Big Creek Research and Extension Team

University of Arkansas System Division of Agriculture

Quarterly Report – October 1 to December 31, 2018

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 second Quarterly Report of 2018 for the Big Creek Research and Extension Team that details activities and progress made from October 1 through December 31, 2018.

1. Collection of 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 area of the holding ponds and operation 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. This Report contains certified analyses of samples collected since those reported in the last quarterly report and September 30, 2018.
3. Sample collection and custody logs for samples collected and reported this quarter are posted on the Project's website.

Big Creek Science Team

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

Andrew Bartlett, Ph.D., Clinical Assistant Professor, Agricultural Statistics Laboratory, Experimental regression, agricultural applications of statistics.

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., Professor, 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.

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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 9. Left Fork downstream of the C&H Farm operation.

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

Site 11. South interceptor trench below the manure holding ponds.

Site 12. House well at animal facility.

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

Site description	Site	Latitude	Longitude	Elevation, ft
Field 1	BC1	35 55’ 06.42”	93 03’ 38.34”	984
Field 5a	BC2	35 56’03.01”	93 04’ 25.85”	778
Field 12	BC3	35 54’ 13.57”	93 04’ 04.76”	838
Ephemeral stream	BC4	35 55’ 25.89”	93 04’ 14.94”	824
Spring	BC5	35 54’ 57.06”	93 03’ 34.64”	977
Big Creek upstream of farm	BC6	35 53’ 32.28”	93 04’ 06.38”	857
Big Creek downstream of farm	BC7	35 56’ 18.98”	93 04’ 21.81”	769
Left Fork	BC9	35 56’ 48.33”	93 04” 0.92”	760
Trench 1 (south)	T1	35 55’ 19.24”	93 04’ 23.04”	890
Trench 2 (north)	T2	35 55’ 21.39”	93 04’ 19.93”	882
House well	W1	35 55’ 27.02”	93 04’ 22.71”	915
Well water depth		35 55’ 27.02”	93 04’ 22.71”	590
Pond 1 base		35 55’ 20.36”	93 04’ 23.58”	900
Pond 2 base		35 55’ 22.27”	93 04’ 21.61”	892

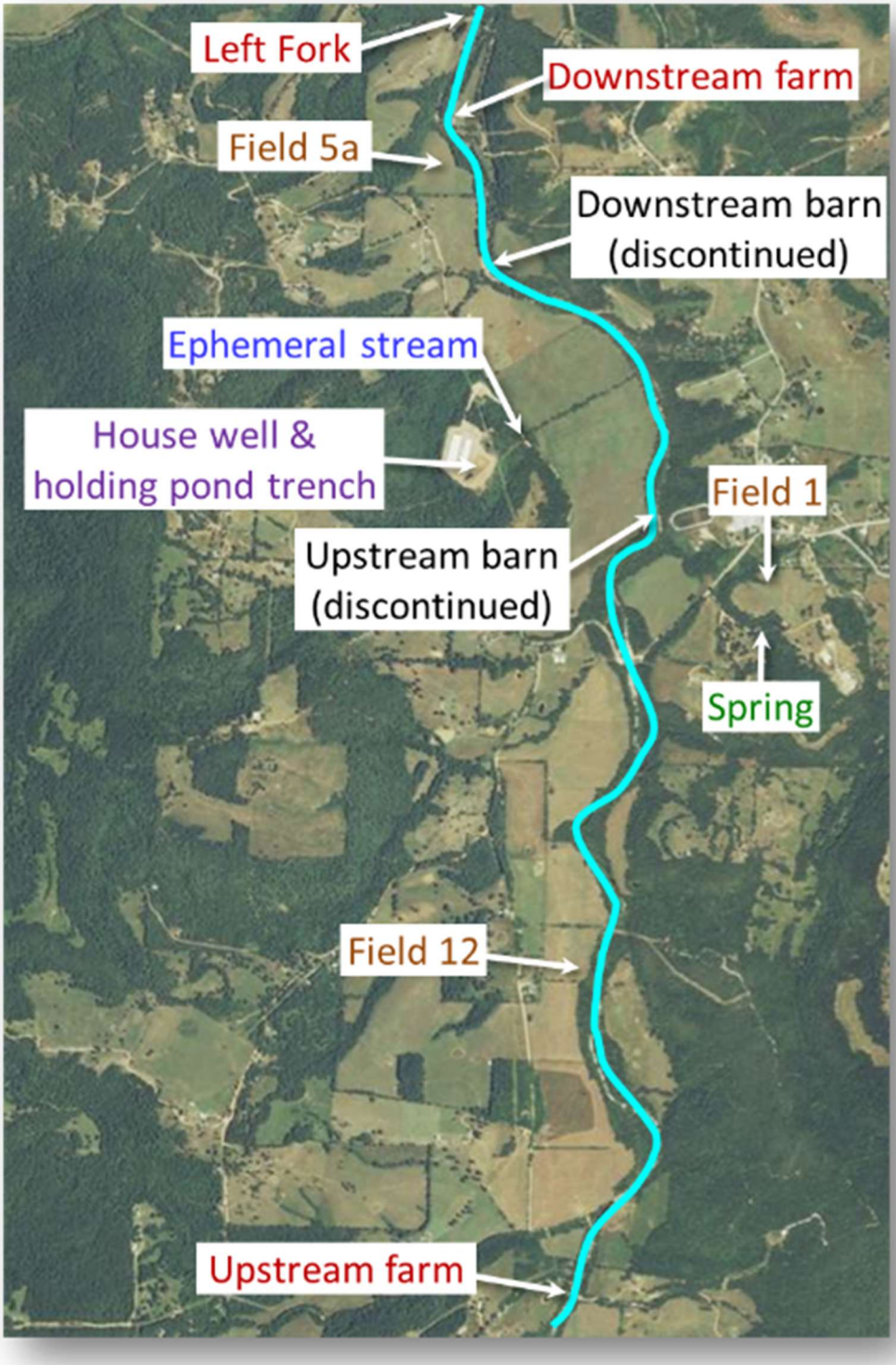


Figure 1. Location of sampling sites for the Big Creek Research and Extension Team project.

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. The ISCO autosamplers collect storm flow samples at sites edge-of-field sites on Fields 1, 5a, and 12, and at the ephemeral stream, upstream of the C&H Farm, and downstream of the C&H Farm sites (i.e., BC1, BC2, BC3, BC4, BC 6, and BC 7, respectively). Water-sample collection criteria for each site are detailed in Tables 2 and 3.
7. 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
8. 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. 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
9. Minimum detection limits (MDLs) for each chemical and biological constituent are listed in Table 4. 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.

10. Chemical and biological analyses of samples collected from the beginning of 2017 to the current date are given in Tables 5, 6, 7, and 8.

Table 2. Parameters used to enable ISCO auto-samplers at BCRET edge-of-field sites Field 1, 5a, and 12.

Site	Identifier	ISCO enabled when stage height (inches) above	Volume pacing, 100 mL water collected per gallon of water		
			Rainfall, inches		
			<2.5	2.5 to 4	>4
Field 1	BC1	> 0.75	500	1,000	5,000
Field 5a	BC2	> 0.75	5,000	10,000	50,000
Field 12	BC3	> 0.75	500	1,000	5,000

Table 3. Parameters used to enable ISCO auto-samplers at BCRET stream sites BC4, BC6, and BC7.

Site	Identifier	ISCO enabled when, over a 30-minute period, stage height (inches) increases by	Volume pacing, 100 mL water collected per gallon of water		
			Rainfall, inches		
			<2.5	2.5 to 4	>4
Ephemeral stream	BC4	> 2.0 *	25,000	50,000	100,000
Upstream Big Creek	BC6	1.2	40,000,000	50,000,000	70,000,000
Downstream Big Creek	BC7	1.8	60,000,000	80,000,000	100,000,000

* For ephemeral stream stage height increases >2.0 inches over a 30-min period.

