Big Creek Research and Extension Team

University of Arkansas System Division of Agriculture

Quarterly Report – October 1 to December 31, 2017

MONITORING THE SUSTAINABLE MANAGEMENT OF NUTRIENTS ON C&H FARM IN BIG CREEK WATERSHED

Mission of the University of Arkansas System Division of Agriculture

The mission of the **Division of Agriculture** is to advance the stewardship of natural resources and the environment, cultivate the improvement of agriculture and agribusiness, develop leadership skills and productive citizenship among youth and adults, enhance economic security and financial responsibility among the citizens of the state, ensure a safe, nutritious food supply, improve the quality of life in communities across Arkansas, and strengthen Arkansas families.

Dr. Mark J. Cochran
Vice President for Agriculture

Executive Summary

This is the third Quarterly Report of 2017 for the Big Creek Research and Extension Team that details activities and progress made from October 1 through December 31, 2017.

1. We continue to collect weekly base flow and periodic stormflow water samples from Big Creek above and below the C&H Farm, along with water from a spring (reflecting shallow aquifer flow), ephemeral stream (reflecting landscape drainage from the holding ponds and operational facilities), surface runoff sites on Fields 1, 5a, and 12, two interceptor trenches below the slurry holding ponds (reflecting subsurface flow below the holding ponds), and house well (reflecting deeper ground water) for chemical and bacterial analysis.
2. During this fourth quarter of 2017, no consistent trends in nutrient (nitrogen or phosphorus) and bacterial concentrations were observed at each of the sites.
3. During the complete monitoring period from September 2013 to the end of 2017, we have no consistent trends (positive or negative) in nutrient and bacterial concentrations at any of the sampling sites have been observed. This encompasses deep ground water (house well), shallow aquifer flow (spring), aquifer flow beneath the holding ponds, Big Creek up and down stream of the farm operation, Left Fork, ephemeral stream, and surface runoff from application fields. While the current four-year monitoring period is short relative to recommended monitoring periods that give reliable land management impacts on water quality, no impact of farm operation on area water quality has been observed.
4. To date, the following general conclusions can be drawn from the monitoring data;
    a. Nitrogen, P, sediment, and bacteria concentration – flow regime relationships showed that the concentration of dissolved and total P, sediment and bacteria increased from base, to intermediate, to storm flows. In contrast, nitrate-N and total N decreased from base, to intermediate, to storm flows. These patterns reflect that the dominant flow pathway contributing to flow in Big Creek during storm flow is surface runoff and during base flow is groundwater flow and provide insight into identifying and targeting conservation practices designed to minimize any nutrient and bacteria transport in Big Creek Watershed.
    b. In the Ozark Mountain karst region, nutrient concentrations in streams of the Buffalo, Upper Illinois, and Upper White River Watersheds increase as the percent of land in pasture and urban use increases. Averaged over the last three years, nutrient concentrations in Big Creek above and below the C&H Farm are similar to concentrations found in other watersheds where there is a similar amount of pasture and urban land use.
    c. Evaluation of flow-adjusted concentrations over time showed that nutrient concentrations in Big Creek downstream of the C&H Farm were not increasing over the short duration of monitoring, for which concentration and discharge data were available (May 2014 through December 2017). At this point in time, it is evident that nutrient concentrations in Big Creek have not increased at the monitored site, downstream of the C&H Farm. However, flow and nutrient concentration data over a longer period are needed to reliably quantify water–quality trends and characterize

sources, and monitoring needs to continue for at least five years to evaluate how discharge, season, and time influence nutrient fluxes. Use of these relationships provides a method to determine if nutrient concentrations in a given watershed are changing over time, relative to observed nutrient concentration-land use gradients in other watersheds of the Ozark Highlands and Boston Mountains.

Big Creek Science Team

Andrew Sharpley, Ph.D., TEAM LEADER – Distinguished Professor - Soil science, water quality, soil phosphorus chemistry, agricultural management

Kris Brye, Ph.D., Professor - Effects of land application of poultry litter on in-situ nutrient leaching, effects of land use and management practices on soil physical, chemical, and biological properties related to soil quality and sustainability

Mike Daniels, Ph.D., Professor – Extension water quality and nutrient management specialist

Ed Gbur, Ph.D., Professor and Director, Agricultural Statistics Laboratory - Experimental design, linear and generalized linear mixed models, regression, agricultural applications of statistics.

Brian Haggard, Ph.D., Professor - Ecological engineering, environmental soil and water sciences, water quality chemistry, water quality monitoring and modeling, algal nutrient limitation, pollutant transport in aquatic systems

Phil Hays, Ph.D. Ground Water Specialist, U.S. Geological Survey and Research Professor with Geosciences Dept., University of Arkansas, application of stable isotopes and other geochemical indicators in delineating movement and behavior of contaminants in ground-water systems

Mary Savin, Ph.D. - Structure and function of microbial communities in natural and managed ecosystems, microorganisms in nutrient cycling, contaminant degradation

Karl VanDevender, Ph.D. and P.E., Professor - Extension Engineer, Livestock and poultry manure and mortality management, nutrient management planning

Jun Zhu, PhD., Professor - Biological and agricultural engineering, agricultural sustainability, manure treatment technologies

Adam Willis, M.Sc., Newton County Extension Agent - Agriculture

Field Technicians - The Big Creek Research and Extension Team are ably supported by several outstanding and dedicated Program Technicians based in Fayetteville and Little Rock.

Table of Contents

List of Tables

List of Figures

Water Sampling and Analytical Methods

Sampling Locations

Water quality monitoring sites are;

Site 1. Edge-of-field monitoring on Field 1 permitted to receive slurry.

Site 2. Edge-of-field monitoring on Field 5a excluded from receiving slurry.

Site 3. Edge-of-field monitoring on Field 12 permitted to receive slurry.

Site 4. Ephemeral stream flow draining a subwatershed containing the production facilities.

Site 5. Spring below Field 1.

Site 6. Big Creek upstream of the C&H Farm operation.

Site 7. Big Creak downstream of the C&H Farm operation.

Site 8. Left Fork downstream of the C&H Farm operation.

Site 9. North interceptor trench below the manure holding ponds.

Site 10. South interceptor trench below the manure holding ponds.

Site 11. House well at animal facility.

Table 1. Location of sampling sites on the Big Creek Research and Extension Team project.

Site description	Latitude	Longitude	Elevation, ft
Field 1	35 55’ 06.42”	93 03’ 38.34”	984
Field 5a	35 56’03.01”	93 04’ 25.85”	778
Field 12	35 54’ 13.57”	93 04’ 04.76”	838
Ephemeral stream	35 55’ 25.89”	93 04’ 14.94”	824
Spring	35 54’ 57.06”	93 03’ 34.64”	977
Big Creek upstream of farm	35 53’ 32.28”	93 04’ 06.38”	857
Big Creek downstream of farm	35 56’ 18.98”	93 04’ 21.81”	769
Left Fork	35 5’”48.04”	93 04” 02.02”	760
Trench 1 (south)	35 55’ 19.24”	93 04’ 23.04”	896
Trench 2 (north)	35 55’ 21.39”	93 04’ 19.93”	883
House well	35 55’ 27.02”	93 04’ 22.71”	915

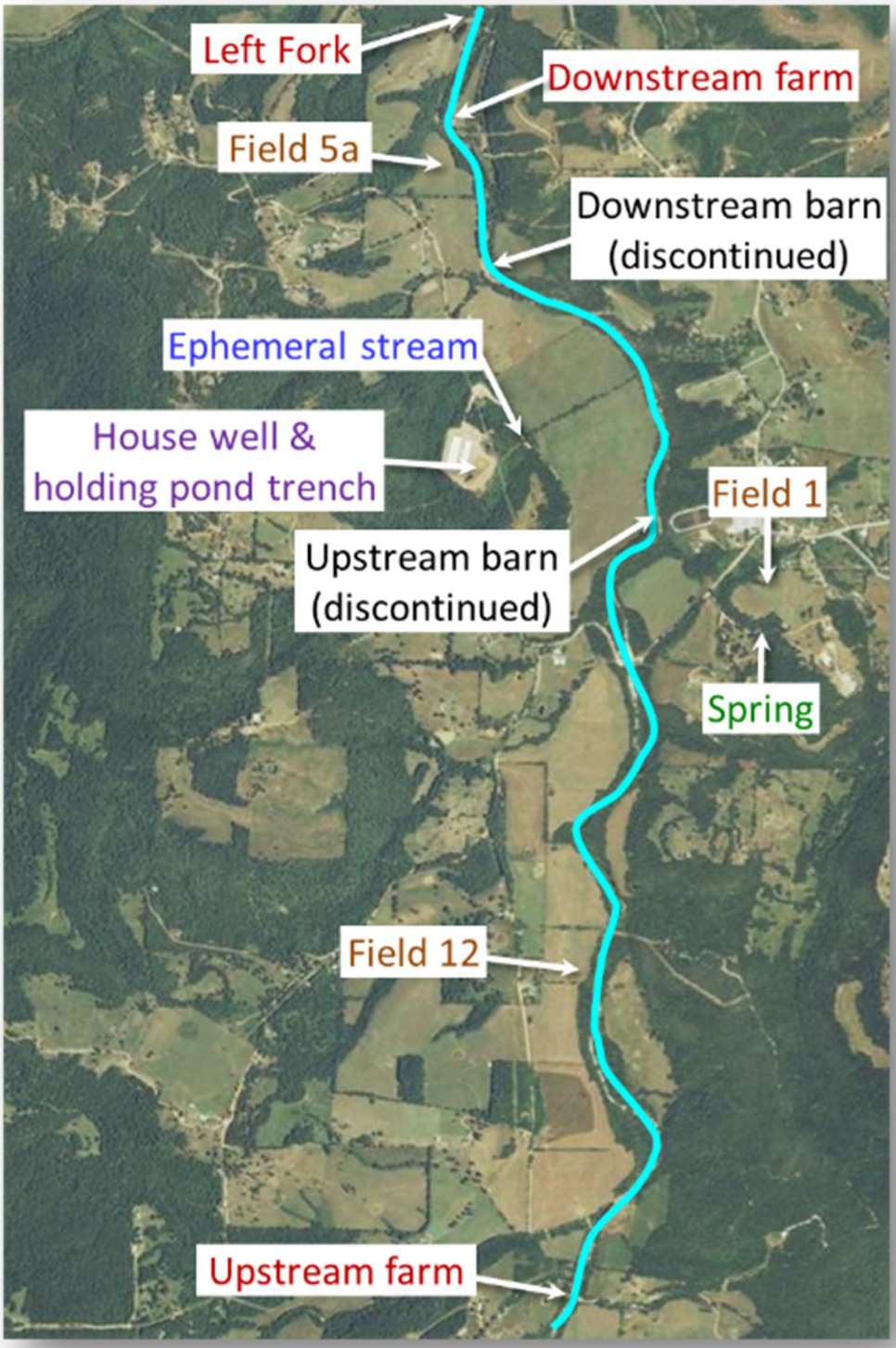

Figure 1. Location of sampling sites for the Big Creek Research and Extension Team project.

Sampling Protocols and Analyses

The following protocols were used to collect, prepare, and analyze all water samples:

1. One-liter acid-washed bottles were used to collect the stream samples for nutrient analyses.
2. Water was collected from just beneath the surface, where the stream was actively moving and well-mixed.
3. The bottle was rinsed with stream water before collecting the sample.
4. Sterilized specimen cups were used to collect samples for bacterial evaluation.
5. Time of collection was noted, and samples placed in a cooler on ice to preserve them until processed and were submitted to the Arkansas Water Resources Center Water Quality Lab on the day of collection for analyses.
6. Analyses included Alkalinity (APHA 2320-B), Ammonia (EPA 351.2), Chloride (EPA 300.0), Dissolved Phosphorus (EPA 365.2), E. coli (APHA 9223-B), Electrical Conductivity (EPA 120.1), Nitrate (EPA 300.0), pH (EPA 150.1), Total Coliforms (APHA 9223-B), Total Dissolved Solids (EPA 160.1), Total Nitrogen (APHA 4500-P J), Total Phosphorus (APHA 4500-P J), and Total Suspended Solids (EPA 160.2). APHA is American Public Health Association from the Wadeable Streams Assessment, Water Chemistry Laboratory Manual http://www.epa.gov/owow/monitoring/wsa/WRS_lab_manual.pdf
7. Prior to collection of a house well water sample, the well is purged and water temperature, pH, and electrical conductivity measured on-site every 30 seconds until all values stabilize (primarily water temperature). At that point a sample of water is collected in a 1-L acid-washed bottle. This method is taken from USGS and EPA well-water sampling protocols. See USGS methods for sampling at https://water.usgs.gov/owq/FieldManual/chapter4/pdf/Chap4_v2.pdf. Specific and detailed guidance on the collected of water quality data can be found in the USGS National Field Manual at file:///U:/Words/C&H%20Farm/Publications/Planning/USGS%20National%20Field%20Mannual_complete%202015.pdf

   The U.S. EPA also recommend that selected water quality parameters can be monitored during low-rate purging, with stabilization of these parameters indicating when the discharge water represents aquifer water or source well water. See: http://www.csus.edu/indiv/h/hornert/Geol_210_Summer_2012/Week%202%20readings/Puls%20and%20Barcelona%201996%20Low%20flow%20sampling.pdf and https://in-situ.com/wp-content/uploads/2015/01/Low-Flow-Groundwater-Sampling-Techniques-Improve-Sample-Quality-and-Reduce-Monitoring-Program-Costs-Case-Study.pdf
8. Minimum detection limits (MDLs) for each chemical and biological constituent are listed in Table 1. Some constituent concentrations were reported by the laboratory as less than the MDL but greater than zero. Those values are given in subsequent tables but have less confidence in their accuracy than concentrations above the MDL.
9. Chemical and biological analyses of samples collected from the beginning of 2017 to May 31, 2017 are given in Tables 3, 4, 5, and 6.

