technical memo

Project Name	2017 Water Quality Monitoring	**Date**	4/9/2018
To / Contact info	Kayla Bergman: Squaw Creek WMA		
From / Contact info	Pat Conrad, Joe Pallardy, Kristine Maurer		
Regarding	2017 Water Quality Monitoring Summary Report		

In an effort to establish a baseline measurement of water quality, the Squaw Creek WMA has installed automated monitoring stations in Squaw Creek immediately downstream of the Lincoln Way crossing in Ames and in East Indian Creek at the 650th St. crossing, southeast of Nevada (Figure 1). The monitoring stations consist of a level logger which measures water levels, and an automated sampler which collects water samples during storm events. The monitoring stations were programmed to: a) record water level information at 15 minute intervals, b) collect storm-event samples when water levels exceeded a certain level, and c) grab sample every two weeks throughout the year. The following memorandum summarizes the 2017 monitoring results for these two stations.

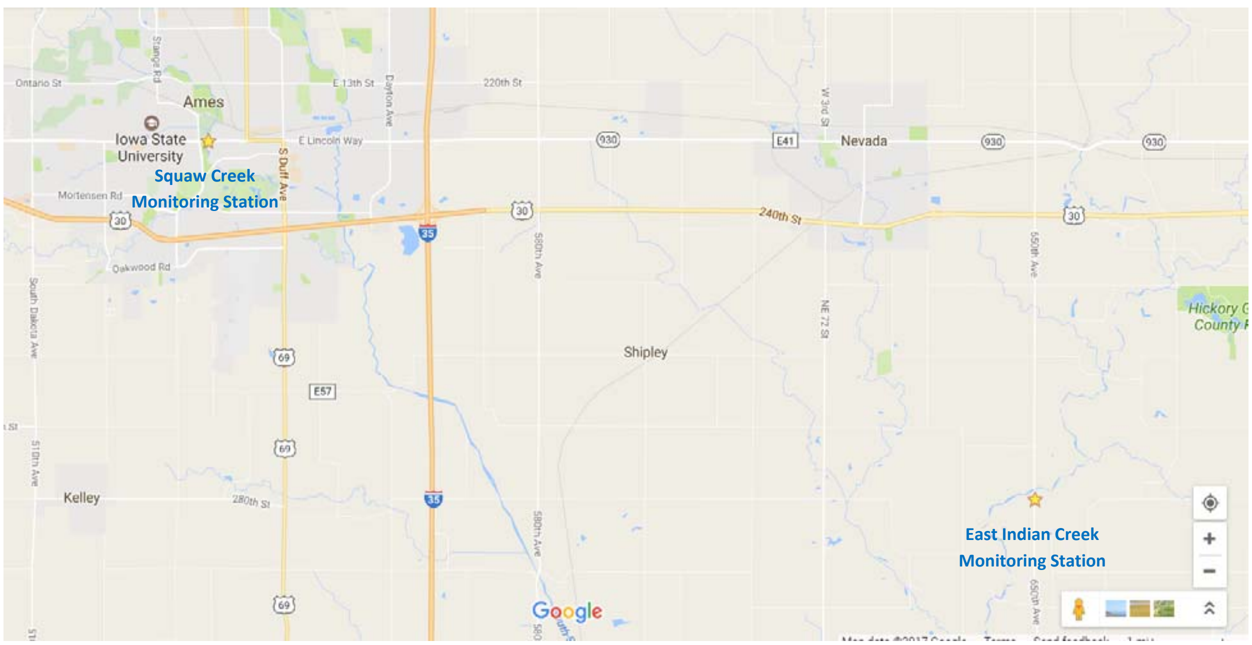

Figure 1. Monitoring Station Locations

1. WATER QUALITY CRITERIA

The State of Iowa has drinking water standards for nitrate, and stream water quality standards for *E. coli* levels (Table 1). No state specific water quality criteria have been established in Iowa for phosphorus and nitrogen. However, the Environmental Protection Agency (EPA) developed national nutrient criteria recommendations by ecoregion based on nutrient data from a large number of the nation's lakes and rivers (EPA 2000). Ecoregions are defined as areas of similar ecosystem and geography. Both East Indian Creek and Squaw Creek fall within the Level III aquatic ecoregion Western Corn Belt Plains. Table 1 outlines the EPA water quality criteria for total phosphorus and total nitrogen for the Western Corn Belt Plain Ecoregion. 2017 water quality monitoring data for East Indian Creek and Squaw Creek were evaluated in comparison with these criteria.

Table 1. Applicable Water Quality Criteria

Parameter	EPA Ecoregion 25th percentile	Iowa State Drinking Water Standard
Total Phosphorous	0.118 mg/L	NA
Total Nitrogen	3.3 mg/L	10.0 mg/L
Parameter	**Iowa State Standard Maximum Single Sample MPN/100ml**	
E. coli	235 MPN/100ml	

2. EAST INDIAN CREEK 2017

A total of sixteen samples including 9 grab samples and 7 rain event (composite) samples were collected from East Indian Creek from April through October in 2017 (Table 2).

Nitrate-Nitrogen

Observed nitrogen concentrations (measured as Nitrate using EPA Method 4500 NO3D) were higher than the EPA Ecoregion's 25th percentile for Total Nitrogen (TN) from 4/12/2017 through 06/28/2017 (7 samples) while samples collected from 7/12/2017 through 8/03/2017 (5 samples) were all below the EPA criteria (Figure 3). TN concentrations were highest during spring and fall baseflow events suggesting either contributions from subsurface tile drainage or near stream sources of nitrate as opposed to watershed runoff during storm events. Similar seasonal patterns in nitrate concentrations have been observed in the Raccoon River watershed in west Central Iowa (Schilling, 2004). The total annual TN load for East Indian Creek was estimated at 1,728,700 pounds or approximately 21.6 pounds/acre/year over the 125 square mile (80,000 acre) drainage area to East Indian Creek.

Note: In this monitoring effort, samples were analyzed for the Nitrate form of nitrogen. The common convention when discussing nitrogen levels in streams is to report on Total Nitrogen, which includes ammonia, organic nitrogen and nitrate-nitrite. However, nitrate typically represents the largest portion of total nitrogen in surface water samples and therefore was used as a surrogate for total nitrogen concentrations. But as a result, total nitrogen levels reported are likely underestimated.

Phosphorus

Observed total phosphorus (TP) concentrations were consistently above the EPA Ecoregion's 25th percentile for TP from with the exception of four base flow samples collected on 4/26/2017, 6/28/2017, 7/12/2017, and 10/25/2017. The two highest TP concentrations observed occurred following rain events on 5/11/2017 and 10/15/2017 (Figure 4). The correlation between storm events and high observed TP concentrations suggests phosphorus loading increases as a function of increased overland flow during storm events. The total annual TP load for East Indian Creek was estimated at 31,737 pounds per year or approximately 0.4 pounds/acre/year which falls within the range of expected TP loading rates for watersheds in Story County. Given that TP concentrations were highest during periods when stream flow (discharge) was also highest, the majority of the total annual TP load was derived from a small number of storm events that collectively represent a relatively small period of the entire monitoring season.

E. coli (Bacteria)

A comparison of observed *E. coli* concentrations with the Iowa single sample maximum state standard of 235 organisms/100 ml revealed exceedances throughout the year with the exception of one base flow grab sample event on 4/26/2017. The highest observed bacteria concentration occurred during a sampling event conducted on August 23rd, 2017 following a 1.5 inch rain event on August 22nd (Figure 5). The geometric mean for all samples collected from April through October was 1,598 organisms/100 ml. Observed *E. coli* concentrations were consistently greater than the Iowa state standard during base flow and storm flow conditions indicating both point and non-point sources as potential sources of *E. coli* to this portion of East Indian Creek.

