



Water Quality in Calvert County Streams

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Patuxent River Conference

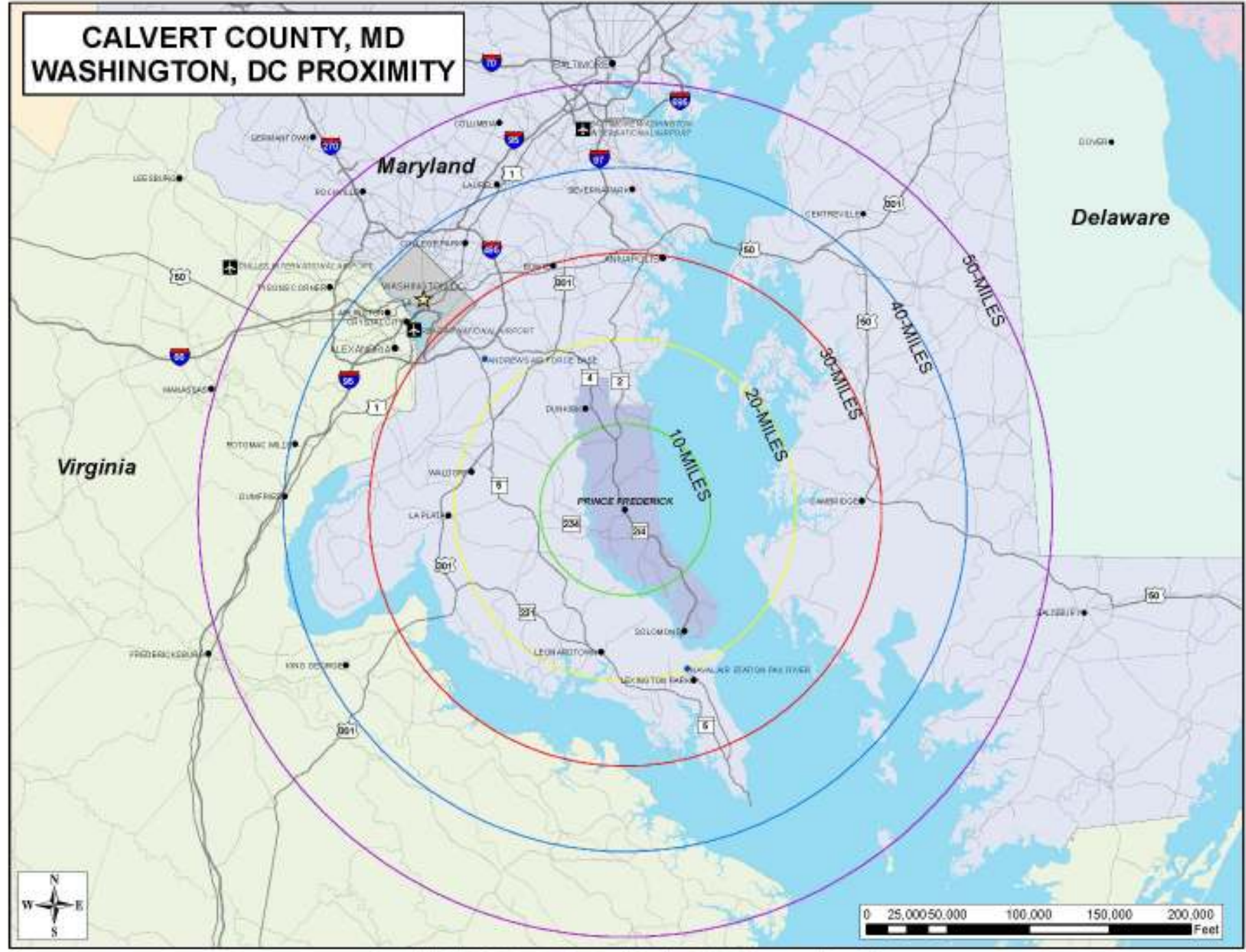
June 18, 2015

Acknowledgements

- **Cove Point Natural Heritage Trust**
- **Volunteers, Staff**
- **Board of County Commissioners,
Calvert County**



CALVERT COUNTY, MD WASHINGTON, DC PROXIMITY



Prepared by the Calvert County Community Planning and Building Department for illustrative purposes, February, 2014

Water Quality Monitoring on a Shoe String Budget

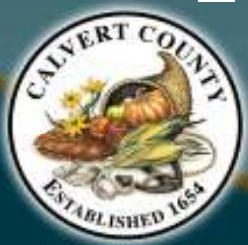
- Approach

- Quarterly sample in each 12-digit watershed
- Looking for “Hot Spots” and “Reference Sites”
- Compare water quality results to county water quality goals
- Sample for Nitrogen (NH₄ and NO₂), Phosphorous (PO₄) and Total Suspended Solids (TSS)
- Currently measuring loadings



Water Quality Monitoring

- Methodology
 - Use County Staff and Volunteers
 - Fill out data collection forms
 - Simple but clean collection – fill prepared bottles with sample water after rinsing
 - Place labeled bottles on ice and deliver to Chesapeake Biological Laboratory
 - Chesapeake Biological Laboratory does all filtering and analysis



Calvert County 12-Digit Watersheds



Reference Sites

- The Gray's Creek site in the Calvert Cliffs Park has had excellent water quality at every sampling time and thus is an excellent reference site.

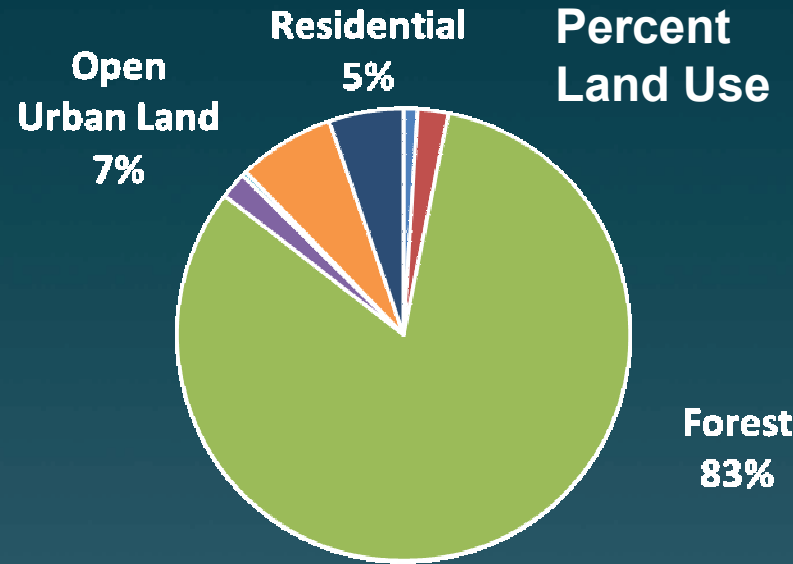
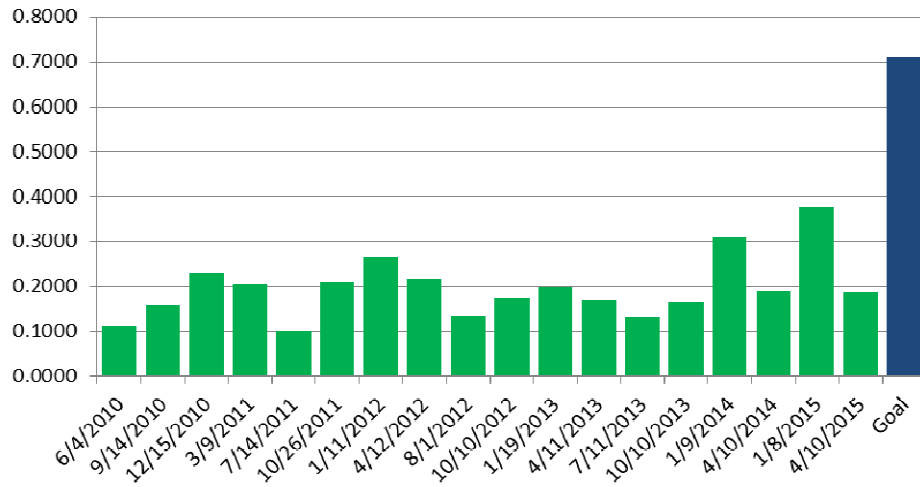


Gray's Creek Calvert Cliff State Park

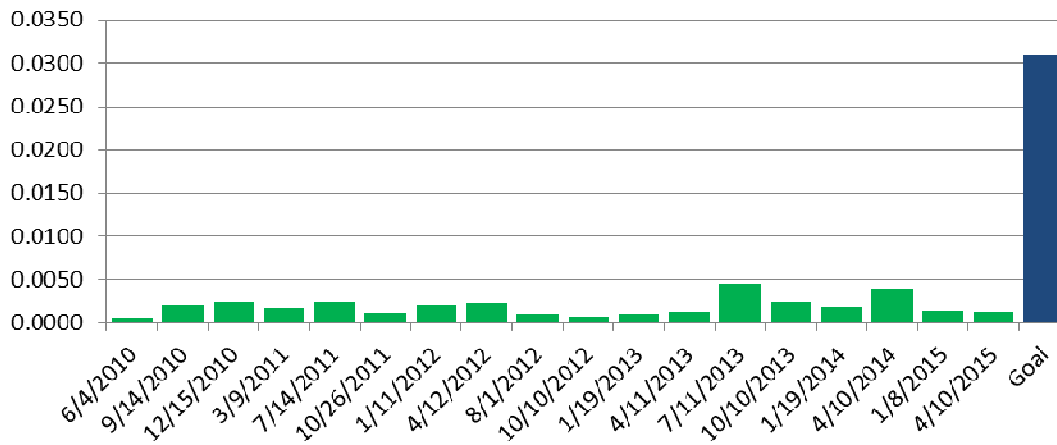


Gray's Creek, Calvert Cliff State Park

Gray's Creek 2 (CCP) NO₃ (mg/l)



Gray's Creek 2 (CCP) PO₄ (mg/l)



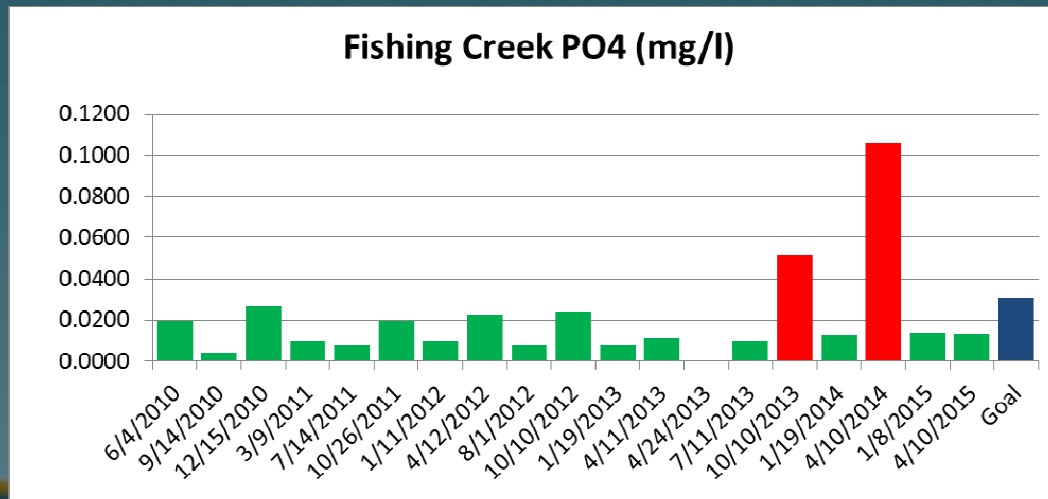
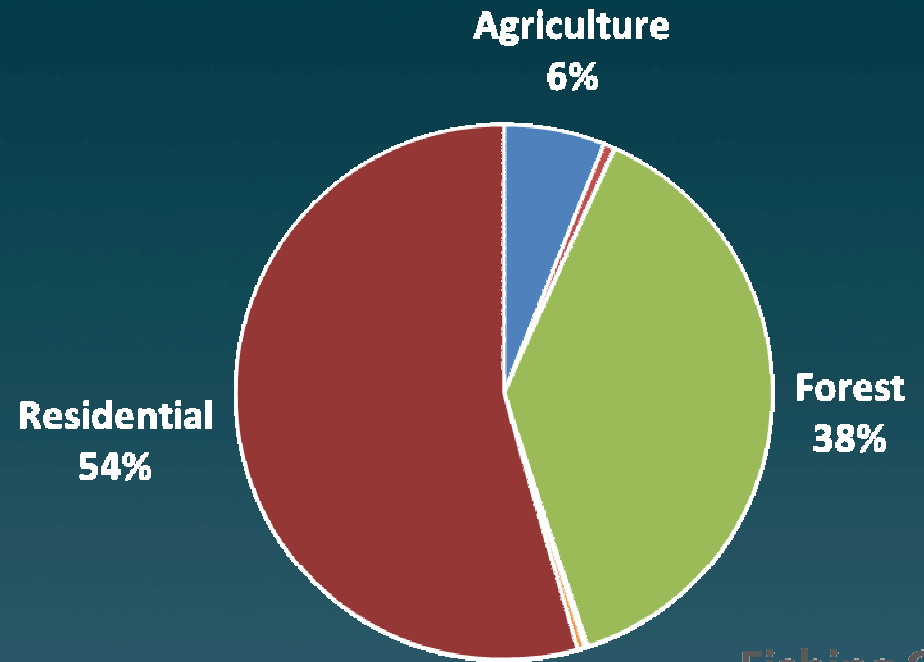
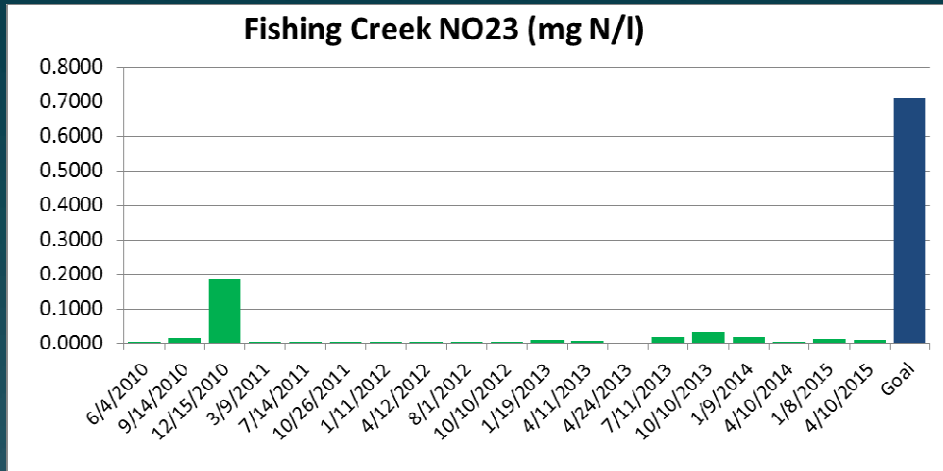
Fishing Creek



