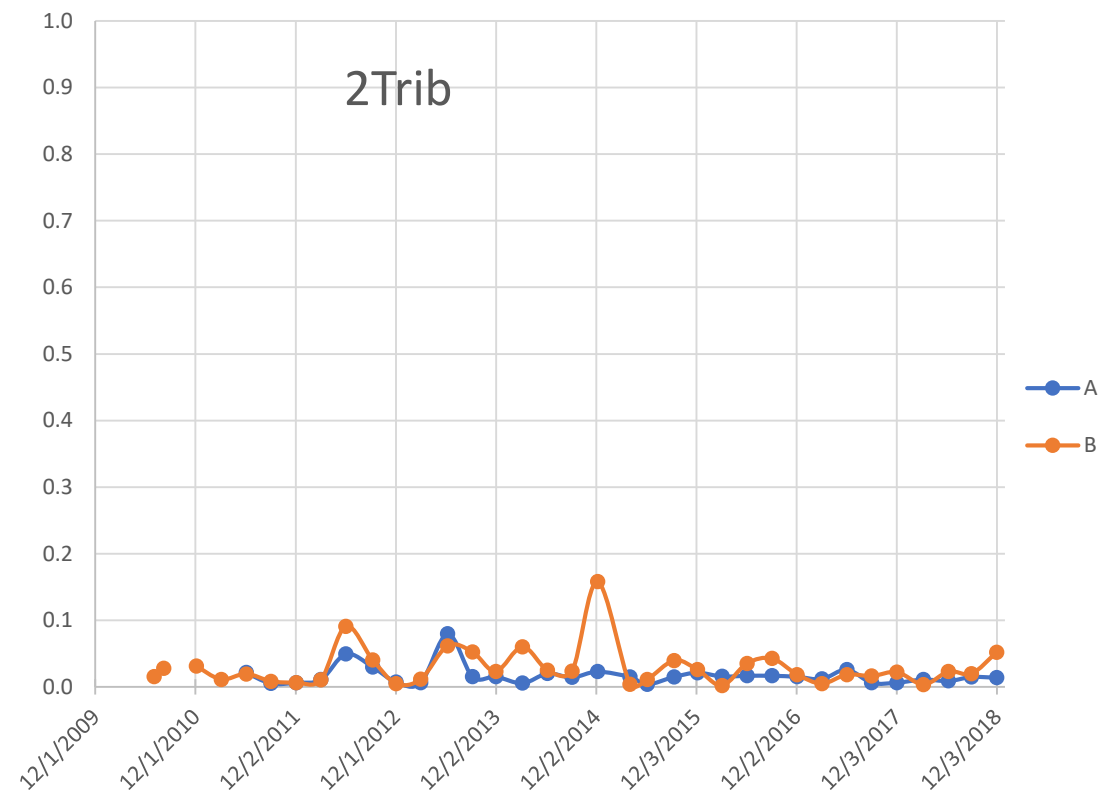
Nitrate NO_3^- (mg/L)