Total Suspended Solids

Observed Total Suspended Solids (TSS) concentrations in grab samples collected during baseflow events were significantly less than observed TSS concentrations in grab samples collected during storm events (Figure 6). Similar to patterns observed with TP concentrations, the two highest observed TSS concentrations observed occurred following rain events on 5/11/2017 and 10/15/2017. The combination of high TSS loading with high TP loading during storm events provides evidence to suggest that the majority of the TP load is from sediment bound phosphorus.

The total annual TSS load for East Indian Creek was estimated at 8,823,394 pounds per year or approximately 110 pounds/acre/year. The low observed TSS loading rate in East Indian Creek may be a result of compositing (aggregating) storm samples collected throughout the entire storm event which resulted in an average TSS concentration that did not reflect the high TSS concentrations often observed during the rising limb (first few hours) of the hydrograph (Figure 2).

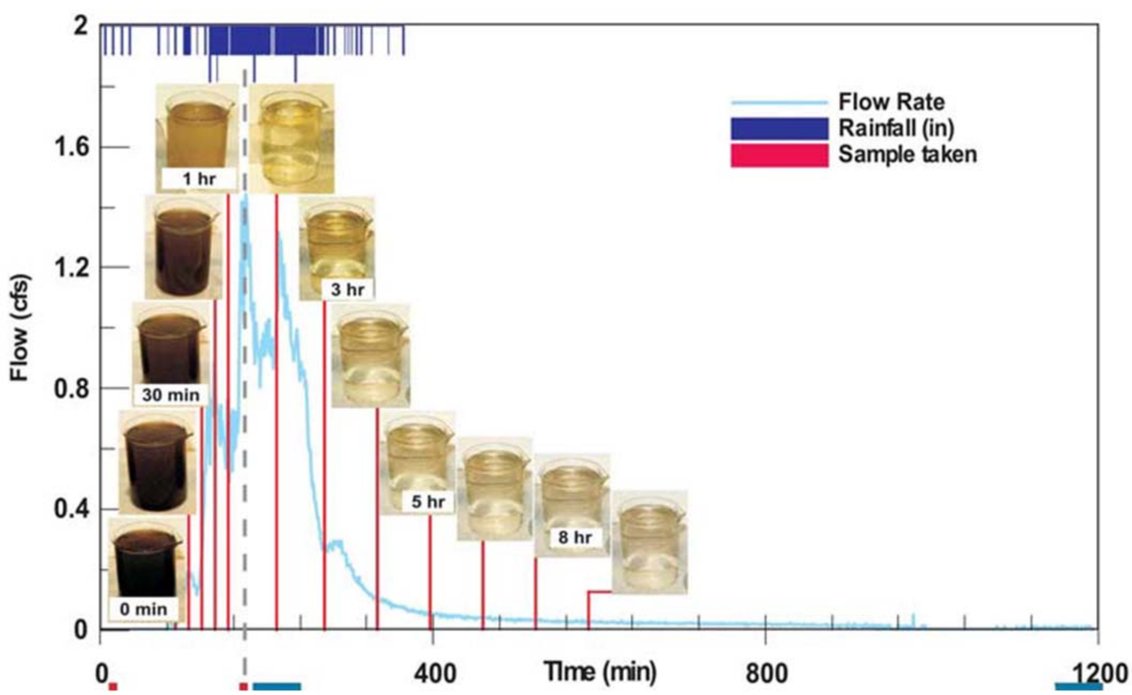

Figure 2. Typical storm event with visual samples showing turbid water (more suspended solids) initially followed by increasing clarity (less pollutants) as flows decline.

Table 2: East Indian Creek Monitoring Results

Sample Date	Sample Type	Flow (m^3/s)	Nitrate (mg/L)	Total Phosphorus (mg/L)	Total Suspended Solids (mg/L)	E.coli (MPN/100ml)
04/26/17	Grab	3.4	10	0.1	27	109
05/11/17	Rain Event (Composite)	7.8	10	0.28	190	12230
05/18/17	Rain Event (Composite)	5.6	10	0.13	33	740
05/24/17	Grab	8.7	14	0.2	72	2014
06/14/17	Rain Event (Grab)	2.0	12	0.16	56	5480
06/28/17	Grab	0.8	10	0.05	11	740
07/12/17	Grab	0.5	5.2	0.05	10	830
07/26/17	Grab	0.2	0.5	0.16	24	706
08/09/17	Grab	0.1	0.5	0.17	41	754
08/23/17	Rain Event (Grab)	0.1	0.5	0.22	52	15531
09/06/17	Grab	0.1	0.5	0.18	41	4884
09/26/17	Rain Event (Composite)	0.2	0.5	0.13	12	2010
10/11/17	Grab	0.5	1.9	0.18	11	906
10/15/17	Rain Event (Composite)	1.2	2	0.5	74	3450
10/22/17	Rain Event (Composite)	0.7	4.5	0.17	10	850
10/25/17	Grab	0.5	5.1	0.05	3.1	554

m^3/s – cubic meters per second, mg/l – milligrams per liter, MPN/100ml – most probable number(organisms) per 100 milliliters

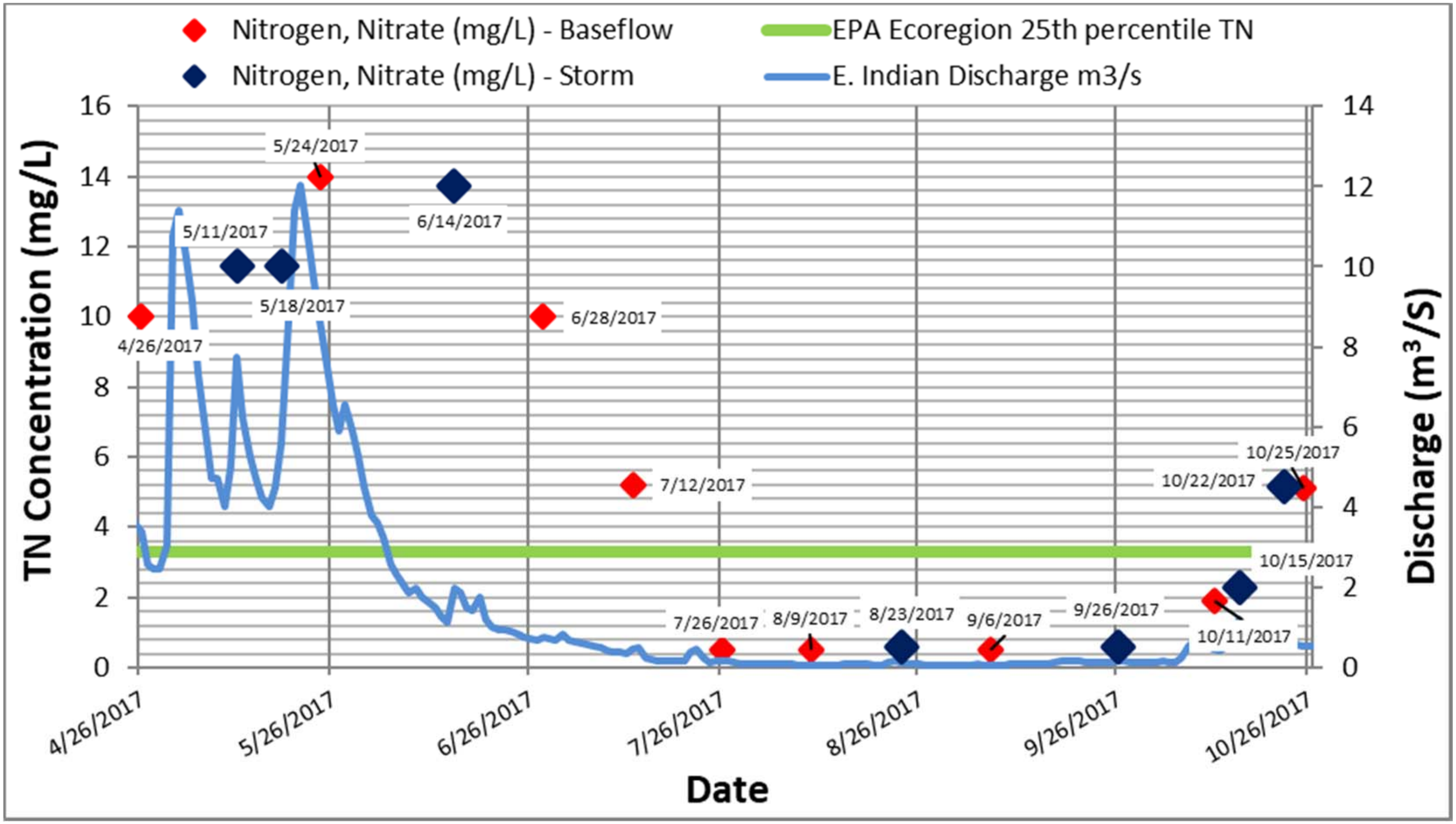

Figure 3. 2017 Observed Nitrogen (Nitrate) Concentrations for East Indian Creek in Relation to Flow (Discharge).