Table 2. Minimum detection limits (MDLs) for each chemical and biological constituent.

Constituent	Minimum detection limit [1]
Alkalinity, mg/L as $CaCO_3$	2
Chloride, mg/L	0.093
Dissolved P, mg/L	0.002
Conductivity, uS/cm	1
Ammonia-N, mg/L	0.03
Dissolved organic carbon, mg/L	0.18
E. coli, MPN/100 mL	1
Nitrate-N, mg/L	0.004
pH	0.1
Total coliform, MPN/100 mL	1
Total dissolved solids, mg/L	15.22
Total N, mg/L	0.006
Total P, mg/L	0.012
Total suspended solids, mg/L	6.58

[1] MDL the Minimum Detection Limit of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. Further information is available at http://water.usgs.gov/owq/OFR_99-193/detection.html

Big Creek Research and Extension Team Monitoring Data

Nutrients, Sediment, and Bacteria by Date of Sampling

Table 3. Water quality analyses at each sample site since January 2017, with those collected since the last report noted. Coliform units are Most Probable Number (MPN) per 100 mL of water.

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
			---------- mg/L ----------							-- MPN/100 mL --	
1/5/2017	**1/25/2017**	**Grab sample**									
12:28	15:25	Spring	0.004	0.026	0.04	0.276	0.390	9.5	0.94	74.4	1413.6
13:12	15:25	Upstream farm	0.009	0.014	0.02	0.059	0.090	0.7	0.66	52.0	2419.2
12:00	15:25	Downstream farm	0.012	0.019	0.04	0.257	0.310	1.3	0.55	5.2	1986.3
11:42	15:25	Left Fork	0.006	0.011	0.03	0.229	0.260	0.7	0.85	6.2	1732.9
12:47	15:25	House well	0.008	0.014	0.04	0.610	0.660	0.3	0.30	<1.0 ¶	<1.0
1/19/2017	**1/19/2017**	**Grab sample**									
10:41	14:30	Spring	0.009	0.017	0.04	0.286	0.600	33.0	13.31	<1.0	2260.0
11:27	14:30	Upstream farm	0.010	0.016	0.03	0.050	0.140	1.9	4.22	137.6	>2419.2
10:30	14:30	Downstream farm	0.014	0.024	0.02	0.121	0.210	2.5	3.19	60.1	3990.0
10:10	14:30	Left Fork	0.010	0.019	0.03	0.243	0.360	2.6	4.25	55.4	>2419.2
11:00	14:30	House well	0.009	0.013	0.03	0.617	0.690	0.9	7.87	<1.0	<1.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
2/2/2017	**2/2/2017**	**Grab sample**									
10:45	14:30	Spring	0.011	0.030	<0.03	0.823	0.890	7.3	5.06	6.3	1732.9
11:20	14:30	Upstream farm	0.009	0.017	<0.03	0.056	0.070	1.1	1.72	41.9	>2419.2
10:30	14:30	Downstream farm	0.014	0.026	0.01	0.160	0.210	5.1	2.21	41.3	>2419.2
10:15	14:30	Left Fork	0.008	0.019	0.01	0.139	0.180	1.1	1.69	17.1	>2419.2
10:57	14:30	House well	0.011	0.031	0.01	0.614	0.780	0.4	2.22	<1.0	<1.0
2/15/2017	**2/15/2017**	**Grab sample**									
11:50	15:35	Spring	0.013	0.093	0.02	0.201	0.570	12.7	8.76	178.5	4350.0
13:30	15:35	Upstream farm	0.009	0.060	0.01	0.132	0.300	5.0	3.04	1986.3	6570.0
11:24	15:35	Downstream farm	0.012	0.082	0.03	0.159	0.420	9.0	3.46	1732.9	11000.0
12:08	15:35	Ephemeral stream	0.020	0.064	0.02	1.323	1.450	3.1	5.06	166.9	5630.0
11:11	15:35	Left Fork	0.015	0.080	0.03	0.314	0.600	17.7	4.66	648.8	11060.0
12:46	15:35	Trench 1	0.004	0.023	0.01	0.141	0.200	1.3	0.45	1.0	1299.7
12:56	15:35	Trench 2	0.004	0.087	0.04	0.486	1.120	6.1	5.99	19.7	42860.0
12:25	15:35	House well	0.008	0.023	0.02	0.649	0.720	0.5	2.07	<1.0	<1.0
3/1/2017	**3/1/2017**	**Grab sample**									

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:38	14:55	Upstream farm	0.009	0.044	0.03	0.069	0.240	4.7	3.93	2590.0	7940.0
11:18	14:55	Downstream farm	0.005	0.016	0.03	0.148	0.270	2.6	3.24	71.7	2430.0
11:43	14:55	Ephemeral stream	0.011	0.016	0.02	0.659	0.710	1.5	6.75	195.6	5730.0
11:00	14:55	Left Fork	0.008	0.024	0.02	0.136	0.280	4.3	2.46	1119.9	4260.0
12:16	14:55	Trench 2	0.002	0.050	0.04	0.345	0.760	11.6	4.90	98.8	34480.0
11:52	14:55	House well	0.012	0.040	0.03	0.620	0.720	0.5	5.85	<1.0	<1.0
3/16/2017	**3/16/2017**	**Grab sample**									
7:30	11:45	Spring	0.009	0.061	<0.03	0.729	0.990	15.5	2.69	24.0	>2419.2
8:38	11:45	Upstream farm	0.006	0.046	<0.03	0.118	0.290	1.7	1.08	75.9	1299.7
7:13	11:45	Downstream farm	0.010	0.031	<0.03	0.266	0.300	2.9	0.97	68.3	1986.3
7:38	11:45	Ephemeral stream	0.005	0.021	<0.03	0.738	0.800	0.8	2.99	14.8	2419.2
7:00	11:45	Left Fork	0.009	0.043	<0.03	0.300	0.410	3.1	1.77	45.5	>2419.2
8:00	11:45	Trench 1	0.006	0.020	<0.03	0.083	0.110	1.1	1.87	<1.0	179.3
7:46	11:45	House well	0.009	0.023	<0.03	0.856	0.880	0.1	1.52	<1.0	<1.0
3/27/2017	**3/27/2017**	**Grab sample**									
11:27	15:40	Spring	0.007	0.044	<0.03	0.213	0.600	7.2	9.58	770.1	8800.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:51	15:40	Upstream farm	0.012	0.122	0.06	0.181	0.740	131.4	5.72	1986.3	17850.0
10:51	15:40	Downstream farm	0.047	0.096	0.20	0.173	1.490	321.9	6.68	9840.0	72150.0
10:37	15:40	Left Fork	0.058	0.164	0.17	0.206	1.500	1005.1	8.51	9330.0	38770.0
11:50	15:40	Trench 1	0.004	0.048	0.03	0.129	0.390	3.1	4.36	387.3	17230.0
11:55	15:40	Trench 2	0.009	0.102	0.13	0.060	0.820	7.0	7.13	488.4	29240.0
12:38	15:40	House well	0.007	0.038	0.02	0.573	0.630	1.6	3.83	18.1	261.3
3/27/2017	**3/27/2017**	**Storm sample**									
11:40	15:40	Ephemeral stream	0.151	0.268	0.29	1.704	3.300	448.3	16.47	18500.0	66530.0
11:05	15:40	Field 1	0.420	0.670	0.43	0.090	1.870	124.4	9.29	8390.0	45690.0
12:15	15:40	Field 5a	2.980	3.232	1.40	0.122	1.800	30.2	32.01	2419.2	69100.0
13:06	15:40	Field 12	0.800	1.276	2.02	2.798	6.040	134.2	9.35	7120.0	96060.0
3/30/2017	**3/30/2017**	**Storm sample**									
11:15	14:15	Ephemeral stream	0.005	0.032	0.01	0.796	0.860	8.6	1.89	ND §	ND
4/6/2017	**4/6/2017**	**Grab sample**									
11:40	15:25	Spring	0.009	0.032	0.01	0.265	0.420	5.2	6.36	1413.6	1413.6
11:30	15:25	Upstream farm	0.007	0.038	0.01	0.099	0.210	2.3	2.53	72.0	>2419.2

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:55	15:25	Downstream farm	0.009	0.034	0.01	0.173	0.260	3.1	1.96	107.6	>2419.2
11:20	15:25	Ephemeral stream	0.008	0.022	<0.03	0.717	0.760	1.6	1.69	148.3	1986.3
11:50	15:25	Left Fork	0.010	0.048	0.01	0.222	0.410	4.7	2.32	135.4	2780.0
10:20	15:25	Trench 1	0.004	0.022	0.03	0.165	0.300	17.2	1.98	47.2	2750.0
4/6/2017	**4/6/2017**	**Storm sample**									
11:15	15:25	Ephemeral stream	0.018	0.080	0.06	0.807	1.140	19.9	4.14	ND	ND
4/13/2017	**4/13/2017**	**Grab sample**									
12:22	15:30	Spring	0.011	0.022	<0.03	0.600	0.630	3.6	15.57	8.6	816.4
13:05	15:30	Upstream farm	0.008	0.054	<0.03	0.026	0.110	2.5	4.64	83.6	2419.2
11:56	15:30	Downstream farm	0.009	0.028	0.01	0.092	0.170	1.1	2.33	135.4	>2419.2
12:50	15:30	Ephemeral stream	0.010	0.018	<0.03	0.593	0.600	1.5	7.73	71.7	6700.0
11:33	15:30	Left Fork	0.010	0.024	<0.03	0.123	0.210	1.6	2.75	22.3	>2419.2
12:35	15:30	House well	0.011	0.020	<0.03	0.564	0.590	0.1	6.22	<1.0	1.0
4/17/2017	**4/17/2017**	**Grab sample**									
12:02	14:55	Spring	0.007	0.044	0.02	0.154	0.400	5.3	6.46	1413.6	18420.0
11:45	14:55	Upstream farm	0.019	0.054	<0.03	0.025	0.120	5.3	1.55	1553.1	9330.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
10:51	14:55	Downstream farm	0.011	0.046	0.01	0.129	0.240	3.3	1.51	866.4	8360.0
11:10	14:55	Ephemeral stream	0.005	0.018	<0.03	0.651	0.680	0.9	1.71	410.6	7270.0
10:40	14:55	Left Fork	0.040	0.112	0.02	0.173	0.460	19.5	4.55	9090.0	129970.0
11:25	14:55	House well	0.006	0.016	0.01	0.563	0.570	0.2	1.94	<1.0	12.1
4/24/2017	**4/24/2017**	**Storm sample**									
11:50	15:30	Ephemeral stream	0.007	0.128	0.04	0.000	1.830	318.0	7.35	ND	ND
11:15	15:30	Field 1	0.395	0.592	0.13	0.143	1.500	43.1	7.25	ND	ND
11:35	15:30	Field 5a	0.961	1.212	0.12	0.321	1.530	11.7	11.53	ND	ND
12:15	15:30	Trench 1	0.005	0.040	21.95	0.133	22.760	18.5	7.04	ND	ND
12:20	15:30	Trench 2	0.010	0.084	0.04	0.087	0.930	8.2	8.78	ND	ND
4/27/2017	**4/27/2017**	**Grab sample**									
11:05	16:25	Spring	0.011	0.022	<0.03	0.380	0.440	3.1	2.58	165.8	>2419.2
12:10	16:25	Upstream farm	0.010	0.036	<0.03	0.117	0.120	7.1	1.34	172.3	2430.0
10:35	16:25	Downstream farm	0.014	0.042	<0.03	0.231	0.240	10.7	1.70	214.3	6090.0
10:20	16:25	Left Fork	0.016	0.046	<0.03	0.306	0.320	16.4	2.08	275.5	7230.0
11:30	16:25	House well	0.011	0.014	<0.03	0.532	0.530	0.1	0.69	5.1	52.8

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:43	16:25	Trench 2	0.006	0.046	0.04	0.029	0.420	2.4	4.95	115.3	2419.2
4/27/2017	**4/27/2017**	**Storm sample**									
11:52	16:25	Ephemeral stream	0.042	0.253	0.01	0.302	2.570	734.5	8.29	186.0	>2419.2
10:50	16:25	Field 1	0.550	0.784	0.08	0.107	1.320	52.2	8.46	ND	ND
11:15	16:25	Field 5a	0.686	0.846	0.07	0.063	0.860	11.3	7.26	ND	ND
13:40	16:25	Field 12	0.326	0.544	0.02	0.105	0.710	102.3	5.64	ND	ND
11:40	16:25	Trench 1	0.006	0.048	1.04	0.081	1.430	7.2	4.04	40.4	3990.0
5/1/2017	**5/1/2017**	**Grab sample**									
11:35	15:45	Spring	0.012	0.012	<0.03	0.343	0.480	0.3	4.34	127.4	2419.2
13:05	15:45	Upstream farm	0.013	0.026	<0.03	0.144	0.250	4.1	1.01	95.9	2280.0
11:01	15:45	Downstream farm	0.018	0.032	<0.03	0.279	0.390	6.9	1.22	187.2	3010.0
12:54	15:45	Ephemeral stream	0.014	0.018	<0.03	0.681	0.750	68.2	1.12	146.7	1986.3
10:50	15:45	Left Fork	0.019	0.068	<0.03	0.362	0.550	14.1	1.68	129.1	7430.0
12:15	15:45	House well	0.015	0.042	<0.03	0.529	0.650	1.8	1.59	4.1	3740.0
12:30	15:45	Trench 1	0.007	0.008	<0.03	0.124	0.180	2.3	1.05	435.2	12960.0
12:40	15:45	Trench 2	0.013	0.022	<0.03	0.000	0.230	3.4	3.02	435.2	3890.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
5/1/2017	**5/1/2017**	**Storm sample**									
11:20	15:45	Field 1	0.534	0.760	0.33	0.321	2.200	36.7	12.66	ND	ND
12:00	15:45	Field 5a	0.734	0.916	0.22	0.281	1.560	13.1	9.81	ND	ND
13:15	15:45	Field 12	0.224	0.374	0.03	0.166	1.060	40.6	7.25	ND	ND
12:30	15:45	Trench 1	0.009	0.050	0.61	0.076	2.400	10.7	4.56	ND	ND
12:40	15:45	Trench 2	0.008	0.066	0.02	0.010	0.810	11.2	8.31	ND	ND
5/11/2017	**5/11/2017**	**Grab sample**									
7:40	12:05	Spring	0.013	0.016	<0.03	0.406	0.410	0.9	4.97	30.5	1986.3
8:25	12:05	Upstream farm	0.009	0.022	<0.03	0.125	0.170	2.4	1.32	165.8	2419.2
7:24	12:05	Downstream farm	0.010	0.026	<0.03	0.397	0.400	2.4	1.18	93.3	3090.0
7:50	12:05	Ephemeral stream	0.009	0.018	<0.03	0.682	0.740	1.5	1.49	48.0	2419.2
7:13	12:05	Left Fork	0.012	0.024	<0.03	0.383	0.380	1.3	1.09	78.9	5460.0
7:55	12:05	House well	0.010	0.016	<0.03	1.023	1.080	0.6	1.19	<1.0	6.3
5/18/2017	**5/18/2017**	**Grab sample**									
10:55	15:00	Spring	0.006	0.018	<0.03	0.220	0.340	0.4	4.91	88.0	2419.2
11:40	15:00	Upstream farm	0.006	0.048	<0.03	0.067	0.190	2.9	1.50	260.2	>2419.2

