

WATER QUALITY MONITORING

2011 Results for the Middle Huron River Watershed

December 6, 2011



Protecting the river since 1965

Water Quality Monitoring Program

Collect water quality information from tributaries to the Huron River to evaluate sources of problems and measure the degree of management success



OUTLINE

- What was measured?
- Where?
- Important results
- How are the results being used?
- What's next?



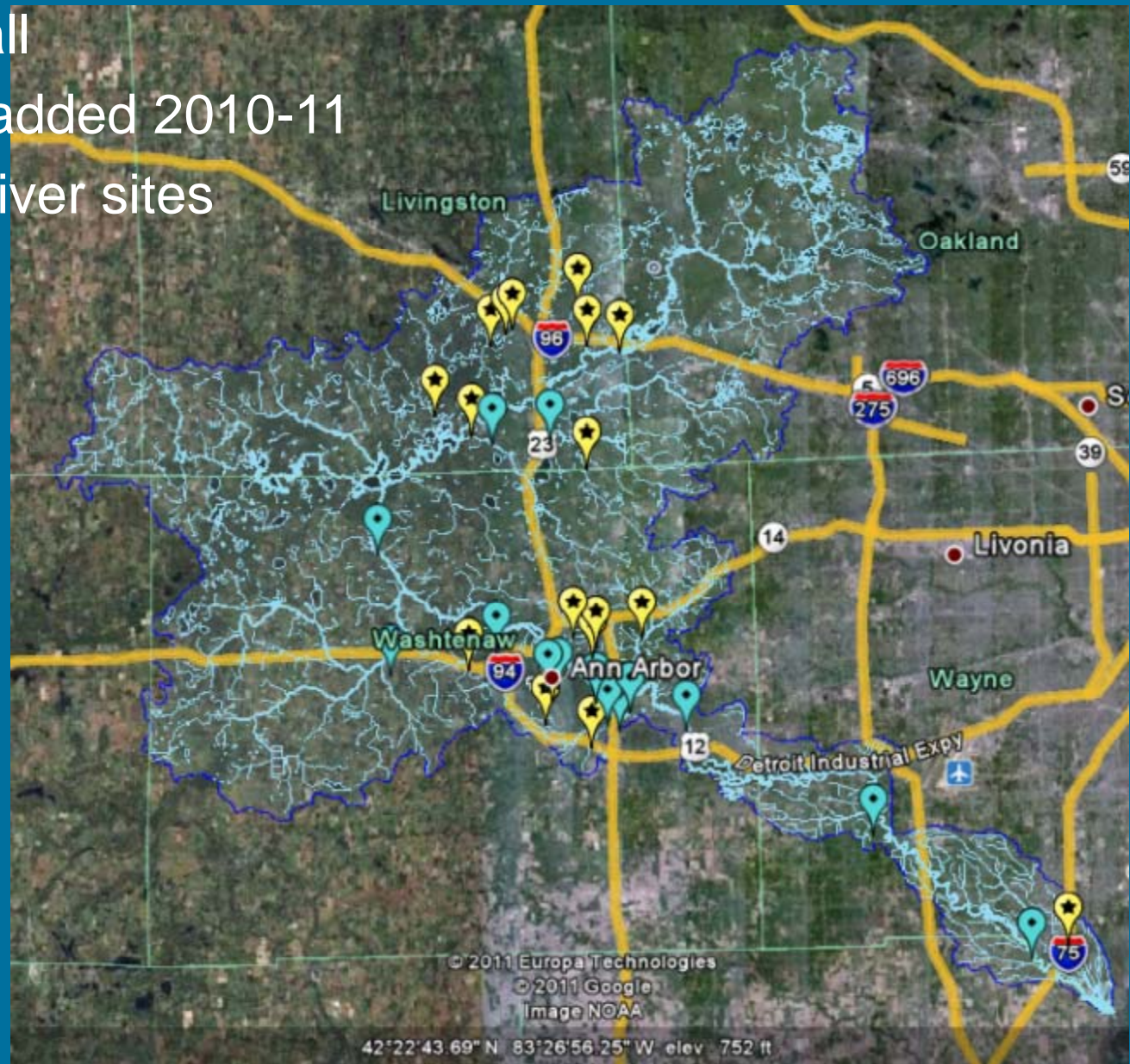
WHAT WAS MEASURED IN 2011?

- 46 volunteers
- 325 sample sets collected
 - Nutrients (Phosphorus, Nitrogen)
 - Sediments (Total Suspended Solids)
 - Bacteria (*E. coli*)
 - Other (Dissolved Oxygen, pH, Temperature, Conductivity)
- 65 flow measures
- 80 investigative samples
- 8 storm samples

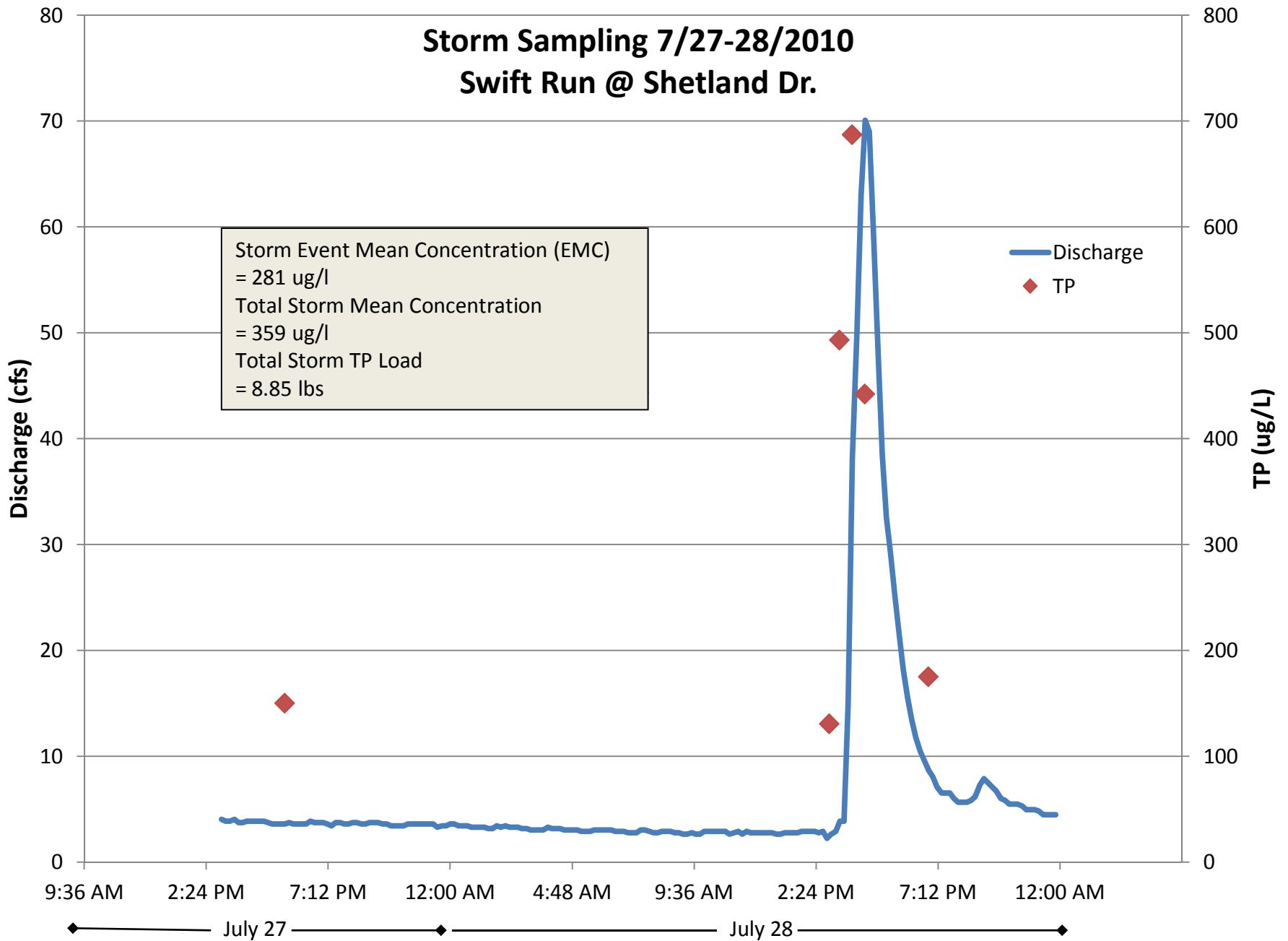
- 33 sites overall
- 19 new sites added 2010-11
- 17 creeks, 3 river sites