Table 4. 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 5. Water quality analyses at each sample site since January 2018, 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 --	
1/4/2018	**1/4/2018**	**Grab sample**									
12:45	15:20	Upstream farm	0.006	0.006	0.01	0.165	0.270	1.3	2.19	18.3	2880.0
12:05	15:20	Downstream farm	0.009	0.009	0.01	0.300	0.410	0.5	2.22	2.0	613.1
11:52	15:20	Left Fork	0.004	0.005	0.01	0.228	0.310	0.7	1.58	1.0	461.1
12:22	15:20	House well	0.007	0.007	0.01	0.683	0.840	0.1	3.05	<1.0	1.0
1/18/2018	**1/18/2018**	**Grab sample**									
11:50	14:45	Upstream farm	0.005	0.005	0.02	0.125	0.180	0.5	2.14	24.7	2419.2
11:01	14:45	Downstream farm	0.007	0.007	0.01	0.214	0.300	0.5	1.97	14.5	547.5
10:45	14:45	Left Fork	0.002	0.002	0.01	0.128	0.180	0.6	1.17	1.0	461.1
11:24	14:45	House well	0.006	0.006	0.03	0.670	0.820	0.3	0.72	<1.0	<1.0
1/30/2018	**1/30/2018**	**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
12:13	14:30	Upstream farm	0.006	0.007	<0.03	0.143	0.210	1.1	2.40	18.9	613.1
11:36	14:30	Downstream farm	0.005	0.005	<0.03	0.163	0.230	4.6	2.22	4.1	579.4
11:24	14:30	Left Fork	0.005	0.005	<0.03	0.216	0.280	4.0	2.37	9.7	686.7
12:00	14:30	House well	0.009	0.009	<0.03	0.642	0.800	0.4	4.84	<1.0	<1.0
2/14/2018	**2/14/2018**	**Grab sample**									
10:46	13:20	Upstream farm	0.006	0.006	0.01	0.064	0.090	0.7	0.82	53.0	613.1
10:00	13:20	Downstream farm	0.008	0.008	0.01	0.150	0.220	1.4	1.29	35.5	816.1
9:44	13:20	Left Fork	0.004	0.004	0.01	0.143	0.130	1.2	1.29	13.4	866.4
10:31	13:20	House well	0.008	0.008	0.04	0.711	0.820	0.6	1.27	<1.0	<1.0
2/21/2018	**2/21/2018**	**Storm sample**									
11:32	15:32	Field 5a	1.496	2.078	0.14	0.307	2.990	66.9	17.12	ND	ND
2/22/2018	**2/22/2018**	**Grab sample**									
11:16	14:35	Spring	0.010	0.032	0.02	0.560	0.780	1.1	8.28	86.0	2419.2
12:16	14:35	Upstream farm	0.008	0.043	0.01	0.358	0.460	5.7	2.89	261.3	2419.2
11:00	14:35	Downstream farm	0.011	0.050	0.03	0.499	0.720	6.5	3.19	387.3	2650.0
12:04	14:35	Ephemeral stream	0.009	0.037	0.01	1.869	2.030	1.4	4.22	90.6	2720.0

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
10:52	14:35	Left Fork	0.015	0.057	0.02	0.660	0.880	7.4	3.32	238.2	4130.0
11:38	14:35	House well	0.007	0.024	0.01	0.697	0.900	0.2	3.19	<1.0	<1.0
11:43	14:35	Trench 1	0.008	0.043	0.06	1.334	1.590	2.1	3.55	8.4	6113.0
2/26/2018	**2/26/2018**	**Storm sample**									
11:52	15:40	Ephemeral stream	0.061	0.173	0.04	1.735	2.720	56.5	6.34	ND	ND
12:05	15:40	Field 5a	0.735	1.495	0.12	0.087	2.280	175.5	7.22	ND	ND
3/1/2018	**3/1/2018**	**Grab sample**									
11:43	15:00	Spring	0.014	0.037	<0.03	0.284	0.540	6.9	5.44	74.4	613.1
12:36	15:00	Upstream farm	0.009	0.032	0.01	0.226	0.370	0.0	1.94	325.5	1732.9
11:29	15:00	Downstream farm	0.008	0.035	0.01	0.337	0.460	2.9	2.17	142.1	1413.6
12:24	15:00	Ephemeral stream	0.010	0.029	<0.03	1.078	1.310	0.9	5.62	90.7	2419.2
11:20	15:00	Left Fork	0.011	0.037	0.01	0.349	0.490	2.6	2.26	137.6	1986.3
11:55	15:00	House well	0.014	0.031	0.02	0.655	0.770	0.5	3.77	8.5	16.0
12:06	15:00	Trench 1	0.007	0.024	0.01	1.668	1.850	0.5	1.89	1.0	235.9
3/7/2018	**3/7/2018**	**Grab sample**									
11:21	15:10	Spring	0.008	0.033	0.01	0.790	1.100	20.2	2.74	34.1	613.1

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
12:06	15:10	Upstream farm	0.006	0.009	<0.03	0.177	0.260	1.6	1.02	35.5	344.8
11:03	15:10	Downstream farm	0.008	0.013	<0.03	0.356	0.480	1.3	1.07	29.9	613.1
11:31	15:10	Ephemeral stream	0.008	0.010	0.01	0.764	0.980	1.5	0.72	101.4	5940.0
10:50	15:10	Left Fork	0.009	0.009	<0.03	0.345	0.460	0.8	0.81	63.1	579.4
11:40	15:10	House well	0.012	0.012	0.04	0.679	0.840	0.7	0.81	<1.0	<1.0
3/14/2018	**3/14/2018**	**Grab sample**									
12:20	15:00	Upstream farm	0.006	0.006	<0.03	0.072	0.160	0.6	0.69	118.3	461.1
11:38	15:00	Downstream farm	0.007	0.019	<0.03	0.254	0.410	0.2	0.81	24.3	387.3
11:25	15:00	Left Fork	0.006	0.006	<0.03	0.175	0.270	0.5	1.21	18.3	365.4
3/29/2018	**3/29/2018**	**Grab sample**									
12:13	15:50	Spring	0.007	0.035	<0.03	0.127	0.470	7.3	6.01	1046.2	21430.0
13:30	15:50	Upstream farm	0.037	0.167	0.01	0.149	0.840	99.3	6.10	3840.0	30760.0
12:35	15:50	Ephemeral stream	0.039	0.075	0.02	0.870	1.430	8.6	4.64	5370.0	27550.0
11:45	15:50	Left Fork	0.066	0.275	0.03	0.141	0.950	147.9	7.90	10460.0	54750.0
12:40	15:50	House well	0.013	0.013	0.02	0.648	0.830	0.1	1.28	<1.0	5.2
12:50	15:50	Trench 1	0.003	0.040	0.02	1.014	1.600	3.8	5.22	770.1	32550.0

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
13:05	15:50	Field 5a	2.067	2.247	0.05	0.296	1.750	27.1	12.48	72700.0	>241920
3/29/2018	**3/29/2018**	**Storm sample**									
11:56	15:50	Downstream farm	0.003	0.079	0.01	0.016	0.590	44.1	27.16	ND	ND
4/5/2018	**4/5/2018**	**Grab sample**									
9:39	14:10	Spring	0.008	0.008	<0.03	0.448	0.650	2.7	3.29	21.8	648.8
10:34	14:10	Upstream farm	0.006	0.006	<0.03	0.115	0.190	1.3	1.17	62.0	727.0
9:19	14:10	Downstream farm	0.006	0.006	<0.03	0.268	0.380	1.8	1.31	224.7	1046.2
9:54	14:10	Ephemeral stream	0.005	0.005	<0.03	0.778	0.980	1.1	2.38	40.8	2419.2
9:01	14:10	Left Fork	0.007	0.007	<0.03	0.277	0.410	2.0	1.63	104.6	1046.2
10:07	14:10	House well	0.007	0.007	<0.03	0.524	0.810	0.7	2.38	<1.0	5.2
11:00	14:10	Trench 1	0.002	0.002	0.01	1.291	1.470	0.9	0.88	1.0	275.5
4/12/2018	**4/12/2018**	**Grab sample**									
8:31	13:15	Spring	0.008	0.008	<0.03	0.848	1.050	0.9	12.16	8.4	410.6
9:21	13:15	Upstream farm	0.003	0.003	<0.03	0.051	0.110	0.9	4.09	98.7	1119.9
8:13	13:15	Downstream farm	0.004	0.004	<0.03	0.189	0.280	0.9	3.25	74.9	1119.9
8:46	13:15	Ephemeral stream	0.004	0.004	<0.03	0.717	0.870	0.3	5.75	30.9	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
7:58	13:15	Left Fork	0.003	0.003	<0.03	0.156	0.250	0.7	3.15	45.7	1203.3
4/16/2018	**4/16/2018**	**Storm sample**									
12:30	15:00	Ephemeral stream	0.009	0.038	0.04	0.920	1.230	7.2	2.20	ND	ND
4/19/2018	**4/19/2018**	**Grab sample**									
10:37	15:30	Spring	0.008	0.008	<0.03	0.772	1.030	0.8	1.94	22.8	410.6
11:17	15:30	Upstream farm	0.006	0.009	<0.03	0.076	0.170	0.9	0.99	88.0	866.4
10:15	15:30	Downstream farm	0.005	0.014	<0.03	0.154	0.250	1.3	0.95	113.7	1553.1
10:51	15:30	Ephemeral stream	0.003	0.004	<0.03	0.654	0.820	0.7	1.09	29.2	1986.3
10:01	15:30	Left Fork	0.004	0.007	<0.03	0.113	0.230	1.3	1.17	127.4	2419.2
11:04	15:30	House well	0.006	0.006	0.01	0.642	0.830	0.1	7.41	<1.0	<1.0
4/23/2018	**4/23/2018**	**Storm sample**									
	15:05	Ephemeral stream	0.002	0.014	0.02	0.680	0.940	10.4	7.70	ND	ND
4/26/2018	**4/26/2018**	**Grab sample**									
11:30	15:10	Spring	0.006	0.032	<0.03	0.131	0.390	2.0	6.56	547.5	2419.2
12:23	15:10	Upstream farm	0.004	0.022	<0.03	0.057	0.150	2.4	1.94	307.6	3500.0
11:15	15:10	Downstream farm	0.004	0.029	<0.03	0.081	0.230	4.5	1.98	686.7	5120.0