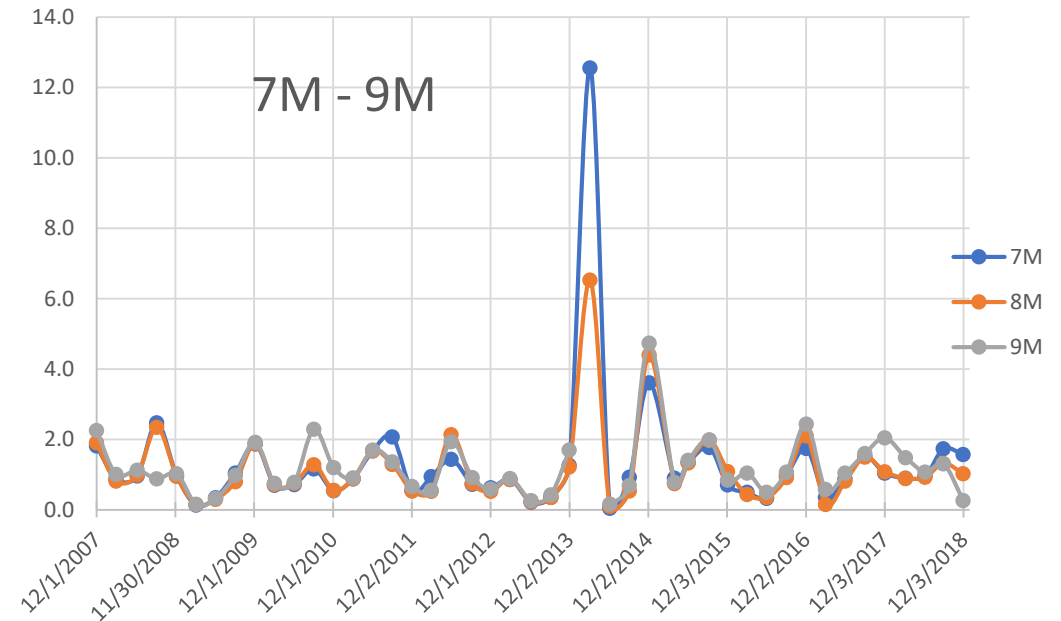
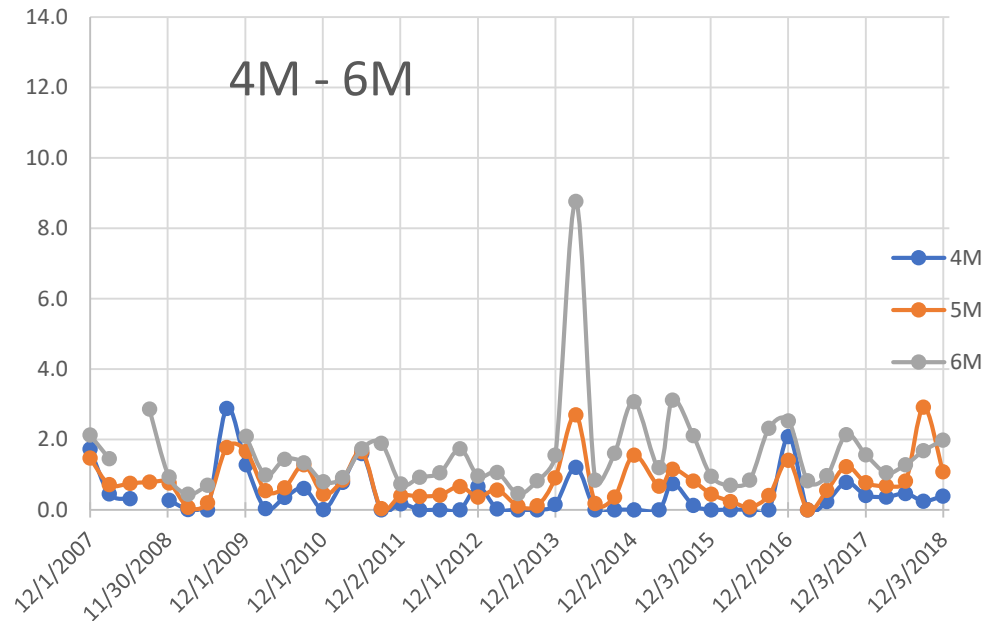