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
10:45	15:00	Downstream farm	0.008	0.024	<0.03	0.189	0.300	1.9	1.10	129.6	3690.0
11:05	15:00	Ephemeral stream	0.012	0.020	<0.03	0.692	0.750	1.7	1.76	49.6	2419.2
10:30	15:00	Left Fork	0.009	0.022	<0.03	0.167	0.260	1.9	1.54	50.4	2419.2
11:15	15:00	House well	0.011	0.020	<0.03	0.431	0.600	0.6	5.05	1.0	3.1
5/25/2017	**5/25/2017**	**Grab sample**									
12:16	15:27	Spring	0.007	0.042	0.01	0.219	0.330	22.2	3.76	68.9	2419.2
13:06	15:27	Upstream farm	0.007	0.052	0.01	0.109	0.240	1.9	1.53	ND	ND
11:35	15:27	Downstream farm	0.008	0.020	0.01	0.295	0.300	1.7	1.41	101.7	>2419.2
12:25	15:27	Ephemeral stream	0.013	0.016	0.01	0.661	0.710	0.4	2.01	72.8	>2419.2
11:18	15:27	Left Fork	0.010	0.022	0.01	0.303	0.320	1.4	1.48	58.1	2419.2
12:48	15:27	House well	0.010	0.016	0.02	0.525	0.570	0.3	1.71	<1.0	613.1
5/25/2017	**5/25/2017**	**Storm sample**									
11:35	15:27	Downstream farm	0.006	0.050	<0.03	0.274	0.310	3.0	1.35	ND	ND
5/31/2017	**5/31/2017**	**Grab sample**									
10:38	13:50	Spring	0.007	0.036	<0.03	0.163	0.320	13.2	3.81	235.9	4280.0
11:05	13:50	Upstream farm	0.009	0.020	<0.03	0.053	0.140	1.9	1.34	157.6	2419.2

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
10:30	13:50	Downstream farm	0.008	0.052	<0.03	0.188	0.250	1.6	1.33	150.0	2419.2
10:55	13:50	Ephemeral stream	0.009	0.020	<0.03	0.769	0.790	2.5	1.53	275.5	3500.0
10:20	13:50	Left Fork	0.008	0.020	<0.03	0.156	0.220	1.5	1.58	260.2	4720.0
10:51	13:50	House well	0.019	0.026	<0.03	0.605	0.920	0.4	1.86	<1.0	22.1
6/5/2017	**6/5/2017**	**Grab sample**									
10:53	14:35	Spring	0.007	0.026	0.02	0.225	0.330	9.7	6.63	160.7	4640.0
11:51	14:35	Upstream farm	0.007	0.054	0.01	0.114	0.210	8.3	3.01	178.5	5040.0
10:35	14:35	Downstream farm	0.013	0.064	0.01	0.185	0.290	12.9	1.81	313.0	9330.0
11:03	14:35	Ephemeral stream	0.010	0.028	<0.03	0.706	0.710	1.5	2.38	613.1	5830.0
10:25	14:35	Left Fork	0.011	0.070	0.01	0.179	0.320	14.4	1.63	579.4	24000.0
11:09	14:35	House well	0.008	0.026	0.01	0.586	0.590	0.3	0.00	6.3	48.0
11:30	14:35	Trench 2	0.003	0.086	0.02	0.018	0.750	8.7	7.04	2780.0	>241920
6/6/2017	**6/6/2017**	**Storm sample**									
11:17	15:30	Field 1	0.747	0.998	0.51	0.438	2.340	56.0	10.39	ND	ND
12:12	15:30	Field 5a	1.000	1.430	0.05	1.861	2.380	<10.0	6.21	ND	ND
12:46	15:30	Field 12	0.316	0.470	0.03	0.166	1.660	280.8	6.65	ND	ND

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:30	15:30	Ephemeral stream	0.041	0.816	0.14	0.580	4.610	1788.2	9.24	ND	ND
11:02	15:30	Downstream farm	0.018	0.118	0.03	0.073	0.900	291.5	6.35	ND	ND
6/12/2017	**6/12/2017**	**Grab sample**									
10:27	14:25	Spring	0.006	0.084	0.01	0.193	0.400	53.3	2.57	29.5	155310.0
11:02	14:25	Upstream farm	0.008	0.026	0.01	0.105	0.130	2.0	1.01	121.1	6280.0
10:14	14:25	Downstream farm	0.009	0.020	0.01	0.256	0.270	1.6	0.77	119.8	4350.0
10:35	14:25	Ephemeral stream	0.010	0.882	<0.03	0.732	0.730	0.6	0.67	33.6	2419.2
10:05	14:25	Left Fork	0.006	0.016	<0.03	0.143	0.190	0.9	1.17	77.1	4350.0
10:40	14:25	House well	0.010	0.012	0.00	0.591	0.590	0.0	1.20	<1.0	3.1
6/19/2017	**6/19/2017**	**Grab sample**									
10:45	14:25	Spring	0.007	0.046	0.01	0.227	0.710	25.6	7.34	9.6	1986.3
11:17	14:25	Upstream farm	0.009	0.014	<0.03	0.089	0.120	1.4	2.99	60.1	3640.0
10:35	14:25	Downstream farm	0.007	0.016	0.01	0.256	0.300	1.9	2.75	75.9	7590.0
10:25	14:25	Left Fork	0.006	0.018	0.01	0.226	0.280	2.1	2.15	32.3	4130.0
11:00	14:25	House well	0.009	0.014	0.02	0.582	0.580	0.3	6.92	<1.0	<1.0
6/29/2017	**6/29/2017**	**Grab sample**									

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:47	14:55	Spring	0.006	0.016	0.01	0.244	0.280	5.0	9.08	9.8	866.4
12:19	14:55	Upstream farm	0.007	0.016	0.01	0.083	0.130	1.1	3.10	52.9	3950.0
11:35	14:55	Downstream farm	0.010	0.018	0.02	0.293	0.360	1.8	2.27	28.8	3410.0
11:24	14:55	Left Fork	0.010	0.016	0.02	0.236	0.320	1.3	2.77	29.8	3640.0
12:01	14:55	House well	0.009	0.014	0.01	0.574	0.640	0.3	4.39	1.0	2.0
7/5/2016	**7/5/2016**	**Grab sample**									
11:25	14:55	Spring	0.008	0.022	<0.03	0.107	0.250	1.9	9.11	90.7	4430.0
12:15	14:55	Upstream farm	0.011	0.028	<0.03	0.094	0.180	2.5	2.76	261.3	9060.0
11:05	14:55	Downstream farm	0.011	0.026	<0.03	0.169	0.270	3.1	2.29	185.0	18500.0
10:55	14:55	Left Fork	0.014	0.040	<0.03	0.220	0.390	8.7	3.37	387.3	28510.0
12:30	14:55	House well	0.009	0.010	<0.03	0.570	0.570	0.0	2.61	1.0	31.1
7/11/2017	**7/11/2017**	**Grab sample**									
10:40	13:48	Spring	0.004	0.008	<0.03	0.296	0.330	1.5	7.60	20.1	>2419.2
11:23	13:48	Upstream farm	0.004	0.026	0.01	0.064	0.110	1.5	2.56	585.0	5860.0
10:26	13:48	Downstream farm	0.006	0.014	<0.03	0.154	0.210	1.5	1.45	55.4	11120.0
10:17	13:48	Left Fork	0.005	0.020	0.02	0.125	0.210	3.0	2.52	73.8	12590.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
10:50	13:48	House well	0.006	0.012	0.03	0.573	0.570	0.3	3.50	<1.0	1.0
7/19/2017	**7/19/2017**	**Grab sample**									
10:51	15:30	Spring	0.002	0.214	0.03	0.295	0.770	156.7	0.75	4.1	1119.9
12:04	15:30	Upstream farm	0.003	0.030	0.01	0.105	0.130	1.3	0.92	27.2	7514.7
10:26	15:30	Downstream farm	0.005	0.016	0.01	0.232	0.280	1.7	0.53	35.0	9060.0
10:12	15:30	Left Fork	0.004	0.018	0.01	0.213	0.310	6.4	1.62	19.3	10810.0
11:40	15:30	House well	0.005	0.012	0.04	0.730	0.730	0.0	0.47	<1.0	<1.0
7/26/2017	**7/26/2017**	**Grab sample**									
7:28	11:40	Spring	0.001	0.248	0.02	0.209	0.760	174.7	3.47	2.0	>2419.2
8:08	11:40	Upstream farm	0.005	0.014	0.04	0.162	0.290	3.6	1.87	166.4	11530.0
7:05	11:40	Downstream farm	0.005	0.018	0.03	0.364	0.450	3.1	1.78	28.1	15660.0
6:51	11:40	Left Fork	0.003	0.016	0.05	0.223	0.370	2.7	1.89	27.8	14670.0
7:44	11:40	House well	0.004	0.012	0.01	0.779	0.820	0.1	2.62	<1.0	<1.0
8/3/2017	**8/3/2017**	**Grab sample**									
11:52	15:08	Spring	0.001	0.036	0.01	0.156	0.240	7.5	3.98	33.1	3680.0
12:32	15:08	Upstream Farm	0.005	0.022	<0.03	0.136	0.210	1.0	0.89	27.2	6500.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:25	15:08	Downstream Farm	0.007	0.026	0.02	0.297	0.390	1.5	0.84	43.2	12110.0
11:12	15:08	Left Fork	0.003	0.022	0.04	0.221	0.360	2.0	1.24	14.6	7800.0
12:09	15:08	House well	0.006	0.018	0.02	0.542	0.630	0.0	1.09	<1.0	1.0
8/3/2017	**8/3/2017**	**Storm sample**									
11:25	15:08	Downstream farm	0.000	0.032	0.01	0.185	0.250	1.1	7.88	ND	ND
8/9/2017	**8/9/2017**	**Grab sample**									
11:56	15:00	Spring	0.004	0.024	0.04	0.158	0.200	3.5	0.59	22.8	>2419.2
12:36	15:00	Upstream farm	0.008	0.022	0.04	0.162	0.210	1.0	0.50	177.9	7710.0
11:29	15:00	Downstream farm	0.010	0.036	0.02	0.351	0.440	1.5	0.38	23.1	7980.0
11:11	15:00	Left Fork	0.007	0.032	0.03	0.259	0.370	2.1	0.78	60.9	5300.0
12:10	15:00	House well	0.008	0.020	0.00	0.596	0.630	0.3	0.03	<1.0	<1.0
8/16/2017	**8/16/2017**	**Grab sample**									
7:04	11:50	Spring	0.005	0.094	0.01	0.111	0.470	40.7	7.99	816.4	16690.0
7:58	11:50	Upstream farm	0.010	0.030	<0.03	0.092	0.210	3.9	2.50	648.8	13540.0
6:47	11:50	Downstream farm	0.010	0.028	<0.03	0.216	0.320	3.3	1.66	157.6	12960.0
6:29	11:50	Left Fork	0.010	0.028	0.01	0.659	0.770	4.6	2.20	517.2	15530.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
7:24	11:50	House well	0.016	0.016	<0.03	0.652	0.650	0.3	1.83	<1.0	2.0
8/24/2016	**8/24/2016**	**Grab sample**									
11:58	14:55	Spring	0.005	0.064	<0.03	0.075	0.360	27.0	4.38	435.2	20140.0
12:38	14:55	Upstream farm	0.011	0.038	<0.03	0.132	0.280	3.3	2.35	344.8	18420.0
11:23	14:55	Downstream farm	0.012	0.040	0.01	0.192	0.330	3.5	2.37	261.3	31300.0
11:11	14:55	Left Fork	0.011	0.044	<0.03	0.175	0.330	5.3	2.14	461.1	17820.0
12:15	14:55	House well	0.014	0.018	<0.03	0.625	0.640	0.2	0.59	<1.0	4.1
8/24/2017	**8/24/2017**	**Storm sample**									
11:23	14:55	Downstream farm	0.007	0.126	<0.03	0.182	0.570	38.1	26.88	ND	ND
8/31/2017	**8/31/2017**	**Grab sample**									
11:28	14:15	Spring	0.008	0.084	0.16	0.299	0.520	42.3	2.77	101.7	7490.0
11:55	14:15	Upstream farm	0.009	0.024	0.02	0.075	0.150	1.5	0.73	105.0	5370.0
11:18	14:15	Downstream farm	0.010	0.026	<0.03	0.167	0.230	2.7	1.08	47.2	10460.0
11:00	14:15	Left Fork	0.008	0.024	<0.03	0.063	0.140	2.2	0.00	55.7	6570.0
11:41	14:15	House well	0.010	0.018	0.01	0.664	0.660	0.5	0.52	1.0	4.1
Samples analyzed since the last quarterly report											