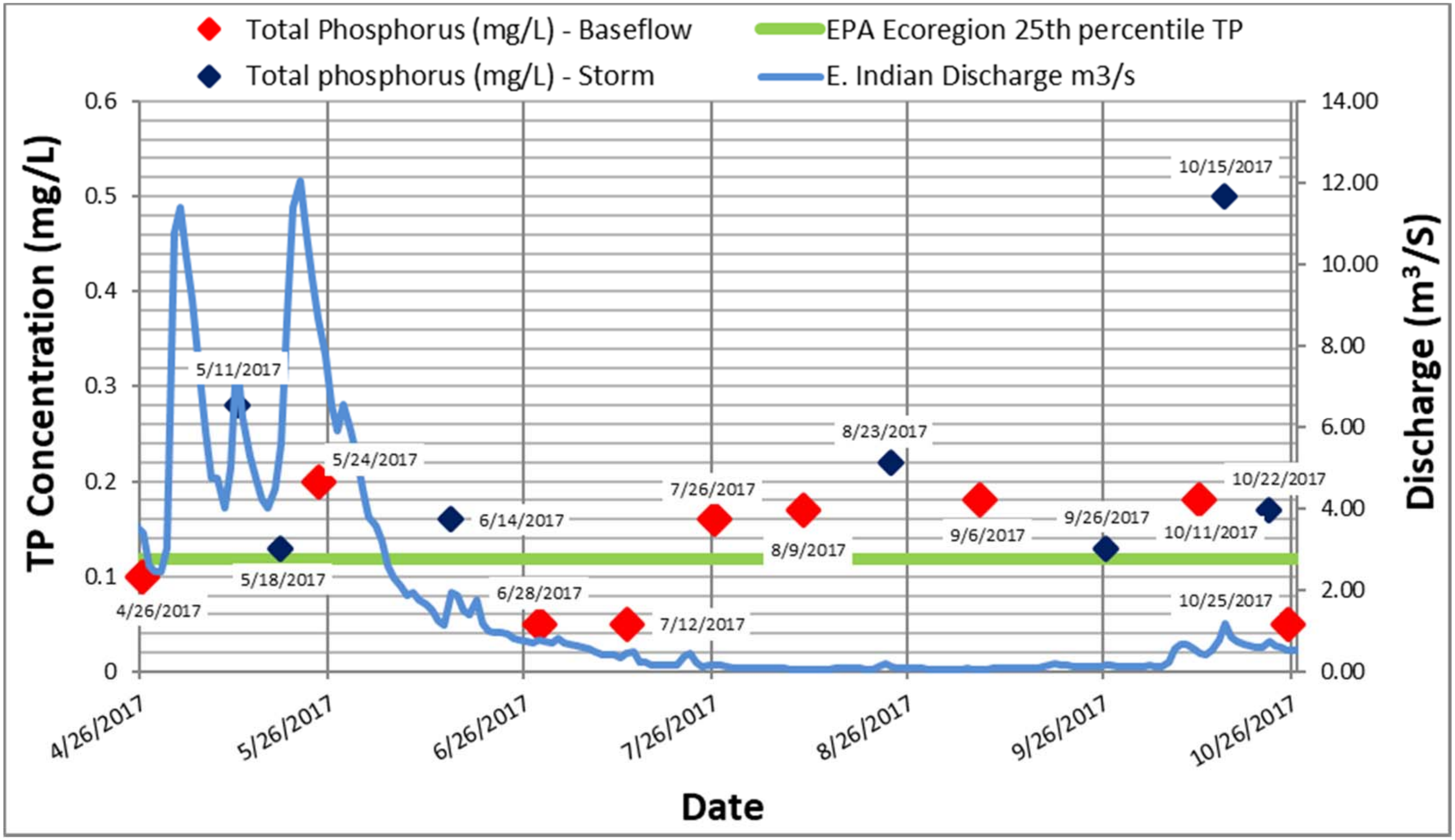

Figure 4. 2017 Observed Total Phosphorus Concentrations for East Indian Creek in Relation to Flow (Discharge).

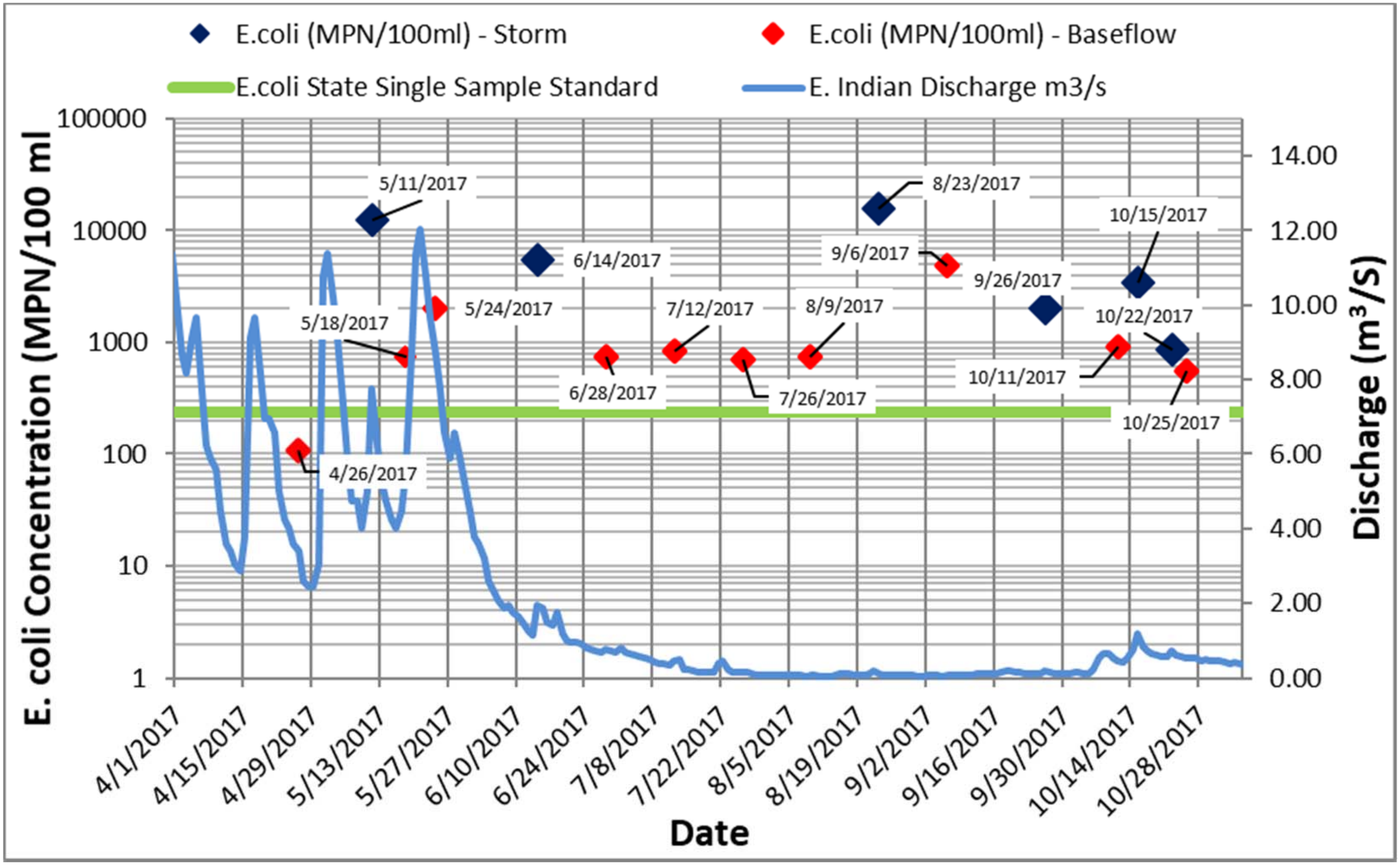

Figure 5. 2017 Observed *E. coli* Concentrations for East Indian Creek in Relation to Flow (Discharge).