 Existing sites

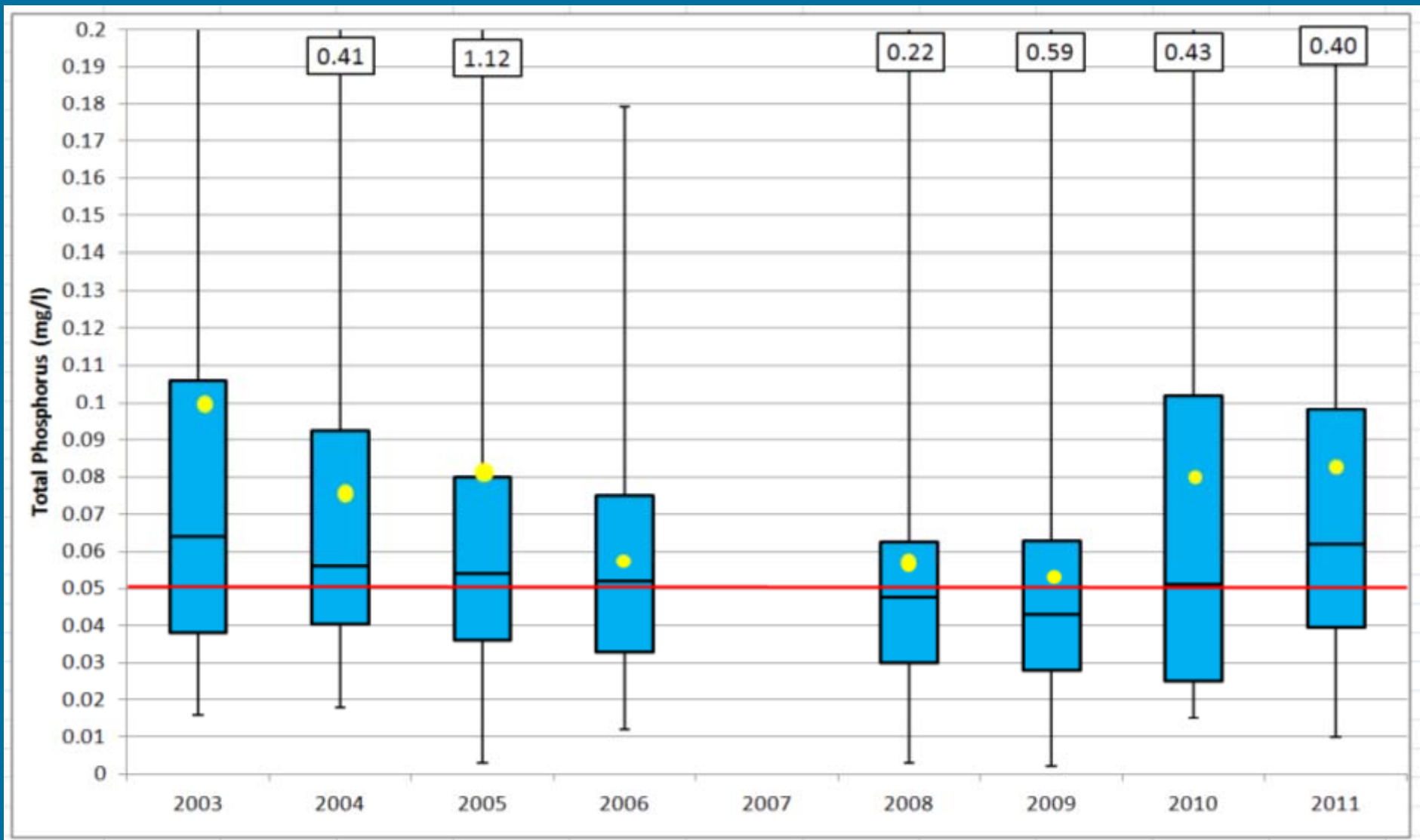
 New sites



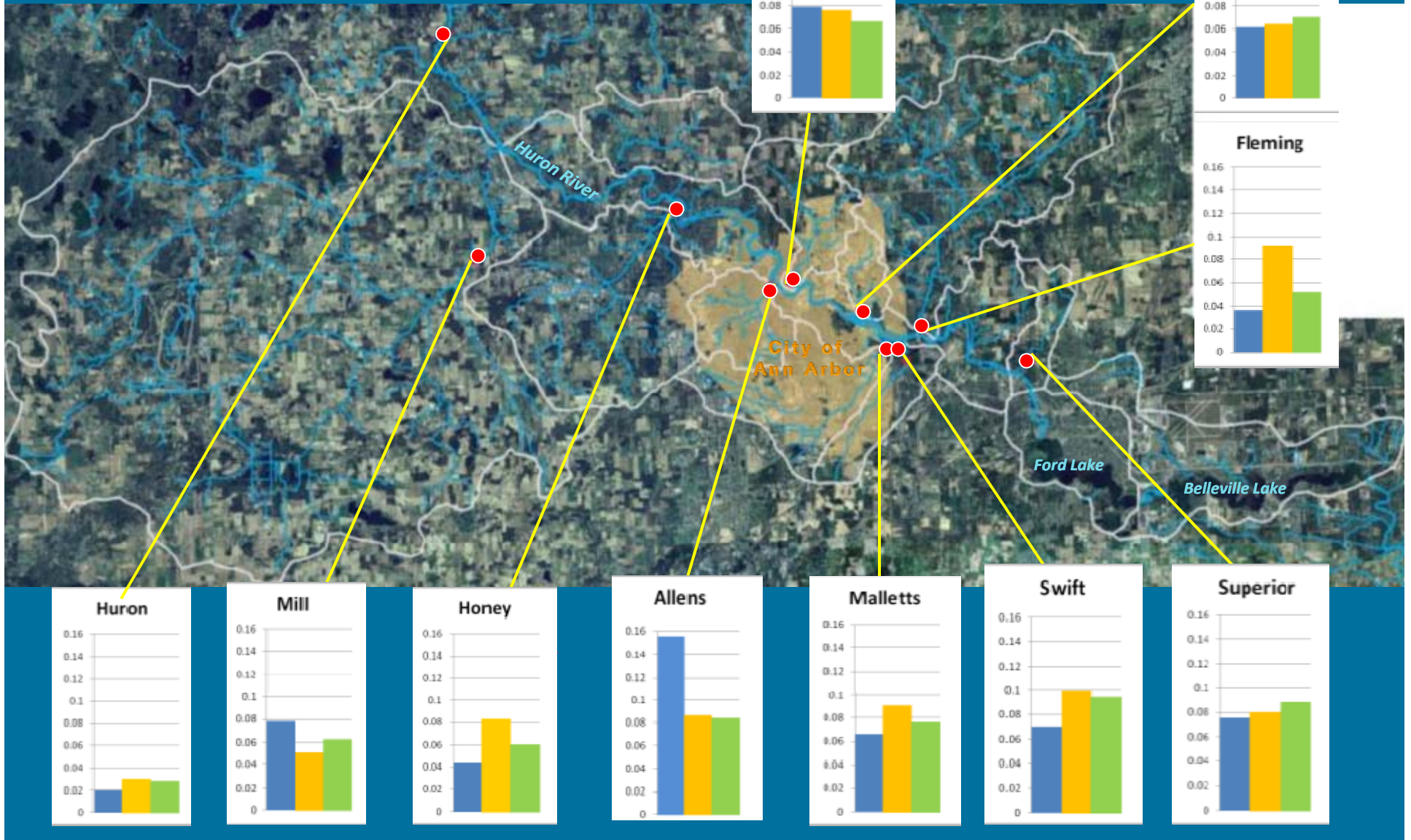
Storm Sampling 7/27-28/2010 Swift Run @ Shetland Dr.



PHOSPHORUS (TP) IN MIDDLE HURON



TP Results



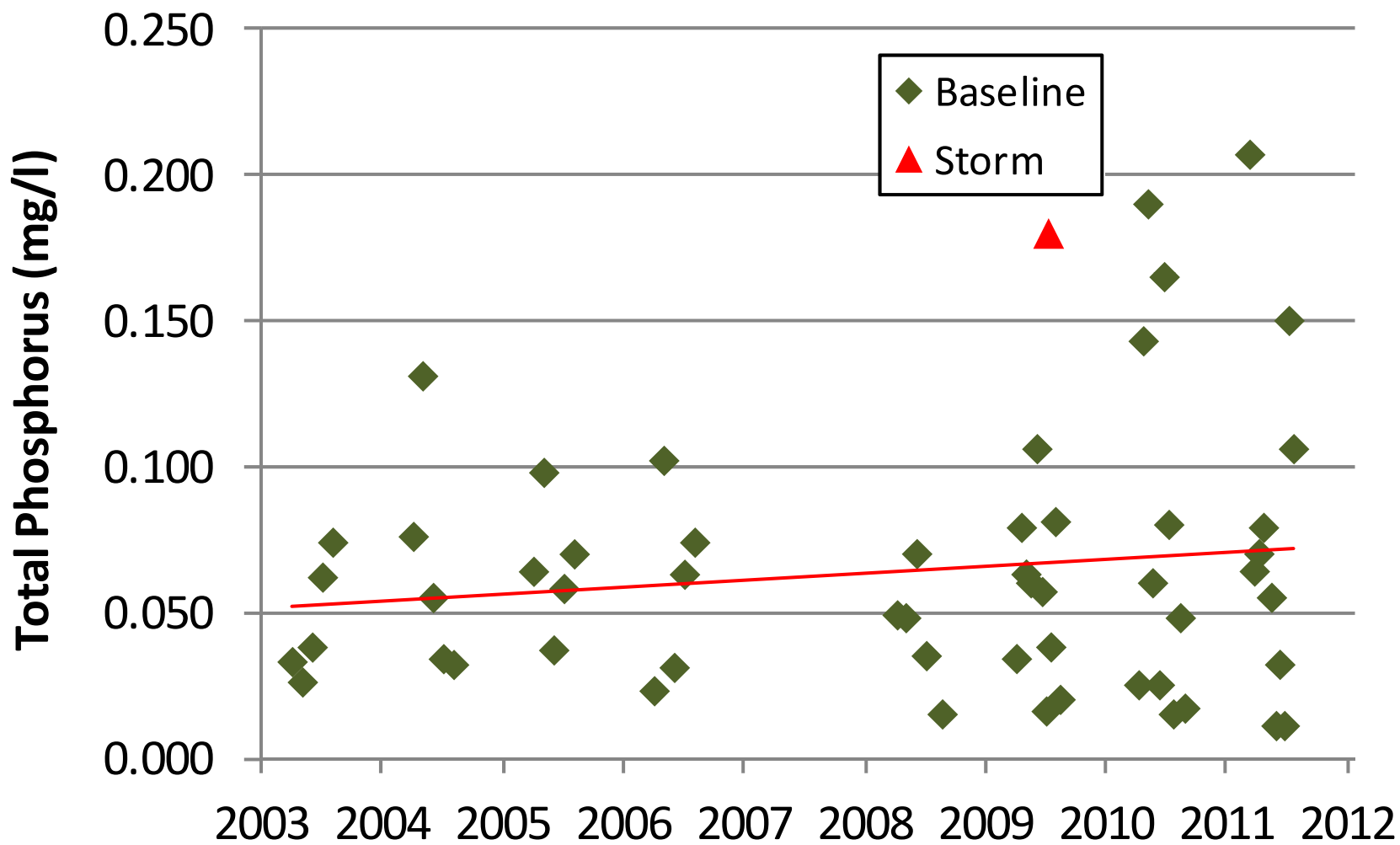
TP CHANGE BY SITE

| Site(s) | TP (mg/l) 2003-06 | TP (mg/l) 2008-11 | % Change | Significant |
|------------------|----------------------|----------------------|------------|-------------|
| Non-Ann Arbor | 0.061 | 0.062 | +1 | No |
| Ann Arbor | 0.086 | 0.075 | -13 | Yes |
| | | | | |
| Huron above Mill | 0.031 | 0.029 | -7 | No |
| Mill Creek | 0.052 | 0.066 | +27 | No |
| Honey Creek | 0.083 | 0.061 | -27 | Almost |
| Allens Creek | 0.086 | 0.084 | -2 | No |
| Traver Creek | 0.076 | 0.067 | -12 | No |
| Millers Creek | 0.062 | 0.071 | +15 | No |
| Malletts Creek | 0.091 | 0.074 | -19 | No |
| Swift Run | 0.103 | 0.099 | -4 | No |
| Superior Drain | 0.081 | 0.092 | +14 | No |
| Fleming Creek | 0.092 | 0.052 | -44 | No |