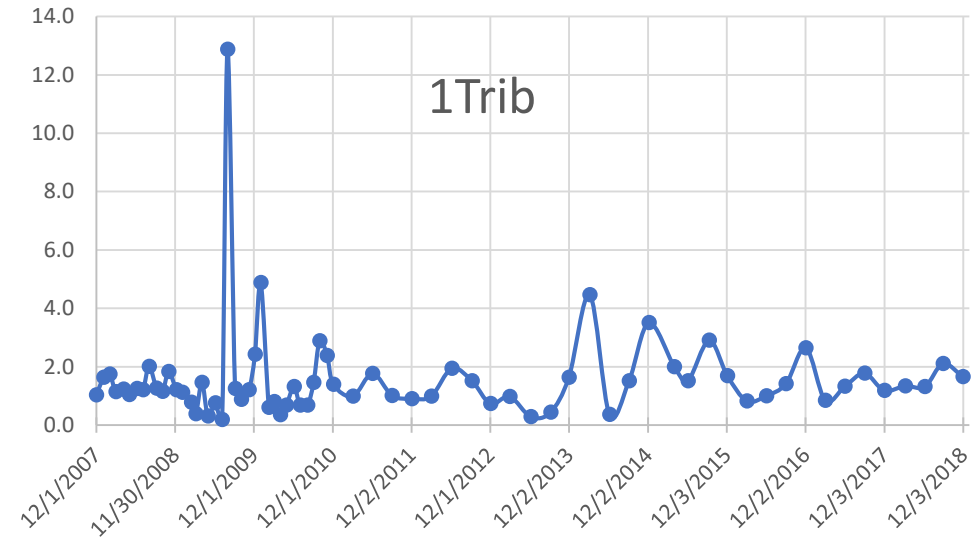
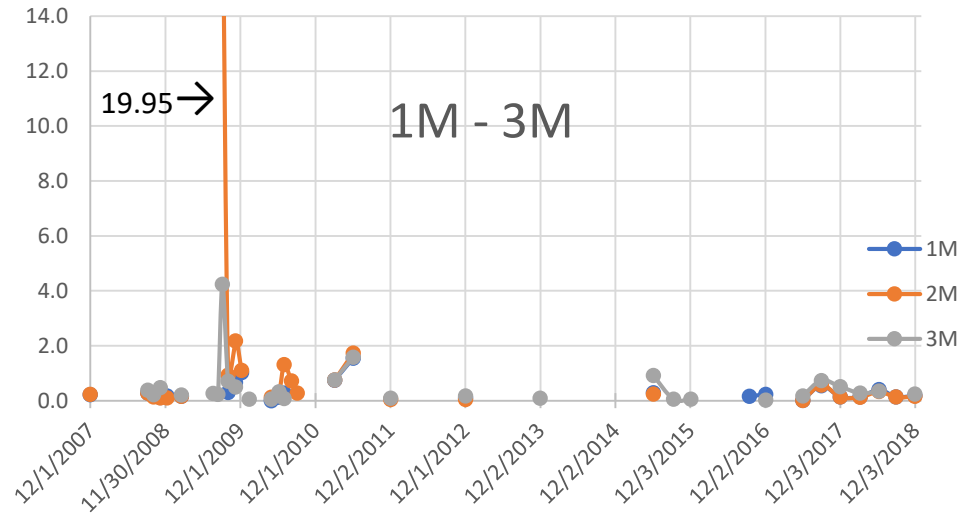
Phosphorous as P (mg/L) ^{0.3}