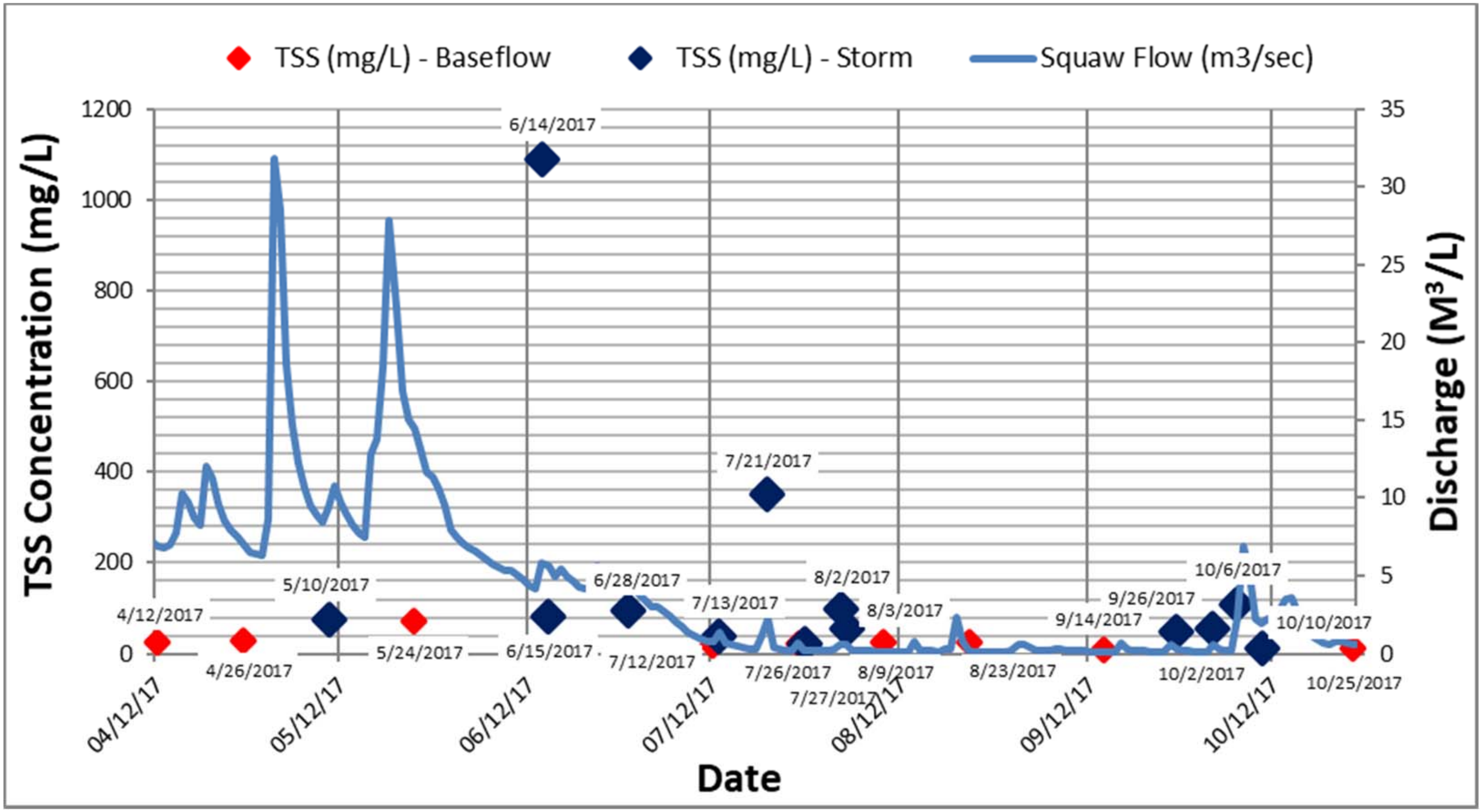

Figure 6. Observed Total Suspended Solids Concentrations for East Indian Creek in Relation to Flow (Discharge).

3. SQUAW CREEK 2017

A total of twenty-two samples including 9 grab samples and 13 rain event (composite) were collected from Squaw Creek from April through October in 2017 (Table 3).

Nitrate-Nitrogen

Observed nitrogen concentrations were higher than the EPA Recommended Criteria Range for Total Nitrogen (TN) from 4/12/2017 through 07/13/2017 (9 samples) while samples collected from 7/13/2017 through 10/10/2017 (13 samples) were all below the EPA criteria (Figure 8). Over 93% of the total annual discharge occurred prior to July 15th, 2017. Stream discharge and nitrogen concentration appear to be strongly correlated with the establishment of row crops which can provide a buffering capacity to storm events through interception and evapotranspiration of precipitation. In the absence of perennial vegetation, these buffering mechanisms are lost during the periods of year (especially spring) when row crops are not fully established. The total annual TN load for Squaw Creek was estimated at 3,248,946 pounds per year or approximately 24.9 pounds/acre/year over the 2004 square mile (130,560 acre) drainage area.

Note: In this monitoring effort, samples were analyzed for the Nitrate form of nitrogen; total nitrogen levels reported are likely underestimated.

Phosphorus

Observed total phosphorus (TP) concentrations were consistently above the EPA Recommended Criteria Range of 0.07 to 0.118 mg/L (76-118 ug/L) with the exception of three base flow samples collected on 4/12/2017, 7/12/2017, and 9/14/2017 (Figure 9). The two highest TP concentrations observed occurred following rain events on 6/14/2017 and 7/21/2017. The correlation between storm events and high observed TP concentrations suggests phosphorus loading is likely correlated with increases in overland flow during storm events. The total annual TP load for Squaw Creek was estimated at 52,578 pounds per year or approximately 0.40 pounds/acre/year. Given that TP concentrations were highest during periods when stream flow (discharge) was also highest, the majority of the total annual TP load was derived from a small number of storm events that collectively represent a small period of the monitoring season. Composite samples aggregated over the entire length of the storm event hydrograph may have underestimated phosphorus concentrations during the rising limb of the hydrograph which ultimately resulted in an underestimation of the annual TP load given that the storm events represented the period in which the majority of the annual TP load was derived.

E. coli (Bacteria)

A comparison of observed E. coli concentrations with the Iowa single sample maximum state standard of 235 organisms/100 ml revealed exceedances throughout the year with the exception of one base flow grab sample event on 4/12/2017 (Figure 10). The geometric mean for all samples collected from April through October was 1,845 organisms/100 ml. Increases in observed *E. coli* concentrations in samples collected following storm events indicates non-point sources are the predominant source of *E.coli* in Squaw Creek.