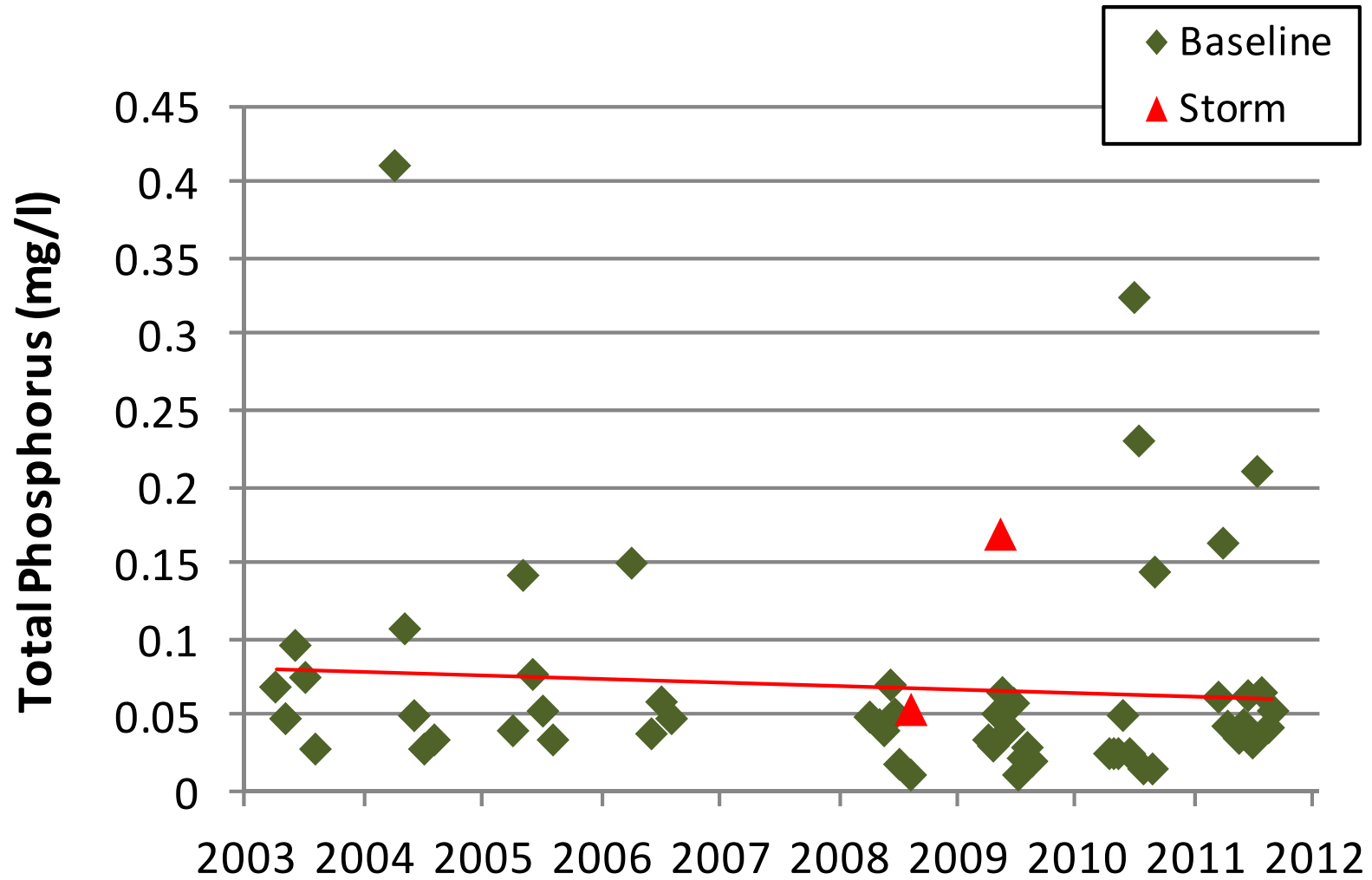
Ann Arbor

Two-sample T-tests, assuming unequal variances were run on LN-transformed TP data for the time periods indicated.