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
9/6/2017	**9/6/2017**	**Grab sample**									
8:41	12:15	Spring	0.006	0.116	<0.03	0.255	0.550	62.8	1.06	31.7	2419.2
9:20	12:15	Upstream farm	0.008	0.020	<0.03	0.126	0.180	1.1	0.50	66.3	4280.0
8:22	12:15	Downstream farm	0.019	0.019	0.01	0.246	0.330	1.7	0.51	51.2	6970.0
8:06	12:15	Left Fork	0.011	0.024	0.01	0.101	0.200	1.9	0.76	133.3	7800.0
8:57	12:15	House well	0.010	0.018	0.01	0.669	0.690	0.3	0.25	<1.0	<1.0
9/13/2017	**9/13/2017**	**Grab sample**									
10:02	13:25	Spring	0.007	0.132	0.01	0.193	0.400	80.0	0.85	8.6	6970.0
10:30	13:25	Upstream farm	0.011	0.022	0.01	0.132	0.220	2.3	0.87	410.6	16070.0
9:46	13:25	Downstream farm	0.015	0.024	0.02	0.355	0.430	2.5	0.52	18.7	7280.0
9:36	13:25	Left Fork	0.010	0.028	0.02	0.130	0.220	1.7	0.69	18.7	6270.0
10:15	13:25	House well	0.012	0.016	0.02	0.664	0.690	1.2	0.33	<1.0	<1.0
9/21/2017	**9/21/2017**	**Grab sample**									
10:50	14:40	Downstream farm	0.012	0.026	0.02	0.418	0.470	1.8	1.93	101.4	6240.0
10:34	14:40	Left Fork	0.007	0.026	<0.03	0.143	0.270	2.1	2.43	10.9	6380.0
11:25	14:40	House well	0.007	0.016	<0.03	0.671	0.680	0.0	1.33	<1.0	1.0
9/28/2017	**9/28/2017**	**Grab sample**									

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
11:29	14:19	Downstream farm	0.015	0.028	0.04	0.402	0.480	1.3	2.14	62.7	3320.0
11:17	14:19	Left Fork	0.010	0.026	0.02	0.106	0.200	1.8	2.64	3.1	7120.0
11:45	14:19	House well	0.014	0.018	0.03	0.623	0.680	0.6	2.16	<1.0	<1.0
10/5/2017	**10/5/2017**	**Grab sample**									
9:15	13:20	Downstream farm	0.014	0.022	0.01	0.478	0.560	2.1	0.76	99.1	7030.0
9:03	13:20	Left Fork	0.011	0.022	0.01	0.135	0.240	2.3	0.24	10.9	8570.0
9:46	13:20	House well	0.014	0.014	0.03	0.660	0.690	0.2	0.60	<1.0	17.5
10/12/2017	**10/12/2017**	**Grab sample**									
8:13	12:40	Downstream farm	0.012	0.024	0.02	0.511	0.580	0.7	0.55	72.7	3690.0
8:01	12:40	Left Fork	0.011	0.020	<0.03	0.122	0.180	0.8	0.80	17.3	4410.0
8:40	12:40	House well	0.010	0.016	<0.03	0.660	0.730	0.0	0.28	<1.0	<1.0
10/18/2017	**10/18/2017**	**Grab sample**									
12:12	15:00	Downstream farm	0.012	0.020	0.02	0.495	0.700	2.1	0.42	11.0	3010.0
11:59	15:00	Left Fork	0.010	0.018	0.01	0.129	0.270	2.3	1.14	4.1	3640.0
12:35	15:00	House well	0.009	0.010	0.01	0.632	0.780	0.5	0.04	<1.0	1.0
10/23/2017	**10/23/2017**	**Grab sample**									
12:00	15:20	Spring	0.011	0.220	0.04	0.402	1.100	124.4	4.37	1986.3	28090.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
12:52	15:20	Upstream farm	0.025	0.042	0.02	0.469	0.640	1.7	1.26	1046.2	39680.0
11:28	15:20	Downstream farm	0.017	0.044	0.02	1.056	1.370	4.5	2.25	1732.9	270.0
11:10	15:20	Left Fork	0.022	0.058	0.01	1.042	1.350	5.9	2.36	3090.0	39680.0
12:31	15:20	House well	0.010	0.012	<0.03	0.641	0.800	0.0	0.13	<1.0	6.3
10/23/2017	**10/23/2017**	**Storm sample**									
12:16	15:20	Ephemeral stream	0.109	0.348	0.70	5.834	9.820	538.3	13.53	ND	ND
11/1/2017	**11/1/2017**	**Grab sample**									
8:06	12:15	Downstream farm	0.017	0.024	0.02	0.510	0.650	1.5	0.22	20.1	4260.0
7:51	12:15	Left Fork	0.010	0.014	0.01	0.189	0.270	0.0	0.94	23.8	2419.2
8:43	12:15	House well	0.012	0.018	0.01	0.833	0.960	0.0	0.24	<1.0	<1.0
11/9/2017	**11/9/2017**	**Grab sample**									
7:59	12:05	Downstream farm	0.013	0.018	0.02	0.466	0.570	0.7	6.04	9.8	6440.0
7:42	12:05	Left Fork	0.009	0.016	0.01	0.130	0.250	0.6	6.44	16.9	4410.0
8:30	12:05	House well	0.009	0.012	0.01	0.770	0.860	0.3	7.98	<1.0	<1.0
11/15/2017	**11/15/2017**	**Grab sample**									
7:36	13:15	Downstream farm	0.013	0.022	0.04	0.475	0.660	4.1	0.63	6.3	4640.0

Time sample collected	Time received @ laboratory	Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic Carbon	E. coli	Total coliform
7:24	13:15	Left Fork	0.006	0.015	0.03	0.142	0.260	0.2	0.68	3.1	198630.0
8:54	13:15	House well	0.007	0.007	0.02	0.789	0.850	0.0	0.00	<1.0	1.0
9:10	13:15	Trench 2	0.009	0.275	0.06	5.959	8.280	23.0	4.20	9080.0	241960
11/15/2017	**11/15/2017**	**Storm sample ‡**									
8:37	13:15	Downstream farm	0.036	0.085	0.04	0.443	0.770	18.5	2.04	4220.0	61310.0
8:27	13:15	Left Fork	0.012	0.021	0.04	0.155	0.340	1.1	1.01	124.6	7430.0
11/30/2017	**11/30/2017**	**Grab sample**									
7:45		Downstream farm	0.012	0.029	0.05	0.361	0.500	0.9		2.0	2419.2
7:28		Left Fork	0.005	0.016	0.05	0.122	0.230	1.1		10.0	1732.0
8:24		House well	0.009	0.024	0.04	0.717	0.850	0.0		<1.0	<1.0

¶ Values proceeded by '<' were reported by the analytical laboratory as zero and the minimum detection limit is given.
§ ND is No Data, due to coliform not measured on water samples collected automatically by non-sterilized ISCO sampler.
‡ Storm sample collected by hand after a 30-minute storm in the watershed at 7:35 on 11/15/2017.

Nutrients, Sediment, and Bacteria by Date Spring, Upstream, and Downstream Sites

Table 4. Water quality analyses in Big Creek upstream and downstream of the C&H Farm boundary of permitted land application since January 2017, with those collected since the last report noted.

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
	---------- mg/L ----------							--- MPN/100 mL ---	
1/5/2017									
Upstream	0.009	0.014	0.02	0.059	0.09	0.7	0.66	52.0	2419.2
Downstream	0.012	0.019	0.04	0.257	0.31	1.3	0.55	5.2	1986.3
1/19/2017									
Upstream	0.010	0.016	0.03	0.050	0.14	1.9	4.22	137.6	2419.2
Downstream	0.014	0.024	0.02	0.121	0.21	2.5	3.19	60.1	3990.0
2/2/2017									
Upstream	0.009	0.017	<0.03 ¶	0.056	0.07	1.1	1.72	41.9	>2419.2
Downstream	0.014	0.026	0.01	0.160	0.21	5.1	2.21	41.3	>2419.2
2/15/2017									
Upstream	0.009	0.060	0.01	0.132	0.30	5.0	3.04	1986.3	6570.0
Downstream	0.012	0.082	0.03	0.159	0.42	9.0	3.46	1732.9	11000.0
3/1/2017									
Upstream	0.009	0.044	0.03	0.069	0.24	4.7	3.93	2590.0	7940.0

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.005	0.016	0.03	0.148	0.27	2.6	3.24	71.7	2430.0
3/16/2017									
Upstream	0.006	0.046	<0.03	0.118	0.29	1.7	1.08	75.9	1299.7
Downstream	0.010	0.031	<0.03	0.266	0.30	2.9	0.97	68.3	1986.3
3/27/2017									
Upstream	0.012	0.122	0.06	0.181	0.74	131.4	5.72	1986.3	17850.0
Downstream	0.047	0.096	0.20	0.173	1.49	321.9	6.68	9840.0	72150.0
4/6/2017									
Upstream	0.007	0.038	0.01	0.099	0.21	2.3	2.53	72.0	>2419.2
Downstream	0.009	0.034	0.01	0.173	0.26	3.1	1.96	107.6	>2419.2
4/13/2017									
Upstream	0.008	0.054	<0.03	0.026	0.11	2.5	4.64	83.6	2419.2
Downstream	0.009	0.028	0.01	0.092	0.17	1.1	2.33	135.4	>2419.2
4/17/2017									
Upstream	0.019	0.054	<0.03	0.025	0.12	5.3	1.55	1553.1	9330.0
Downstream	0.011	0.046	0.01	0.129	0.24	3.3	1.51	866.4	8360.0
4/27/2017									
Upstream	0.010	0.036	<0.03	0.117	0.12	7.1	1.34	172.3	2430.0

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.014	0.042	<0.03	0.231	0.24	10.7	1.70	214.3	6090.0
5/18/2017									
Upstream	0.006	0.048	<0.03	0.067	0.19	2.9	1.50	260.2	>2419.2
Downstream	0.008	0.024	<0.03	0.189	0.30	1.9	1.10	129.6	3690.0
5/31/2017									
Upstream	0.009	0.020	0.00	0.053	0.14	1.9	1.34	157.6	2419.2
Downstream	0.008	0.052	0.00	0.188	0.25	1.6	1.33	150.0	2419.2
6/5/2017									
Upstream	0.007	0.054	0.01	0.114	0.210	8.3	3.01	178.5	5040
Downstream	0.013	0.064	0.01	0.185	0.290	12.9	1.81	313.0	9330
6/12/2017									
Upstream	0.008	0.026	0.01	0.105	0.130	2	1.01	121.1	6280
Downstream	0.009	0.02	0.01	0.256	0.270	1.6	0.77	119.8	4350
6/19/2017									
Upstream	0.009	0.014	<0.03	0.089	0.120	1.4	2.99	60.1	3640
Downstream	0.007	0.016	0.01	0.256	0.300	1.9	2.75	75.9	7590
6/29/2017									
Upstream	0.007	0.016	0.01	0.083	0.130	1.1	3.1	52.9	3950

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.010	0.018	0.02	0.293	0.360	1.8	2.27	28.8	3410
7/5/2016									
Upstream	0.011	0.028	<0.03	0.094	0.180	2.5	2.76	261.3	9060
Downstream	0.011	0.026	<0.03	0.169	0.270	3.1	2.29	185.0	18500
7/11/2017									
Upstream	0.004	0.026	0.01	0.064	0.110	1.5	2.56	585.0	5860
Downstream	0.006	0.014	<0.03	0.154	0.210	1.5	1.45	55.4	11120
7/19/2017									
Upstream	0.003	0.03	0.01	0.105	0.130	1.3	0.92	27.2	7514.7
Downstream	0.005	0.016	0.01	0.232	0.280	1.7	0.53	35.0	9060
7/26/2017									
Upstream	0.005	0.014	0.04	0.162	0.290	3.6	1.87	166.4	11530
Downstream	0.005	0.018	0.03	0.364	0.450	3.1	1.78	28.1	15660
8/3/2017									
Upstream	0.005	0.022	0	0.136	0.210	1	0.89	27.2	6500
Downstream	0.000	0.032	0.01	0.185	0.250	1.1	7.88	ND §	ND
8/9/2017									
Upstream	0.008	0.022	0.04	0.162	0.210	1	0.5	177.9	7710

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.010	0.036	0.02	0.351	0.440	1.5	0.38	23.1	7980
8/16/2017									
Upstream	0.010	0.03	<0.03	0.092	0.210	3.9	2.5	648.8	13540
Downstream	0.010	0.028	<0.03	0.216	0.320	3.3	1.66	157.6	12960
8/24/2017									
Upstream	0.011	0.038	<0.03	0.132	0.280	3.3	2.35	344.8	18420
Downstream	0.012	0.040	0.01	0.192	0.330	3.5	2.37	261.3	31300
8/31/2017									
Upstream	0.009	0.024	0.02	0.075	0.150	1.5	0.73	105.0	5370
Downstream	0.010	0.026	<0.03	0.167	0.230	2.7	1.08	47.2	10460
Samples analyzed since the last quarterly report									
9/6/2017									
Upstream	0.008	0.020	<0.03	0.126	0.180	1.1	0.50	66.3	4280.0
Downstream	0.019	0.019	0.01	0.246	0.330	1.7	0.51	51.2	6970.0
9/13/2017									
Upstream	0.011	0.022	0.01	0.132	0.220	2.3	0.87	410.6	16070.0
Downstream	0.015	0.024	0.02	0.355	0.430	2.5	0.52	18.7	7280.0
10/23/2017									

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Upstream	0.025	0.042	0.02	0.469	0.640	1.7	1.26	1046.2	39680.0
Downstream	0.017	0.044	0.02	1.056	1.370	4.5	2.25	1732.9	270.0

¶ Values proceeded by '<' were reported by the analytical laboratory as zero and the Minimum detection limit is given.