Total Suspended Solids

Similar to patterns observed with TP concentrations, the two highest observed TSS concentrations occurred following rain events on 6/14/2017 and 7/21/2017 (Figure 11). The total annual TSS load for Squaw Creek was estimated at 43,080,031 pounds per year or approximately 330 pounds/acre/year. The combination of high TSS loading with high TP loading during storm events provides evidence to suggest that the majority of the TP load is from sediment bound phosphorus. A 2011 USGS study of select Minnesota Rivers reported an average annual basin TSS yield for the Des Moines River near the border of Minnesota and Iowa at 313 pounds/acre/year (Ellison et. al., 2013). The Des Moines River watershed has similar land use (extensive cultivation) in the watershed with similar topographic relief. For comparison purposes, observed TSS yields in the Squaw Creek watershed were compared to TSS yields in the Minnesota River basin, the Minnesota River basin has been identified as the primary source of sediment to Lake Pepin (Wilcock et. al., 2006). Results from this comparison suggest TSS loading rates in the Squaw Creek watershed are relatively high.

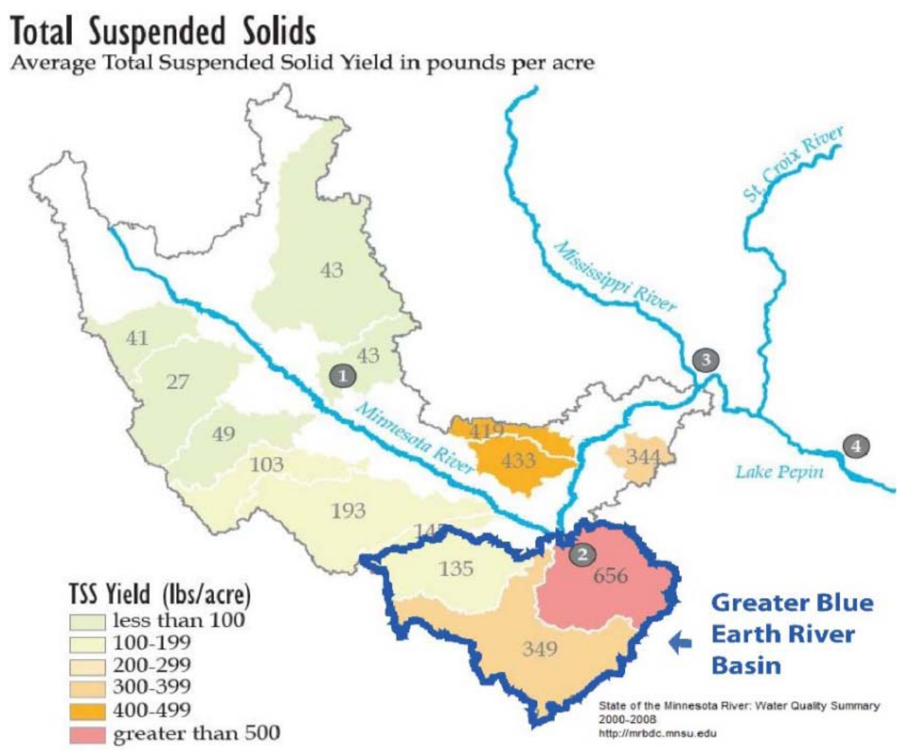

Figure 7. Average Total Suspended Solids Yield (pounds/acre/year) for watersheds of the Minnesota River Basin.

Table 3. Squaw Creek Monitoring Results.

Sample Date	Sample Type	Flow (m^3/s)	Nitrate (mg/L)	Total Phosphorus (mg/L)	Total Suspended Solids (mg/L)	E.coli (MPN/100ml)
04/12/17	Grab	6.9	11	0.11	24	95
04/26/17	Grab	7.0	12	0.12	27	301
05/10/17	Rain Event (Composite)	9.4	10	0.21	76	5,460
05/24/17	Grab	14.4	17	0.14	71	521
06/14/17	Rain Event (Composite)	5.8	10	0.38	1090	2,750
06/15/17	Rain Event (Composite)	5.6	13	0.26	83	N/A
06/28/17	Rain Event (Composite)	4.7	9.2	0.21	94	3,130
07/12/17	Grab	0.8	7.5	0.11	18	663
07/13/17	Rain Event (Composite)	1.4	6.1	0.17	38	1,340
07/21/17	Rain Event (Composite)	2.2	0.5	0.54	350	7,030
07/26/17	Grab	0.7	1	0.23	21	1,396
07/27/17	Rain Event (Composite)	0.2	0.5	0.25	21	4,960
08/02/17	Rain Event (Composite)	0.6	0.5	0.24	100	7,330
08/03/17	Rain Event (Composite)	0.6	0.5	0.2	54	1,340
08/09/17	Grab	0.1	0.5	0.19	24	384
08/23/17	Grab	0.2	0.5	0.24	25	1211
09/14/17	Grab	0.1	0.5	0.05	8.2	336
09/26/17	Rain Event (Composite)	0.3	0.5	0.17	47	9,080
10/02/17	Rain Event (Composite)	0.6	0.5	0.19	54	29,090
10/06/17	Rain Event (Composite)	2.3	0.5	0.3	110	7,701
10/10/17	Rain Event (Composite)	2.0	2	0.25	13	2,820
10/22/17	Grab	0.6	4.7	0.16	12	663

m^3/s – cubic meters per second, mg/l – milligrams per liter, MPN/100ml – most probable number(organisms) per 100 milliliters

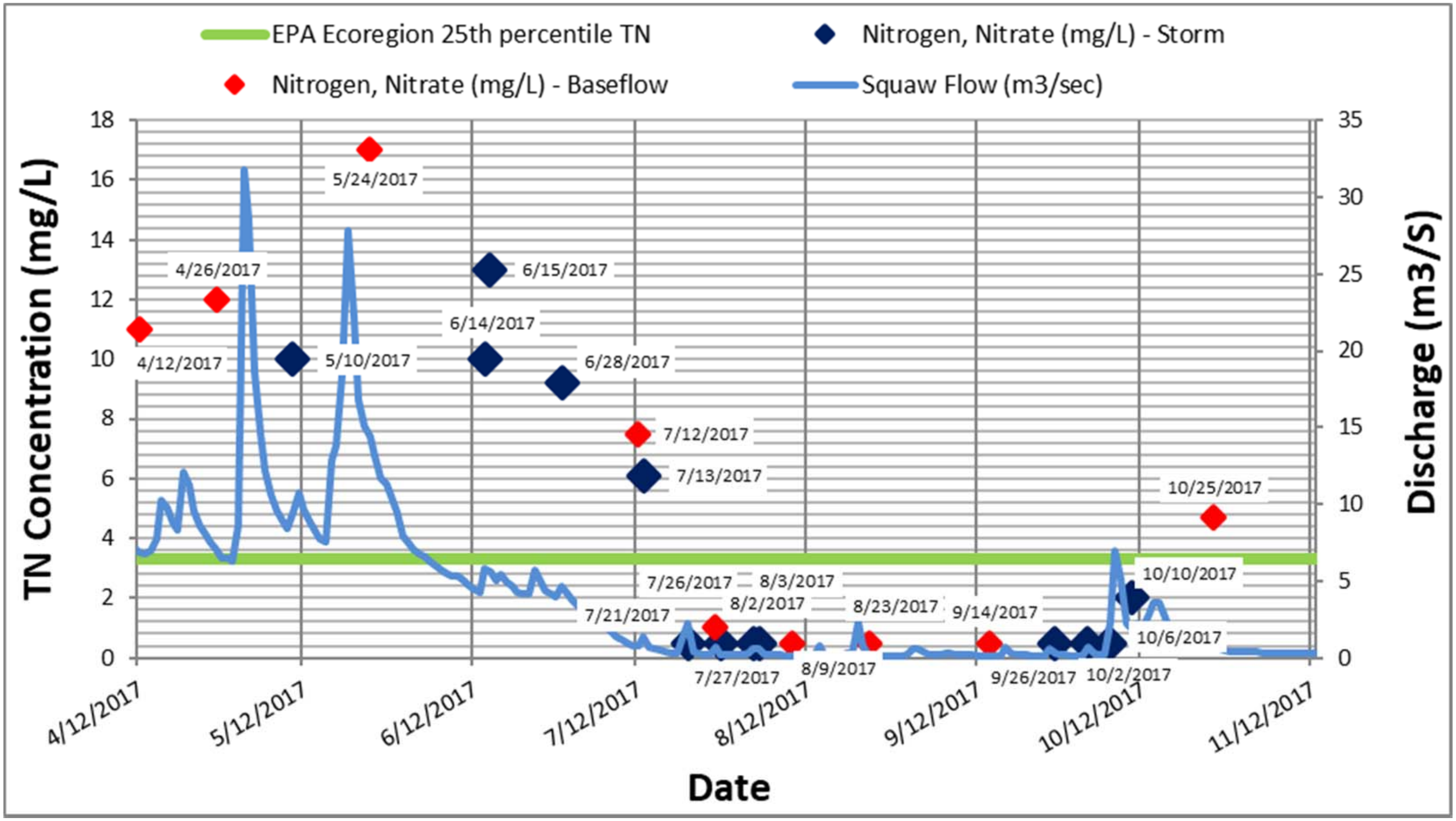

Figure 8. 2017 Observed Nitrogen (as Nitrate) Concentrations for Squaw Creek in Relation to Flow (Discharge).