Fishing Creek



Fishing Creek



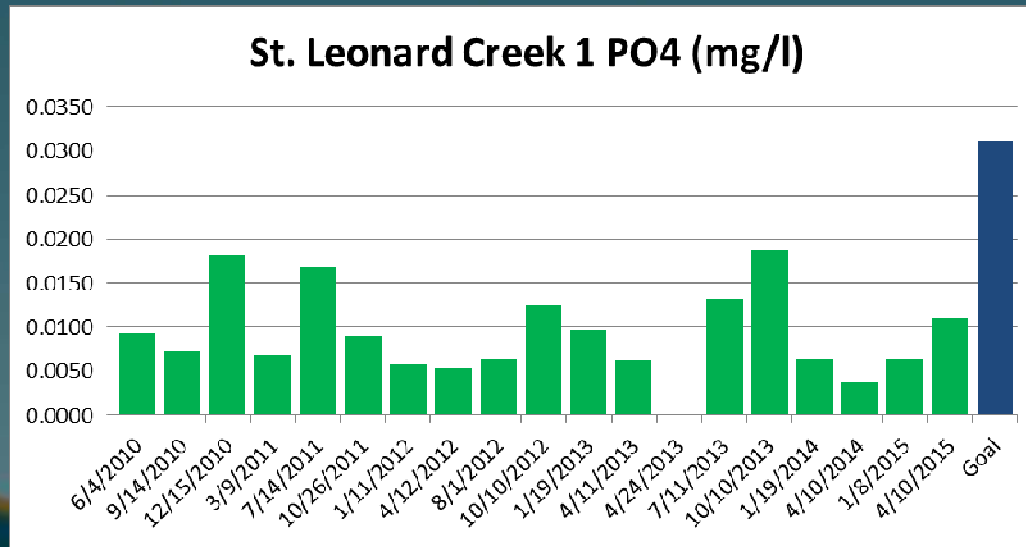
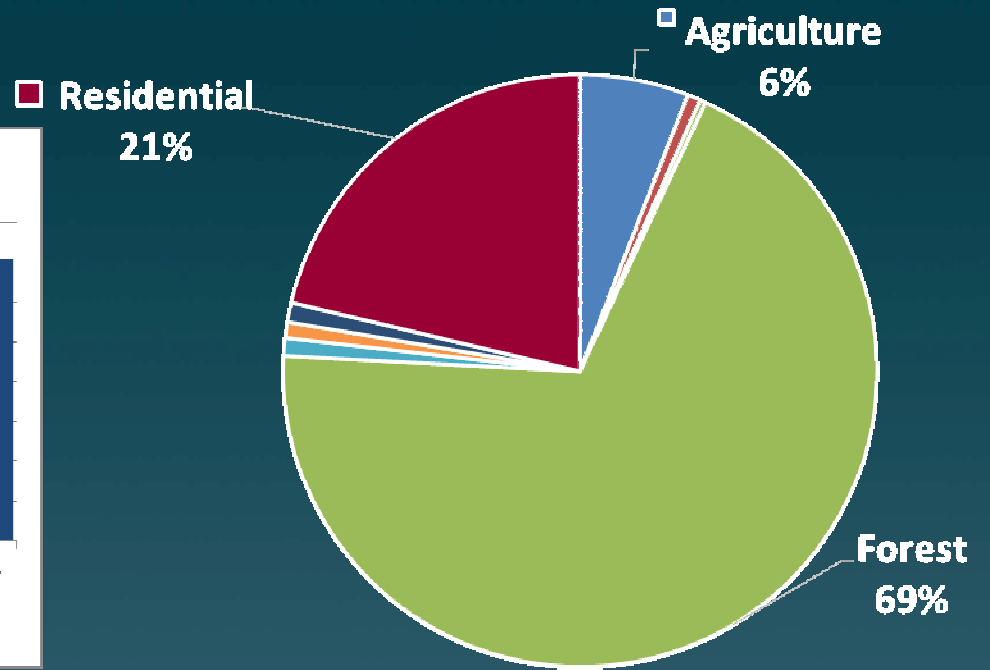
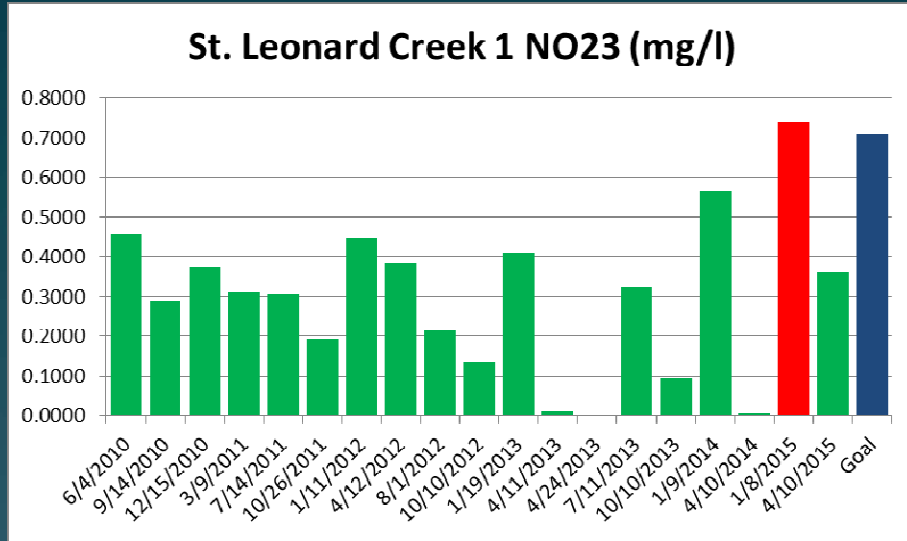
Fishing C

Percent
Land Use

St. Leonard's Creek



St. Leonard Creek



Percent Land Use

Sites with High Nutrient Levels

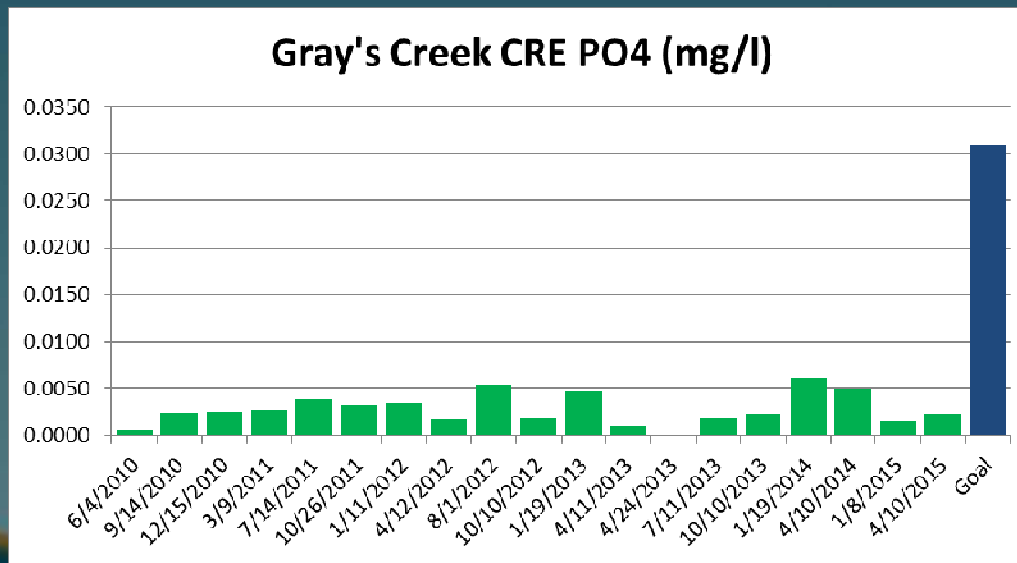
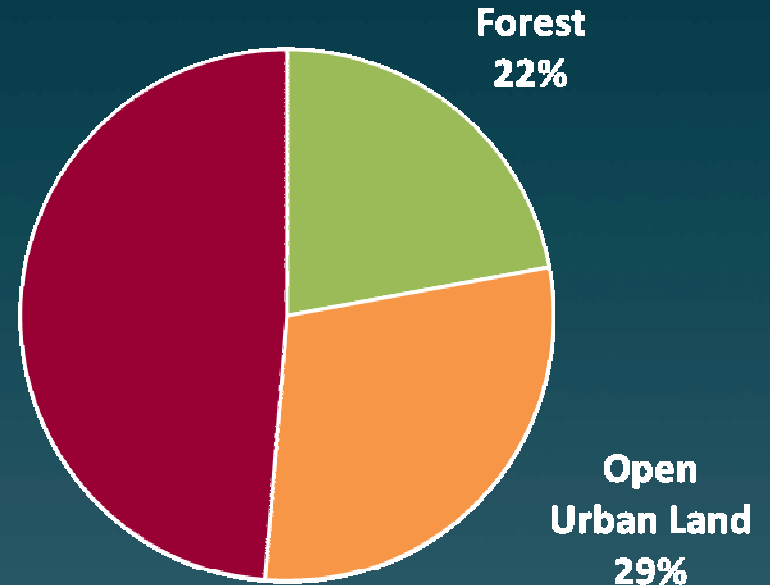
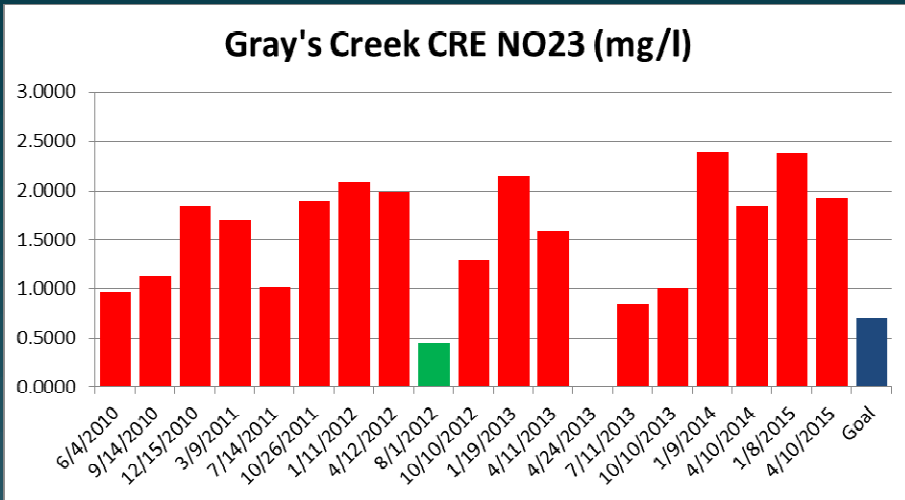
- These sites have nitrogen or nitrogen and phosphorus levels above the County goal for these nutrients in most instances.