§ ND is No Data, due to coliform not measured on water samples collected automatically by non-sterilized ISCO sampler.

Nutrients, Sediment, and Bacteria by Site for Ephemeral Stream, Trenches, Left Fork and Field Runoff

Table 5. Water quality analyses at the ephemeral stream draining the subwatershed containing the production houses and manure holding ponds, and surface runoff from Fields 1, 5a, and 12 since January, 2017, with those collected since the last report noted.

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
	mg/L							MPN/100 mL	
Ephemeral stream									
2/15/2017	0.020	0.064	0.02	1.323	1.45	3.1	5.06	166.9	5630.0
3/1/2017	0.011	0.016	0.02	0.659	0.71	1.5	6.75	195.6	5730.0
3/16/2017	0.005	0.021	<0.03 ¶	0.738	0.800	0.8	2.99	14.8	2419.2
3/27/2017	0.151	0.268	0.29	1.704	3.30	448.3	16.47	18500.0	66530.0
3/30/2017	0.005	0.032	0.01	0.796	0.86	8.6	1.89	2.7	224.0
4/6/2017	0.008	0.022	<0.03	0.717	0.76	1.6	1.69	148.3	1986.3
4/6/2017	0.018	0.080	0.06	0.807	1.14	19.9	4.14	ND §	ND
4/17/2017	0.005	0.018	<0.03	0.651	0.68	0.9	1.71	410.6	7270.0
4/24/2017	0.007	0.128	0.04	0.000	1.83	318.0	7.35	ND	ND
4/27/2017	0.042	0.253	0.01	0.302	2.57	734.5	8.29	186.0	>2419.2
5/18/2017	0.012	0.020	<0.03	0.692	0.75	1.7	1.76	49.6	2419.2
5/31/2017	0.009	0.020	<0.03	0.769	0.79	2.5	1.53	275.5	3500.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
6/5/2017	0.010	0.028	<0.03	0.706	0.710	1.5	2.38	613.1	5830
6/6/2017	0.041	0.816	0.14	0.58	4.610	1788.2	9.24	ND	ND
6/12/2017	0.010	0.882	<0.03	0.732	0.730	0.6	0.67	33.6	2419.2
Samples analyzed since the last quarterly report									
10/23/2017	0.109	0.348	0.70	5.834	9.820	538.3	13.53	ND	ND
House well									
1/5/2017	0.008	0.014	0.04	0.610	0.66	0.3	0.30	<1.0	<1.0
1/19/2017	0.009	0.013	0.03	0.617	0.69	0.9	7.87	<1.0	<1.0
2/2/2017	0.011	0.031	0.01	0.614	0.78	0.4	2.22	<1.0	<1.0
2/15/2017	0.008	0.023	0.02	0.649	0.72	0.5	2.07	<1.0	<1.0
3/1/2017	0.012	0.040	0.03	0.620	0.72	0.5	5.85	<1.0	<1.0
3/16/2017	0.009	0.023	<0.03	0.856	0.88	0.1	1.52	<1.0	1.0
3/27/2017	0.007	0.038	0.02	0.573	0.63	1.6	3.83	18.1	261.3
4/13/2017	0.011	0.020	<0.03	0.564	0.59	0.1	6.22	<1.0	1.0
4/17/2017	0.006	0.016	0.01	0.563	0.57	0.2	1.94	<1.0	12.1
4/27/2017	0.011	0.014	<0.03	0.532	0.49	0.1	0.69	5.1	52.8

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
5/18/2017	0.011	0.020	<0.03	0.431	0.60	0.6	5.05	1.0	3.1
5/31/2017	0.019	0.026	<0.03	0.605	0.92	0.4	1.86	<1.0	22.1
6/5/2017	0.008	0.026	0.01	0.586	0.590	0.3	0	6.3	48
6/12/2017	0.010	0.012	<0.03	0.591	0.590	0	1.2	<1.0	3.1
6/19/2017	0.009	0.014	0.02	0.582	0.580	0.3	6.92	<1.0	<1.0
6/29/2017	0.009	0.014	0.01	0.574	0.640	0.3	4.39	1.0	2
7/5/2016	0.009	0.01	<0.03	0.57	0.570	0	2.61	1.0	31.1
7/11/2017	0.006	0.012	0.03	0.573	0.570	0.3	3.5	<1.0	1
7/19/2017	0.005	0.012	0.04	0.73	0.730	0	0.47	<1.0	<1.0
7/26/2017	0.004	0.012	0.01	0.779	0.820	0.1	2.62	<1.0	<1.0
8/3/2017	0.006	0.018	0.02	0.542	0.630	0	1.09	<1.0	1
8/9/2017	0.008	0.02	<0.03	0.596	0.630	0.3	0.03	<1.0	<1.0
8/16/2017	0.016	0.016	<0.03	0.652	0.650	0.3	1.83	<1.0	2
8/24/2016	0.014	0.018	<0.03	0.625	0.640	0.2	0.59	<1.0	4.1
8/31/2017	0.010	0.018	0.01	0.664	0.660	0.5	0.52	1.0	4.1
Samples analyzed since the last quarterly report									
9/6/2017	0.010	0.018	0.01	0.669	0.690	0.3	0.25	<1.0	<1.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
9/13/2017	0.012	0.016	0.02	0.664	0.690	1.2	0.33	<1.0	<1.0
9/21/2017	0.007	0.016	<0.03	0.671	0.680	0.0	1.33	<1.0	1.0
9/28/2017	0.014	0.018	0.03	0.623	0.680	0.6	2.16	<1.0	<1.0
10/5/2017	0.014	0.014	0.03	0.660	0.690	0.2	0.60	<1.0	17.5
10/12/2017	0.010	0.016	<0.03	0.660	0.730	0.0	0.28	<1.0	<1.0
10/18/2017	0.009	0.010	0.01	0.632	0.780	0.5	0.04	<1.0	1.0
10/23/2017	0.010	0.012	<0.03	0.641	0.800	0.0	0.13	<1.0	6.3
11/1/2017	0.012	0.018	0.01	0.833	0.960	0.0	0.24	<1.0	<1.0
11/9/2017	0.009	0.012	0.01	0.770	0.860	0.3	7.98	<1.0	<1.0
11/15/2017	0.007	0.007	0.02	0.789	0.850	0.0	0.00	<1.0	1.0
11/30/2017	0.009	0.024	0.04	0.717	0.850	0.0		<1.0	<1.0
Interceptor Trench 1 (South)									
2/15/2017	0.004	0.023	0.01	0.141	0.20	1.3	0.45	1.0	1299.7
3/16/2017	0.006	0.020	<0.03	0.083	0.11	1.1	1.87	<1.0	179.3
3/27/2017	0.004	0.048	0.03	0.129	0.39	3.1	4.36	387.3	17230.0
4/6/2017	0.004	0.022	0.03	0.165	0.30	17.2	1.98	47.2	2750.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
4/24/2017	0.005	0.040	0.20	0.133	1.76	18.5	7.04	ND	ND
4/27/2017	0.006	0.048	1.04	0.081	1.43	7.2	4.04	40.4	3990.0
No samples collected and analyzed since the last quarterly report									
Interceptor Trench 2 (North)									
2/15/2017	0.004	0.087	0.04	0.486	1.12	6.1	5.99	19.7	42860.0
3/1/2017	0.002	0.050	0.04	0.345	0.76	11.6	4.90	98.8	34480.0
3/27/2017	0.009	0.102	0.13	0.060	0.82	7.0	7.13	488.4	29240.0
4/24/2017	0.010	0.084	0.04	0.087	0.93	8.2	8.78	ND	ND
4/27/2017	0.006	0.046	0.04	0.029	0.42	2.4	4.95	115.3	2419.2
6/5/2017	0.003	0.086	0.02	0.018	0.750	8.7	7.04	2780.0	241920
Samples analyzed since the last quarterly report									
11/15/2017	0.009	0.275	0.06	5.959	8.280	23.0	4.20	9080.0	241960
Left Fork									
1/5/2017	0.006	0.011	0.03	0.229	0.26	0.7	0.85	6.2	1732.9
1/19/2017	0.010	0.019	0.03	0.243	1.00	2.6	4.25	55.4	>2419.2

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
2/2/2017	0.008	0.019	0.01	0.139	0.18	1.1	1.69	17.1	>2419.2
2/15/2017	0.015	0.080	0.03	0.314	0.60	17.7	4.66	648.8	11060.0
3/1/2017	0.008	0.024	0.02	0.136	0.28	4.3	2.46	1119.9	4260.0
3/16/2017	0.009	0.043	<0.03	0.300	0.41	3.1	1.77	45.5	>2419.2
3/27/2017	0.058	0.164	0.17	0.206	1.50	1005.1	8.51	9330.0	38770.0
4/6/2017	0.010	0.048	0.01	0.222	0.41	4.7	2.32	135.4	2780.0
4/13/2017	0.010	0.024	<0.03	0.123	0.21	1.6	2.75	22.3	>2419.2
4/17/2017	0.040	0.112	0.02	0.173	0.46	19.5	4.55	9090.0	129970.0
4/27/2017	0.016	0.046	<0.03	0.306	0.32	16.4	2.08	275.5	7230.0
5/18/2017	0.009	0.022	<0.03	0.167	0.26	1.9	1.54	50.4	2419.2
5/31/2017	0.008	0.020	0.00	0.156	0.22	1.5	1.58	260.2	4720.0
6/5/2017	0.011	0.07	0.01	0.179	0.320	14.4	1.63	579.4	24000
6/12/2017	0.006	0.016	<0.03	0.143	0.190	0.9	1.17	77.1	4350
6/19/2017	0.006	0.018	0.01	0.226	0.280	2.1	2.15	32.3	4130
6/29/2017	0.010	0.016	0.02	0.236	0.320	1.3	2.77	29.8	3640

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
7/11/2017	0.005	0.02	0.02	0.125	0.210	3	2.52	73.8	12590
7/19/2017	0.004	0.018	0.01	0.213	0.310	6.4	1.62	19.3	10810
7/26/2017	0.003	0.016	0.05	0.223	0.370	2.7	1.89	27.8	14670
8/3/2017	0.003	0.022	0.04	0.221	0.360	2	1.24	14.6	7800
8/9/2017	0.007	0.032	0.03	0.259	0.370	2.1	0.78	60.9	5300
8/16/2017	0.010	0.028	0.01	0.659	0.770	4.6	2.2	517.2	15530
8/31/2017	0.008	0.024	<0.03	0.063	0.140	2.2	0	55.7	6570
Samples analyzed since the last quarterly report									
9/6/2017	0.011	0.024	0.01	0.101	0.200	1.9	0.76	133.3	7800.0
9/13/2017	0.010	0.028	0.02	0.130	0.220	1.7	0.69	18.7	6270.0
9/21/2017	0.007	0.026	<0.03	0.143	0.270	2.1	2.43	10.9	6380.0
9/28/2017	0.010	0.026	0.02	0.106	0.200	1.8	2.64	3.1	7120.0
10/5/2017	0.011	0.022	0.01	0.135	0.240	2.3	0.24	10.9	8570.0
10/12/2017	0.011	0.020	<0.03	0.122	0.180	0.8	0.80	17.3	4410.0
10/18/2017	0.010	0.018	0.01	0.129	0.270	2.3	1.14	4.1	3640.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
10/23/2017	0.022	0.058	0.01	1.042	1.350	5.9	2.36	3090.0	39680.0
11/1/2017	0.010	0.014	0.01	0.189	0.270	0.0	0.94	23.8	2419.2
11/9/2017	0.009	0.016	0.01	0.130	0.250	0.6	6.44	16.9	4410.0
11/15/2017	0.006	0.015	0.03	0.142	0.260	0.2	0.68	3.1	198630.0
11/30/2017	0.005	0.016	0.05	0.122	0.230	1.1		10.0	1732.0
Field 1									
10/13/2016	0.940	1.231	0.13	0.335	2.36	59.0	16.67	N.S.	N.S.
3/27/2017	0.420	0.670	0.43	0.090	18.70	124.4	9.29	8390.0	45690.0
4/24/2017	0.395	0.592	0.13	0.143	1.50	43.1	7.25	ND	ND
4/27/2017	0.550	0.784	0.08	0.107	1.32	52.2	8.46	ND	ND
6/6/2017	0.747	0.998	0.51	0.438	2.340	56	10.39	ND	ND
No samples analyzed since the last quarterly report									
Field 5a									
3/31/2016	1.154	1.352	0.27	0.302	1.67	26.5	32.74	ND	ND
5/10/2016	1.114	1.458	1.69	2.894	6.35	79.9	12.82	ND	ND

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
3/27/2017	2.980	3.232	1.40	0.122	1.80	30.2	32.01	2419.2	69100.0
4/24/2017	0.961	1.212	0.12	0.321	1.53	11.7	11.53	ND	ND
4/27/2017	0.686	0.846	0.07	0.063	0.86	11.3	7.26	ND	ND
6/6/2017	1.000	1.430	0.05	1.861	2.380	<10.0	6.21	ND	ND
No samples analyzed since the last quarterly report									
Field 12									
3/10/2016	0.411	0.522	1.17	0.852	4.49	621.5	12.58	ND	ND
5/10/2016	0.370	0.666	0.12	0.062	1.03	96.7	6.92	ND	ND
3/27/2017	0.800	1.276	2.02	2.798	6.04	134.2	9.35	7120.0	96060.0
4/27/2017	0.326	0.544	0.02	0.105	0.71	102.3	5.64	ND	ND
6/6/2017	0.316	0.470	0.03	0.166	1.660	280.8	6.65	ND	ND
No samples analyzed since the last quarterly report									

¶ Values proceeded by '<' were reported by the analytical laboratory as zero and the minimum detection limit is given.