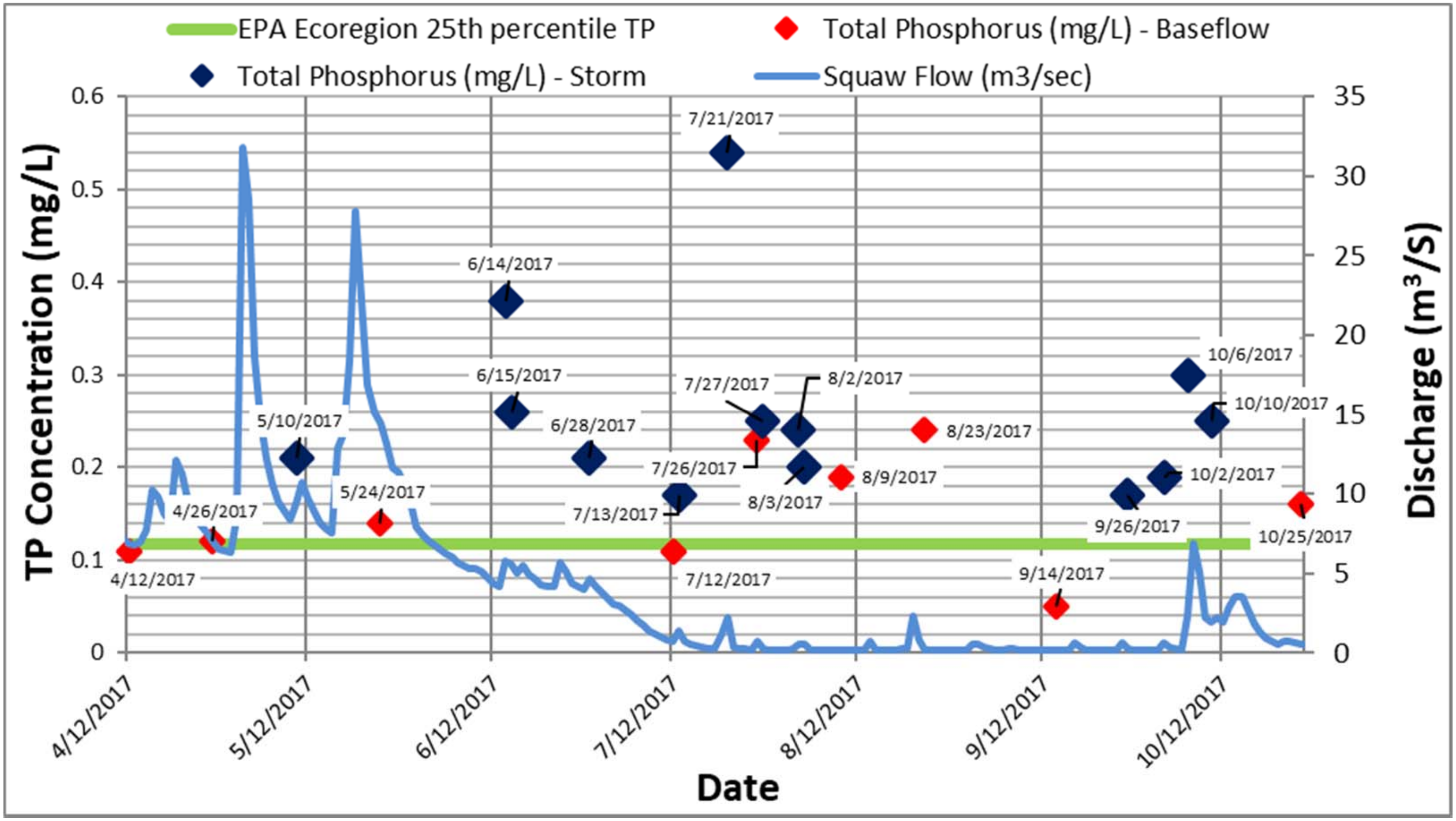

Figure 9. 2017 Observed Total Phosphorus Concentrations for Squaw Creek in Relation to Flow (Discharge).

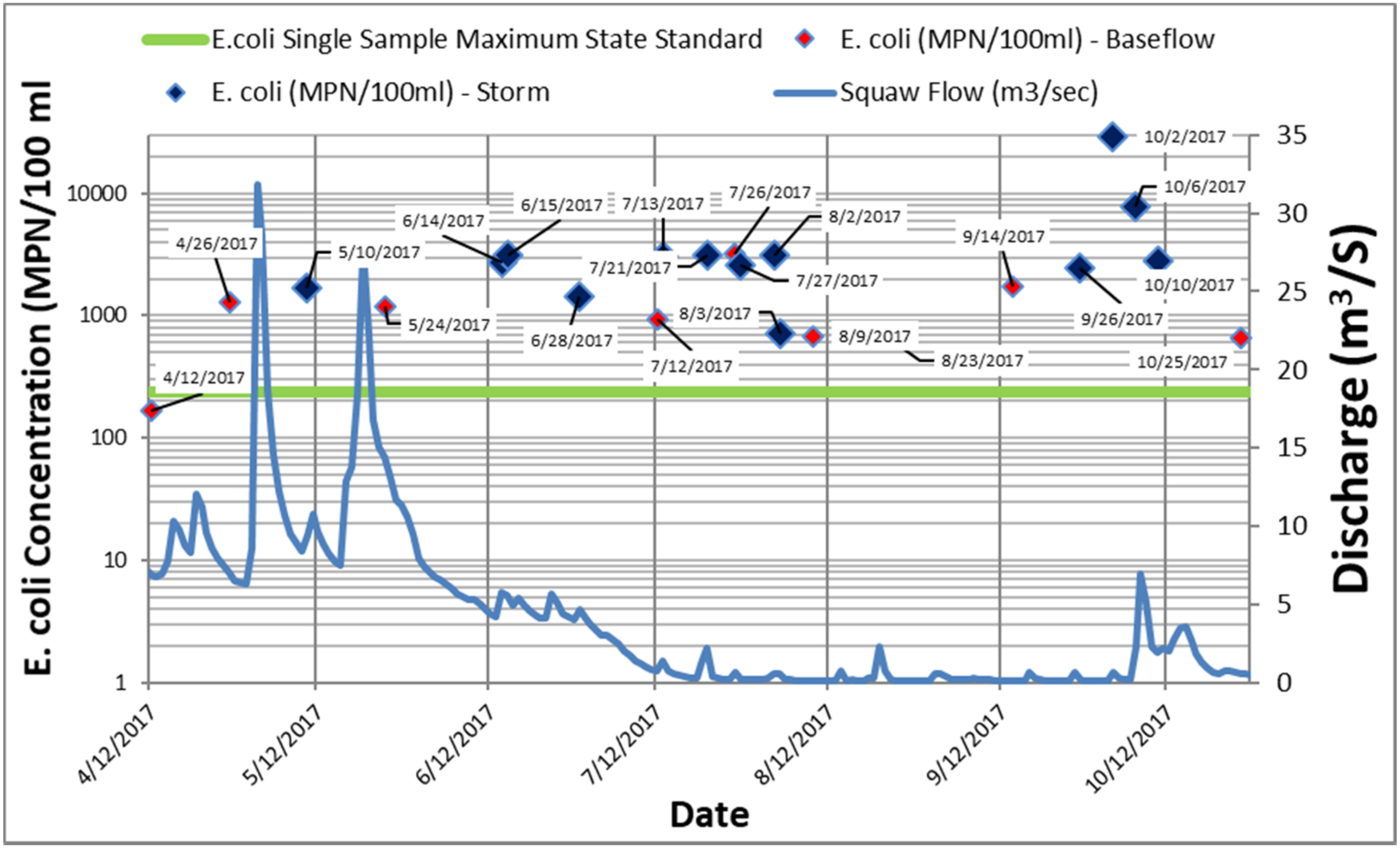

Figure 10. 2017 Observed *E. coli* Concentrations for Squaw Creek in Relation to Flow (Discharge).