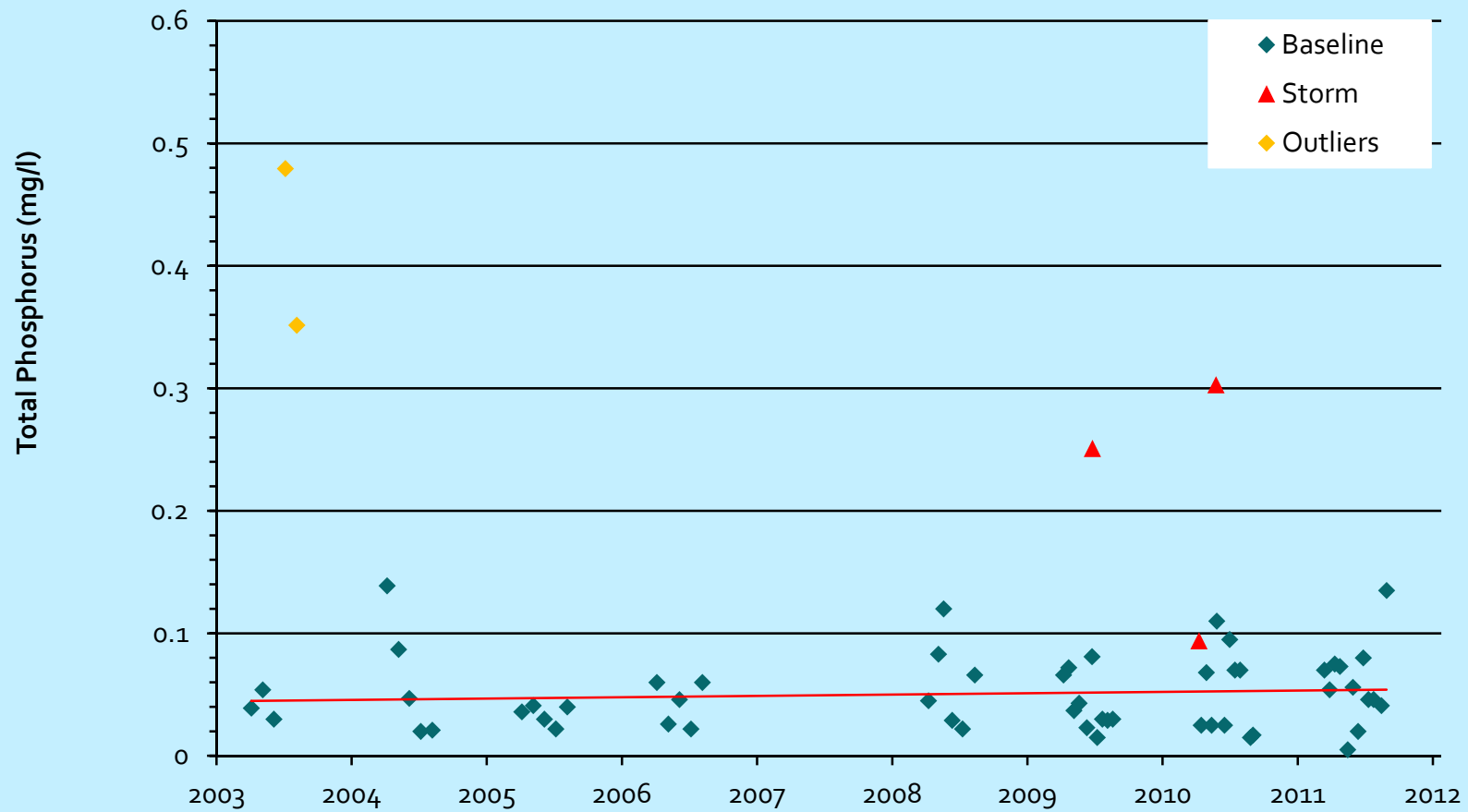
TP @ Mill Creek



TP @ HONEY CREEK



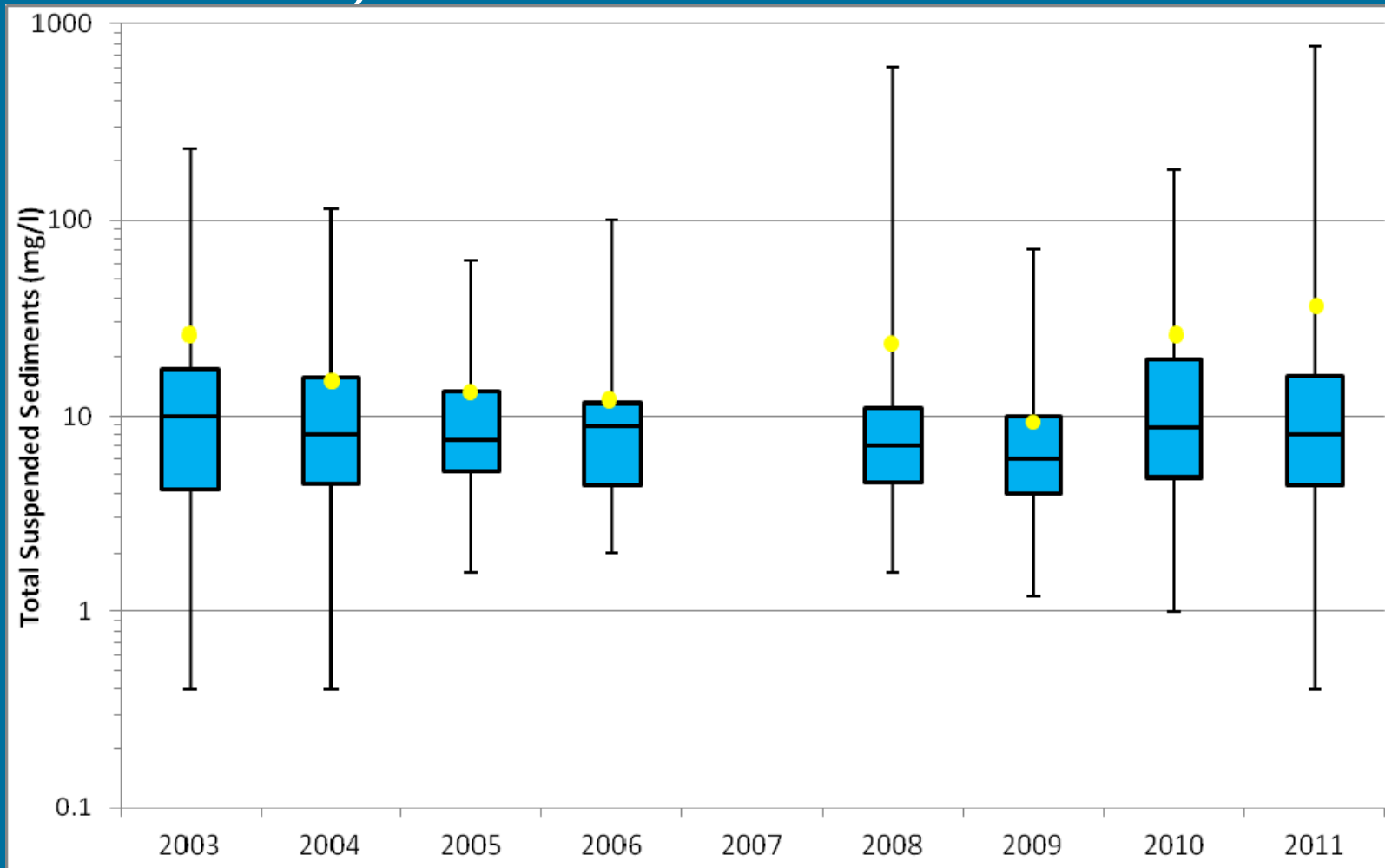
TP @ FLEMING CREEK



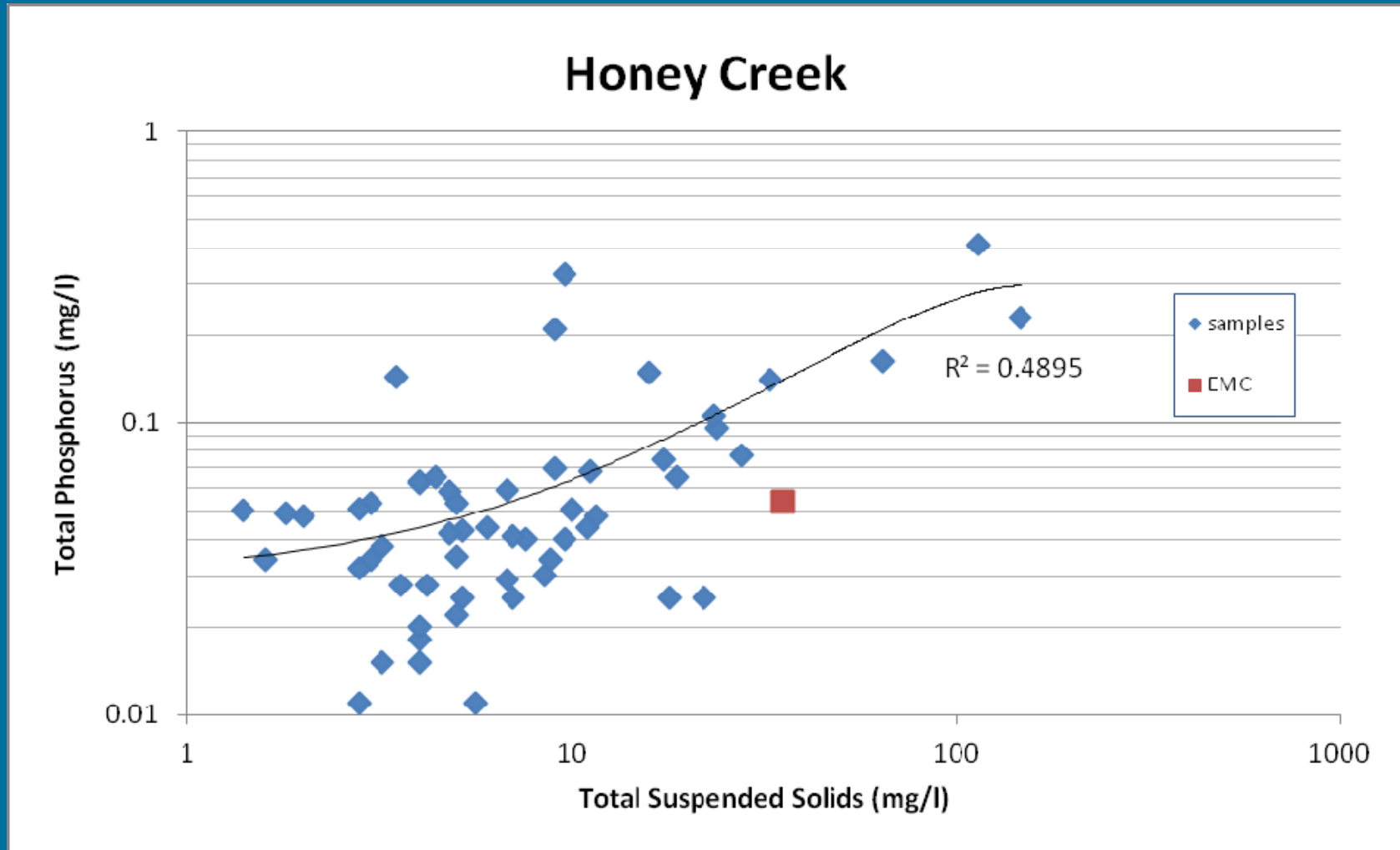
TP LOADING ESTIMATES

| Site | TP Mean Daily Load Est. (2003-11) | TP Mean Daily Load Est. (1995) | % Difference |
|--------------------------------------|--------------------------------------|-----------------------------------|--------------|
| Huron @ N. Territorial (upstream) | 64.83 | 41.07 | +57.9% |
| Mill Creek | 51.78 | 30.25 | +71.2% |
| Honey Creek | 7.94 | 2.22 | +257.7% |
| Allens Creek | 3.91 | 2.74 | +42.7% |
| Traver Creek | 2.59 | 5.08 | -49.0% |
| Fleming Creek | 6.8 | 3.52 | +93.2% |
| Millers Creek | 0.50 | 5.36 | -90.7% |
| Malletts Creek | 13.14 | 14.76 | -11.0% |
| Swift Run | 2.2 | 0.82 | +168.3% |
| Superior Drain | 1.09 | NA | NA |
| Huron @ Ford Lake (US-12) | 151.43 | 200.59 | -24.5 |

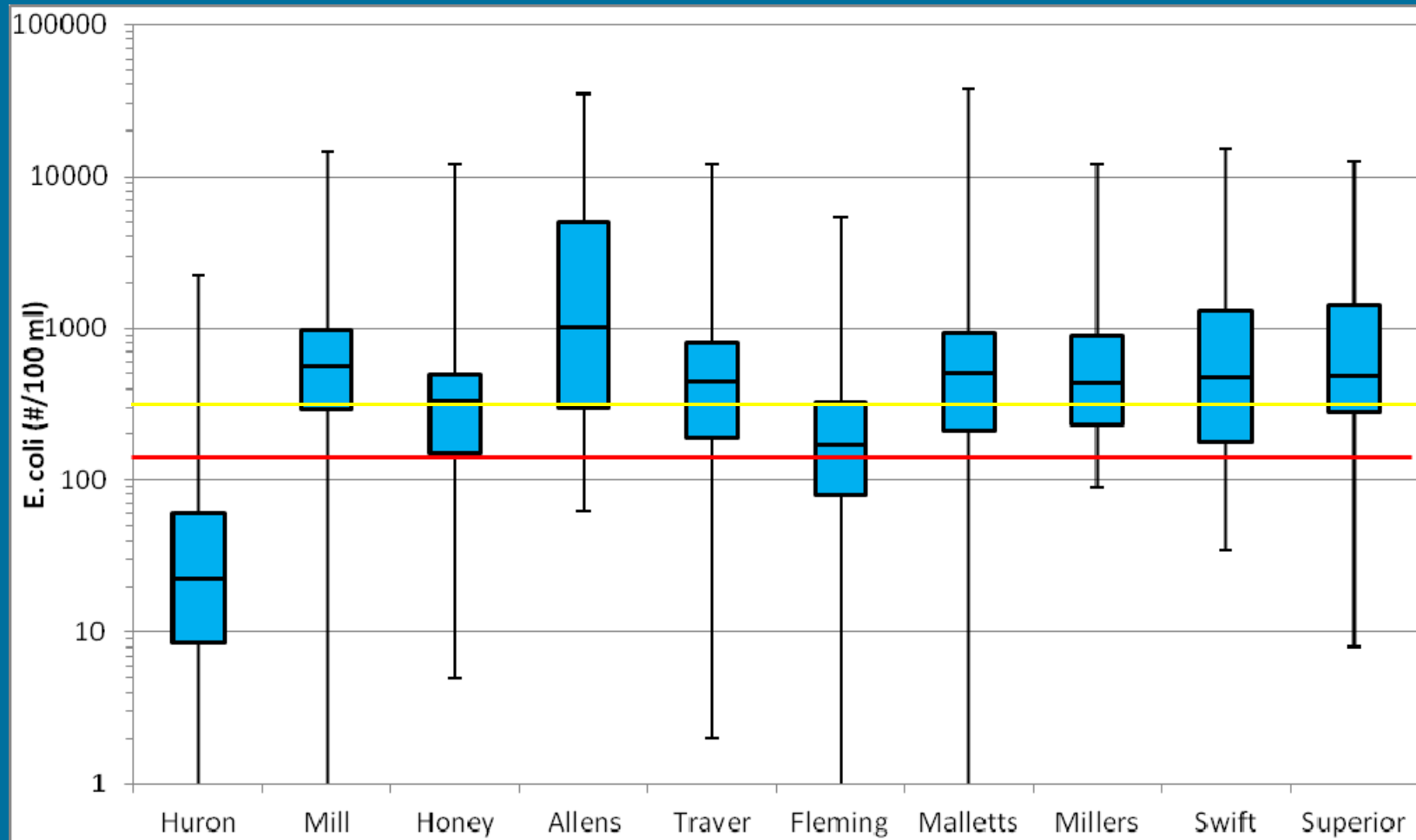
SEDIMENTS (TSS) IN MIDDLE HURON (COMBINED)