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
11:42	15:10	Ephemeral stream	0.005	0.010	<0.03	0.799	1.050	0.3	2.03	60.1	2419.2
11:05	15:10	Left Fork	0.003	0.014	<0.03	0.069	0.210	2.5	1.86	292.4	2010.0
11:53	15:10	House well	0.008	0.009	<0.03	0.628	0.770	0.3	1.60	<1.0	2.0
5/3/2018	**5/3/2018**	**Grab sample**									
10:00	13:44	Spring	0.007	0.058	<0.03	0.115	0.500	4.9	6.06	1046.2	54750.0
11:04	13:44	Upstream farm	0.054	0.305	0.02	0.106	1.080	17.2	3.90	15000.0	173290
9:47	13:44	Downstream farm	0.010	0.065	0.01	0.095	0.400	74.9	5.62	3730.0	23820.0
10:28	13:44	Ephemeral stream	0.017	0.033	<0.03	0.919	1.120	16.2	5.81	248.9	13790.0
9:38	13:44	Left Fork	0.023	0.150	0.01	0.167	0.850	20.9	6.38	7540.0	86640.0
10:38	13:44	House well	0.009	0.026	<0.03	0.661	0.760	0.6	1.62	<1.0	2.0
10:45	13:44	Trench 1	0.004	0.048	<0.03	0.636	0.880	5.9	2.52	135.4	54750.0
10:45	13:44	Trench 2	0.004	0.320	0.02	0.240	1.770	32.1	15.79	290.9	241920
10:15	13:44	Field 1	0.273	0.467	0.06	0.037	1.750	27.5	8.12	41060.0	241920
5/3/2018	**5/3/2018**	**Storm sample**									
10:28	13:44	Ephemeral stream	0.004	0.044	0.01	1.008	1.380	100.8	2.80	ND	ND
5/17/2018	**5/17/2018**	**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
8:09	12:30	Spring	0.005	0.023	0.01	0.673	0.870	13.1	3.78	16.0	579.4
8:53	12:30	Upstream farm	0.004	0.010	0.01	0.130	0.240	2.6	1.67	101.7	3500.0
7:48	12:30	Downstream farm	0.007	0.022	0.02	0.275	0.440	1.8	1.47	82.0	8200.0
7:33	12:30	Left Fork	0.006	0.012	0.02	0.268	0.430	2.0	2.12	26.9	2490.0
8:30	12:30	House well	0.005	0.006	0.01	0.814	0.930	0.3	1.13	1.0	2.0
5/24/2018	**5/24/2018**	**Grab sample**									
11:35	14:40	Spring	0.009	0.017	<0.03	0.634	0.780	2.9	1.71	5.1	4260.0
12:25	14:40	Upstream farm	0.006	0.015	<0.03	0.118	0.220	1.1	0.93	517.2	17890.0
11:25	14:40	Downstream farm	0.010	0.017	0.01	0.315	0.460	1.3	0.84	41.1	2419.2
11:15	14:40	Left Fork	0.008	0.015	0.02	0.318	0.510	2.5	1.07	33.7	4020.0
12:05	14:40	House well	0.009	0.012	0.01	0.666	0.770	0.5	0.96	<1.0	<1.0
5/31/2018	**5/31/2018**	**Grab sample**									
11:17	14:45	Spring	0.005	0.012	<0.03	0.473	0.640	2.0	2.35	74.3	8360.0
11:43	14:45	Upstream farm	0.006	0.015	<0.03	0.085	0.200	1.6	1.13	90.6	4080.0
11:05	14:45	Downstream farm	0.008	0.014	0.01	0.198	0.340	1.9	1.13	66.9	4570.0
11:00	14:45	Left Fork	0.006	0.014	0.01	0.146	0.290	3.1	1.22	60.9	3450.0

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
11:30	14:45	House well	0.007	0.010	0.01	0.661	0.780	0.1	0.55	<1.0	<1.0
6/7/2018	**6/7/2018**	**Grab sample**									
8:04	12:10	Spring	0.008	0.027	<0.03	0.578	0.770	5.8	23.88	145.0	8300.0
8:31	12:10	Upstream farm	0.011	0.020	0.01	0.124	0.230	2.2	7.79	209.8	6630.0
7:51	12:10	Downstream farm	0.009	0.021	0.04	0.112	0.420	2.5	7.51	111.9	4880.0
7:39	12:10	Left Fork	0.009	0.024	0.06	0.189	0.390	3.4	7.93	58.1	8860.0
8:18	12:10	House well	0.008	0.012	0.01	0.825	0.940	0.7	12.33	<1.0	<1.0
6/13/2018	**6/13/2018**	**Grab sample**									
12:53	16:10	Spring	0.005	0.020	<0.03	0.707	0.940	6.4	4.08	74.9	8130.0
12:44	16:10	Upstream farm	0.004	0.017	0.01	0.107	0.290	8.9	1.35	648.8	8300.0
10:51	16:10	Downstream farm	0.008	0.012	0.01	0.320	0.470	1.2	0.94	61.3	5040.0
10:40	16:10	Left Fork	0.006	0.014	0.02	0.213	0.440	2.9	1.46	38.2	6630.0
12:30	16:10	House well	0.006	0.006	<0.03	0.669	0.800	0.1	0.52	<1.0	2.0
6/28/2018	**6/28/2018**	**Grab sample**									
12:38	15:00	Upstream farm	0.008	0.013	0.02	0.217	0.370	1.4	1.84	66.3	985.0
12:00	15:00	Downstream farm	0.008	0.023	0.02	0.375	0.580	8.4	1.96	8.6	374.0

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
11:45	15:00	Left Fork	0.003	0.013	0.02	0.129	0.350	2.4	2.06	5.2	798.0
12:12	15:00	House well	0.007	0.007	<0.03	0.660	0.790	0.0	2.75	<1.0	<1.0
7/5/2018	**7/5/2018**	**Grab sample**									
11:38	15:40	Downstream farm	0.008	0.021	0.02	0.405	0.600	2.3	2.59	14.5	6840.0
11:28	15:40	Left Fork	0.002	0.019	0.01	0.152	0.390	1.8	3.09	1.0	10500.0
12:10	15:40	House well	0.005	0.014	0.00	0.677	0.820	1.1	2.15	<1.0	6.3
7/12/2018	**7/12/2018**	**Grab sample**									
7:07	11:20	Downstream farm	0.008	0.008	0.02	0.480	0.660	1.7	2.79	93.3	7270.0
6:47	11:20	Left Fork	0.007	0.007	0.02	0.120	0.350	2.2	3.61	5.2	11060.0
7:36	11:20	House well	0.006	0.006	<0.03	1.098	1.230	0.2	1.70	<1.0	1.0
7/18/2018	**7/18/2018**	**Grab sample**									
6:44	11:00	Downstream farm	0.013	0.017	0.03	0.487	0.660	1.9	0.43	114.5	8570.0
6:31	11:00	Left Fork	0.011	0.016	0.03	0.120	0.320	1.7	1.27	13.2	11980.0
7:12	11:00	House well	0.010	0.017	0.01	1.587	1.670	1.1	1.23	<1.0	<1.0
7/25/2018	**7/25/2018**	**Grab sample**									
11:08	13:45	Downstream farm	0.008	0.008	<0.03	0.418	0.590	1.7	1.10	13.2	7230.0
10:56	13:45	Left Fork	0.006	0.010	<0.03	0.102	0.280	2.5	1.99	2.0	8600.0