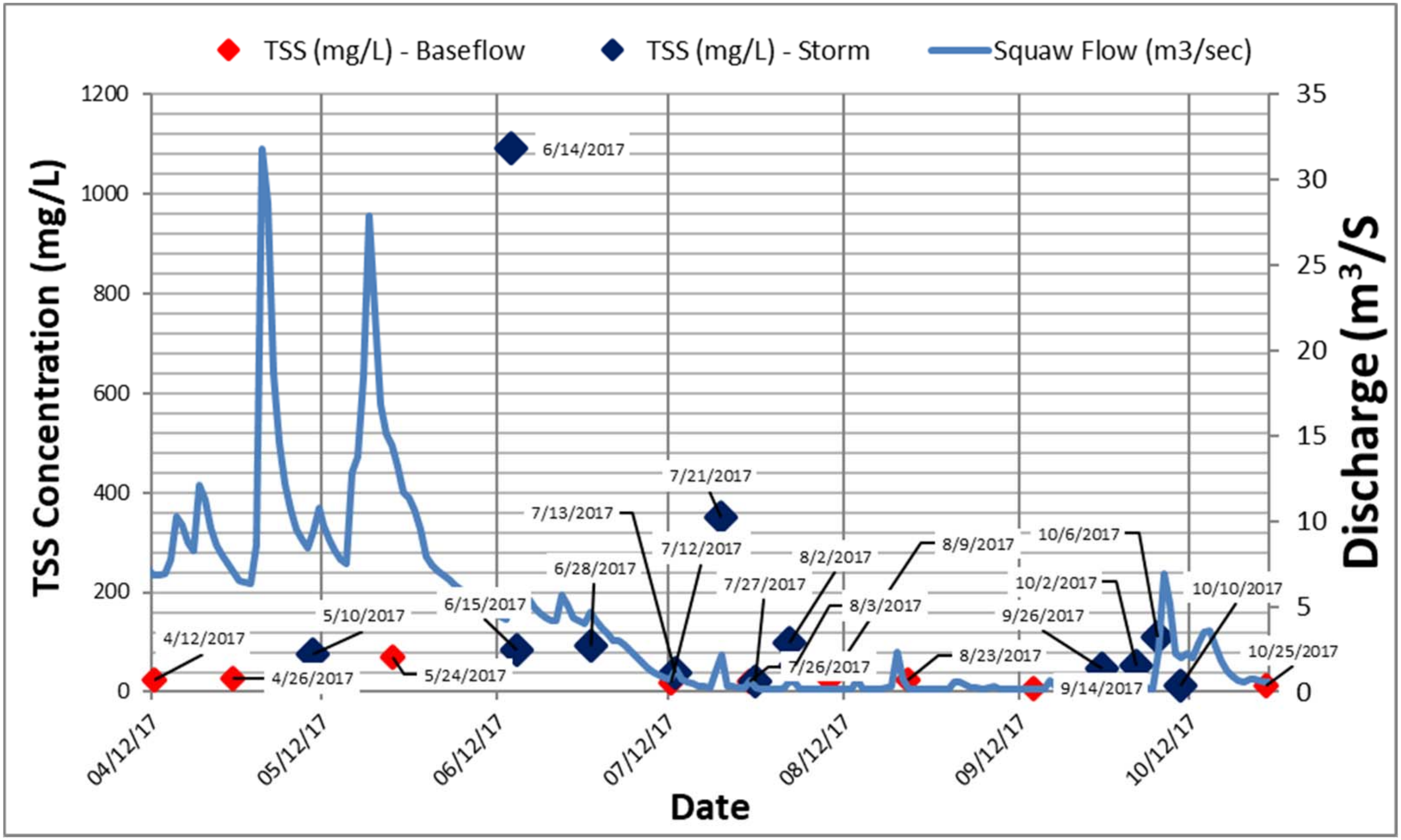

Figure 11. Observed Total Suspended Solids (TSS) Concentrations for Squaw Creek in Relation to Flow (Discharge).

4. RECOMMENDATIONS

The following are recommendations for improvements to the monitoring program.

- Improve the flow rate calculation for the East Indian site by taking stage discharge measurements in the stream. These measurements would then be used for improving the rating curve used to estimate flow. Flow measurements should be taken within the stream at various levels throughout the season.
- Work with the IIHR Iowa Water Quality Information System (IWQIS) to have nitrogen sensors installed at both locations. The IWQIS sensors take nitrogen readings in real-time and record concentration data throughout the year. This data could then be coupled with the USGS flow data, in the case of the Squaw Creek site, to determine nitrogen loading rates. This would eliminate the need to analyze samples for nitrogen.
- Avoid compositing all storm event samples, consider dividing the samples into groups based upon where the sample was collected along the hydrograph to get a better approximation as to the nutrient load derived from each storm event. For two or more composite samples collected that represent portions of the same storm event you can estimate the average flow and concentration by using the equations below. Alternatively, if the samples were collected during separate events or if one of the samples was collected after the storm event had passed, you can delete one event and choose the event that was most representative of the actual storm event. Ultimately, FLUX32 operates on a daily time step so only one representative sample or averaged sample is allowed.

  1. **<u>Average volume:</u>**

     Composite 1 Volume: Event Length (Seconds) * Flux flow (cfs) = (ft^3)

     Composite 2 Volume: Event Length (Seconds) * Flux flow (cfs) = (ft^3)

  2. **<u>Average Composite Flow (cfs)</u>**

     $Composite\ 1\ Volume(ft3)x\ Composite\ 2\ Volume(ft3) \div Comp1(Seconds) + Comp2\ (Seconds)$

  3. **<u>Flow weighted mean concentration (FWMC)</u>**

     a. Composite 1 Mass = Flow x Concentration
     b. Composite 2 Mass = Flow x Concentration

     $$FWMC = \ Composite\ 1\ mass + Composite\ 2\ Mass \div$$

     $$Composite\ 1\ Volume + Composite\ 2\ Volume$$

- Consider collecting additional *E. coli* samples to better characterize average E coli levels such as the change observed between the 4/26 and 5/11 sampling events when concentrations jumped from 109 org/100 ml to 12,230 org/100 ml. There must be a minimum of two days between a given sampling period and no more than two sampled collected within a period of seven consecutive days.

5. CONCLUSIONS

East Indian Creek

2017 monitoring results for stream discharge, Total Phosphorus (TP) and Total Suspended Solids (TSS) followed similar patterns observed during the 2016 monitoring season in that the highest stream flow discharge rates and concentrations were observed immediately following rain events on East Indian Creek. Given that observed TP and TSS concentrations were highest during periods when stream flow was also highest, the majority of the total annual TP and TSS load was derived from a small number of storm events that collectively represent a relatively small period of the entire monitoring season.