§ ND is No Sample. E. coli and total coliform were not measured on surface runoff samples collected by ISCO samplers when sample holding time exceeded the required 8-hour threshold.

Water pH, Alkalinity, Chloride, Electrical Conductivity, and Total Dissolved Solids for Several Big Creek Sites

At the beginning of 2015, the pH, alkalinity, chloride concentration, electrical conductivity and total dissolved solids were determined on water samples collected at the upstream and downstream sites, spring, house well, and trenches, to build a data base that will enable to eventually source track the major water source pathways at these sites. These values are given below in Table 6.

Table 6. The pH, Chloride concentration, and electrical conducting of water samples collected at upstream, downstream, spring, ephemeral stream, house well and trench sites, initiated at the beginning of 2017, with those collected since the last report noted.

Date	pH	Chloride	Electrical conductivity
		mg/L	µS/cm
Upstream			
1/5/2017	8.8	2.264	142.0
1/19/2017	7.9	2.089	
2/2/2017	8.4	2.044	112.0
2/15/2017	7.9	2.022	128.0
3/1/2017	8.4	1.696	115.0
3/16/2017	7.8	1.508	88.0
3/27/2017	7.6	0.997	50.0
4/6/2017	7.5	1.436	72.0
4/13/2017	7.8	1.392	76.0
4/17/2017	7.9	1.372	95.8
4/27/2017	7.7	1.003	68.0
5/18/2017	8.3	1.518	110.0
5/31/2017	8.0	1.296	122.0
6/5/2017	7.9	0.781	75.0

Date	pH	Chloride	Electrical conductivity
6/12/2017	8.0	1.231	120.0
6/19/2017	7.8	1.379	146.0
6/29/2017	7.8	1.554	170.0
7/5/2017	7.6	1.235	109.0
7/11/2017	8.2	1.543	113.0
7/19/2017	8.4	1.415	174.0
7/26/2017	7.8	1.664	193.0
8/3/2017	7.9	1.690	206.0
8/9/2017	8.0	1.930	206.0
8/16/2017	7.4	1.199	163.0
8/24/2017	8.1	1.381	133.0
8/31/2017	8.2	1.461	161.0
Samples analyzed since the last quarterly report			
9/6/2017	8.0	1.697	184.0
9/13/2017	7.9	2.009	194.0
10/23/2017	7.9	2.082	253.0
Downstream			
1/5/2017	8.1	5.692	220.0
1/19/2017	7.6	2.390	
2/2/2017	7.9	2.414	171.0
2/15/2017	8.2	2.199	119.0
3/1/2017	7.8	2.926	162.0
3/16/2017	7.5	1.792	128.0
3/27/2017	7.5	1.113	69.0
4/6/2017	7.5	1.649	106.0
4/13/2017	7.7	1.665	114.0

Date	pH	Chloride	Electrical conductivity
4/17/2017	7.8	1.849	162.9
4/27/2017	7.6	1.160	102.0
5/18/2017	7.7	2.009	172.0
5/31/2017	8.0	1.714	171.0
6/5/2017	7.7	1.810	178.0
6/12/2017	7.9	1.942	225.0
6/19/2017	7.9	2.643	224.0
6/29/2017	7.6	2.652	231.0
7/5/2017	7.7	2.841	246.0
7/11/2017	7.8	1.716	201.0
7/19/2017	7.8	1.350	161.0
7/26/2017	7.3	1.690	213.0
8/3/2017	7.9	1.810	178.0
8/9/2017	7.9	1.942	225.0
8/16/2017	7.6	2.643	224.0
8/24/2017	7.9	2.652	231.0
8/31/2017	8.0	2.841	246.0
Samples analyzed since the last quarterly report			
9/6/2017	7.7	2.132	214.0
9/13/2017	7.7	2.517	251.0
9/21/2017	7.5	2.788	282.0
9/28/2017	7.8	2.882	281.0
10/5/2017	7.5	3.041	292.0
10/12/2017	7.5	3.305	272.0
10/18/2017	7.8	3.391	307.0
10/23/2017	7.6	3.722	292.0
11/1/2017	7.5	3.016	262.0

Date	pH	Chloride	Electrical conductivity
11/9/2017	7.6	3.640	268.0
11/15/2017	7.8	3.114	217.0
11/30/2017	7.6	3.163	176.0
Spring			
1/5/2017	7.2	2.462	504.0
1/19/2017	7.1	2.397	
2/2/2017	7.1	3.099	546.0
2/15/2017	7.3	2.305	353.0
3/16/2017	7.4	2.618	602.0
3/27/2017	7.3	1.223	373.0
4/6/2017	7.1	2.010	486.0
4/13/2017	7.1	2.810	547.0
4/17/2017	7.2	1.720	445.0
4/27/2017	7.4	1.565	476.0
5/18/2017	7.0	1.988	474.0
5/31/2017	7.5	1.305	471.0
6/5/2017	7.5	1.042	469.0
6/12/2017	8.0	1.532	482.0
6/19/2017	7.5	1.766	527.0
6/29/2017	7.2	1.982	451.0
7/5/2017	7.0	1.265	438.0
7/11/2017	7.1	1.972	521.0
7/19/2017	7.1	2.299	567.0
7/26/2017	6.8	2.394	559.0
8/3/2017	7.4	2.349	539.0
8/9/2017	7.4	2.129	518.0

Date	pH	Chloride	Electrical conductivity
8/16/2017	7.5	1.590	430.0
8/24/2017	7.2	1.690	459.0
8/31/2017	7.5	2.068	560.0
Samples analyzed since the last quarterly report			
9/6/2017	7.1	2.276	570.0
9/13/2017	7.0	2.133	317.0
10/23/2017	7.0	2.784	409.0
Ephemeral Stream			
2/15/2017	7.7	3.366	270.0
3/1/2017	7.8	4.328	396.0
3/16/2017	7.5	3.415	354.0
3/27/2017	7.4	4.373	180.0
3/30/2017	7.8	2.705	224.0
4/6/2017	7.3	3.154	223.0
4/13/2017	7.7	3.585	377.0
4/17/2017	7.5	3.997	394.0
4/23/2017	7.5	2.221	321.0
4/27/2017	7.5	1.414	109.0
5/18/2017	7.6	3.247	346.0
5/31/2017	8.0	3.161	380.0
6/5/2017	7.3	1.834	230.0
6/12/2017	8.1	2.961	363.0
Samples analyzed since the last quarterly report			
10/23/2017	7.7	2.149	152.0
House Well			
1/5/2017	7.8	5.371	421.0

Date	pH	Chloride	Electrical conductivity
1/19/2017	7.4	5.234	420.0
2/2/2017	7.5	5.290	420.0
2/15/2017	7.6	5.401	397.0
3/1/2017	7.5	5.162	432.0
3/16/2017	7.5	5.453	416.0
3/27/2017	7.8	5.192	438.0
4/13/2017	7.4	5.508	445.0
4/17/2017	7.5	5.315	285.0
4/27/2017	7.5	5.000	429.0
5/1/2017	7.6	5.021	436.0
5/11/2017	7.4	6.819	433.0
5/18/2017	7.4	5.024	406.0
5/25/2017	7.7	4.124	442.0
5/31/2017	7.7	4.859	327.0
6/5/2017	7.82	4.744	425
6/12/2017	7.87	5.025	415
6/19/2017	7.57	5.140	185
6/29/2017	7.44	5.209	438
7/5/2016	7.36	5.105	417
7/11/2017	7.65	5.136	389
7/19/2017	7.45	12.717	430
7/26/2017	7.34	5.722	402
8/3/2017	7.75	5.085	419
8/9/2017	7.75	5.107	419
8/16/2017	8.00	5.121	413
8/24/2016	7.80	5.115	314
8/31/2017	7.75	4.910	419

Date	pH	Chloride	Electrical conductivity
Samples analyzed since the last quarterly report			
9/13/2017	7.6	5.198	426.0
9/21/2017	7.4	5.065	440.0
9/28/2017	7.5	5.555	442.0
10/5/2017	7.2	5.461	433.0
10/12/2017	7.5	5.544	429.0
10/18/2017	7.5	5.149	436.0
10/23/2017	7.6	5.143	427.0
11/1/2017	7.3	5.622	457.0
11/9/2017	7.4	5.375	464.0
11/15/2017	7.7	5.431	446.0
11/30/2017	7.4	6.020	334.0
9/13/2017	7.6	5.198	426.0
Trench 1			
2/15/2017	8.0	2.344	397.0
3/16/2017	7.8	1.483	164.0
3/27/2017	7.4	1.018	164.0
4/6/2017	7.4	1.877	168.0
4/24/2017	7.4	0.895	160.0
4/27/2017	7.8	0.557	150.0
5/1/2017	7.7	1.193	172.0
No samples collected and analyzed since the last quarterly report			
Trench 2			
2/15/2017	8.0	1.164	135.0
3/1/2017	7.3	0.808	159.0
3/27/2017	7.1	0.376	90.0

Date	pH	Chloride	Electrical conductivity
4/6/2017	7.0	0.325	175.0
4/24/2017	7.3	0.322	134.0
4/27/2017	7.5	0.217	129.0
5/1/2017	7.7	0.340	157.0
6/5/2017	7.0	0.298	160.0
Samples analyzed since the last quarterly report			
11/15/2017	7.7	3.490	264.0

Discharge at USGS 07055790 Site Downstream of C&H Operation

Discharge downstream of the C&H Farm (USGS station 07055790 Big Creek near Mt. Judea, AR) is available at https://nwis.waterdata.usgs.gov/ar/nwis/uv/?cb_00065=on&cb_00045=on&cb_00010=on&format=gif_default&period=&begin_date=2014-04-16&end_date=2014-04-23&site_no=07055790

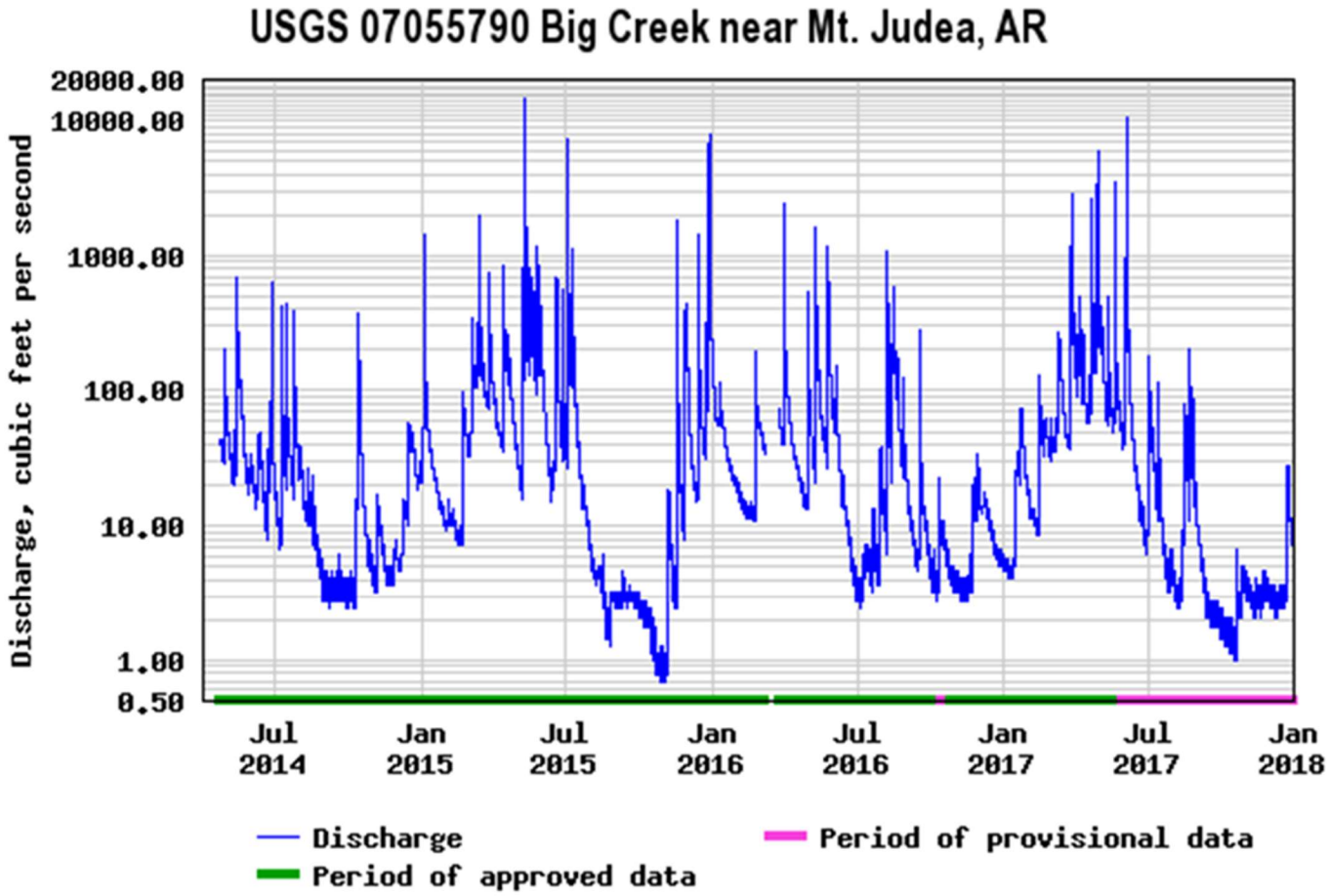

Figure 2. Discharge in Big Creek downstream of the C&H Farm for the period of monitoring; July 2014 to December 2017.