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
11:22	13:45	House well	0.007	0.007	<0.03	0.697	0.840	0.1	6.11	<1.0	<1.0
8/1/2018	**8/1/2018**	**Grab sample**									
11:35	15:00	Spring	0.007	0.028	0.02	2.471	2.990	8.5	4.60	920.8	155310
12:30	15:00	Upstream farm	0.020	0.036	0.03	0.832	1.200	4.0	4.09	1732.9	20460.0
11:17	15:00	Downstream farm	0.008	0.013	0.02	0.605	0.800	2.2	0.93	101.4	10711.0
11:03	15:00	Left Fork	0.006	0.015	0.02	0.482	0.730	3.6	1.44	95.9	9330.0
12:05	15:00	House well	0.009	0.009	0.02	0.697	0.790	0.8	0.54	<1.0	3.1
8/9/2018	**8/9/2018**	**Grab sample**									
11:38	14:15	Spring	0.008	0.008	<0.03	0.367	0.460	2.0	1.21	43.7	28510.0
11:21	14:15	Downstream farm	0.012	0.012	0.01	0.418	0.560	1.5	0.48	74.9	5830.0
11:08	14:15	Left Fork	0.007	0.007	0.01	0.126	0.280	2.8	1.15	32.7	7380.0
11:53	14:15	House well	0.010	0.010	0.01	0.712	0.850	0.9	0.02	<1.0	<1.0
8/16/2018	**8/16/2018**	**Grab sample**									
12:33	15:15	Upstream farm	0.009	0.009	<0.03	0.245	0.340	1.4	1.62	210.5	7540.0
12:43	15:15	Downstream farm	0.009	0.009	0.01	0.486	0.630	1.5	1.30	49.5	5650.0
13:01	15:15	Left Fork	0.006	0.006	0.01	0.413	0.630	36.6	2.02	10.9	4640.0
12:00	15:15	House well	0.008	0.008	<0.03	0.682	0.770	0.0	2.37	<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
8/23/2018	**8/23/2018**	**Grab sample**									
13:05	15:25	Upstream farm	0.009	0.010	0.01	0.110	0.160	1.5	1.39	75.4	4040.0
11:41	15:25	Downstream farm	0.008	0.011	0.02	0.245	0.320	1.7	1.43	44.3	3690.0
11:27	15:25	Left Fork	0.004	0.008	0.03	0.118	0.220	2.2	1.77	57.3	3310.0
12:50	15:25	House well	0.007	0.007	0.01	0.701	0.750	0.0	0.88	<1.0	<1.0
8/30/2018	**8/30/2018**	**Grab sample**									
13:20	15:30	Upstream farm	0.008	0.008	0.01	0.138	0.290	1.3	3.35	1203.3	10710.0
11:58	15:30	Downstream farm	0.018	0.041	0.02	0.474	0.810	20.1	2.15	1986.3	57940.0
11:40	15:30	Left Fork	0.010	0.022	0.01	0.302	0.580	7.1	2.27	248.9	10810.0
12:56	15:30	House well	0.007	0.007	<0.03	0.686	0.840	0.3	11.68	<1.0	3.0
8/30/2018	**8/30/2018**	**Storm sample**									
12:20	15:30	Field 1	1.617	1.875	0.69	1.869	5.510	49.6	17.02	ND	ND
9/6/2018	**9/6/2018**	**Grab sample**									
7:27	11:50	Downstream farm	0.012	0.016	0.02	0.431	0.600	2.9	0.96	143.9	5380.0
7:10	11:50	Left Fork	0.007	0.007	0.02	0.174	0.350	3.6	1.02	45.7	7890.0
7:58	11:50	House well	0.006	0.006	<0.03	0.732	0.820	0.5	0.32	<1.0	4.1

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
9/11/2018	**9/11/2018**	**Grab sample**									
9:42	13:10	Downstream farm	0.012	0.020	0.02	0.382	0.530	2.6	4.27	50.4	5040.0
9:30	13:10	Left Fork	0.007	0.014	0.01	0.162	0.290	2.9	4.38	27.8	5460.0
10:05	13:10	House well	0.007	0.011	<0.03	0.747	0.860	0.5	5.46	<1.0	1.0
Samples analyzed since the last quarterly report											
9/25/2018	**9/25/2018**	**Grab sample**									
11:40	15:00	Spring	0.010	0.034	<0.03	1.386	1.840	17.8	17.41	290.9	14670.0
12:23	15:00	Upstream farm	0.016	0.024	<0.03	0.202	0.320	3.2	5.90	1046.2	22820.0
11:17	15:00	Downstream farm	0.014	0.026	<0.03	0.370	0.570	5.1	5.84	410.6	17250.0
11:05	15:00	Left Fork	0.009	0.013	<0.03	0.363	0.500	3.8	4.50	172.2	10810.0
12:05	15:00	House well	0.009	0.010	<0.03	0.725	0.800	0.9	3.12	<1.0	3.1
10/2/2018	**10/2/2018**	**Grab sample**									
7:04	11:20	Downstream farm	0.014	0.018	0.01	0.365	0.500	2.9	1.56	ND	ND
6:47	11:20	Left Fork	0.006	0.013	0.01	0.115	0.250	2.3	1.51	ND	ND
7:34	11:20	House well	0.008	0.012	<0.03	1.080	1.180	0.7	2.08	ND	ND
10/11/2018	**10/11/2018**	**Grab sample**									
11:33	15:20	Spring	0.013	0.036	<0.03	1.674	1.980	12.5	12.64	686.7	16160.0

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
12:40	15:20	Upstream farm	0.016	0.029	<0.03	0.280	0.460	2.2	3.80	235.9	16310.0
11:18	15:20	Downstream farm	0.019	0.034	<0.03	0.561	0.790	4.0	3.65	770.1	17250.0
11:00	15:20	Left Fork	0.013	0.028	<0.03	0.772	1.040	6.4	4.02	488.4	13760.0
12:18	15:20	House well	0.008	0.008	<0.03	0.722	0.820	0.2	5.39	<1.0	<1.0
10/11/2018	**10/11/2018**	**Storm sample**									
11:57	15:20	Ephemeral stream	0.075	0.166	<0.03	2.223	2.910	59.5	6.79	ND	ND
11:45	15:20	Field 1	1.941	2.103	0.40	2.942	5.830	12.3	21.23	ND	ND
10/16/2018	**10/16/2018**	**Grab sample**									
7:19	11:40	Spring	0.008	0.031	<0.03	1.342	1.790	19.1	4.94	410.6	12360.0
8:18	11:40	Upstream farm	0.011	0.023	<0.03	0.183	0.390	3.5	1.94	195.6	7270.0
7:04	11:40	Downstream farm	0.013	0.019	<0.03	0.273	0.470	5.1	1.60	198.9	11530.0
6:52	11:40	Left Fork	0.010	0.010	<0.03	0.384	0.550	2.7	1.37	156.5	6690.0
7:47	11:40	Trench 1	0.002	0.002	<0.03	0.156	0.240	0.4	8.02	12.1	2620.0
10/24/2018	**10/24/2018**	**Grab sample**									
7:19	11:30	Spring	0.009	0.027	0.01	1.670	1.880	14.3	2.78	29.4	2419.2
8:17	11:30	Upstream farm	0.008	0.015	0.01	0.223	0.300	2.3	0.91	40.4	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
7:05	11:30	Downstream farm	0.011	0.015	0.01	0.434	0.550	2.8	0.96	57.6	2720.0
6:44	11:30	Left Fork	0.008	0.011	0.01	0.342	0.470	2.5	1.33	45.0	3130.0
7:33	11:30	House well	0.007	0.016	0.00	1.745	1.810	1.3	0.15	<1.0	214.3
11/1/2018	**11/1/2018**	**Grab sample**									
11:40	15:05	Spring	0.007	0.025	<0.03	1.348	1.660	5.7	9.05	238.2	8330.0
12:40	15:05	Upstream farm	0.018	0.056	<0.03	0.268	0.510	11.0	4.04	686.7	20140.0
11:12	15:05	Downstream farm	0.028	0.079	<0.03	0.368	0.660	17.7	4.74	920.8	12220.0
11:53	15:05	Ephemeral stream	0.007	0.026	<0.03	1.967	2.100	2.7	3.98	307.6	4620.0
11:00	15:05	Left Fork	0.028	0.082	<0.03	0.435	0.770	16.7	5.06	866.4	19350.0
12:04	15:05	House well	0.008	0.008	0.01	0.744	0.790	1.6	4.97	6.3	49.6
12:15	15:05	Trench 1	0.002	0.050	<0.03	0.465	0.930	4.0	5.29	488.4	43520.0
12:22	15:05	Trench 2	0.003	0.067	<0.03	1.306	2.010	4.6	6.69	866.4	68670.0
11/1/2018	**11/1/2018**	**Storm sample**									
11:53	15:05	Ephemeral stream	0.022	0.094	0.01	2.207	2.790	49.0	6.08	ND	ND
11:30	15:05	Field 1	0.955	1.171	0.38	0.719	3.000	39.3	13.17	ND	ND
11/7/2018	**11/7/2018**	**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
8:00	12:30	Spring	0.010	0.011	0.01	1.354	1.460	5.5	0.61	47.1	2920.0
9:25	12:30	Upstream farm	0.011	0.015	0.02	0.177	0.250	4.3	1.21	41.6	2419.2
7:42	12:30	Downstream farm	0.013	0.018	0.01	0.410	0.520	4.3	0.99	86.2	2419.2
8:16	12:30	Ephemeral stream	0.009	0.009	0.01	0.862	1.510	2.5	1.61	35.0	1732.9
7:25	12:30	Left Fork	0.013	0.024	0.01	0.397	0.520	4.5	1.30	73.3	2419.2
8:27	12:30	House well	0.008	0.008	<0.03	0.863	0.940	2.8	0.36	<1.0	46.4
8:45	12:30	Trench 1	0.002	0.002	0.01	0.612	0.740	3.3	0.66	12.2	980.4
8:57	12:30	Trench 2	0.004	0.004	0.01	0.999	1.210	3.0	1.74	31.8	241920.0
11/20/2018	**11/20/2018**	**Grab sample**									
7:55	11:15	Spring	0.009	0.009	0.26	1.533	1.730	2.2	15.13	10.9	1119.9
8:34	11:15	Upstream farm	0.009	0.009	<0.03	0.118	0.170	0.5	5.89	13.2	1299.7
7:41	11:15	Downstream farm	0.012	0.012	0.01	0.378	0.470	0.9	5.07	6.2	980.4
7:31	11:15	Left Fork	0.010	0.010	0.01	0.296	0.370	0.6	5.13	9.6	1986.3
8:12	11:15	House well	0.010	0.010	0.05	1.168	1.300	0.4	5.62	<1.0	10.9
12/5/2018	**12/5/2018**	**Grab sample**									
8:17	11:30	Spring	0.012	0.015	<0.03	1.149	1.340	7.5	1.46	28.8	1413.6