Gray's Creek Chesapeake Ranch Estates



Gray's Creek, Chesapeake Ranch Estates

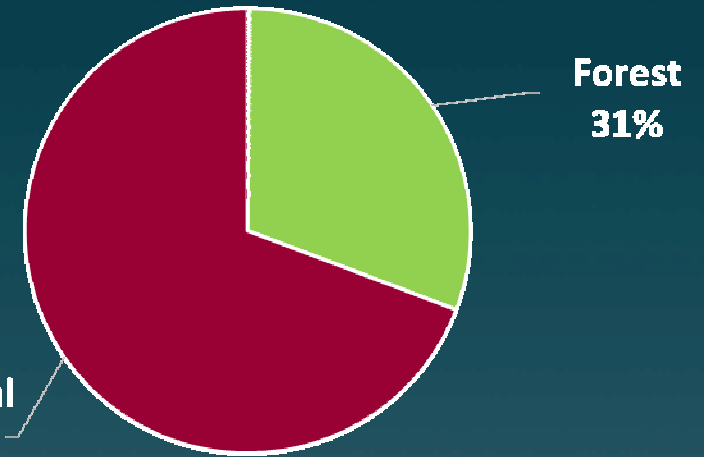
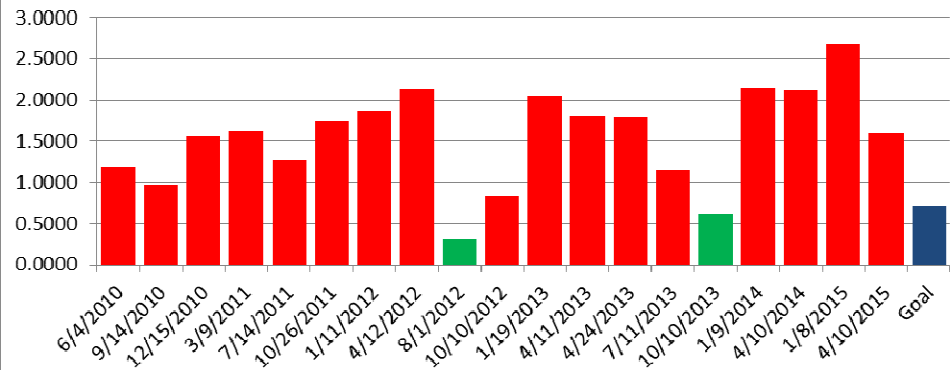


Calvert Beach Run



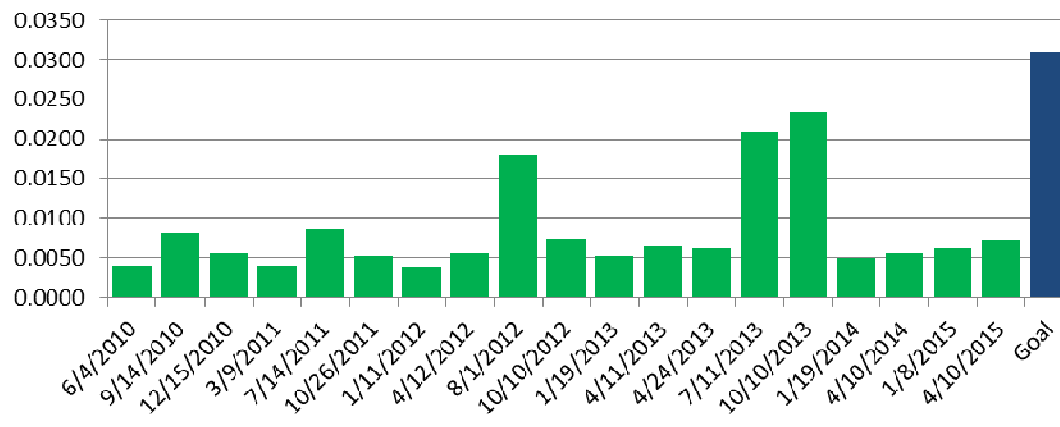
Calvert Beach Run, St. Leonard

Calvert Beach Run NO23 (mg N/l)



Percent Land Use

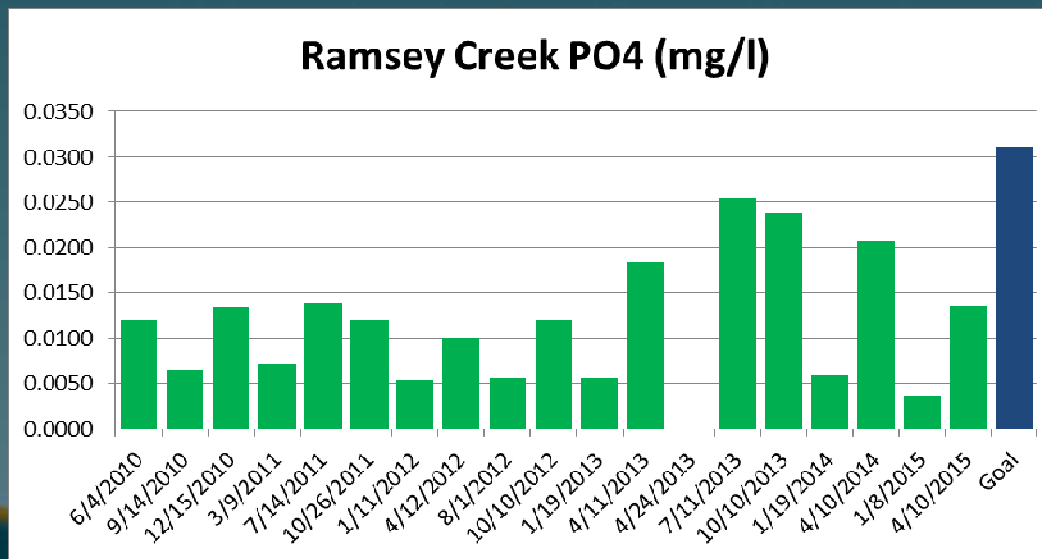
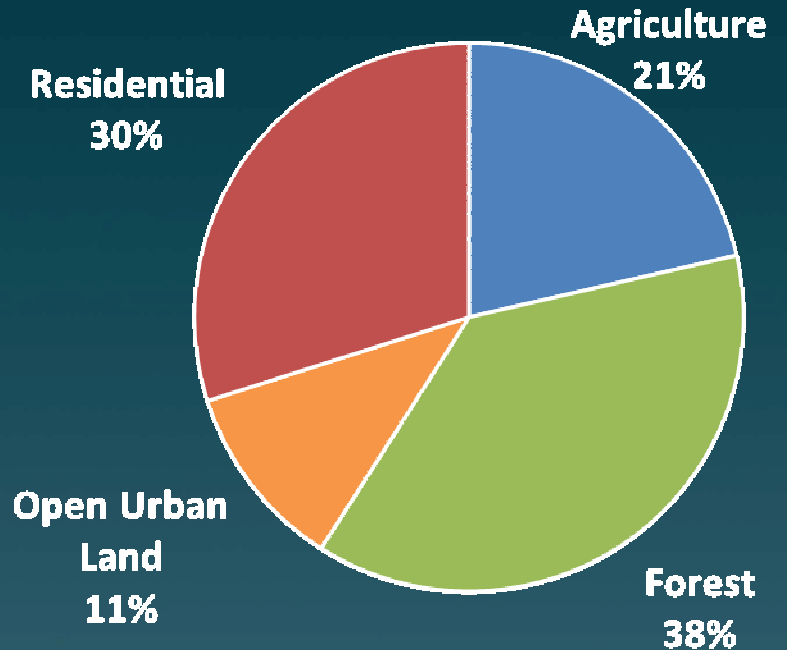
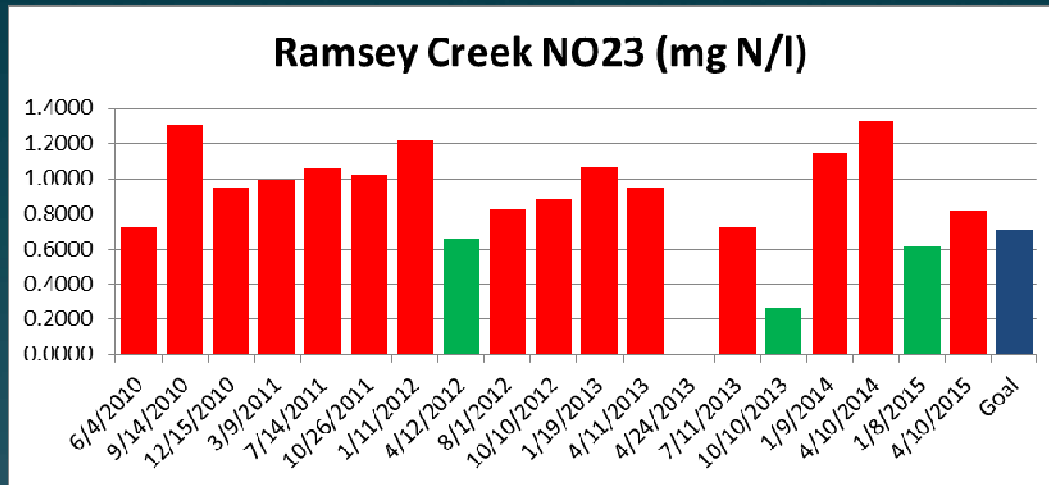
Calvert Beach Run PO4 (mg/l)



Ramsey Creek



“Ramsey Creek, Prince Frederick

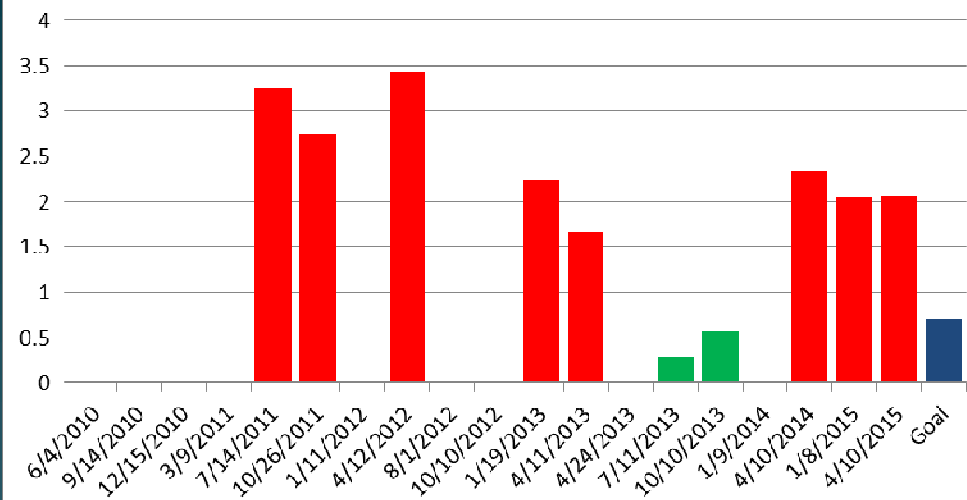


Little Lyons Creek

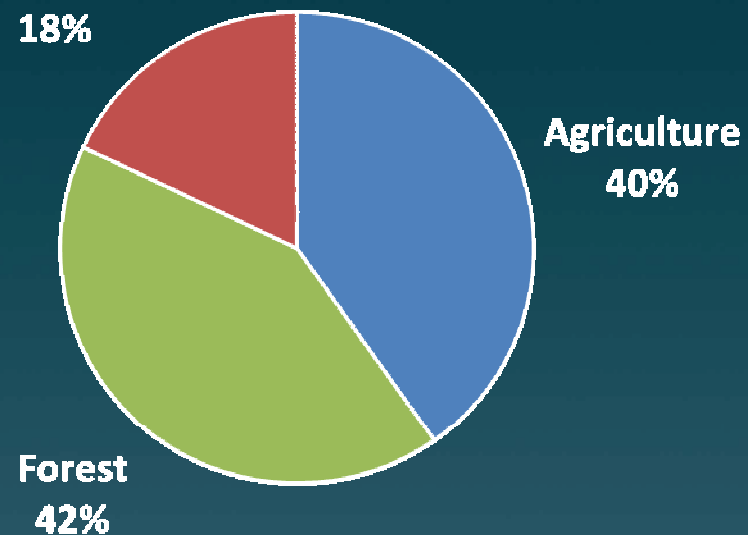


Little Lyons Creek

Hunting Creek 3 NO23 (mg/l)