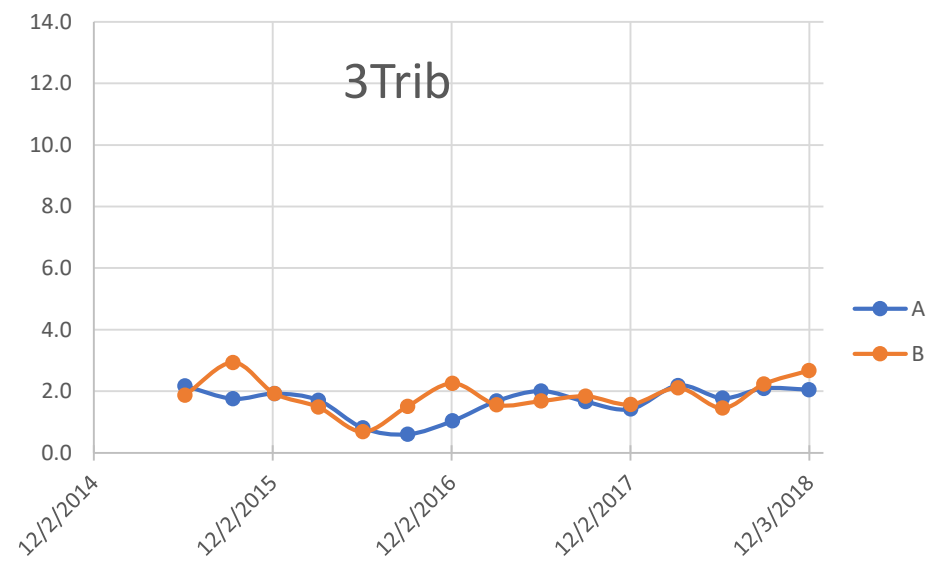
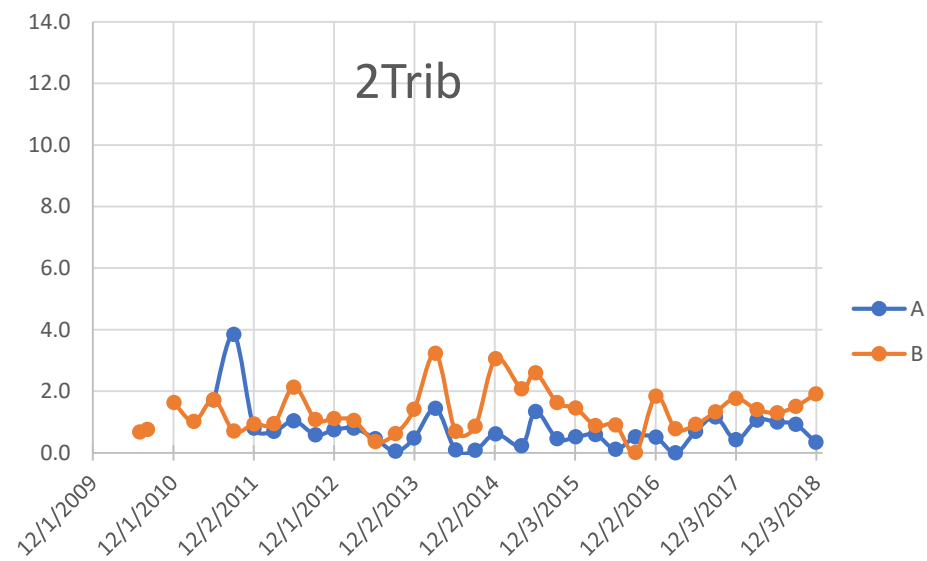
Phosphorous as P (mg/L) _{0.3}