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
8:51	11:30	Upstream farm	0.006	0.009	<0.03	0.061	0.120	1.7	0.61	38.4	1119.9
8:01	11:30	Downstream farm	0.008	0.009	<0.03	0.190	0.250	1.5	0.72	23.1	1413.9
7:50	11:30	Left Fork	0.006	0.009	<0.03	0.171	0.270	1.1	0.83	25.9	1553.1
8:31	11:30	House well	0.006	0.012	<0.03	0.821	1.250	1.1	0.40	<1.0	6.3
12/17/2018	**12/17/2018**	**Grab sample**									
11:45	14:45	Spring	0.007	0.035	<0.03	0.956	1.300	22.3	10.13	34.5	1299.7
12:00	14:45	Upstream farm	0.005	0.018	<0.03	0.203	0.310	1.7	2.93	28.8	1986.3
12:07	14:45	Downstream farm	0.008	0.018	<0.03	0.374	0.500	2.1	2.40	36.4	1986.3
11:30	14:45	Ephemeral stream	0.006	0.010	<0.03	1.167	1.350	0.8	6.28	32.7	2419.2
12:20	14:45	Left Fork	0.010	0.021	<0.03	0.443	0.580	1.5	2.81	55.7	2419.2
11:12	14:45	House well	0.007	0.007	<0.03	0.738	0.880	0.5	18.42	<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 6. Water quality analyses in Big Creek upstream and downstream of the C&H Farm boundary of permitted land application since January 2018, 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 ---	
1/4/2018									
Upstream	0.006	0.006	0.01	0.165	0.270	1.3	2.19	18.3	2880.0
Downstream	0.009	0.009	0.01	0.300	0.410	0.5	2.22	2.0	613.1
1/18/2018									
Upstream	0.007	0.007	0.01	0.214	0.300	0.5	1.97	14.5	547.5
Downstream	0.005	0.005	0.02	0.125	0.180	0.5	2.14	24.7	2419.2
1/30/2018									
Upstream	0.006	0.007	<0.03	0.143	0.210	1.1	2.40	18.9	613.1
Downstream	0.005	0.005	<0.03	0.163	0.230	4.6	2.22	4.1	579.4
2/14/2018									
Upstream	0.006	0.006	0.01	0.064	0.090	0.7	0.82	53.0	613.1
Downstream	0.008	0.008	0.01	0.150	0.220	1.4	1.29	35.5	816.1
2/22/2018									
Upstream	0.008	0.043	0.01	0.358	0.460	5.7	2.89	261.3	2419.2

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.011	0.050	0.03	0.499	0.720	6.5	3.19	387.3	2650.0
3/1/2018									
Upstream	0.009	0.032	0.01	0.226	0.370	0.0	1.94	325.5	1732.9
Downstream	0.008	0.035	0.01	0.337	0.460	2.9	2.17	142.1	1413.6
3/7/2018									
Upstream	0.006	0.009	<0.03	0.177	0.260	1.6	1.02	35.5	344.8
Downstream	0.008	0.013	<0.03	0.356	0.480	1.3	1.07	29.9	613.1
3/14/2018									
Upstream	0.006	0.006	<0.03	0.072	0.160	0.6	0.69	118.3	461.1
Downstream	0.007	0.019	<0.03	0.254	0.410	0.2	0.81	24.3	387.3
4/5/2018									
Upstream	0.006	0.006	<0.03	0.115	0.190	1.3	1.17	62.0	727.0
Downstream	0.006	0.006	<0.03	0.268	0.380	1.8	1.31	224.7	1046.2
4/12/2018									
Upstream	0.003	0.003	<0.03	0.051	0.110	0.9	4.09	98.7	1119.9
Downstream	0.004	0.004	<0.03	0.189	0.280	0.9	3.25	74.9	1119.9
4/19/2018									
Upstream	0.006	0.009	<0.03	0.076	0.170	0.9	0.99	88.0	866.4

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	0.014	<0.03	0.154	0.250	1.3	0.95	113.7	1553.1
4/26/2018									
Upstream	0.004	0.022	<0.03	0.057	0.150	2.4	1.94	307.6	3500.0
Downstream	0.004	0.029	<0.03	0.081	0.230	4.5	1.98	686.7	5120.0
5/3/2018									
Upstream	0.054	0.305	0.02	0.106	1.080	17.2	3.90	15000.0	173290
Downstream	0.010	0.065	0.01	0.095	0.400	74.9	5.62	3730.0	23820.0
5/17/2018									
Upstream	0.004	0.010	0.01	0.130	0.240	2.6	1.67	101.7	3500.0
Downstream	0.007	0.022	0.02	0.275	0.440	1.8	1.47	82.0	8200.0
5/24/2018									
Upstream	0.006	0.015	<0.03	0.118	0.220	1.1	0.93	517.2	17890.0
Downstream	0.010	0.017	0.01	0.315	0.460	1.3	0.84	41.1	2419.2
5/31/2018									
Upstream	0.006	0.015	<0.03	0.085	0.200	1.6	1.13	90.6	4080.0
Downstream	0.008	0.014	0.01	0.198	0.340	1.9	1.13	66.9	4570.0
6/7/2018									
Upstream	0.011	0.020	0.01	0.124	0.230	2.2	7.79	209.8	6630.0

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.009	0.021	0.04	0.112	0.420	2.5	7.51	111.9	4880.0
6/13/2018									
Upstream	0.004	0.017	0.01	0.107	0.290	8.9	1.35	648.8	8300.0
Downstream	0.008	0.012	0.01	0.320	0.470	1.2	0.94	61.3	5040.0
6/28/2018									
Upstream	0.008	0.013	0.02	0.217	0.370	1.4	1.84	66.3	985.0
Downstream	0.008	0.023	0.02	0.375	0.580	8.4	1.96	8.6	374.0
8/1/2018									
Upstream	0.020	0.036	0.03	0.832	1.200	4.0	4.09	1732.9	20460.0
Downstream	0.008	0.013	0.02	0.605	0.800	2.2	0.93	101.4	10711.0
8/16/2018									
Upstream	0.009	0.009	<0.03	0.285	0.340	1.4	1.62	210.5	7540.0
Downstream	0.009	0.009	0.01	0.486	0.630	1.5	1.30	49.5	5650.0
8/23/2018									
Upstream	0.009	0.010	0.01	0.110	0.160	1.5	1.39	75.4	4040.0
Downstream	0.008	0.011	0.02	0.245	0.320	1.7	1.43	44.3	3690.0
8/30/2018									
Upstream	0.008	0.008	0.01	0.138	0.290	1.3	3.35	1203.3	10710.0

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.018	0.041	0.02	0.474	0.810	20.1	2.15	1986.3	57940.0
Samples analyzed since the last quarterly report									
9/25/2018									
Upstream	0.016	0.024	<0.03	0.202	0.320	3.2	5.90	1046.2	22820.0
Downstream	0.014	0.026	<0.03	0.370	0.570	5.1	5.84	410.6	17250.0
10/11/2018									
Upstream	0.016	0.029	<0.03	0.280	0.460	2.2	3.80	235.9	16310.0
Downstream	0.019	0.034	<0.03	0.561	0.790	4.0	3.65	770.1	17250.0
10/16/2018									
Upstream	0.011	0.023	<0.03	0.183	0.390	3.5	1.94	195.6	7270.0
Downstream	0.013	0.019	<0.03	0.273	0.470	5.1	1.60	198.9	11530.0
10/24/2018									
Upstream	0.008	0.015	0.01	0.223	0.300	2.3	0.91	40.4	2419.2
Downstream	0.011	0.015	0.01	0.434	0.550	2.8	0.96	57.6	2720.0
11/1/2018									
Upstream	0.018	0.056	<0.03	0.268	0.510	11.0	4.04	686.7	20140.0
Downstream	0.028	0.079	<0.03	0.368	0.660	17.7	4.74	920.8	12220.0
11/7/2018									