Temporal Trends in Phosphorus, Nitrogen, Bacteria, and Chloride in Big Creek Above and Below the C&H Farm

The concentration of dissolved P, total P, nitrate-N, total N, bacteria and chloride in Big Creek above and below the C&H Farm are presented in subsequent figures to show the season / temporal trends in measured concentrations (Figures 3, 4, 5, 6, 7, 8, and 9).

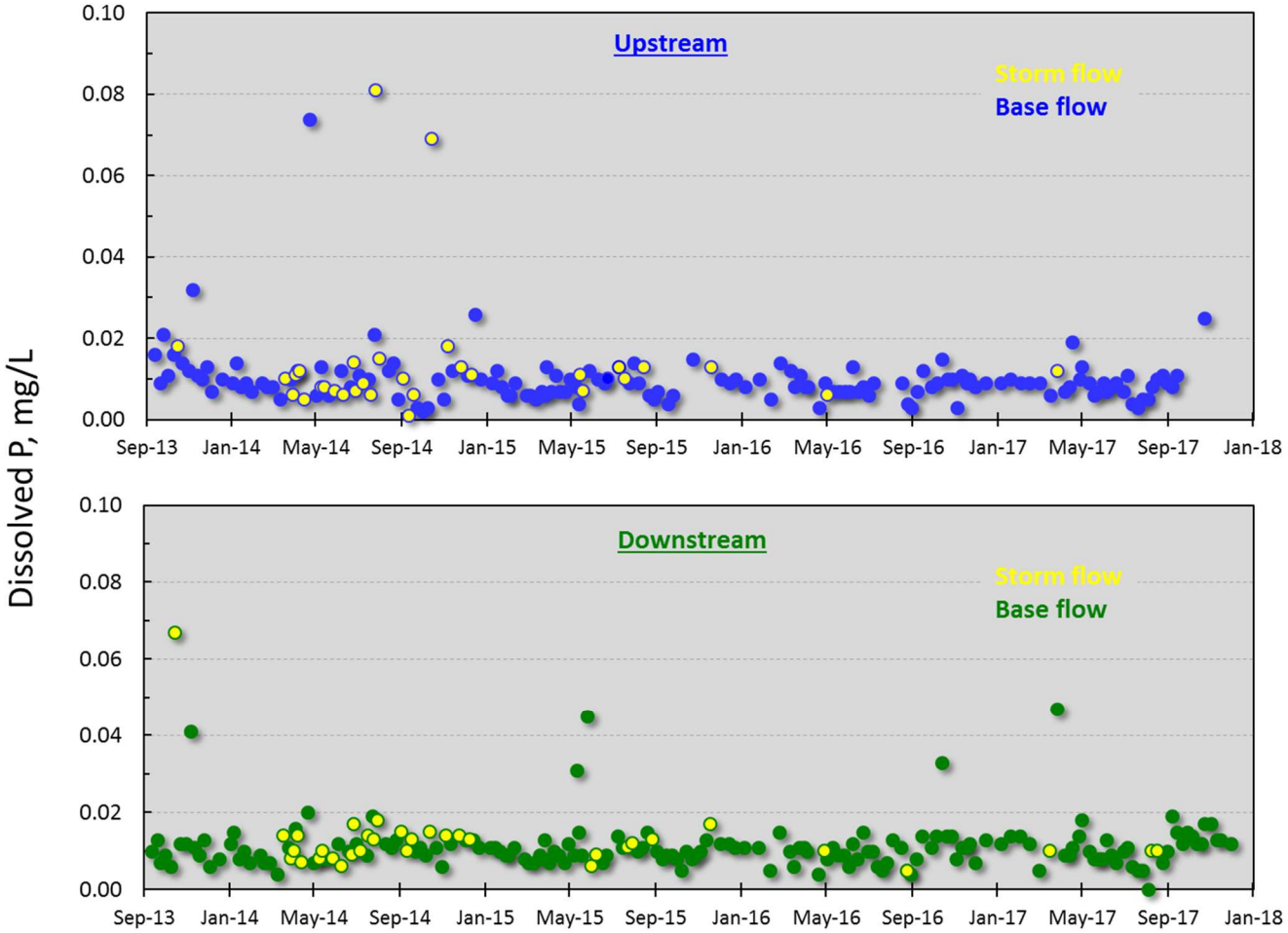

Figure 3. Dissolved P concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

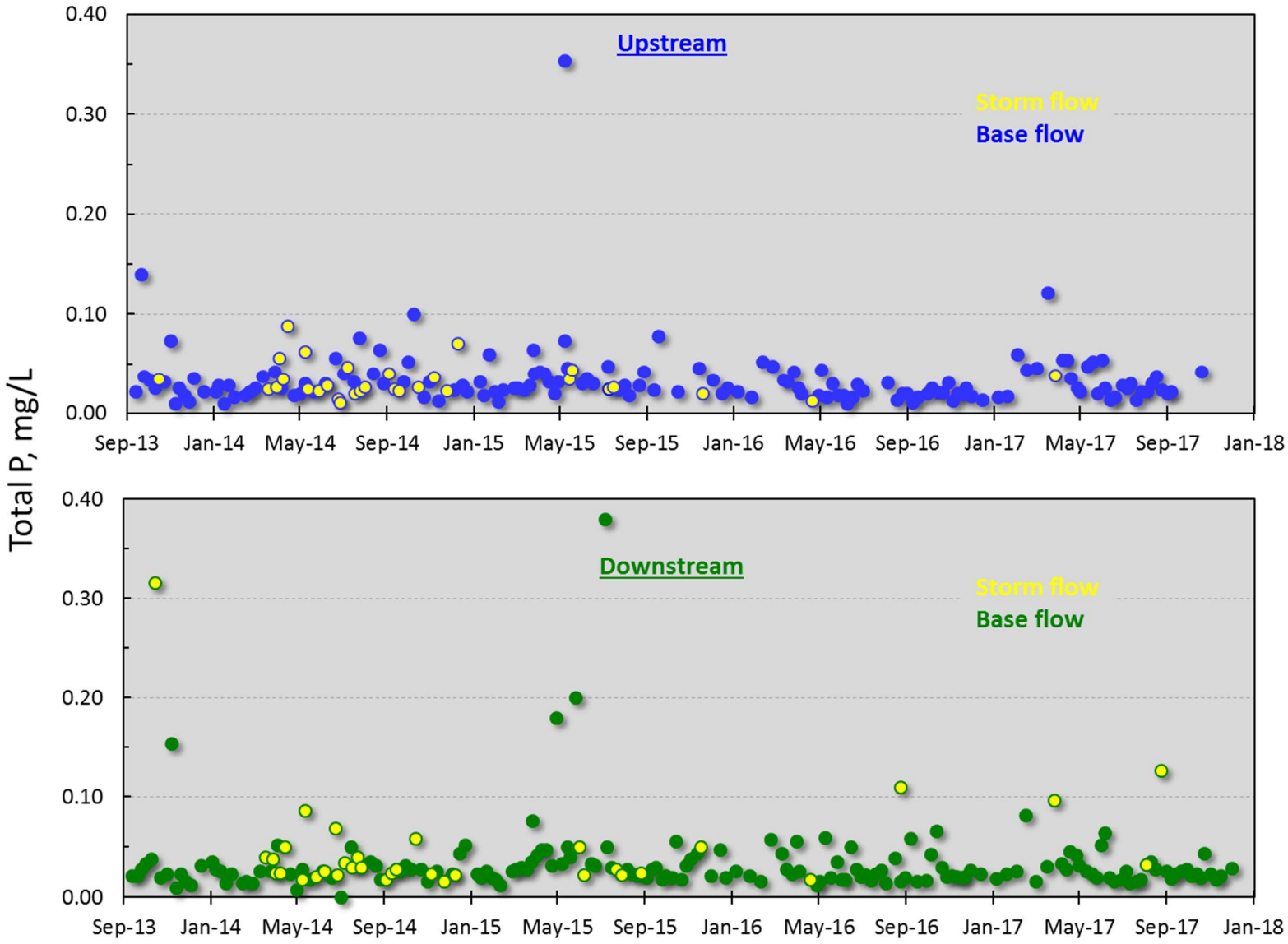

Figure 4. Total P concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

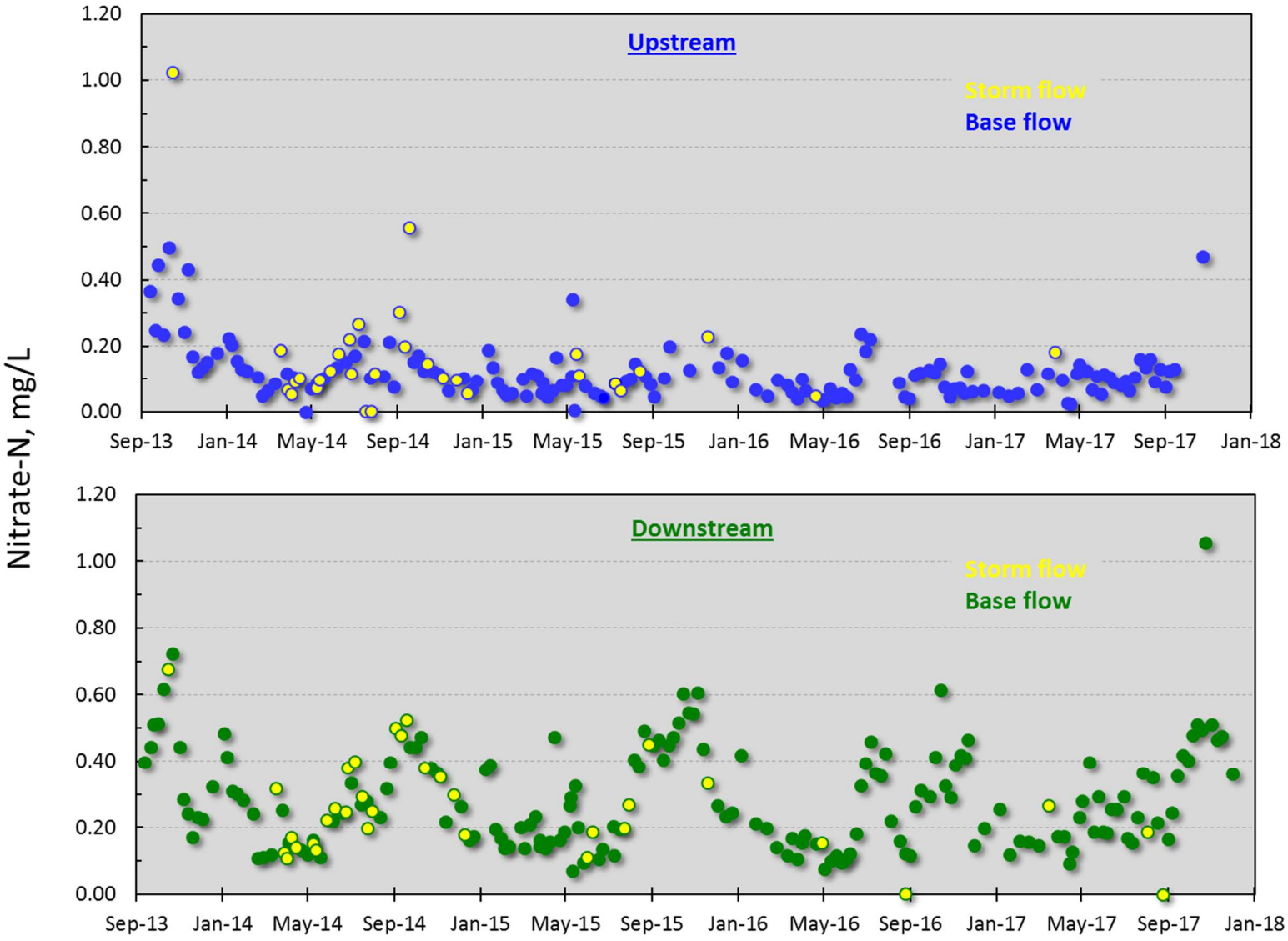