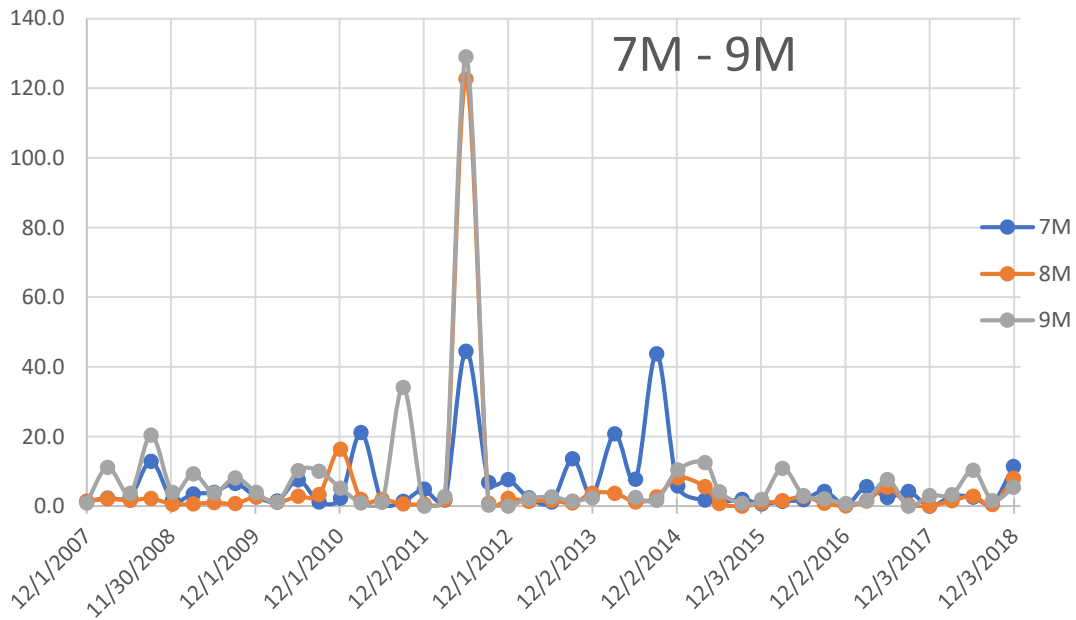
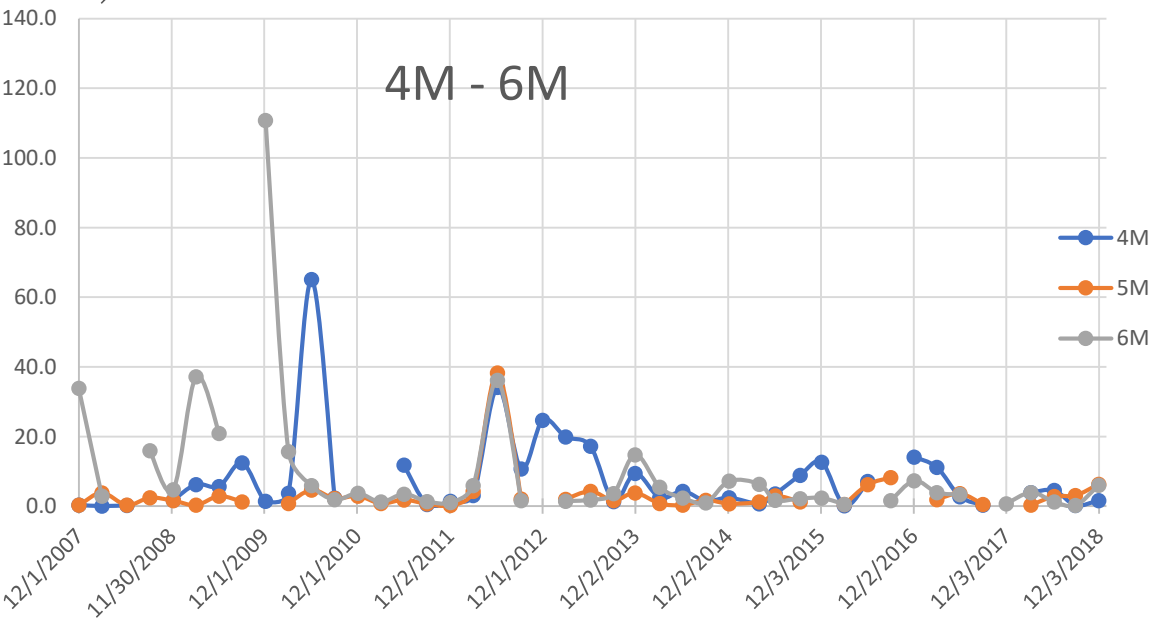