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Upstream	0.011	0.015	0.02	0.177	0.250	4.3	1.21	41.6	2419.2
Downstream	0.013	0.018	0.01	0.410	0.520	4.3	0.99	86.2	2419.2
11/20/2018									
Upstream	0.009	0.009	<0.03	0.118	0.170	0.5	5.89	13.2	1299.7
Downstream	0.012	0.012	0.01	0.378	0.470	0.9	5.07	6.2	980.4
12/5/2018									
Upstream	0.006	0.009	<0.03	0.061	0.120	1.7	0.61	38.4	1119.9
Downstream	0.008	0.009	<0.03	0.190	0.250	1.5	0.72	23.1	1413.9
12/17/2018									
Upstream	0.005	0.018	<0.03	0.203	0.310	1.7	2.93	28.8	1986.3
Downstream	0.008	0.018	<0.03	0.374	0.500	2.1	2.40	36.4	1986.3

¶ 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 7. 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, 2018, 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									
2/22/2018	0.009	0.037	0.01	1.869	2.030	1.4	4.22	90.6	2720.0
2/26/2018	0.061	0.173	0.04	1.735	2.720	56.5	6.34	ND	ND
3/1/2018	0.010	0.029	<0.03	1.078	1.310	0.9	5.62	90.7	2419.2
3/7/2018	0.008	0.010	0.01	0.764	0.980	1.5	0.72	101.4	5940.0
3/29/2018	0.039	0.075	0.02	0.870	1.430	8.6	4.64	5370.0	27550.0
4/5/2018	0.005	0.005	<0.03	0.778	0.980	1.1	2.38	40.8	2419.2
4/12/2018	0.004	0.004	<0.03	0.717	0.870	0.3	5.75	30.9	2419.2
4/16/2018	0.009	0.038	0.04	0.920	1.230	7.2	2.20	ND	ND
4/19/2018	0.003	0.004	<0.03	0.654	0.820	0.7	1.09	29.2	1986.3
4/23/2018	0.002	0.014	0.02	0.680	0.940	10.4	7.70	ND	ND
4/26/2018	0.005	0.010	<0.03	0.799	1.050	0.3	2.03	60.1	2419.2
5/3/2018	0.017	0.033	<0.03	0.919	1.120	16.2	5.81	248.9	13790.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
No samples collected since the last quarterly report									
10/11/2018	0.075	0.166	<0.03	2.223	2.910	59.5	6.79	ND	ND
11/1/2018	0.007	0.026	<0.03	1.967	2.100	2.7	3.98	307.6	4620.0
11/7/2018	0.009	0.009	0.01	0.862	1.510	2.5	1.61	35.0	1732.9
12/17/2018	0.006	0.010	<0.03	1.167	1.350	0.8	6.28	32.7	2419.2
House well									
1/4/2018	0.007	0.007	0.01	0.683	0.840	0.1	3.05	<1.0	1.0
1/18/2018	0.006	0.006	0.03	0.670	0.820	0.3	0.72	<1.0	<1.0
1/30/2018	0.009	0.009	<0.03	0.642	0.800	0.4	4.84	<1.0	<1.0
2/14/2018	0.008	0.008	0.04	0.711	0.820	0.6	1.27	<1.0	<1.0
2/22/2018	0.007	0.024	0.01	0.697	0.900	0.2	3.19	<1.0	<1.0
3/1/2018	0.014	0.031	0.02	0.655	0.770	0.5	3.77	8.5	16.0
3/7/2018	0.012	0.012	0.04	0.679	0.840	0.7	0.81	<1.0	<1.0
3/29/2018	0.013	0.013	0.02	0.648	0.830	0.1	1.28	<1.0	5.2
4/5/2018	0.007	0.007	<0.03	0.524	0.810	0.7	2.38	<1.0	5.2
4/19/2018	0.006	0.006	0.01	0.642	0.830	0.1	7.41	<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
4/26/2018	0.008	0.009	<0.03	0.628	0.770	0.3	1.60	<1.0	2.0
5/3/2018	0.009	0.026	<0.03	0.661	0.760	0.6	1.62	<1.0	2.0
5/17/2018	0.005	0.006	0.01	0.814	0.930	0.3	1.13	1.0	2.0
5/24/2018	0.009	0.012	0.01	0.666	0.770	0.5	0.96	<1.0	<1.0
5/31/2018	0.007	0.010	0.01	0.661	0.780	0.1	0.55	<1.0	<1.0
6/7/2018	0.008	0.012	0.01	0.825	0.940	0.7	12.33	<1.0	<1.0
6/13/2018	0.006	0.006	<0.03	0.669	0.800	0.1	0.52	<1.0	2.0
6/28/2018	0.007	0.007	<0.03	0.660	0.790	0.0	2.75	<1.0	<1.0
7/5/2018	0.005	0.014	<0.03	0.677	0.820	1.1	2.15	<1.0	6.3
7/12/2018	0.006	0.006	<0.03	1.098	1.230	0.2	1.70	<1.0	1.0
7/18/2018	0.010	0.017	0.01	1.587	1.670	1.1	1.23	<1.0	<1.0
7/25/2018	0.007	0.007	<0.03	0.697	0.840	0.1	6.11	<1.0	<1.0
8/1/2018	0.009	0.009	0.02	0.697	0.790	0.8	0.54	<1.0	3.1
8/9/2018	0.010	0.010	0.01	0.712	0.850	0.9	0.02	<1.0	<1.0
8/16/2018	0.008	0.008	<0.03	0.682	0.770	0.0	2.37	<1.0	<1.0
8/23/2018	0.007	0.007	0.01	0.701	0.750	0.0	0.88	<1.0	<1.0
8/30/2018	0.007	0.007	<0.03	0.686	0.840	0.3	11.68	<1.0	3.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
9/6/2018	0.006	0.006	<0.03	0.732	0.820	0.5	0.32	<1.0	4.1
9/11/2018	0.007	0.011	<0.03	0.747	0.860	0.5	5.46	<1.0	1.0
Samples collected since the last quarterly report									
9/25/2018	0.009	0.010	<0.03	0.725	0.800	0.9	3.12	<1.0	3.1
10/2/2018	0.008	0.012	<0.03	1.080	1.180	0.7	2.08	ND	ND
10/11/2018	0.008	0.008	<0.03	0.722	0.820	0.2	5.39	<1.0	<1.0
10/24/2018	0.007	0.016	<0.03	1.745	1.810	1.3	0.15	<1.0	214.3
11/1/2018	0.008	0.008	0.01	0.744	0.790	1.6	4.97	6.3	49.6
11/7/2018	0.008	0.008	<0.03	0.863	0.940	2.8	0.36	<1.0	46.4
11/20/2018	0.010	0.010	0.05	1.168	1.300	0.4	5.62	<1.0	10.9
12/5/2018	0.006	0.012	<0.03	0.821	1.250	1.1	0.40	<1.0	6.3
12/17/2018	0.007	0.007	<0.03	0.738	0.880	0.5	18.42	<1.0	1.0
Interceptor Trench 1 (South)									
2/22/2018	0.008	0.043	0.06	1.334	1.590	2.1	3.55	8.4	6113.0
3/1/2018	0.007	0.024	0.01	1.668	1.850	0.5	1.89	1.0	235.9
3/29/2018	0.003	0.040	0.02	1.014	1.600	3.8	5.22	770.1	32550.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
4/5/2018	0.002	0.002	0.01	1.291	1.470	0.9	0.88	1.0	275.5
5/3/2018	0.004	0.048	<0.03	0.636	0.880	5.9	2.52	135.4	54750.0
No samples collected since the last quarterly report									
10/16/2018	0.002	0.002	<0.03	0.156	0.240	0.4	8.02	12.1	2620.0
11/1/2018	0.002	0.050	<0.03	0.465	0.930	4.0	5.29	488.4	43520.0
11/7/2018	0.002	0.002	<0.03	0.612	0.740	3.3	0.66	12.2	980.4
Interceptor Trench 2 (North)									
5/3/2018	0.004	0.320	0.02	0.240	1.770	32.1	15.79	290.9	241920
No samples collected since the last quarterly report									
11/1/2018	0.003	0.067	<0.03	1.306	2.010	4.6	6.69	866.4	68670.0
11/7/2018	0.004	0.004	0.01	0.999	1.210	3.0	1.74	31.8	214920.0
Left Fork									
1/4/2018	0.004	0.005	0.01	0.228	0.310	0.7	1.58	1.0	461.1
1/18/2018	0.002	0.002	0.01	0.128	0.180	0.6	1.17	1.0	461.1
1/30/2018	0.005	0.005	<0.03	0.216	0.280	4.0	2.37	9.7	686.7