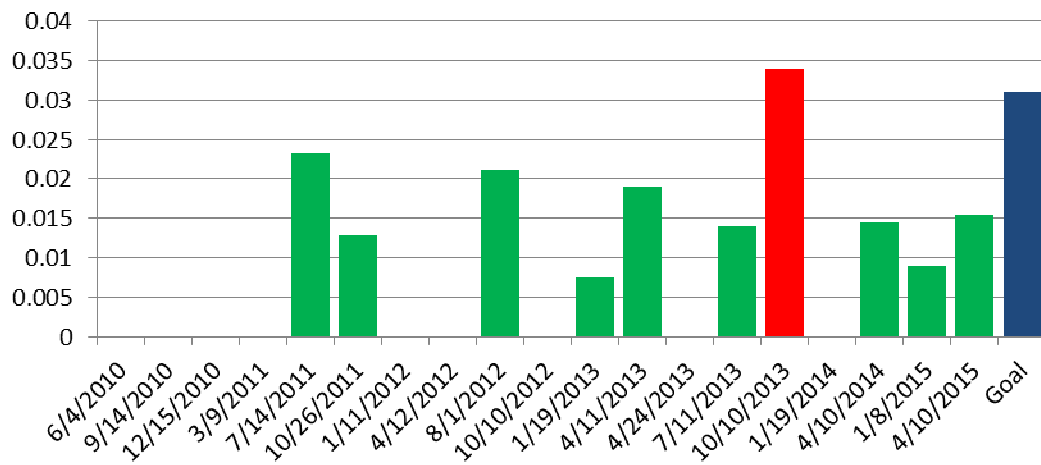


Residential
18%



**Percent
Land Use**

Hunting Creek 3 PO4 (mg/l)

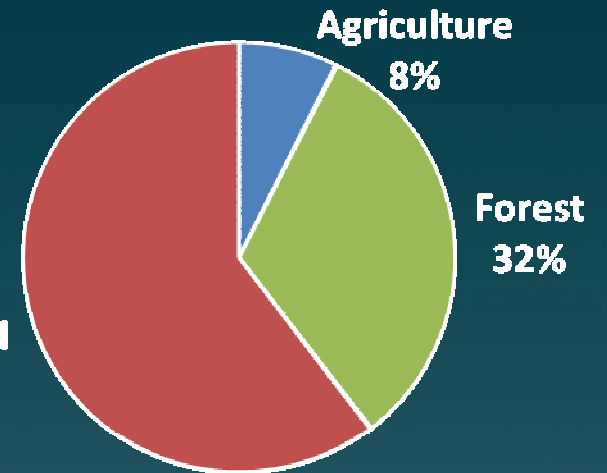
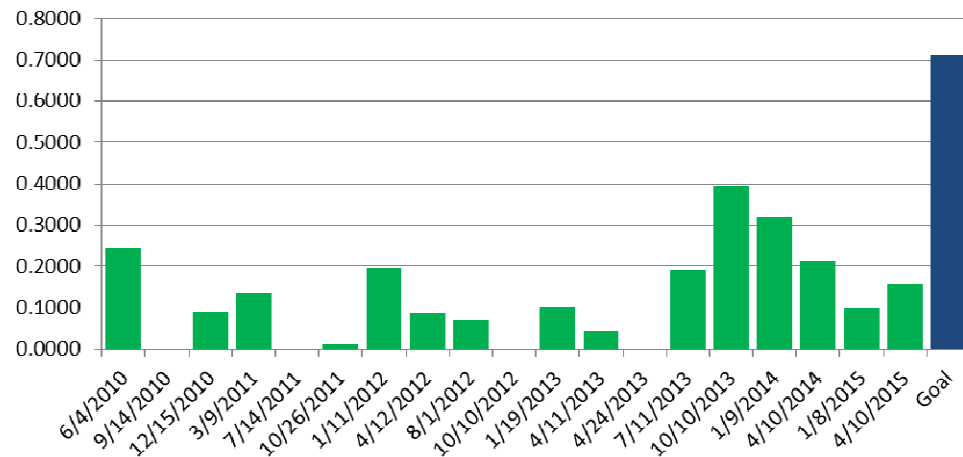


Plum Point Creek

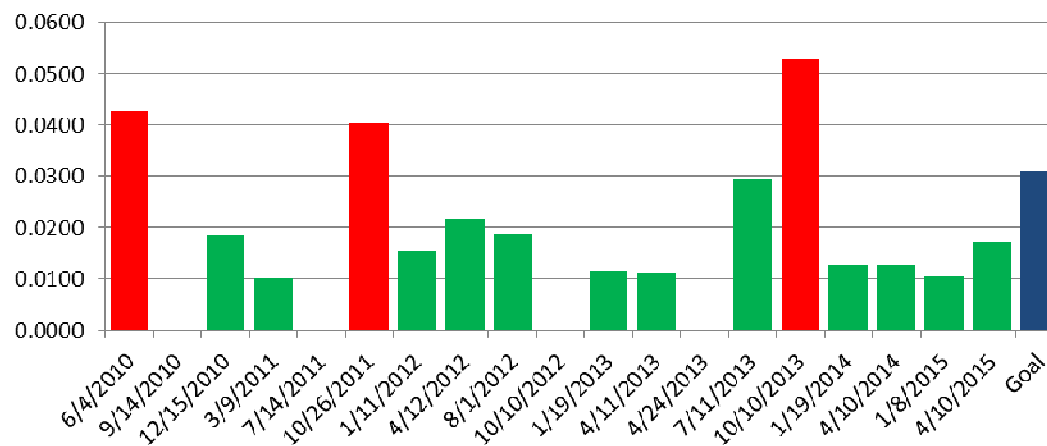


Plum Point Creek

Plum Point Creek NO₂3 (mg N/l)



Plum Point Creek PO₄ (mg/l)



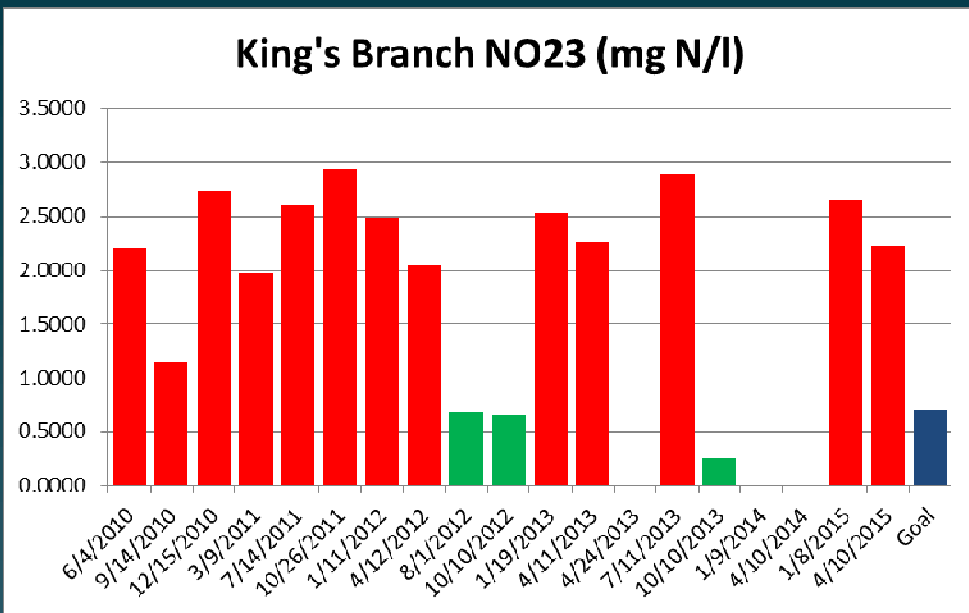
Percent Land Use



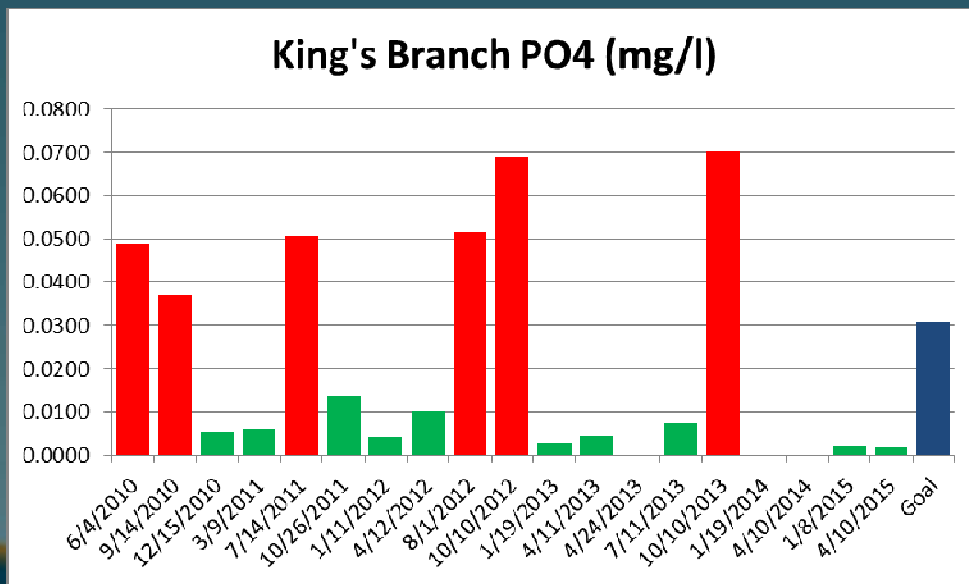
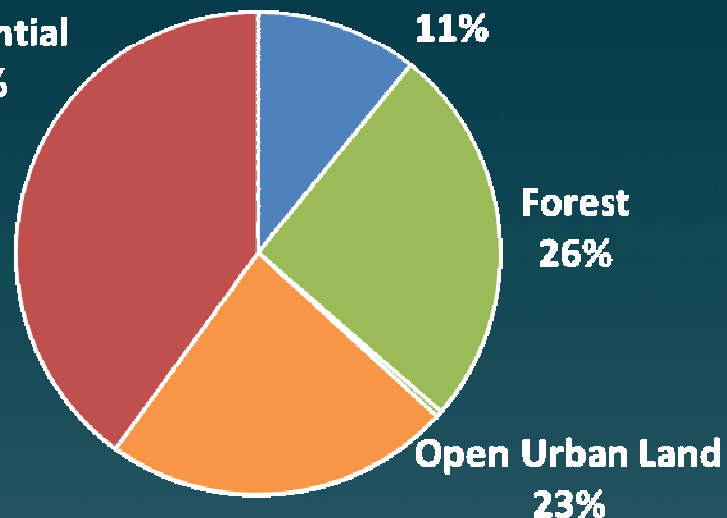
King's Branch



King's Branch



Residential
40%



Percent
Land Use

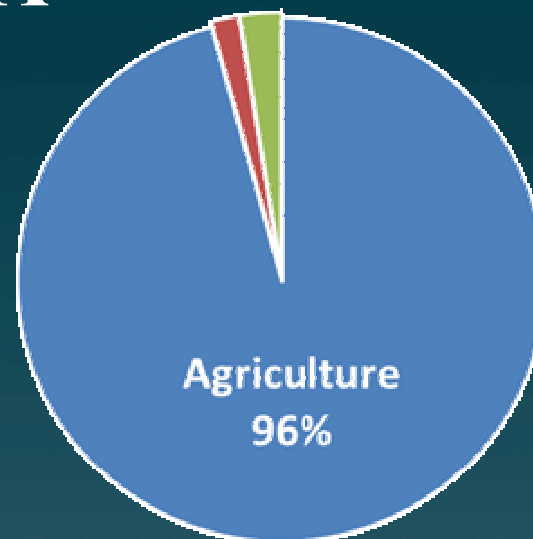
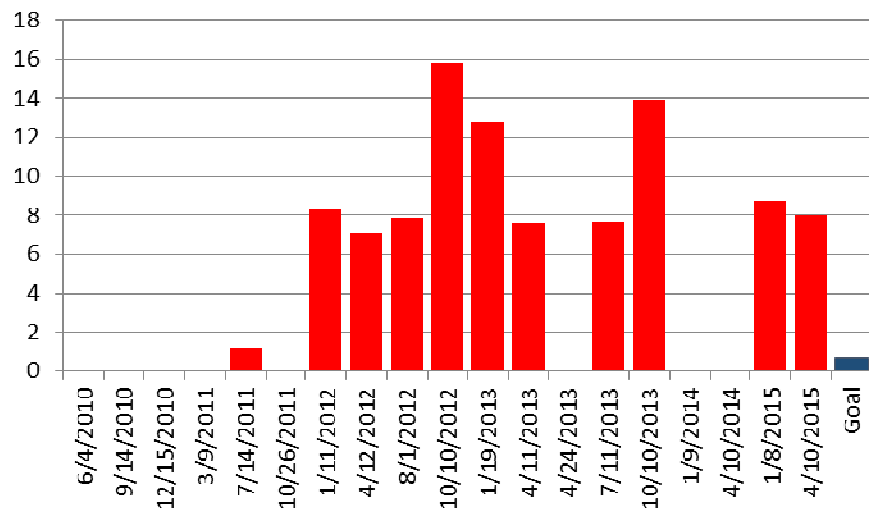


King's Branch Unnamed Tributary (Smithville 7A)