In 2017, the majority of the annual TP and TSS load was derived in the first 5 months of the year (prior to crop establishment) when stream discharges and observed TP and TSS concentrations were highest. The establishment of row crop vegetation by mid-June combined with a lack of large storm events reduced soil erosion and increased nutrient and water uptake which likely resulted in significantly lower discharge and nutrient loading rates from June through September.

In 2016, observed TP concentrations from grab samples collected following storm events in July and September were consistently above the EPA Recommended Criteria Range. The correlation between storm events and high observed TP concentrations suggests phosphorus loading increases as a function of increased overland flow during storm events, even during periods when crops are established. Estimated annual TP loads in 2016 (47,147 pounds) were higher in comparison with 2017 (31,737 pounds). The reduction in TP loading rates in 2017 can be attributed to the lack of precipitation and associated storm events during the second half of 2017 as compared to 2016.

In 2017, Total Nitrogen as nitrate concentrations were highest during spring and fall base flow events suggesting contributions from subsurface tile drainage or near stream sources of nitrate as opposed to watershed runoff during storm events. Likewise, TN concentrations were highest during base flow events in 2016. Similar patterns have been observed in the Raccoon River watershed where base flow nitrate-N concentrations have continuously increased since 1970 despite a net (25%) decrease in nitrogen available (lost) for application into the watershed (Hatfield et. al., 2009). Implementation of cover crops which can intercept and transpire precipitation during periods when row crops are not growing will be vital to reducing nitrate losses to East Indian Creek in the spring and fall. Estimated annual TN loads in 2016 (1,230,930 pounds) were lower in comparison with 2017 (1,728,700 pounds) despite an increase in precipitation totals and associated storm events in 2016 as compared to 2017.

Based on monitoring results from the 2016 and 2017 monitoring seasons, significant contributing point and non-point *E. coli* sources are likely present within the East Indian Creek watershed as well as instream legacy sources present within the stream sediment. In total, there have been only 2 samples over the course of two monitoring seasons that did not exceed the single sample maximum standard. With that said, the highest observed *E. coli* concentrations in East Indian Creek occurred immediately following storm events with concentrations occasionally exceeding 10,000 MPN/100ml which suggests non-point sources are the dominant source of pollution.

Squaw Creek

2017 monitoring results for stream discharge, Total Phosphorus (TP) and Total Suspended Solids (TSS) followed similar patterns observed during the 2016 monitoring season in that the highest stream flow discharge rates and concentrations were observed immediately following rain events on Squaw Creek. This pattern is similar to patterns observed in East Indian Creek.

In 2017, the vast majority of the annual TP and TSS load was derived in the first 5 months of the year (prior to crop establishment) when stream discharges and observed TP and TSS concentrations were highest. The establishment of row crop vegetation by mid-June combined with a lack of large storm events reduced soil erosion and increased nutrient and water uptake which likely resulted in significantly lower discharge and nutrient loading rates from June through September.

In 2016, observed TP concentrations from grab samples collected following storm events in July and September were consistently above the EPA Recommended Criteria Range. The correlation between storm events and high observed TP concentrations suggests TP loading increases as a function of increased overland flow during storm events, even during periods when crops are established.

Estimated annual TP loads in 2016 (59,310 pounds) were higher in comparison with 2017 (52,578 pounds). The difference in TP loading rates between the two years can be attributed to the lack of precipitation and associated storm events during the second half of 2017 as compared to 2016.

In 2017, Total Nitrogen as nitrate concentrations were highest during spring and fall base flow events suggesting contributions from subsurface tile drainage or near stream sources of nitrate as opposed to watershed runoff during storm events. Likewise, TN concentrations were highest during base flow events in 2016. Estimated annual TN loads in 2016 (4,535,454 pounds) were higher in comparison with 2017 (3,248,946 pounds).

Based on monitoring results from the 2016 and 2017 monitoring seasons, significant contributing point and non-point *E. coli* sources are likely present within the Squaw Creek watershed as well as instream legacy sources present within the stream sediment. In total, there have been only 2 samples over the course of two monitoring seasons that did not exceed the single sample maximum standard. Similar to East Indian Creek, the highest observed *E. coli* concentrations in Squaw Creek occurred immediately following storm events with concentrations occasionally exceeding 10,000 MPN/100ml which suggests non-point sources are the dominant source of pollution.

Research conducted by Iowa State University on Squaw Creek in 2014 found that *E. coli* concentrations in the water column can increase considerably within a short period of time as stream flow increases as the result of the resuspension of streambed sediment into the water column (Pandey and Soupir, 2014). Additional data collected by ISU on Squaw Creek suggests legacy organisms (*E. coli* already present in the streambed sediment) can become the dominant source of the total *E. coli* load during high flows and can maintain elevated concentrations during periods of low flow (Soupir and Pandey, 2016). Reducing in-stream *E.coli* concentrations will require significant reductions in external sources through landscape best management practices which will ultimately reduce the legacy impact of existing internal sources over time.

6. REFERENCES

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APPENDIX A: FLOW AND POLLUTANT LOADING CALCULATION METHODS

Stream stage data collected by project staff at Story County Conservation was compared with Continuous stage data (collected at 15 minute intervals) for East Indian Creek was downloaded from the Iowa Flood Information System (IFIS) for the entire 2017 monitoring season (1/1/2017-12/14/2017). Continuous discharge data was not available at East Indian Creek. Continuous stage and discharge information was available for Squaw Creek at a downstream USGS stream gauge for the entire 2017 monitoring season. The 15 minute interval data were aggregated to a daily time series which is the preferred timestep for FLUX32. FLUX 32 is the standard program used to calculate annual pollutant loads based on observed streamflow data and pollutant concentrations based on water quality grab samples in river systems. FLUX 32 was created by the U.S. Army Corps of Engineers and has been applied to streams and rivers across the country. Inputs to the FLUX 32 program include grab sample water quality data which is organized in an excel spreadsheet such that each water quality grab sample collected corresponds with a specific flow measurement and date.

In the absence of observed flow data, a rating curve can be used to approximate daily flow values. A rating curve is a graph of stream volume(s) (discharge) versus stage (elevation) for a chosen point in a stream or river. A collection of measurements of discharge at various stages can be used to estimate flow during times when flow collection is not possible. In East Indian Creek, the USGS gauge was too far downstream to develop a meaningful rating curve. Instead, the USGS has developed a method for computing daily mean streamflow at ungaged locations in Iowa using the Flow Anywhere Statistical Methods (Linhart et., al, 2012) available online through the USGS Stream Stats Program. This program can be used to 1) delineate an upstream drainage area, 2) identify key watershed characteristics (e.g., dominant soil types), and 3) compare the upstream drainage area and watershed characteristics to 123 continuous-record stream gages in Iowa to develop a regression equation which approximates flow duration statistics such as those shown for East Indian Creek in **Error! Reference source not found.**. Next, the 2017 stage data were grouped into percentiles to evaluate the relative standing of each stage data as a percentage of the entire data set. Each stage data was then assigned a representative discharge based on the values shown in **Error! Reference source not found.**.

Next steps included arranging the daily flow data and water quality data into the format required for FLUX 32. Once the data was input to the FLUX 32 program, the following basic calibration steps were completed to estimate annual pollutant (nitrogen, phosphorus) loadings in accordance with standard operating procedures developed by the Environmental Services Division of Minnesota's Metropolitan Council https://eims.metc.state.mn.us/Documents/GetDocument/884.

- Adjusting flow or seasonal stratification breaks to reduce the coefficient of variance (C.V.) to 0.2 or lower
- Adjusting flow or seasonal stratification breaks to reduce the slope and regression coefficient in residual plots to approximately 0.

Table 4. Flow-Duration Statistics for East Indian Creek.

Statistic	Discharge (Cubic Feet per Second)
1 Percent	773
5 Percent	354
10 Percent	201
15 Percent	132
20 Percent	103
30 Percent	73.2
40 Percent	51.7
50 Percent	39
60 Percent	28.3
70 Percent	18.1
80 Percent	7.72
85 Percent	5.53
90 Percent	4.07
95 Percent	2.12
99 Percent	0.628