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
2/14/2018	0.004	0.004	0.01	0.143	0.143	1.2	1.29	13.4	866.4
2/22/2018	0.015	0.057	0.02	0.660	0.880	7.4	3.32	238.2	4130.0
3/1/2018	0.011	0.037	0.01	0.349	0.490	2.6	2.26	137.6	1986.3
3/7/2018	0.009	0.009	<0.03	0.345	0.460	0.8	0.81	63.1	579.4
3/14/2018	0.006	0.006	<0.03	0.175	0.270	0.5	1.21	18.3	365.4
3/29/2018	0.066	0.275	0.03	0.141	0.950	147.9	7.90	10460.0	54750.0
4/5/2018	0.007	0.007	<0.03	0.277	0.410	2.0	1.63	104.6	1046.2
4/12/2018	0.003	0.003	<0.03	0.156	0.250	0.7	3.15	45.7	1203.3
4/19/2018	0.004	0.007	<0.03	0.113	0.230	1.3	1.17	127.4	2419.2
4/26/2018	0.003	0.014	<0.03	0.069	0.210	2.5	1.86	292.4	2010.0
5/3/2018	0.023	0.150	0.01	0.167	0.850	20.9	6.38	7540.0	86640.0
5/17/2018	0.006	0.012	0.02	0.268	0.430	2.0	2.12	26.9	2490.0
5/24/2018	0.008	0.015	0.02	0.318	0.510	2.5	1.07	33.7	4020.0
5/31/2018	0.006	0.014	0.01	0.146	0.290	3.1	1.22	60.9	3450.0
6/7/2018	0.009	0.024	0.06	0.189	0.390	3.4	7.93	58.1	8860.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
6/13/2018	0.006	0.014	0.02	0.213	0.440	2.9	1.46	38.2	6630.0
6/28/2018	0.003	0.013	0.02	0.129	0.350	2.4	2.06	5.2	798.0
7/5/2018	0.002	0.019	0.01	0.152	0.390	1.8	3.09	1.0	10500.0
7/12/2018	0.007	0.007	0.02	0.120	0.350	2.2	3.61	5.2	11060.0
7/18/2018	0.011	0.016	0.03	0.120	0.320	1.7	1.27	13.2	11980.0
7/25/2018	0.006	0.010	<0.03	0.102	0.280	2.5	1.99	2.0	8600.0
8/1/2018	0.006	0.015	0.02	0.482	0.730	3.6	1.44	95.9	9330.0
8/9/2018	0.007	0.007	0.01	0.126	0.280	2.8	1.15	32.7	7380.0
8/16/2018	0.006	0.006	0.01	0.413	0.630	36.6	2.02	10.9	4640.0
8/23/2018	0.004	0.008	0.03	0.118	0.220	2.2	1.77	57.3	3310.0
8/30/2018	0.010	0.022	0.01	0.302	0.580	7.1	2.27	248.9	10810.0
9/6/2018	0.007	0.007	0.02	0.174	0.350	3.6	1.02	45.7	7890.0
9/11/2018	0.007	0.014	0.01	0.162	0.290	2.9	4.38	27.8	5460.0
Samples collected since the last quarterly report									
9/25/2018	0.009	0.013	0.00	0.363	0.500	3.8	4.50	172.2	10810.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
10/2/2018	0.006	0.013	0.01	0.115	0.250	2.3	1.51	ND	ND
10/11/2018	0.013	0.028	0.00	0.772	1.040	6.4	4.02	488.4	13760.0
10/16/2018	0.010	0.010	0.00	0.384	0.550	2.7	1.37	156.5	6690.0
10/24/2018	0.008	0.011	0.01	0.342	0.470	2.5	1.33	45.0	3130.0
11/1/2018	0.028	0.082	0.00	0.435	0.770	16.7	5.06	866.4	19350.0
11/7/2018	0.013	0.024	0.01	0.397	0.520	4.5	1.30	73.3	2419.2
11/20/2018	0.010	0.010	0.01	0.296	0.370	0.6	5.13	9.6	1986.3
12/5/2018	0.006	0.009	0.00	0.171	0.270	1.1	0.83	25.9	1553.1
12/17/2018	0.010	0.021	0.00	0.443	0.580	1.5	2.81	55.7	2419.2
Field 1									
10/13/2016	0.940	1.231	0.13	0.335	2.360	59.0	16.67	N.S.	N.S.
3/27/2017	0.420	0.670	0.43	0.090	18.700	124.4	9.29	8390.0	45690.0
4/24/2017	0.395	0.592	0.13	0.143	1.500	43.1	7.25	ND	ND
4/27/2017	0.550	0.784	0.08	0.107	1.320	52.2	8.46	ND	ND
6/6/2017	0.747	0.998	0.51	0.438	2.340	56	10.39	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
5/3/2018	0.273	0.467	0.06	0.037	1.750	27.5	8.12	41060.0	241920
8/30/2018	1.617	1.875	0.69	1.869	5.510	49.6	17.02	ND	ND
Samples collected since the last quarterly report									
10/11/2018	1.941	2.103	0.40	2.942	5.830	12.3	21.23	ND	ND
11/1/2018	0.955	1.171	0.38	0.719	3.000	39.3	13.17	ND	ND
Field 5a									
3/31/2016	1.154	1.352	0.27	0.302	1.670	26.5	32.74	ND	ND
5/10/2016	1.114	1.458	1.69	2.894	6.350	79.9	12.82	ND	ND
3/27/2017	2.980	3.232	1.40	0.122	1.800	30.2	32.01	2419.2	69100.0
4/24/2017	0.961	1.212	0.12	0.321	1.530	11.7	11.53	ND	ND
4/27/2017	0.686	0.846	0.07	0.063	0.860	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
2/21/2018	1.496	2.078	0.14	0.307	2.990	66.9	17.12	ND	ND
2/26/2018	0.735	1.495	0.12	0.087	2.280	175.5	7.22	ND	ND
3/29/2018	2.067	2.247	0.05	0.296	1.750	27.1	12.48	72700.0	>241920

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
No samples collected since the last quarterly report									
Field 12									
3/10/2016	0.411	0.522	1.17	0.852	4.490	621.5	12.58	ND	ND
5/10/2016	0.370	0.666	0.12	0.062	1.030	96.7	6.92	ND	ND
3/27/2017	0.800	1.276	2.02	2.798	6.040	134.2	9.35	7120.0	96060.0
4/27/2017	0.326	0.544	0.02	0.105	0.710	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 collected 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

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 database that will enable to better define the major pathways of water sources at these sites. These values are given below in Table 8.

Table 8. 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 2018, with those collected since the last report noted.

Date	pH	Chloride	Electrical conductivity
		mg/L	µS/cm
Upstream			
1/4/2018	8.1	1.771	153.0
1/18/2018	8.3	2.198	143.0
1/30/2018	7.8	2.148	111.0
2/14/2018	8.5	4.213	129.0
2/22/2018	7.5	1.430	66.0
3/1/2018	8.1	1.378	63.0
3/7/2018	8.1	1.535	89.0
3/14/2018	8.2	1.692	103.0
3/29/2018	8.2	0.932	100.0
4/5/2018	8.2	1.354	102.0
4/12/2018	8.0	1.546	107.0
4/19/2018	8.1	1.338	88.0
4/26/2018	8.0	1.113	93.0
5/3/2018	7.7	1.095	95.0
5/17/2018	7.9	1.444	156.0
5/24/2018	8.3	1.600	162.0

Date	pH	Chloride	Electrical conductivity
5/31/2018	8.3	1.373	139.0
6/7/2018	8.0	1.912	112.0
6/13/2018	8.4	1.482	179.0
6/28/2018	8.4	1.625	222.0
8/1/2018	7.7	2.841	256.0
8/16/2018	8.0	1.315	180.0
8/23/2018	8.3	1.591	159.0
8/30/2018	7.8	1.933	205.0
Samples analyzed since the last quarterly report			
9/25/2018	7.8	1.602	216.0
10/11/2018	7.5	1.737	203.0
10/16/2018	7.6	1.752	122.0
10/24/2018	7.7	1.972	166.0
11/1/2018	7.4	1.227	81.0
11/7/2018	7.8	1.600	107.0
11/20/2018	7.8	1.823	135.0
12/5/2018	7.7	1.792	113.0
12/17/2018	7.6	1.617	96.0
Downstream			
1/4/2018	8.3	2.288	210.0
1/18/2018	8.1	2.516	224.0
1/30/2018	8.0	2.330	160.0
2/14/2018	7.9	2.598	178.0
2/22/2018	7.4	1.559	96.0
3/1/2018	7.8	1.548	99.0
3/7/2018	7.7	1.864	136.0