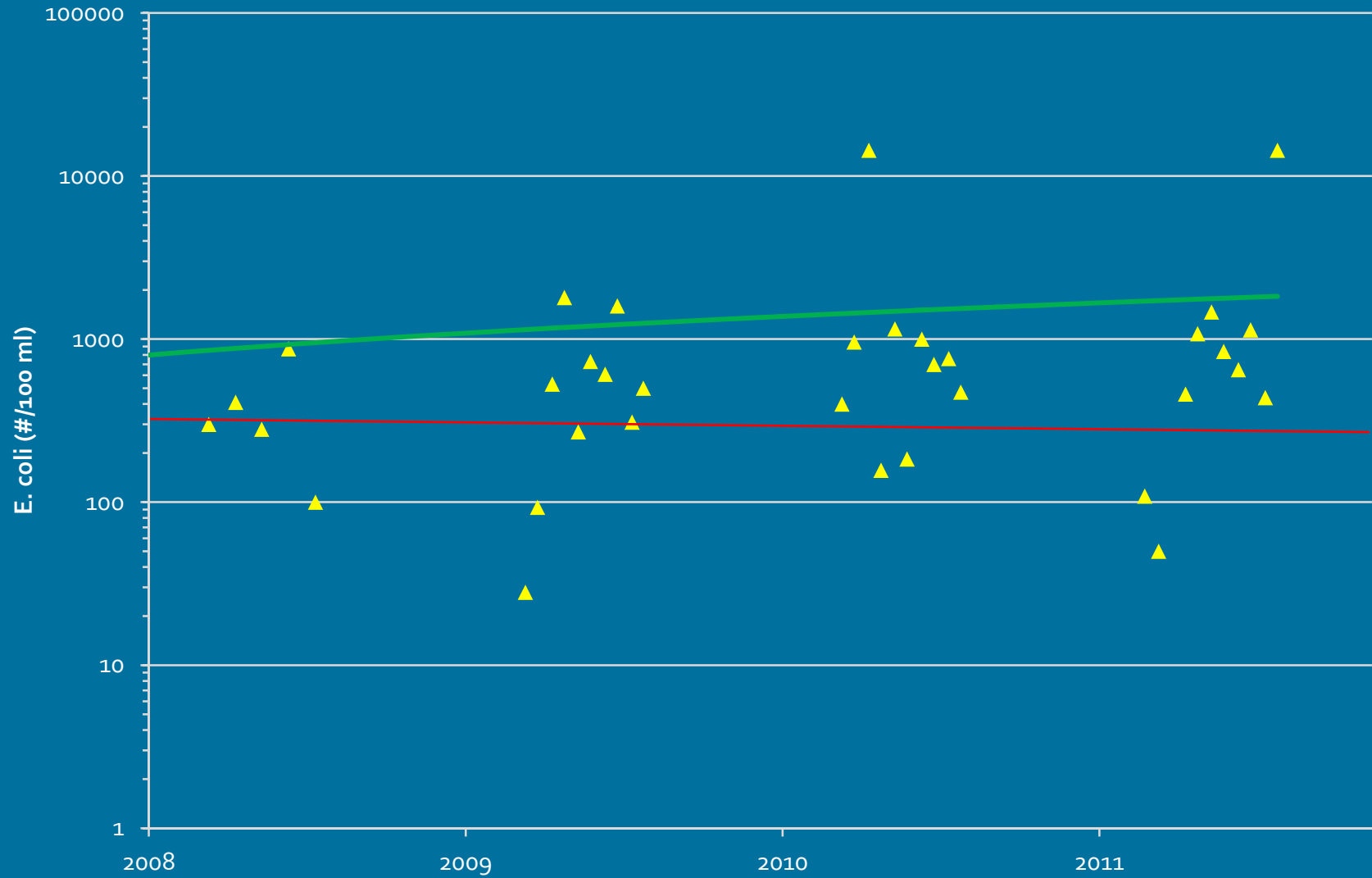
TP-TSS RELATIONSHIP



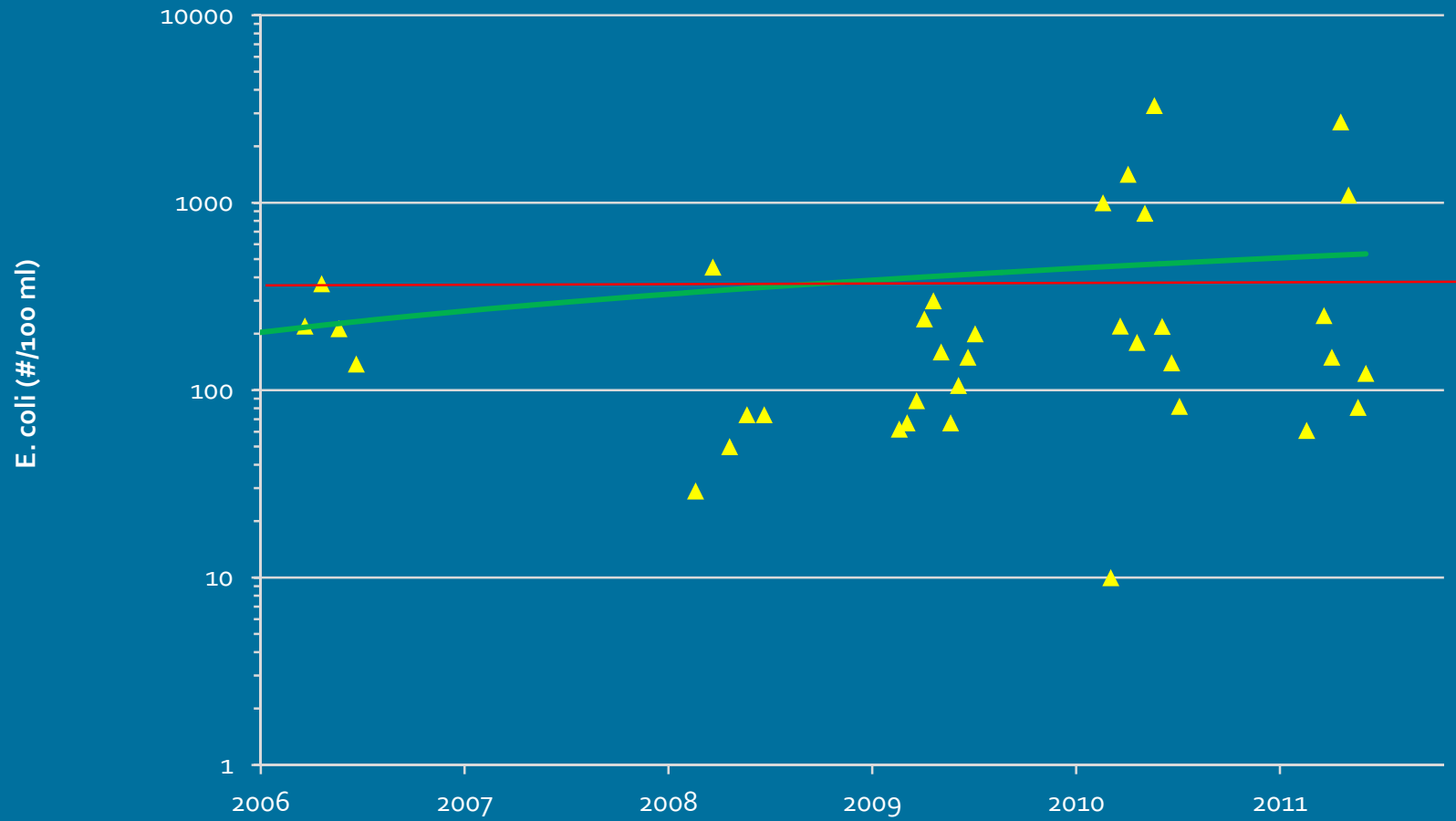
E. COLI IN MIDDLE HURON



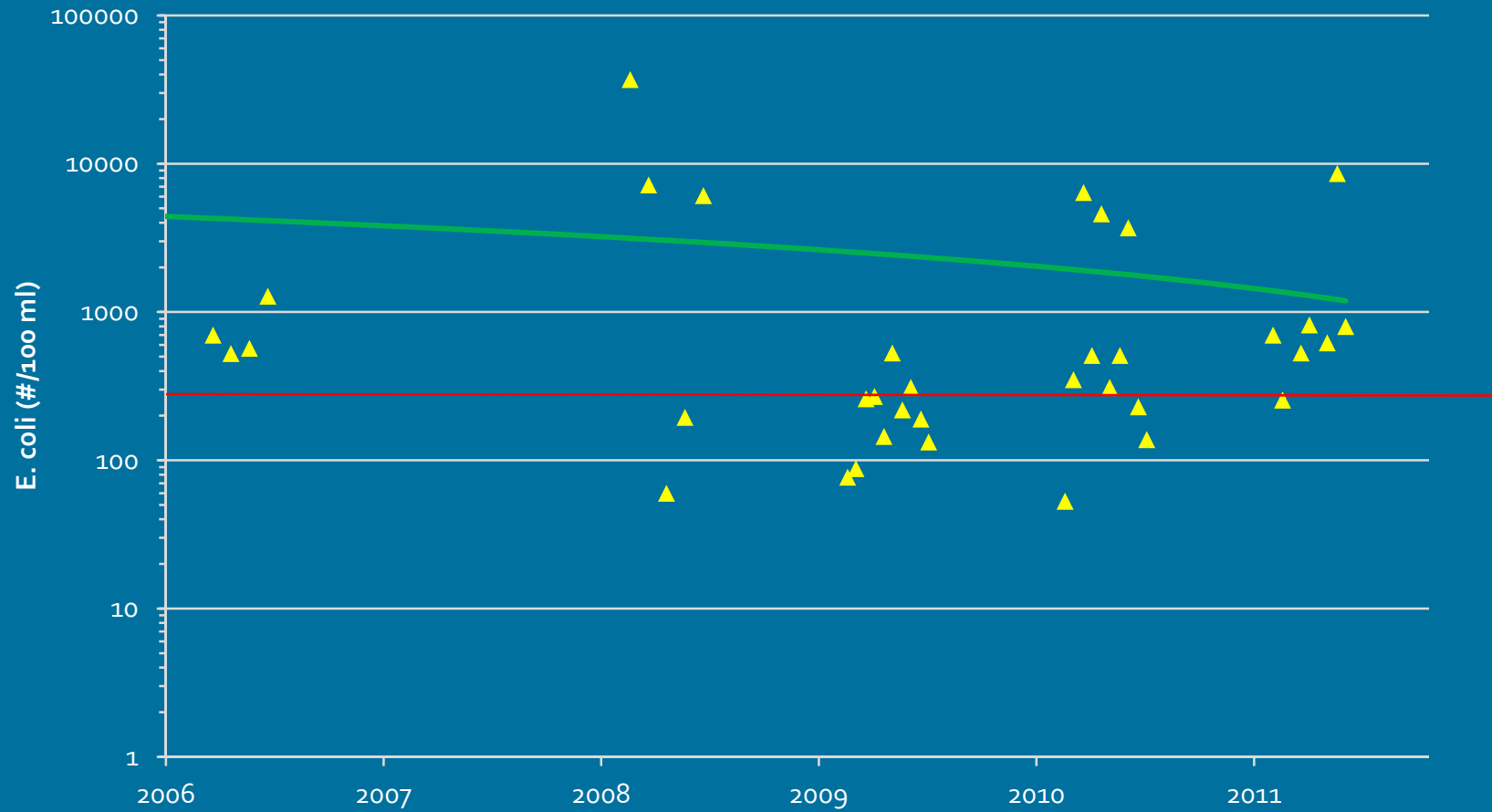
E. COLI @ MILL CREEK



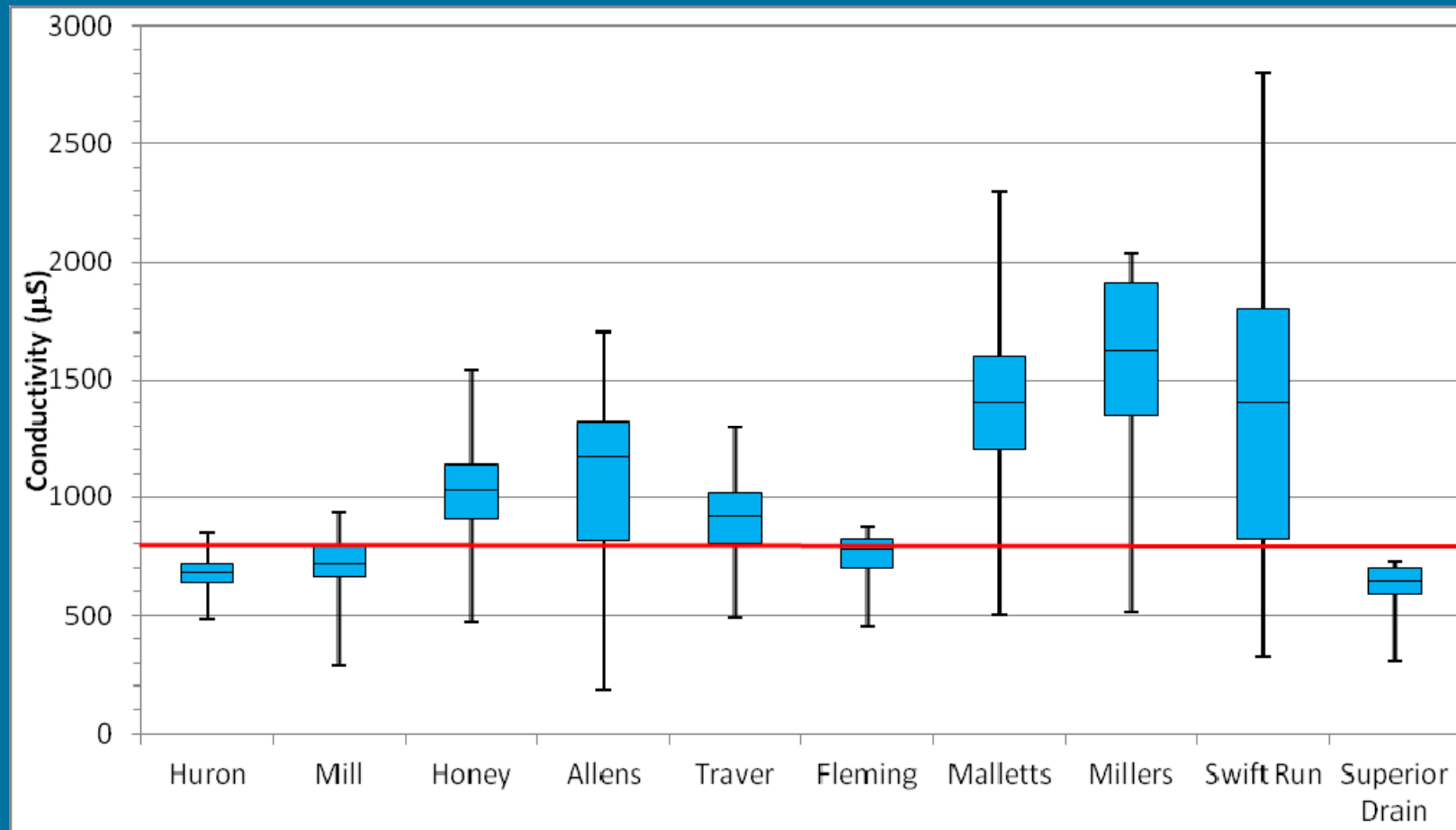
E. COLI @ FLEMING CREEK



E. COLI @ MALLETT'S CREEK

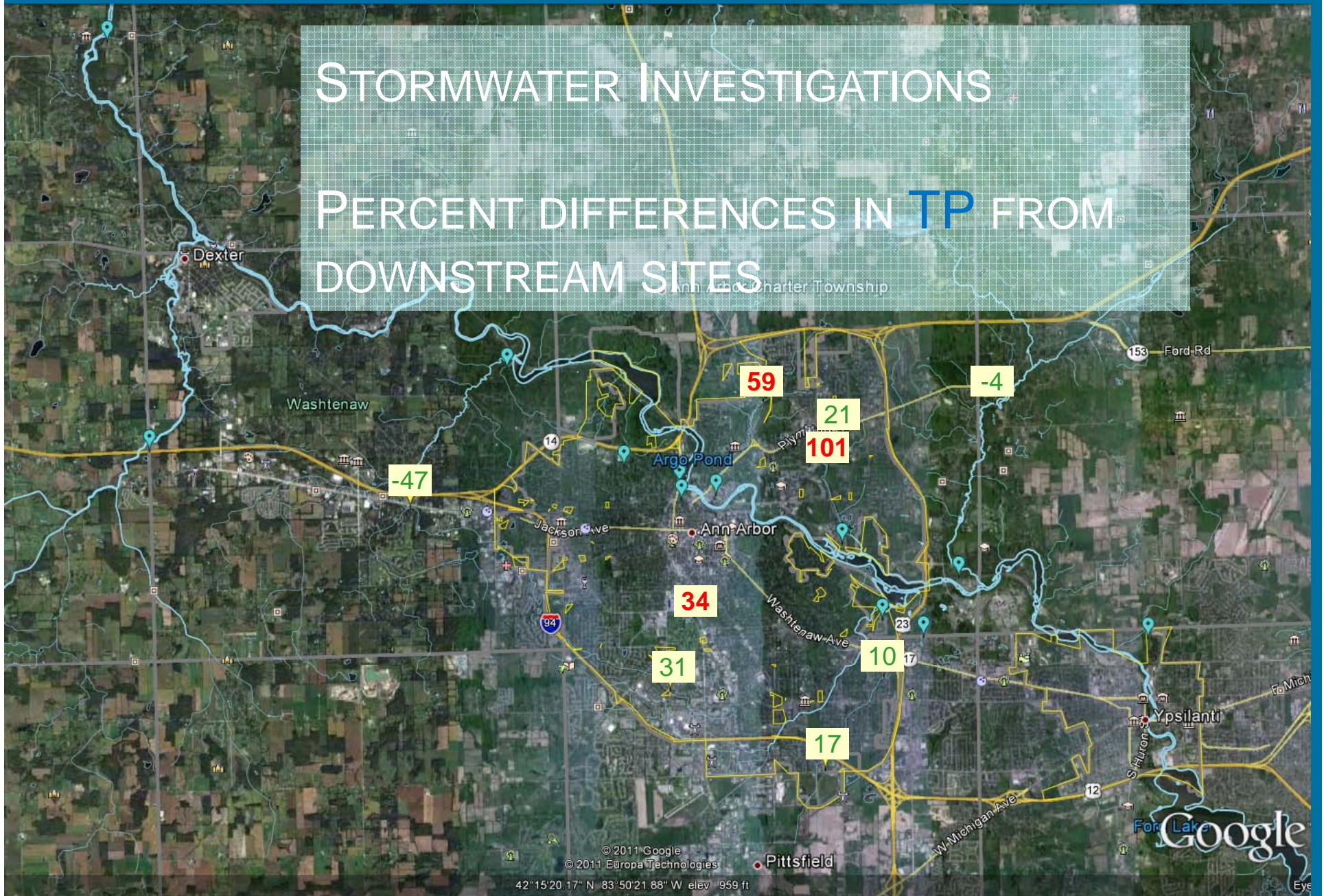


CONDUCTIVITY IN MIDDLE HURON



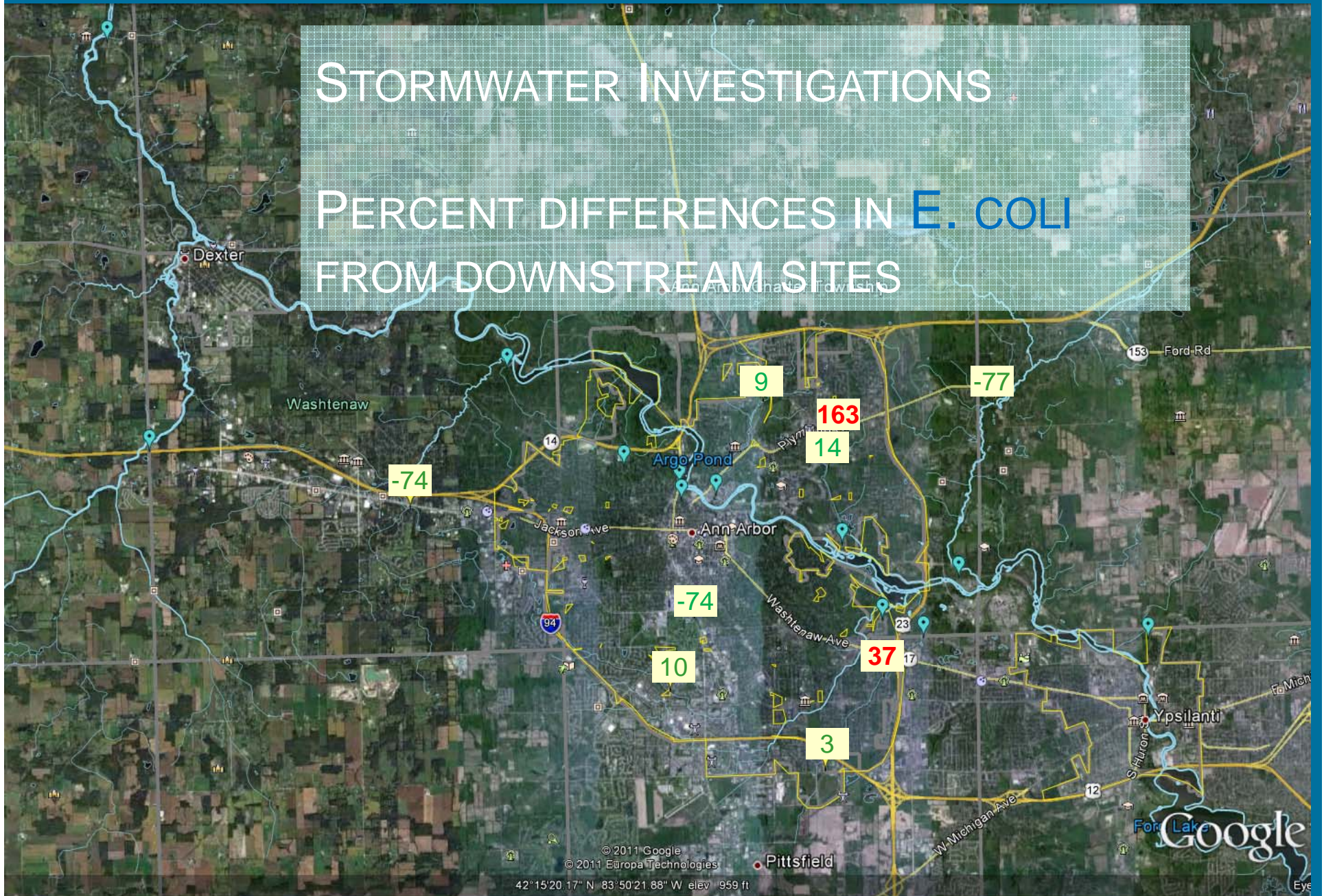
STORMWATER INVESTIGATIONS

PERCENT DIFFERENCES IN TP FROM DOWNSTREAM SITES



STORMWATER INVESTIGATIONS

PERCENT DIFFERENCES IN **E. COLI** FROM DOWNSTREAM SITES



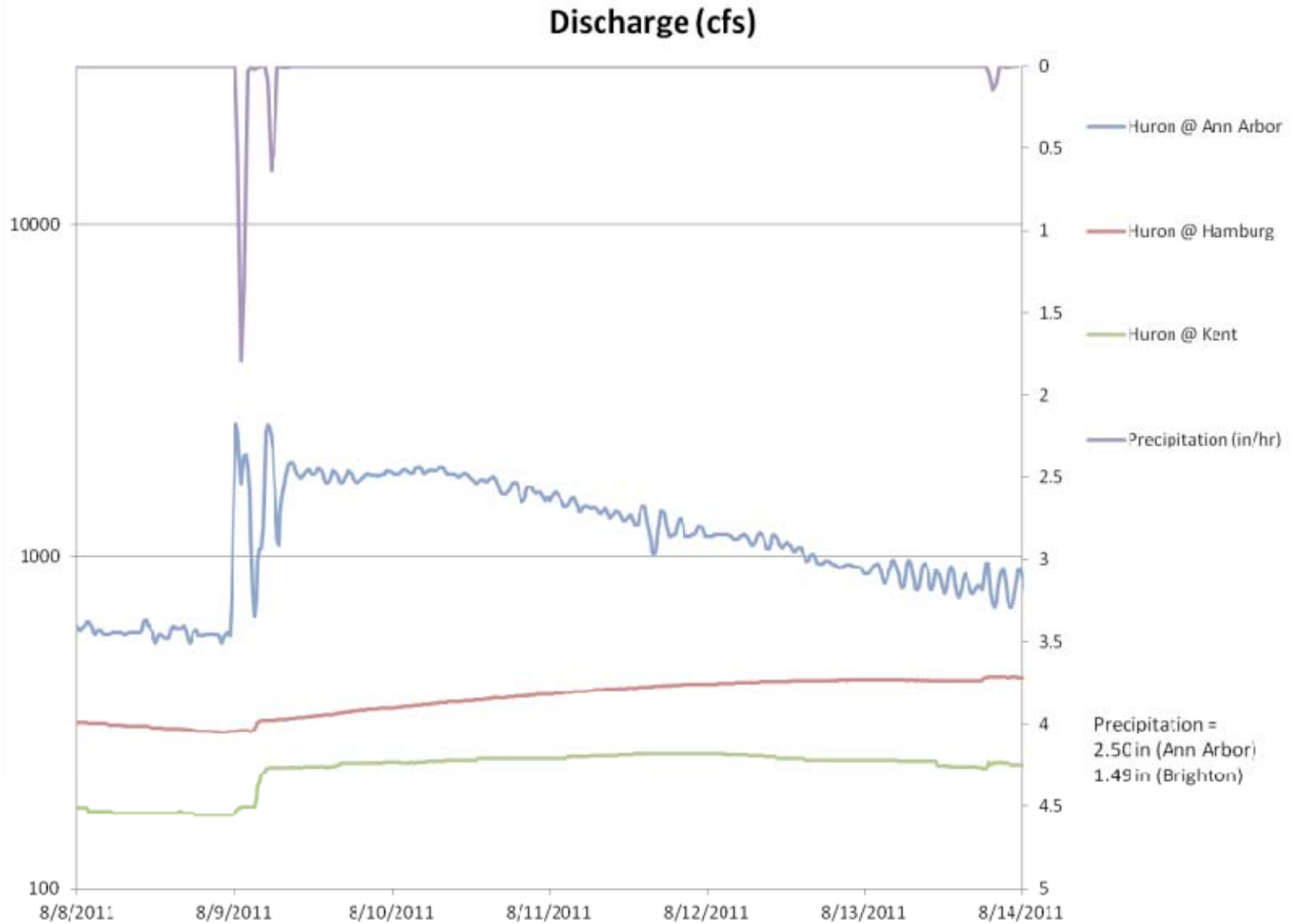
DISCHARGE STATISTICS