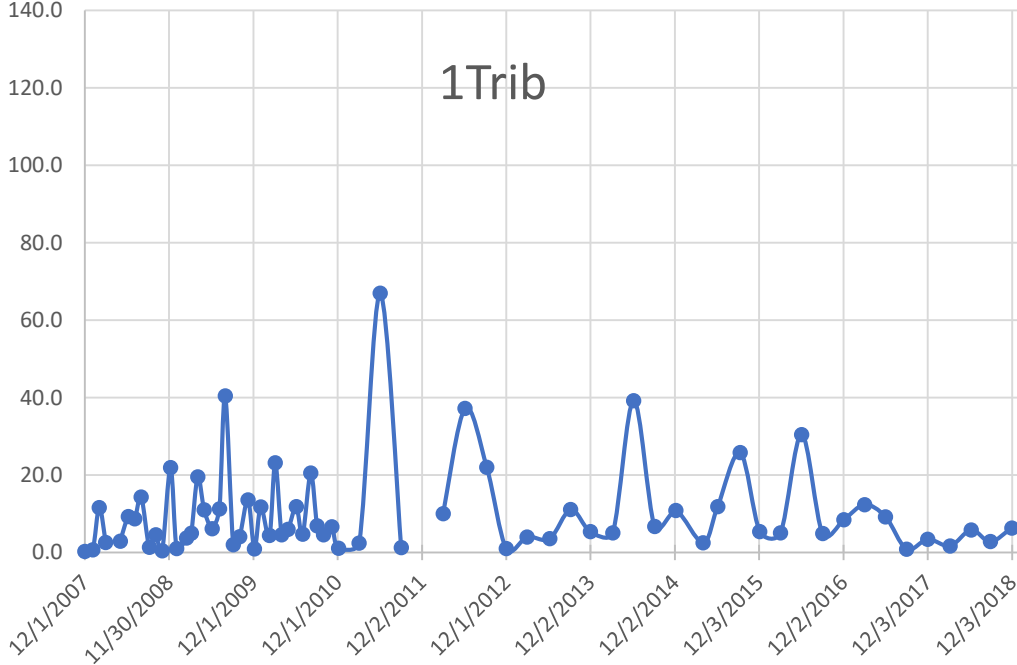
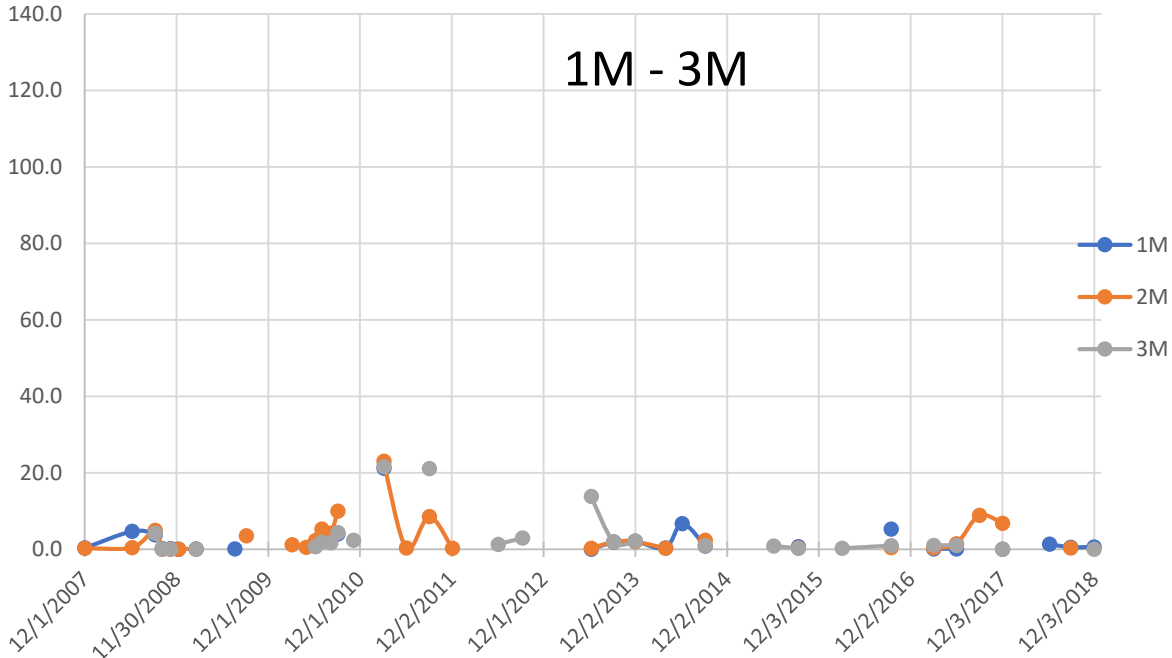
Potassium K^{1+} (mg/L) ₃