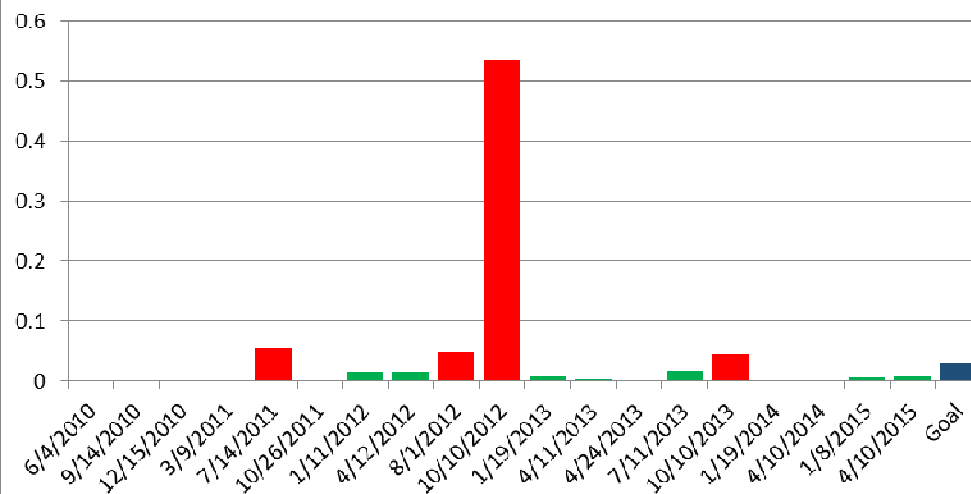
Smithville 7A

Smithville 7A NO₃ (mg N/l)



Percent Land Use

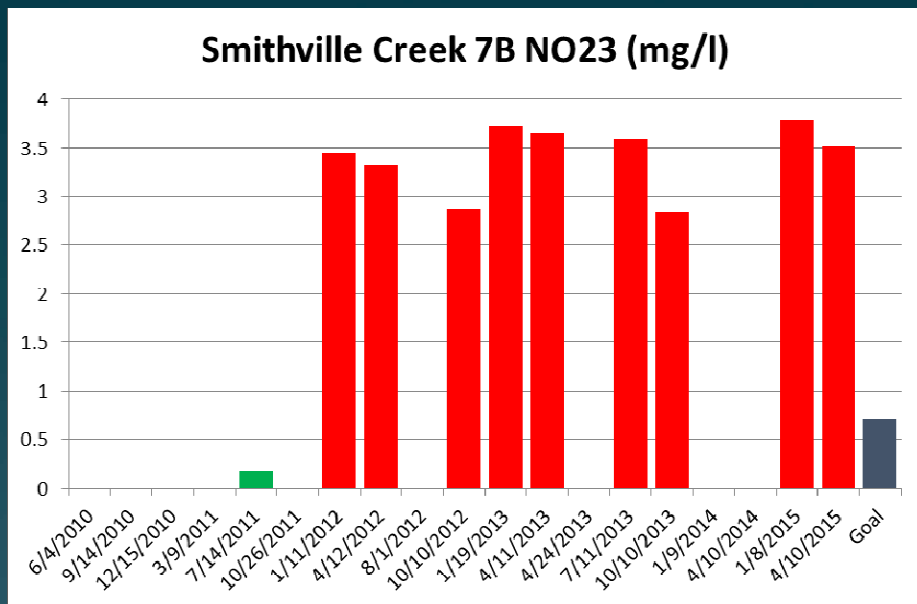
Smithville 7A PO₄ (mg/l)



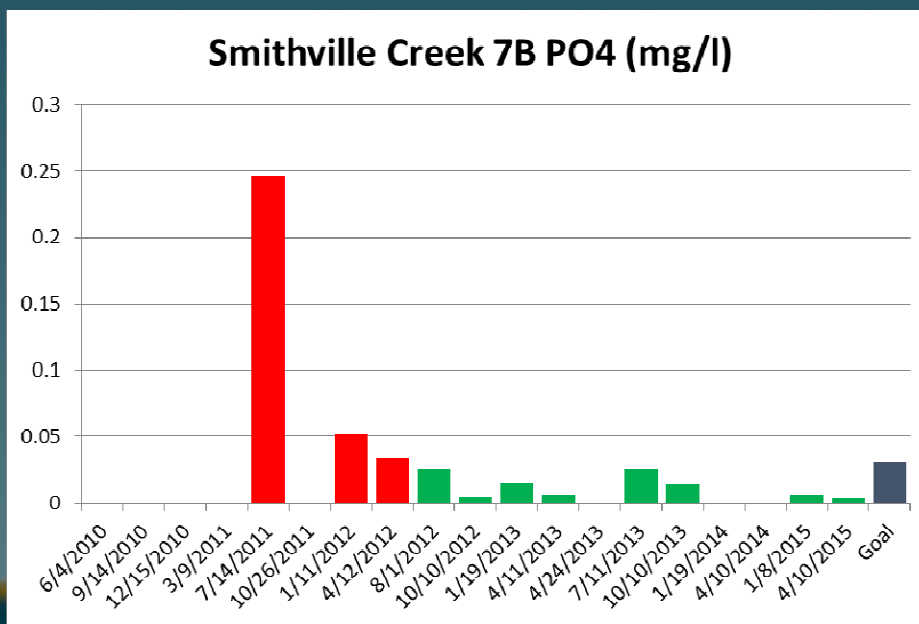
King's Branch Unnamed Tributary (Smithville 7B)



Smithville 7B



Percent Land Use

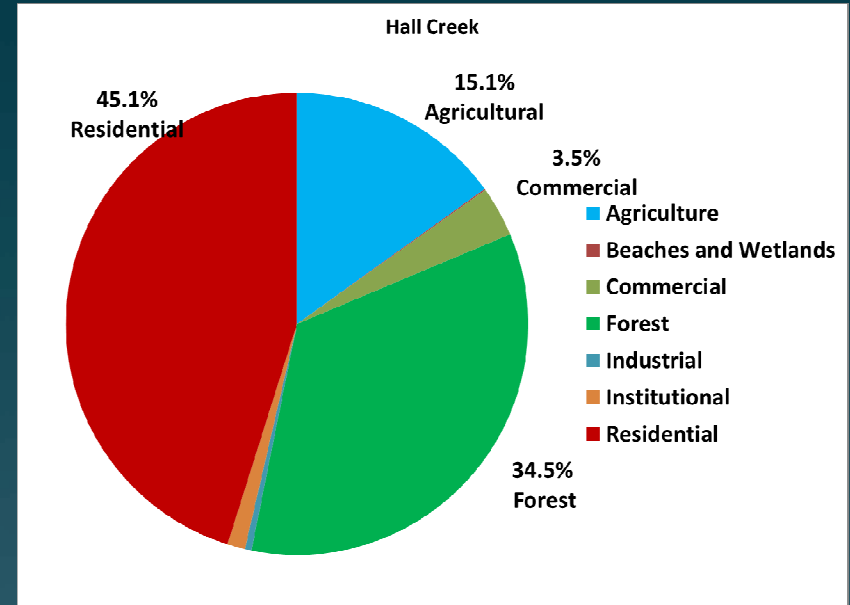
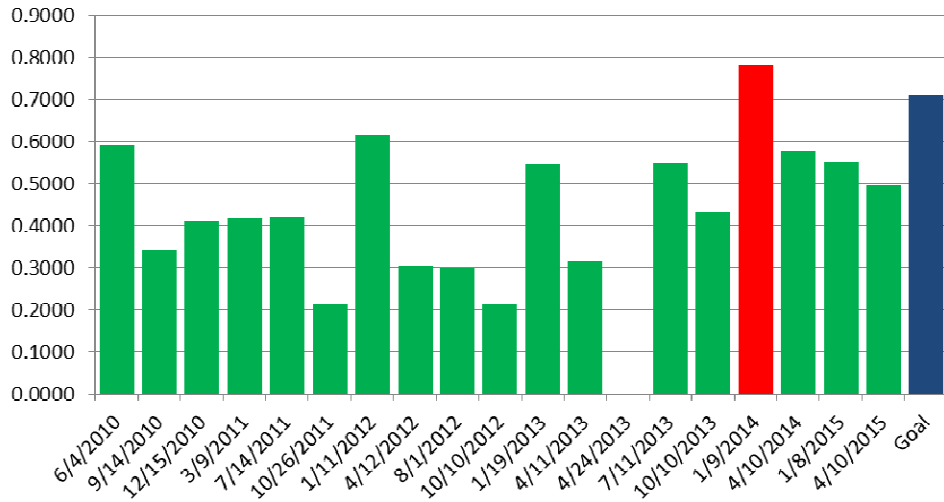


Hall Creek

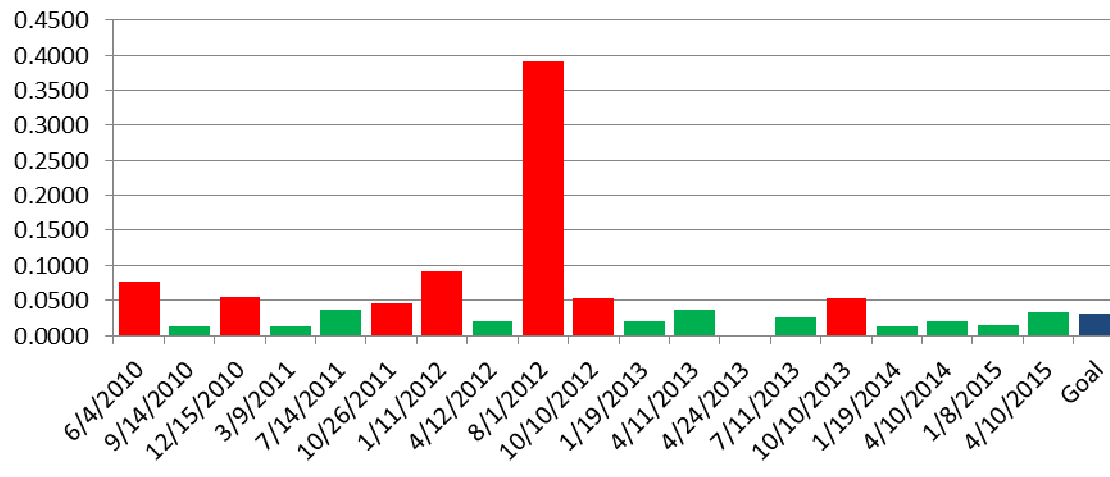


Hall's Creek

Hall Creek NO23 (mg N/l)



Hall Creek PO4 (mg/l)



Percent Land Use

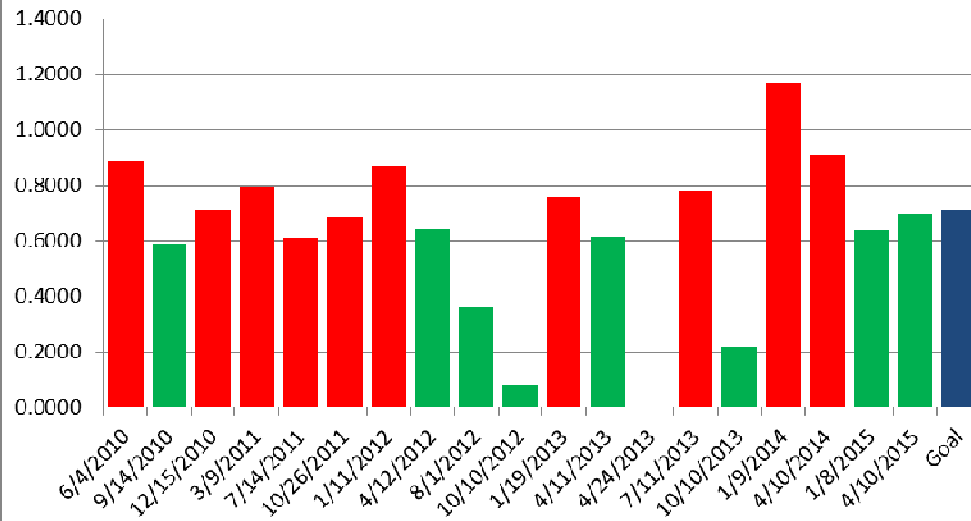


Hall Creek

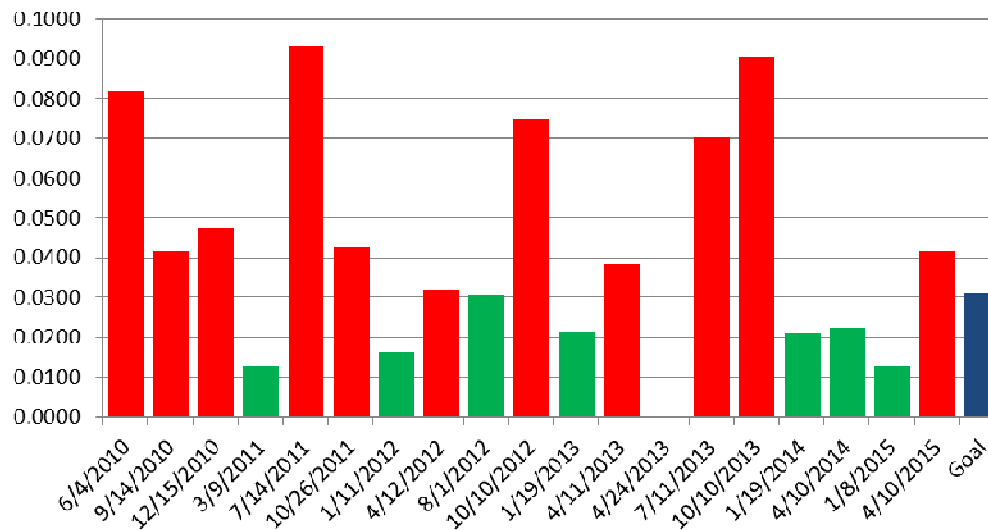


Lyons's Creek

Lyons Creek NO23 (mg N/l)