| Site | Period Monitored | Drainage Area (sq. mi.) | Median Flow (cfs) | Peak Flow* (cfs) (Event Precip. (in)) | Minimum flow* (cfs) | Flashiness (Quartile)† |
|------------------------------|------------------|-------------------------|-------------------|---------------------------------------|---------------------|------------------------|
| Mill Creek (full record) | 2002-2011 | 130 | 62.0 | 996 (6.10) | 18 | 0.20 (4) |
| Malletts Creek (full record) | 2002-2011 | 11 | 4.2 | 775 (2.58) | 0.99 | 0.75 (4) |
| Mill Creek | 2008-2011 | 130 | 75.0 | 996 (6.10) | 21 | 0.20 (4) |
| Malletts Creek | 2008-2011 | 11 | 4.6 | 775 (2.58) | 1.4 | 0.74 (4) |
| Honey Creek | 2008-09 | 23 | 9.0 | 407 (2.61) | 4.3 | 0.35 (3) |
| Allens Creek | 2007-10 | 5 | 5.3 | 1,062 (0.96) | -100 | 0.84 (4) |
| Traver Creek | 2007, 2011 | 7 | 1.7 | 660 (2.73) | 0.01 | 0.55 (4) |
| Fleming Creek | 2009-11 | 31 | 10.7 | 1,176 (2.73) | 3.9 | 0.44 (4) |
| Swift Run | 2007, 2010-11 | 5 | 0.65 | 273 (2.60) | 0 | 0.64 (4) |

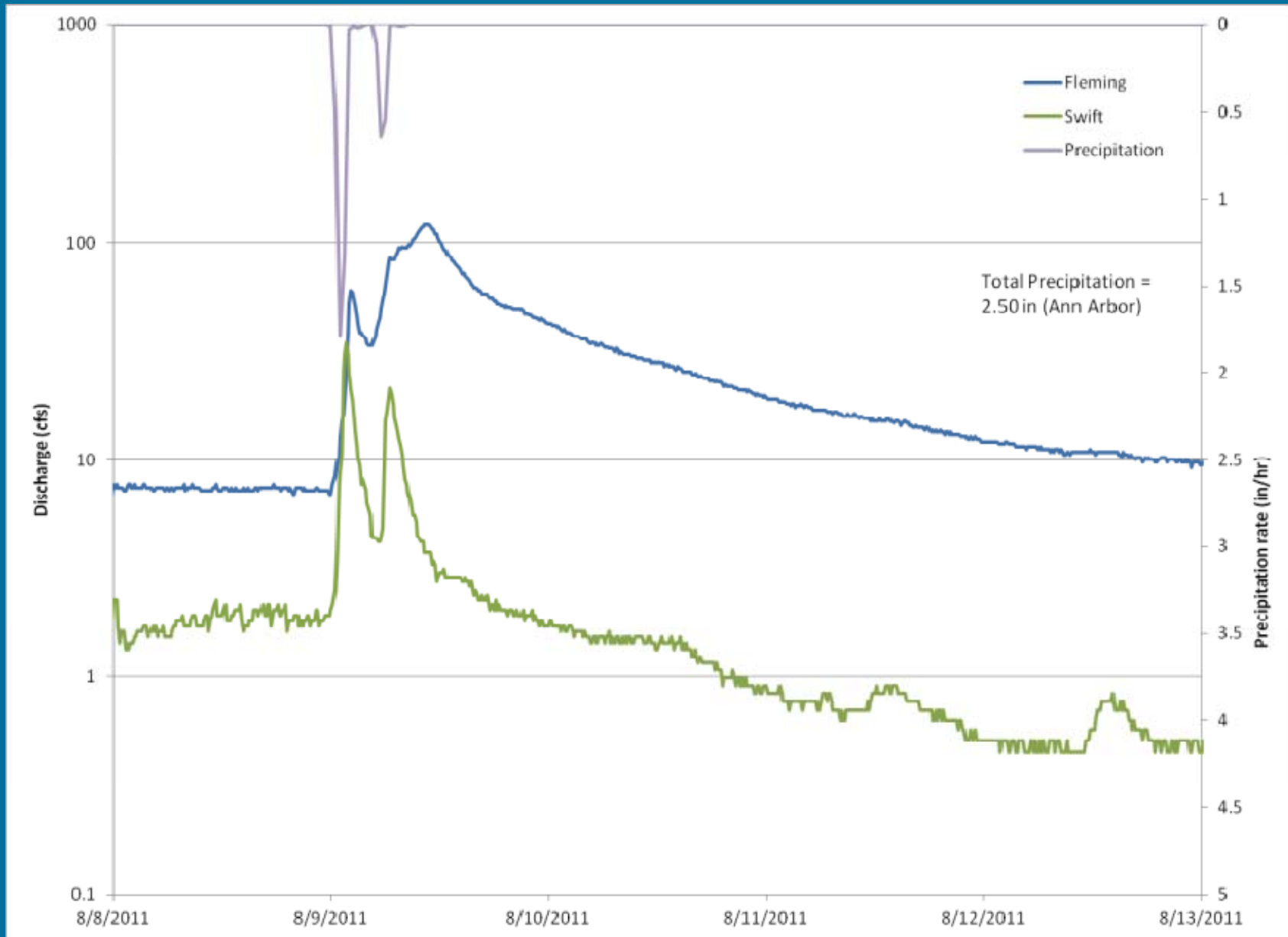
* Peak flow and minimum flow are extracted from the complete, sub-daily flow record, whereas the other statistics are based on mean daily discharge.

† The flashiness quartile is the number of the quartile where the flashiness index would place the stream compared to sites across Michigan, where 1=lowest or most natural quartile and 4=highest or most impacted quartile.