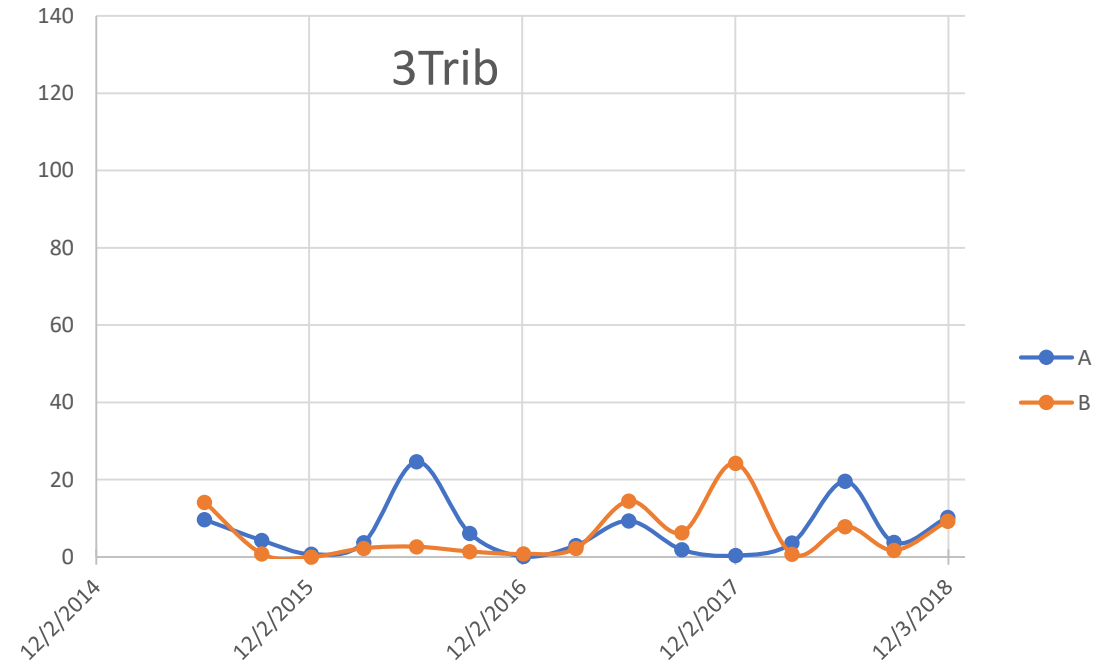
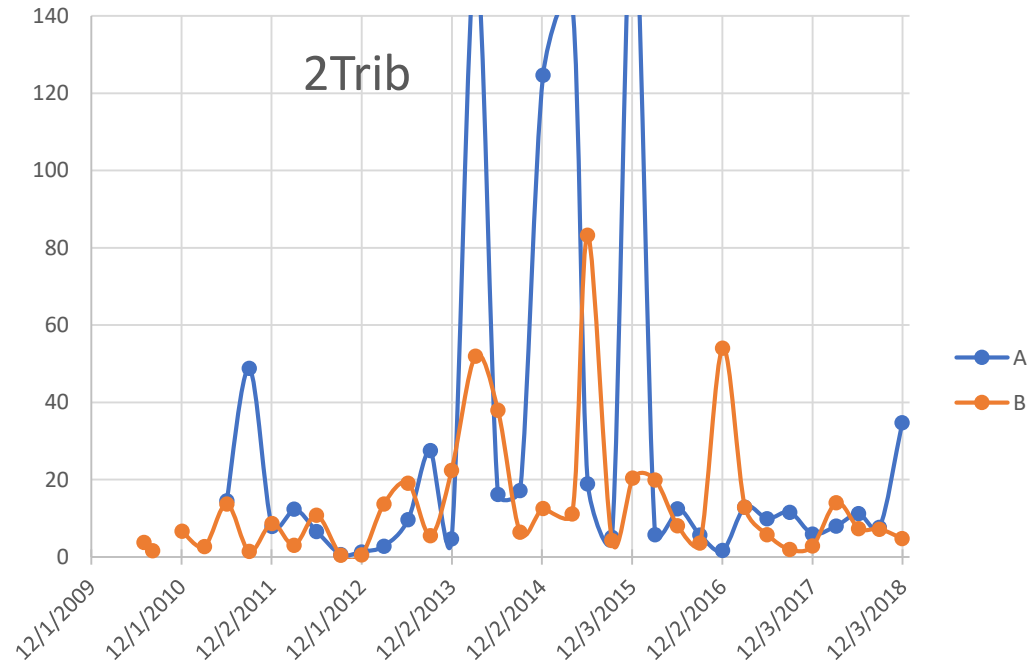
Potassium K¹⁺ (mg/L)₃



Total Suspended Solids (mg/L) ₄₀



Total Suspended Solids (mg/L) 40



Observations

- Acid Remediation site still working well (but is site 3M pH decreasing?)
- Increase in headwater pH, site 1M (due to rain that is less acid?)
- Site 6M much higher than 5M in many cases (e.g. Cl, P)
- Sites 7M though 9M are amazingly similar over time
- Interesting effects at Grove Road Tributary (Trib2A,B)

Future

- Interest in sharing our data: ALLARM at Dickenson College
(Alliance for Aquatic Resources and Monitoring)
- A report card evaluation like Blue Water Baltimore uses would be nice
(To compare with other streams in PA)
- Continue monitoring, explore opportunities to focus on areas of concern, and look at monitoring methods used by other watershed groups.

Tributary Locations w.r.t. Mainstem Monitor Sites

1M

2M

3M

4M

Pleasant Grove

5M

Kaiser Run

6M

North Branch Buffalo Creek (Coal Run)

Grove Road

Rapid Run (Conley Run)

Stony Run

Beaver Run

7M

Spruce Run (Muddy Run) (Black Run)

8M

Little Buffalo Creek

9M

Not Monitored

Planned Monitoring