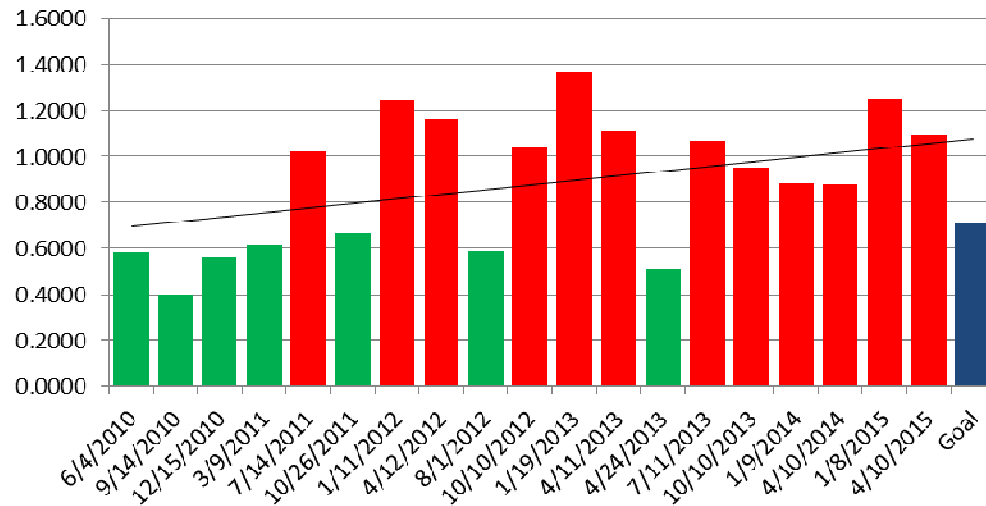


Lyons Creek PO4 (mg/l)

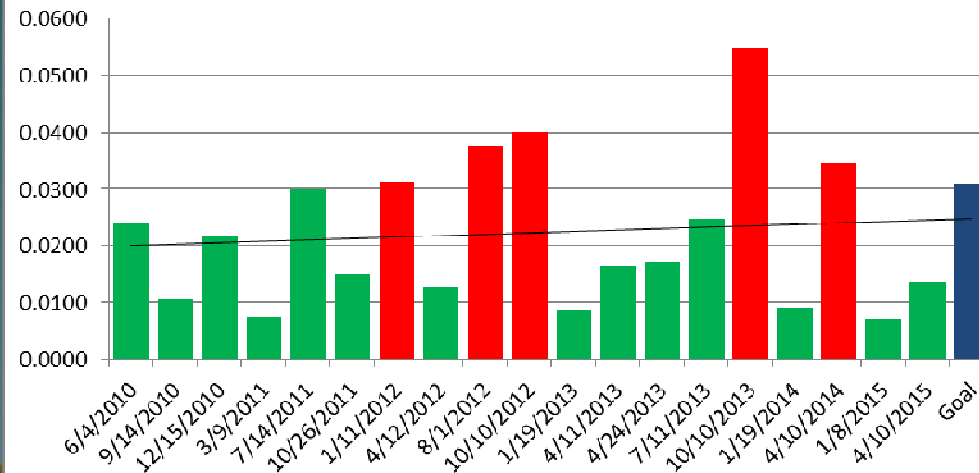


“Mean for All Stations

Mean NO23 (mg N/l)



Mean PO4 (mg P/l)



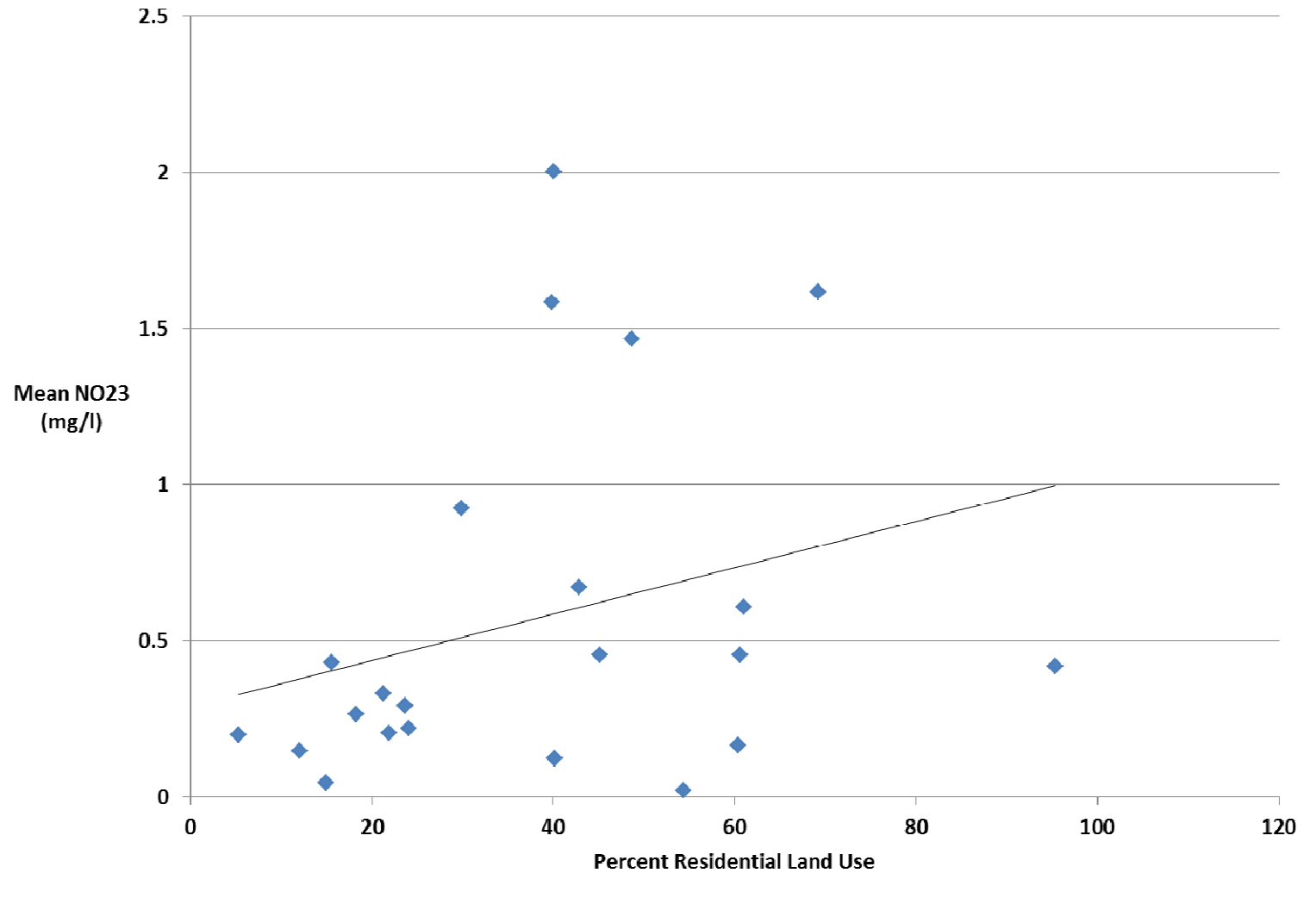
Trends in Nitrogen (NO₂)

- NO₂ increases with increase in residential or agricultural land
- If Forests has a land use coverage of over 50%, then the NO₂ is low
- 2010-2015 trend of increasing nitrogen concentrations