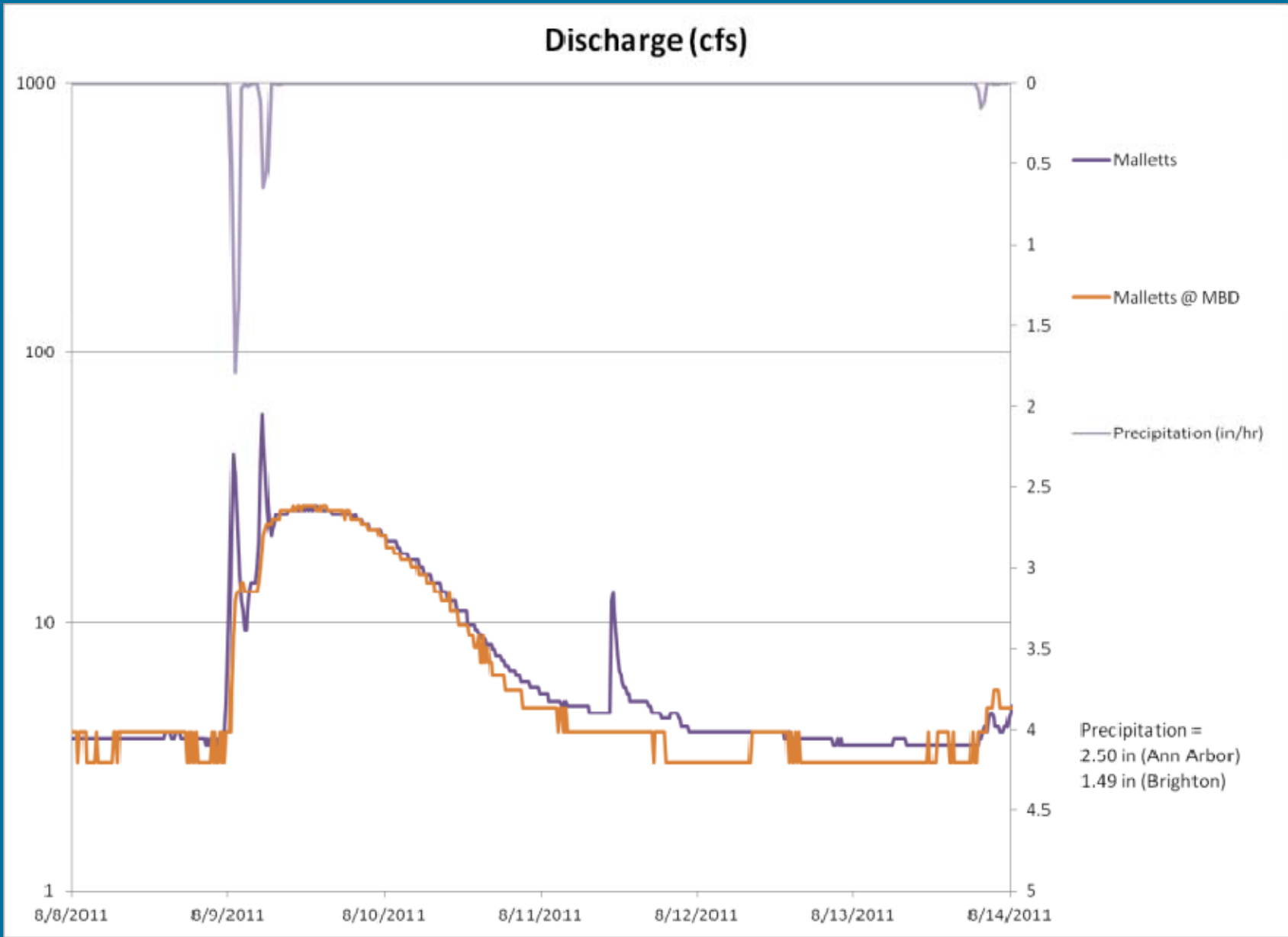
STORM EVENT HYDROGRAPHS



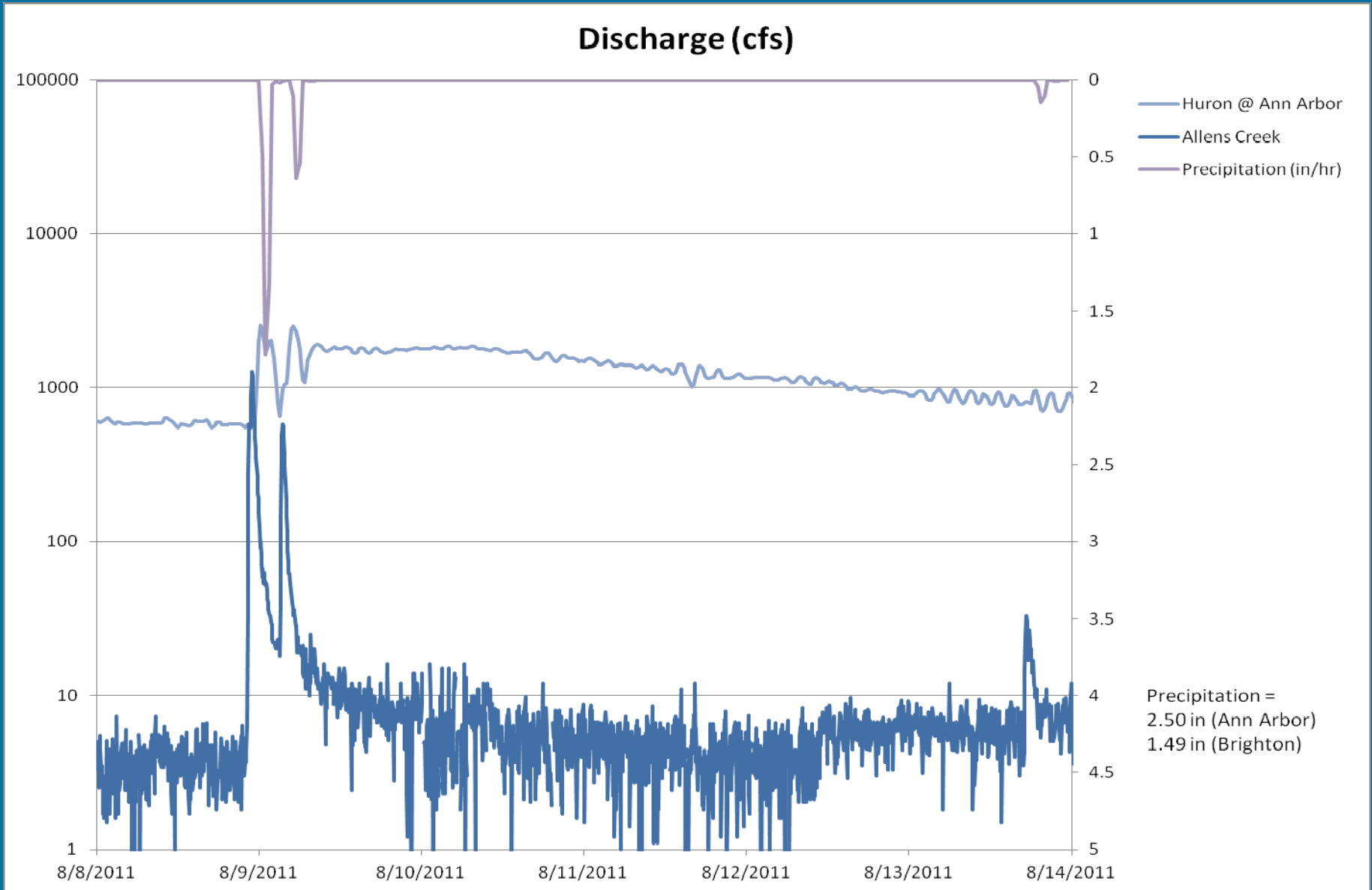
STORM EVENT HYDROGRAPHS



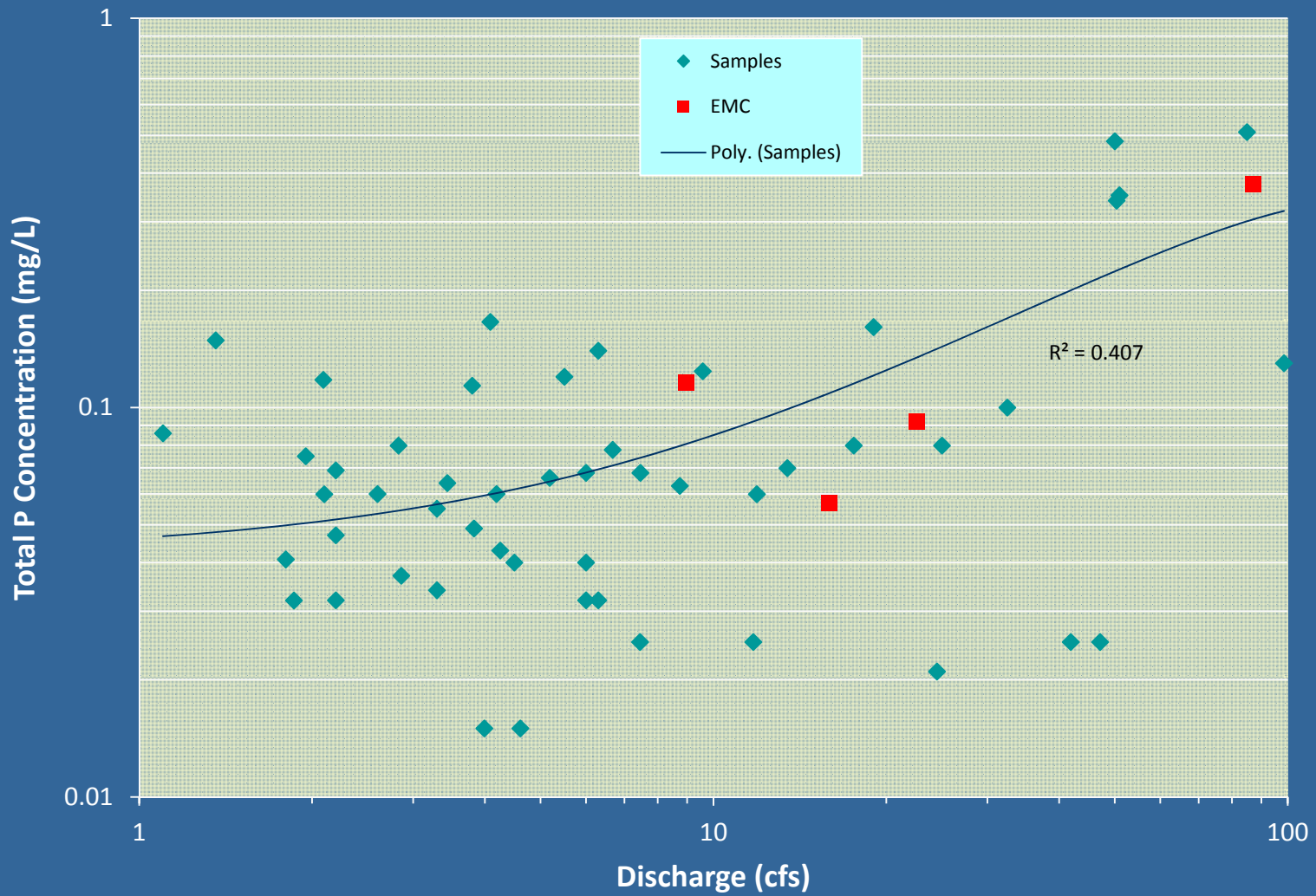
STORM EVENT HYDROGRAPHS



STORM EVENT HYDROGRAPHS



Malletts Creek TP Samples



SUMMARY OF RESULTS

- Phosphorus back up, but loading down overall
- A few hot spots for phosphorus
- Sediment results are mixed
- *E. coli* still a concern
- Flashy flows evident during storms
- Storm sampling consistent with baseline

HOW WAS THE SAMPLING DATA USED?

- Samples were analyzed into raw results, then evaluated and used in seven recent products:
 - Plans to address water quality problems in Ford and Belleville Lakes; Malletts and Swift Run Creeks; and the Huron River
 - Monitoring report for the Middle Huron

WHAT'S NEXT?

- Follow-up on key findings
- Publicize results
- Confirm monitoring strategy for 2012
- *E. coli* monitoring in Honey Creek



Questions?