Figure 5. Nitrate-N concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

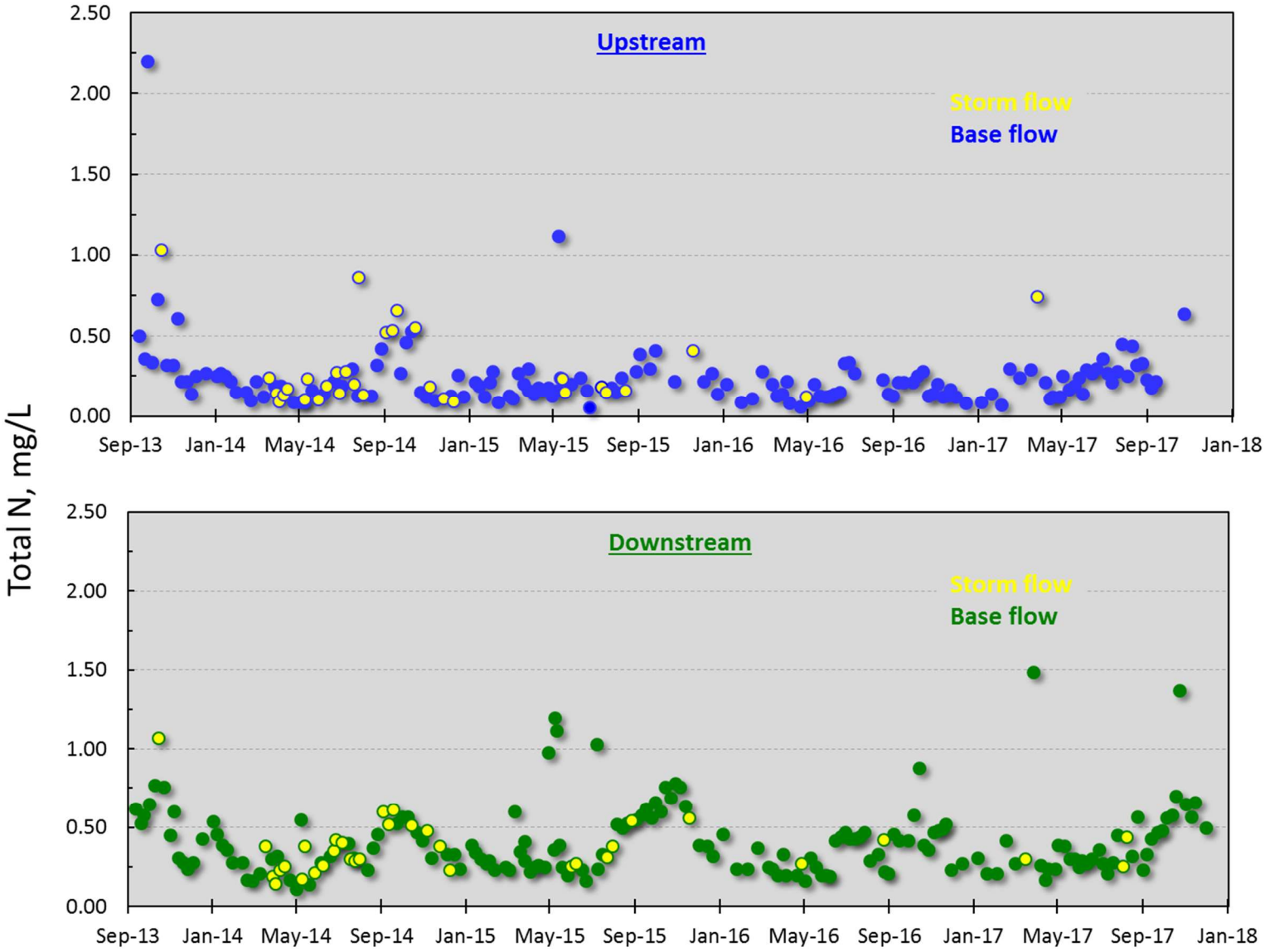

Figure 6. Total N concentration at **the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.**

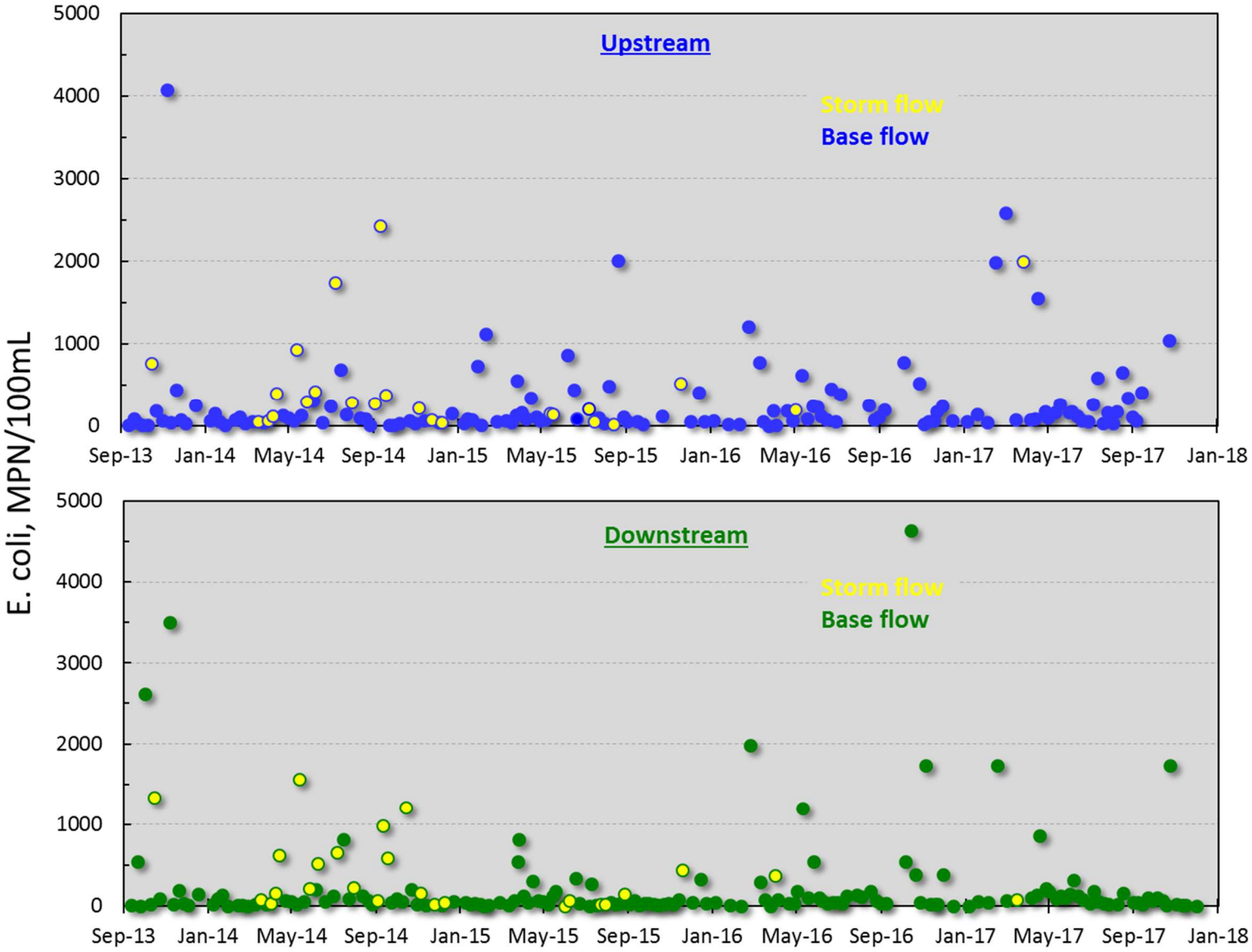

Figure 7. E. coli numbers at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

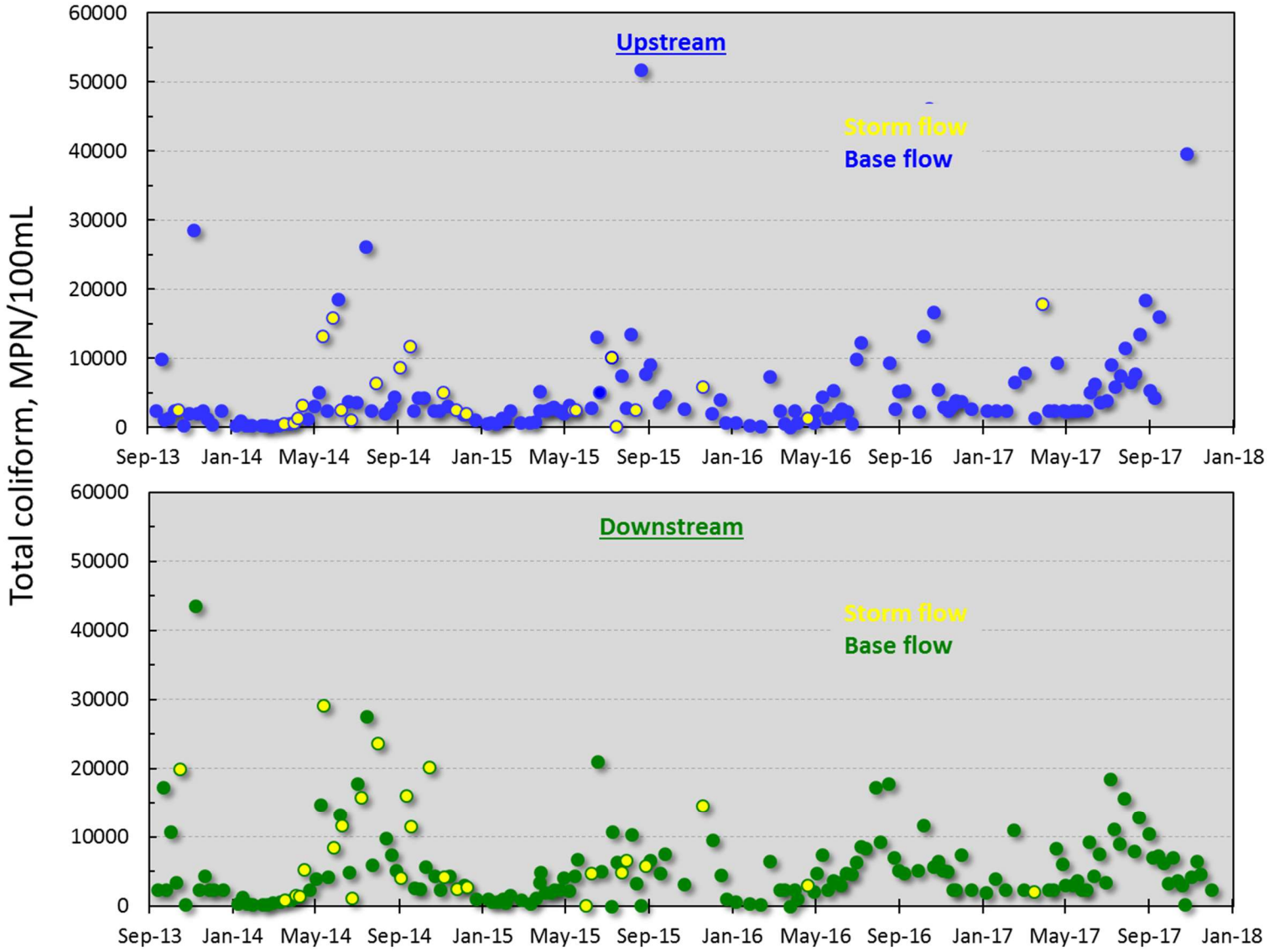

Figure 8. Total coliform numbers at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

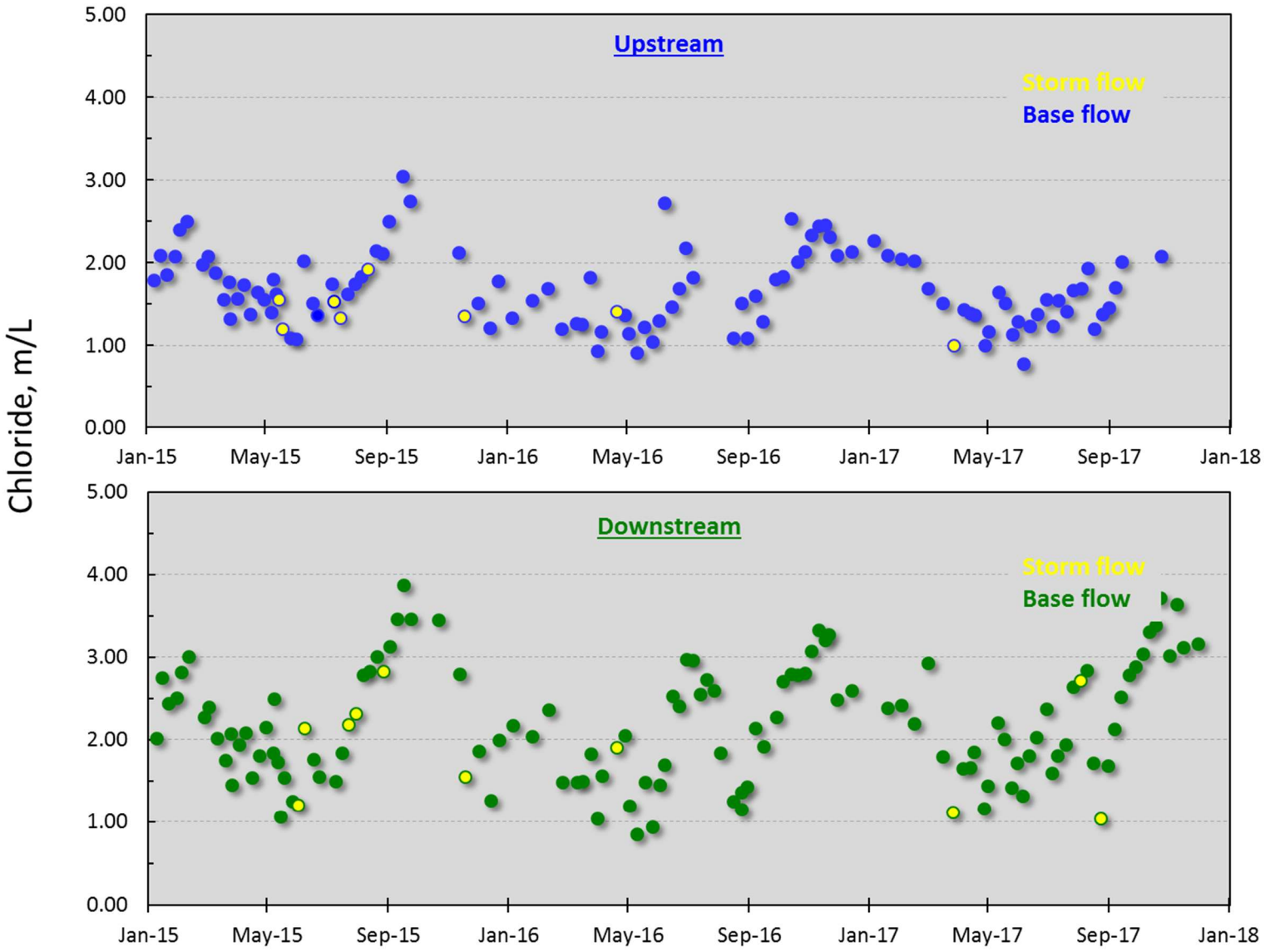

Figure 9. Chloride concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

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