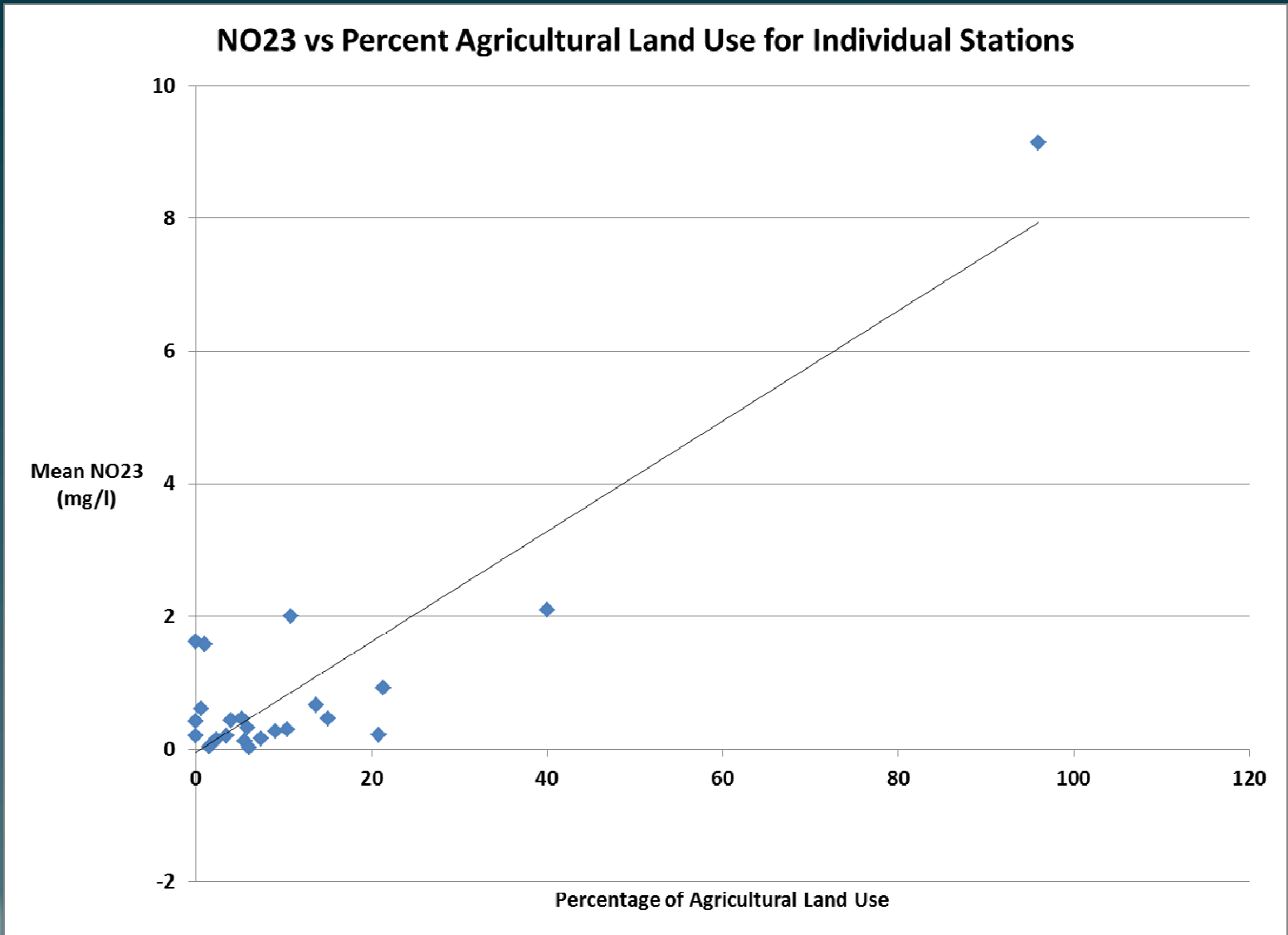


Nitrogen Trends

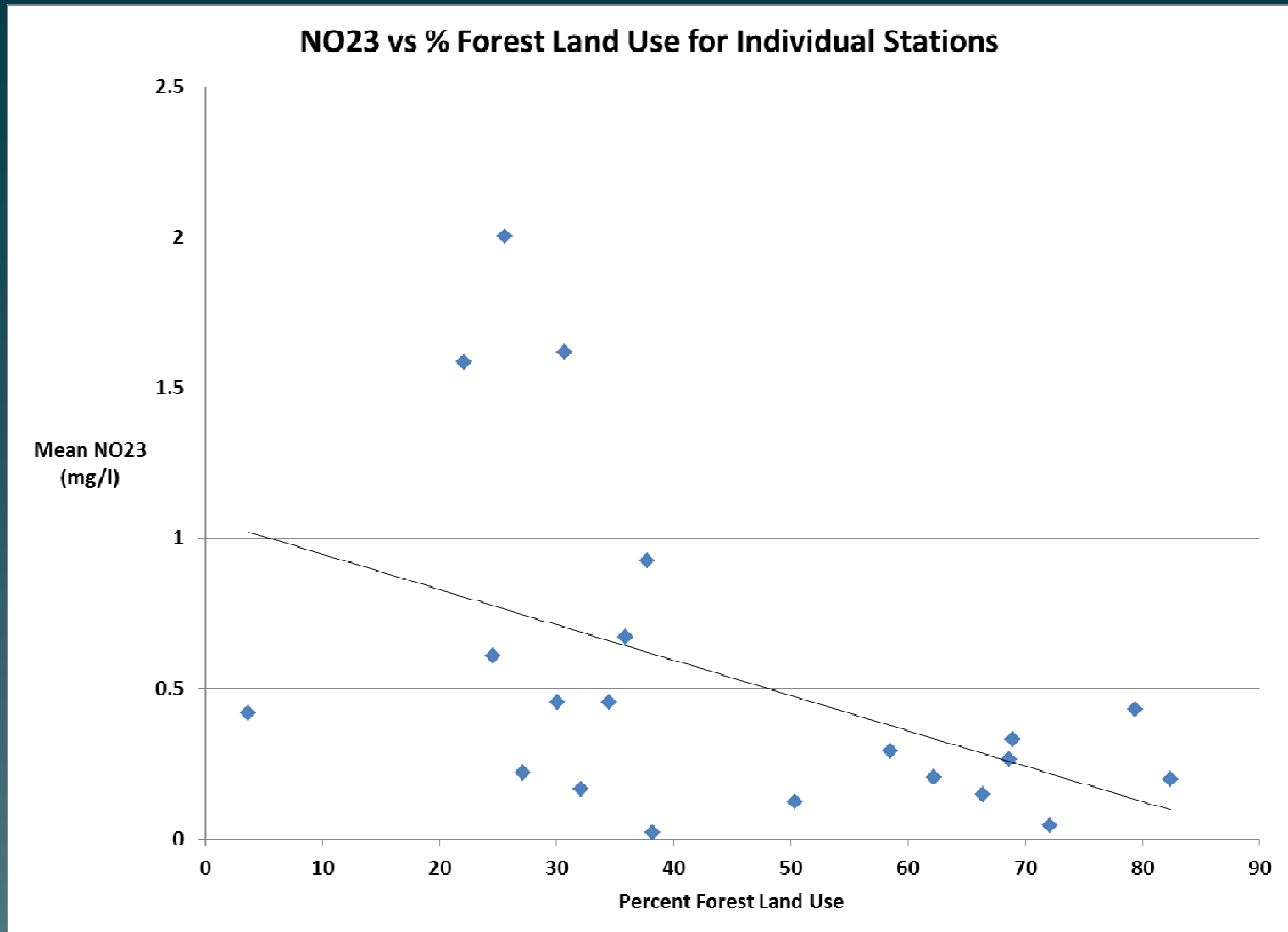
NO23 vs Percent Residential Land Use for Individual Stations



Nitrogen Trends



Nitrogen Trends

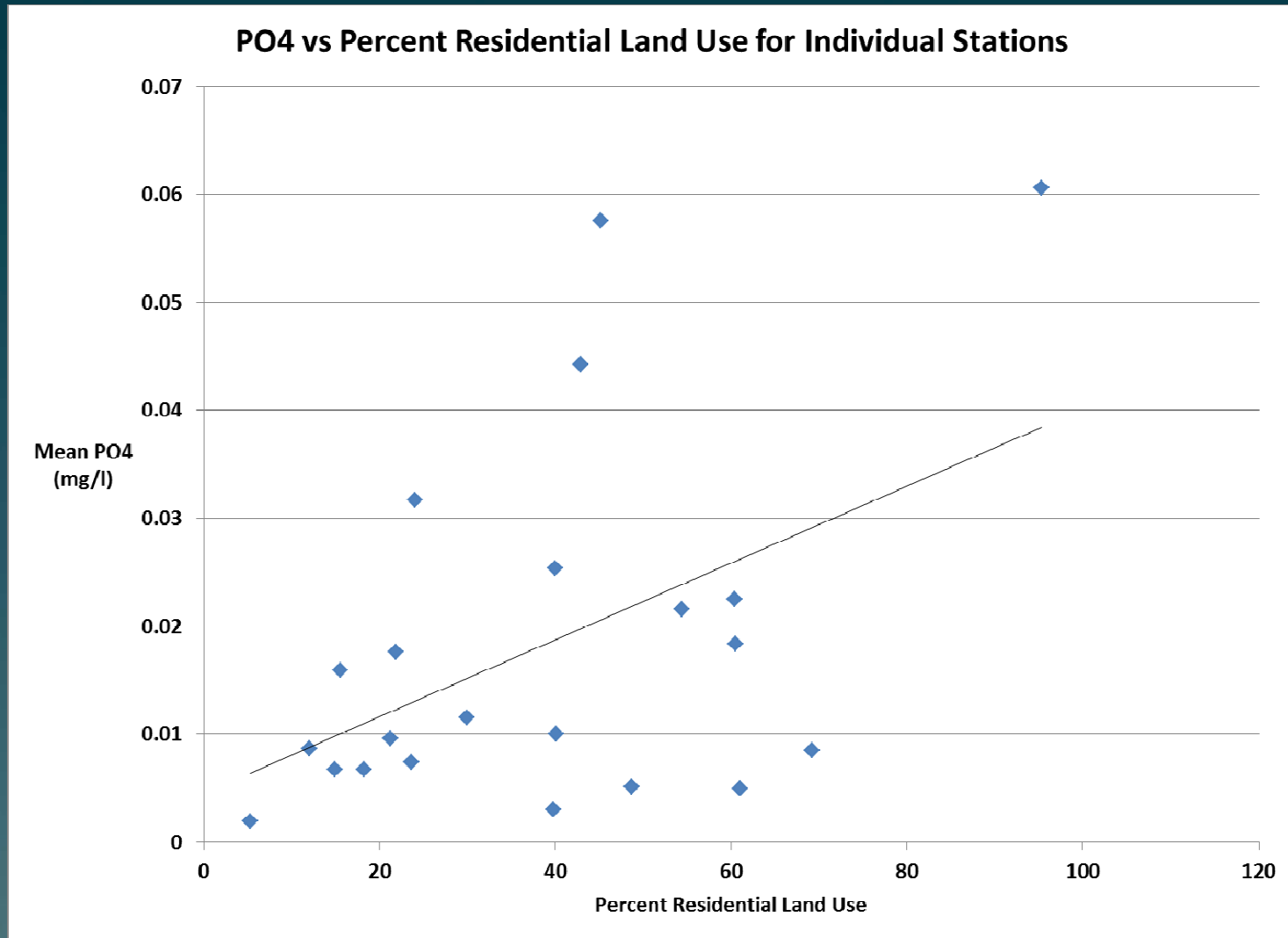


Trends in Phosphate (PO₄)

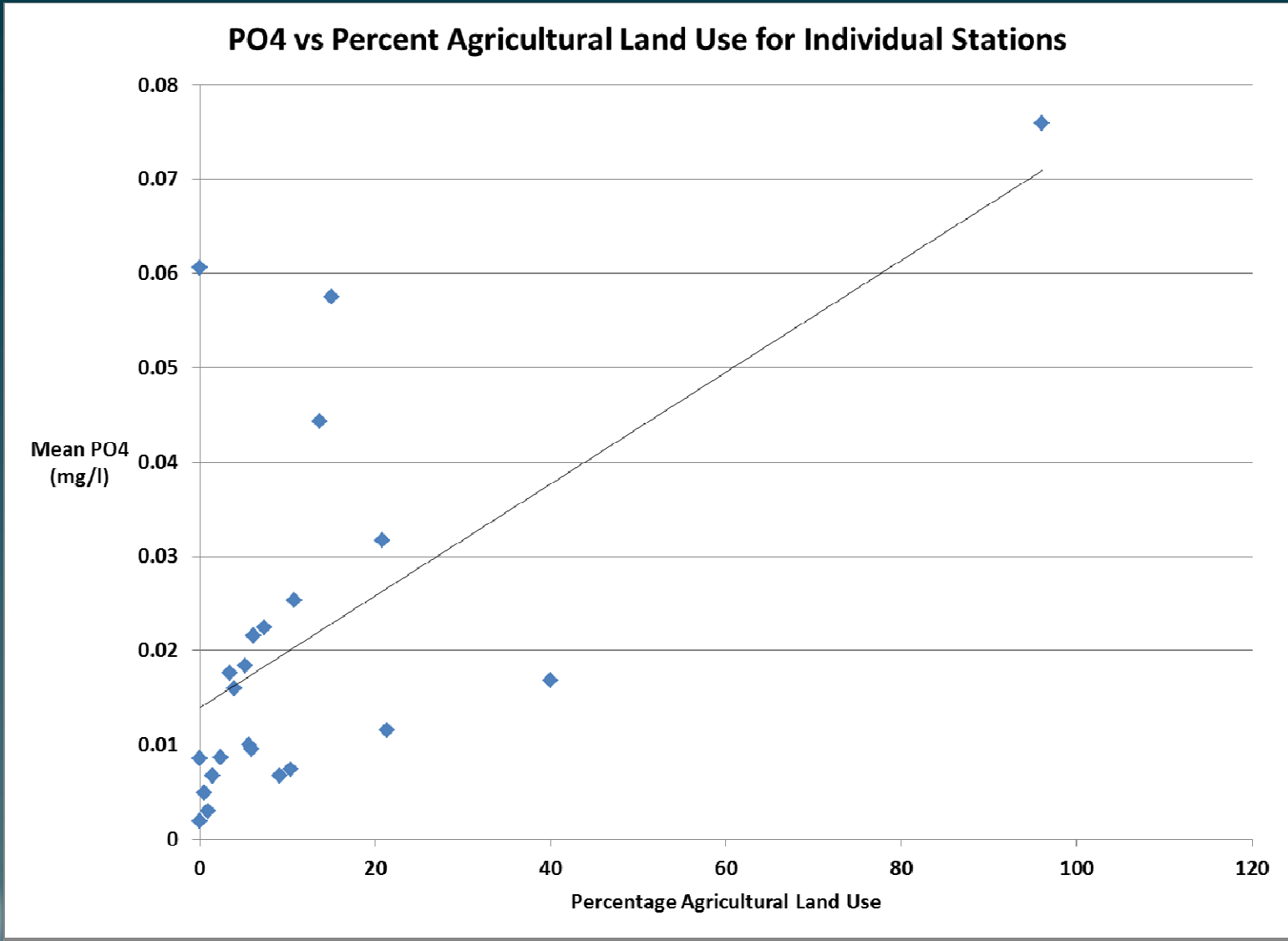
- Increases with percent residential or agricultural land
- Highest PO₄ located in north half of County
- Not as consistently high as nitrogen
- If Forests has a land use coverage of over 50%, then the NO₂₃ is low
- 2010-2015 slight trend of increasing phosphorus concentrations



Phosphorous Trends

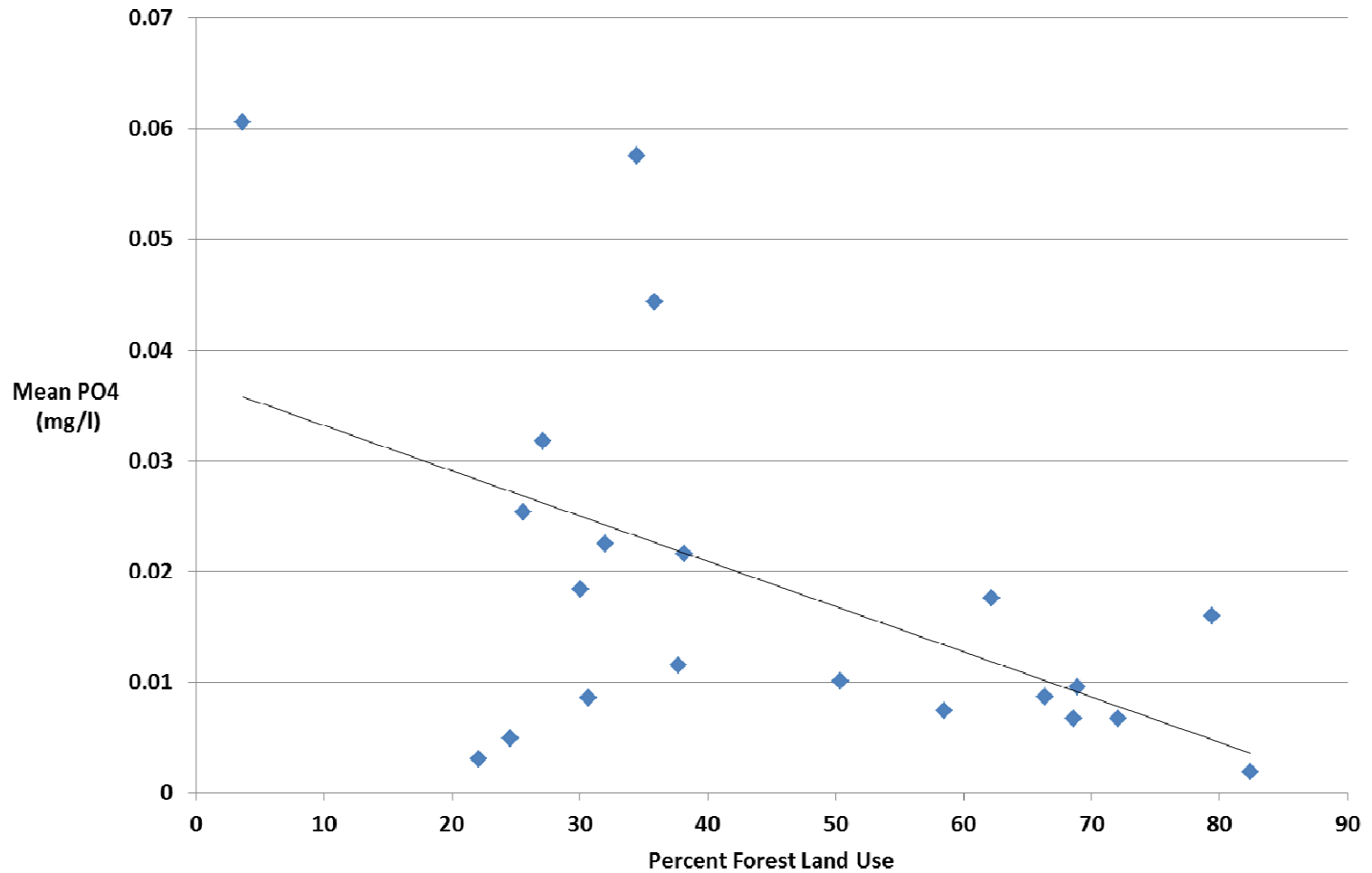


Phosphorous Trends

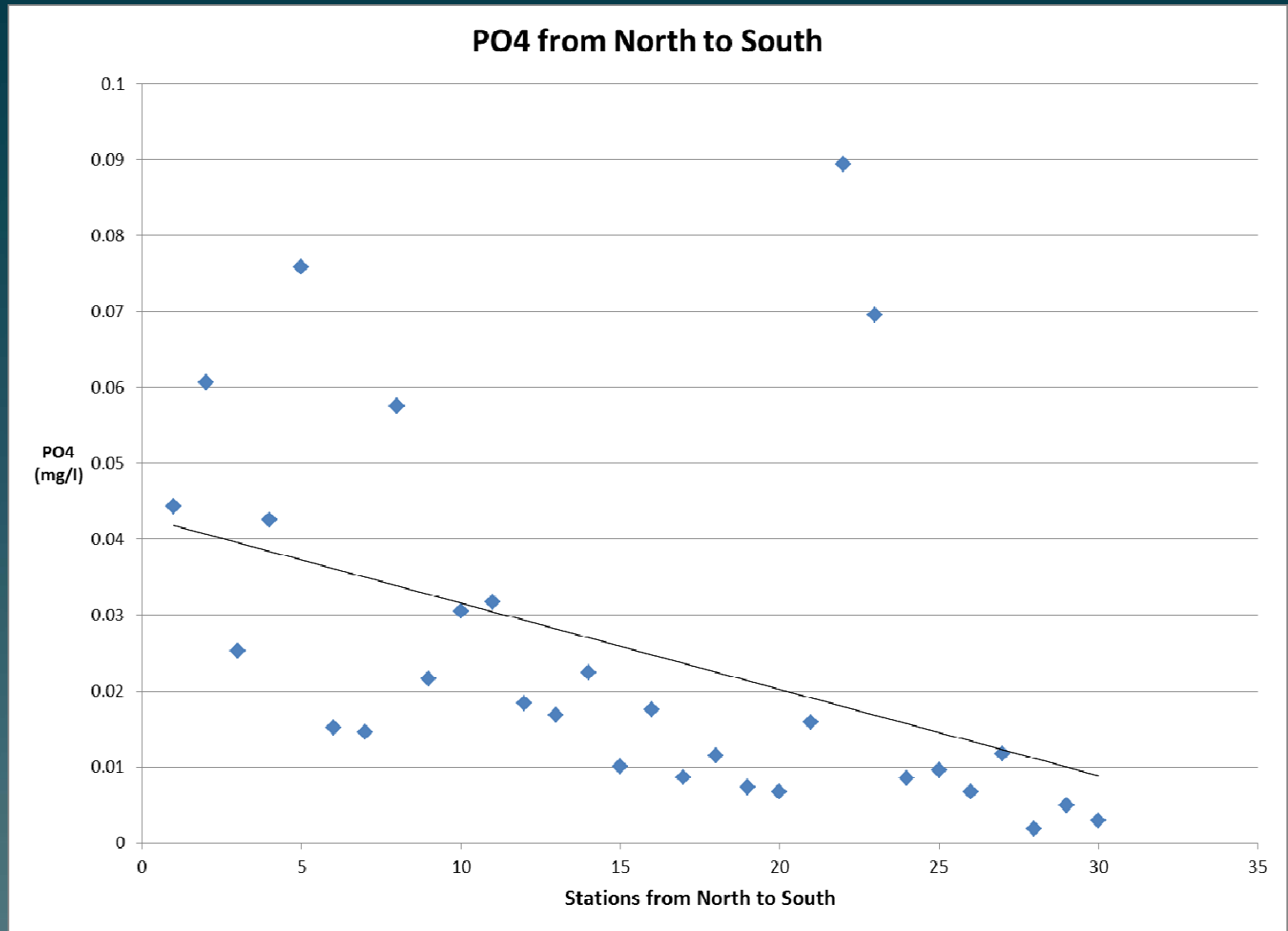


Phosphorous Trends

PO4 vs % Forest Land Use for individual Stations



Phosphorous Trends



Water Quality Monitoring

- Measuring Loading Rates
 - County purchased Hack Flow meter in 2012 with CPNHT support.
 - Has measured loading rates between 2013 and April 2015.



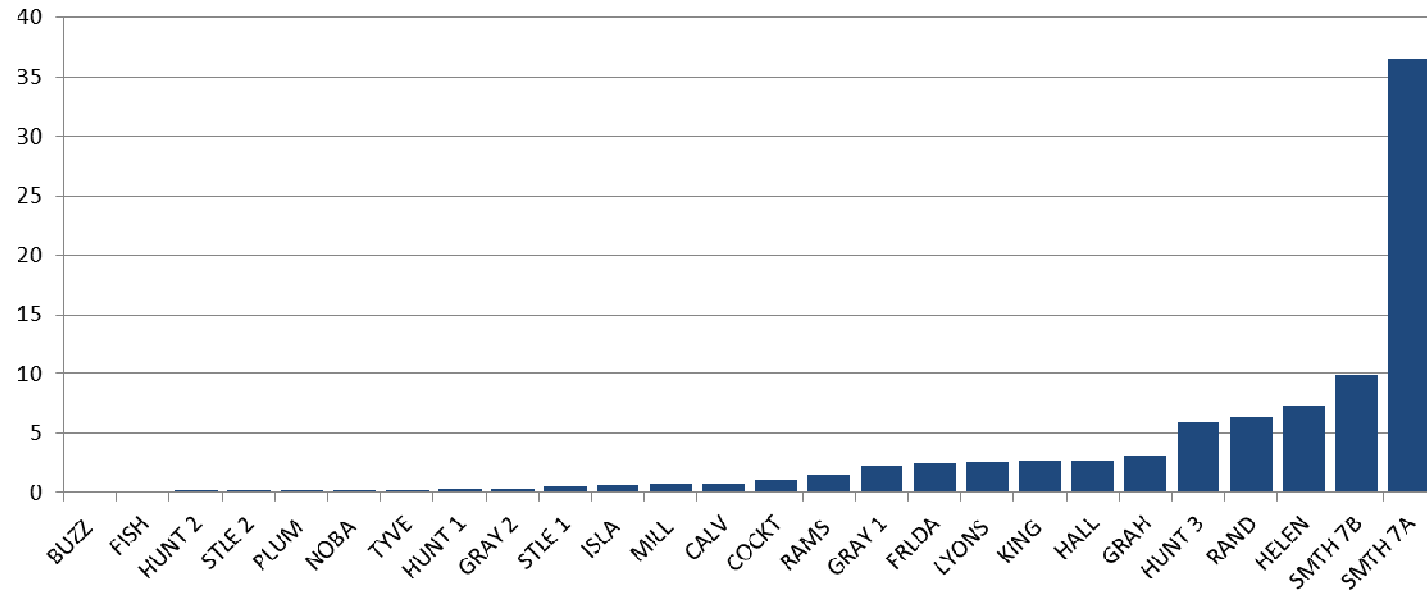
Measuring Discharge



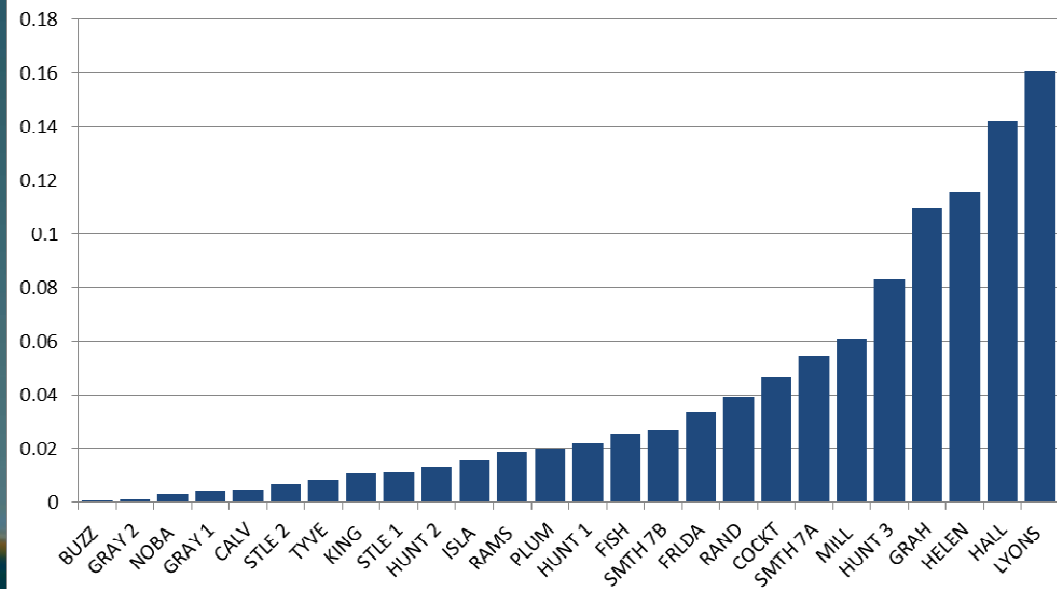
From October 2012- April 2014 Time Period	Average Nitrogen Loading (lbs/yr)	Nitrogen Loadings Projected from Land Use Model	Percent Actual of Projected
Buzzard Island Creek 1	109.64	7,737.73	1.42%
Calvert Beach Run 1+2	774.43	9,599.47	8.07%
Cocktown Creek 1	5,683.88	37,699.63	15.08%
Fishing Creek 1	181.13	106,801.00	0.17%
Graham Creek 1	2,993.38	6,519.40	45.91%
Gray's Creek 1 (CRE)	711.92	6,548.59	10.87%
Hall Creek 1	18,528.44	17,462.82	106.10%
Hunting Creek 1	8,260.25	153,851.00	5.37%
Hunting Creek 2	1,203.11	32,256.00	3.73%
Island Creek 1	1,204.71	5,410.11	22.27%
King's Branch 1	2,802.19	7,634.70	36.70%
Mill Creek 1	9,598.58	75,215.28	12.76%
North Battle Creek 1	2,868.38	48,131.81	5.96%
Plum Point Creek 1	1,123.41	76,373.00	1.47%
Ramsey Creek 2	970.78	3,954.92	24.55%
St. Leonard Creek 1	3,102.10	43,863.93	7.07%
St. Leonard Creek 2	1,137.45	17,909.64	6.35%
Tyverne Creek 1	152.60	2,176.65	7.01%
			17.83%



Mean NO23 Loadings (lbs/yr/acre) by Station



Mean PO4 Loadings (lbs/yr/acre) by Station



Summary

- These baseline non-tidal water quality data can be used to measure the effectiveness of the Calvert WIP.
- These data can also identify problem areas where the County needs to direct clean-up efforts (BMPs)
- The longer the data series, the more useful for estimating impacts and trends.