Date	pH	Chloride	Electrical conductivity
3/14/2018	8.0	2.176	164.0
3/29/2018	8.1	1.392	112.0
4/5/2018	7.7	1.655	149.0
4/12/2018	7.6	2.000	166.0
4/19/2018	7.6	1.619	132.0
4/26/2018	7.9	1.246	131.0
5/3/2018	7.7	1.586	148.0
5/17/2018	7.6	1.981	225.0
5/24/2018	8.0	2.319	226.0
5/31/2018	8.0	1.795	189.0
6/7/2018	7.9	1.362	207.0
6/13/2018	7.9	2.285	260.0
6/28/2018	8.0	2.615	284.0
7/5/2018	7.8	2.944	283.0
7/12/2018	7.4	2.948	234.0
7/18/2018	7.4	3.050	285.0
7/25/2018	7.7	3.085	301.0
8/1/2018	7.6	3.467	316.0
8/9/2018	7.7	2.812	303.0
8/16/2018	7.6	2.939	282.0
8/23/2018	7.9	1.991	224.0
8/30/2018	7.7	2.560	263.0
9/6/2018	7.5	2.561	276.0
9/11/2018	7.6	2.677	271.0
Samples analyzed since the last quarterly report			
9/25/2018	7.7	2.256	297.0
10/2/2018	7.5	2.504	294.0

Date	pH	Chloride	Electrical conductivity
10/11/2018	7.5	2.197	272.0
10/16/2018	7.6	1.983	191.0
10/24/2018	7.6	2.342	203.0
11/1/2018	7.4	1.340	113.0
11/7/2018	7.5	1.884	183.0
11/20/2018	7.6	2.402	204.0
12/5/2018	7.6	2.155	177.0
12/17/2018	7.6	1.805	148.0
Left Fork			
1/4/2018	8.6	2.735	217.0
1/18/2018	8.0	3.029	203.0
1/30/2018	8.3	2.829	201.0
2/14/2018	7.9	5.810	192.0
2/22/2018	7.4	2.251	95.0
3/1/2018	7.9	2.202	137.0
3/7/2018	7.7	2.652	177.0
3/14/2018	8.2	2.841	192.0
3/29/2018	8.0	1.121	181.0
4/5/2018	7.6	2.244	179.0
4/12/2018	7.9	2.731	205.0
4/19/2018	7.9	2.363	187.0
4/26/2018	8.3	1.907	146.0
5/3/2018	7.8	1.843	178.0
5/17/2018	7.9	2.745	267.0
5/24/2018	8.0	3.191	265.0
5/31/2018	8.0	2.029	211.0
6/7/2018	8.0	2.511	249.0

Date	pH	Chloride	Electrical conductivity
6/13/2018	7.8	2.839	273.0
6/28/2018	7.9	3.451	266.0
7/5/2018	7.9	3.406	273.0
7/12/2018	7.5	3.786	172.0
7/18/2018	7.5	3.954	246.0
7/25/2018	7.7	4.067	255.0
8/1/2018	7.8	3.824	288.0
8/9/2018	7.7	3.181	278.0
8/16/2018	8.1	3.710	264.0
8/23/2018	8.0	2.323	245.0
8/30/2018	7.7	2.985	244.0
9/6/2018	7.8	2.704	200.0
9/11/2018	7.9	2.524	269.0
Samples analyzed since the last quarterly report			
9/25/2018	8.0	2.930	315.0
10/2/2018	7.7	2.658	279.0
10/11/2018	7.6	3.263	327.0
10/16/2018	7.9	2.681	322.0
10/24/2018	7.9	2.674	249.0
11/1/2018	7.5	1.649	149.0
11/7/2018	7.7	2.478	149.0
11/20/2018	8.0	3.113	233.0
12/5/2018	7.9	3.115	236.0
12/17/2018	7.9	2.524	197.0
Spring			
2/22/2018	7.2	2.067	371.0

Date	pH	Chloride	Electrical conductivity
3/1/2018	8.3	1.794	362.0
3/7/2018	7.2	2.808	493.0
3/29/2018	7.4	0.903	489.0
4/5/2018	7.3	1.933	481.0
4/12/2018	7.1	2.974	533.0
4/19/2018	7.1	2.810	489.0
4/26/2018	7.3	1.057	387.0
5/3/2018	7.1	1.236	413.0
5/17/2018	7.1	2.812	593.0
5/24/2018	7.3	2.852	564.0
5/31/2018	7.3	2.539	557.0
6/7/2018	7.6	2.575	523.0
6/13/2018	7.8	3.107	511.0
8/1/2018	7.1	3.846	610.0
8/9/2018	7.2	2.405	588.0
Samples analyzed since the last quarterly report			
9/25/2018	7.3	3.950	558.0
10/11/2018	6.9	4.113	649.0
10/16/2018	7.3	3.706	565.0
10/24/2018	7.1	4.685	589.0
11/1/2018	6.7	1.868	475.0
11/7/2018	7.0	3.734	514.0
11/20/2018	7.0	4.655	567.0
12/5/2018	7.2	3.821	551.0
12/17/2018	7.0	2.463	518.0
Ephemeral Stream			

Date	pH	Chloride	Electrical conductivity
2/22/2018	7.1	2.460	236.0
3/1/2018	8.2	2.945	269.0
3/7/2018	7.7	3.517	370.0
3/29/2018	7.5	2.077	369.0
4/5/2018	7.5	2.700	361.0
4/12/2018	7.6	3.235	400.0
4/16/2018	7.8	2.779	261.0
4/19/2018	7.6	2.831	337.0
4/23/2018	8.1	3.285	334.0
4/26/2018	7.5	2.810	381.0
5/3/2018	7.4	3.157	412.0
No samples analyzed since the last quarterly report			
10/11/2018	7.5	2.620	254.0
11/1/2018	6.6	1.986	220.0
11/7/2018	7.5	5.041	381.0
12/17/2018	7.3	2.758	319.0
House Well			
1/4/2018	7.8	5.025	321.0
1/18/2018	8.3	5.282	450.0
1/30/2018	7.7	5.334	436.0
2/14/2018	7.5	5.684	405.0
2/22/2018	7.3	5.088	317.0
3/1/2018	8.4	5.576	413.0
3/7/2018	7.4	5.197	446.0
3/29/2018	7.4	5.315	422.0
4/5/2018	7.5	1.647	460.0
4/19/2018	7.4	4.955	440.0

Date	pH	Chloride	Electrical conductivity
4/26/2018	7.6	5.106	450.0
5/3/2018	7.4	5.160	468.0
5/17/2018	7.4	4.861	464.0
5/24/2018	7.4	4.960	442.0
5/31/2018	7.7	4.840	283.0
6/7/2018	7.9	5.340	421.0
6/13/2018	7.9	4.949	425.0
6/28/2018	7.5	4.906	455.0
7/5/2018	7.6	5.001	455.0
7/12/2018	7.3	5.380	424.0
7/18/2018	7.2	6.588	443.0
7/25/2018	7.4	5.005	446.0
8/1/2018	7.5	5.347	445.0
8/9/2018	7.5	5.080	440.0
8/16/2018	7.5	4.874	415.0
8/23/2018	7.5	5.008	428.0
8/30/2018	7.5	5.010	447.0
9/6/2018	7.5	5.007	436.0
9/11/2018	7.4	5.083	434.0
Samples analyzed since the last quarterly report			
9/25/2018	7.5	4.886	304.0
10/2/2018	7.3	5.022	391.0
10/11/2018	7.4	4.969	479.0
10/24/2018	7.4	5.956	428.0
11/1/2018	7.1	4.614	450.0
11/7/2018	7.5	5.099	456.0
11/20/2018	7.2	5.093	427.0

Date	pH	Chloride	Electrical conductivity
12/5/2018	7.5	5.057	428.0
12/17/2018	7.5	4.709	441.0
Trench 1			
2/22/2018	7.2	1.094	134.0
3/1/2018	8.2	1.224	152.0
3/29/2018	7.8	0.966	179.0
4/5/2018	7.7	1.365	192.0
5/3/2018	7.3	1.208	335.0
No samples analyzed since the last quarterly report			
10/16/2018	7.9	1.032	132.0
11/1/2018	6.6	1.035	152.0
11/7/2018	7.6	1.304	272.0
Trench 2			
5/3/2018	7.0	0.456	111.0
No samples analyzed since the last quarterly report			
11/1/2018	6.5	1.233	133.0
11/7/2018	6.8	1.560	208.0

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

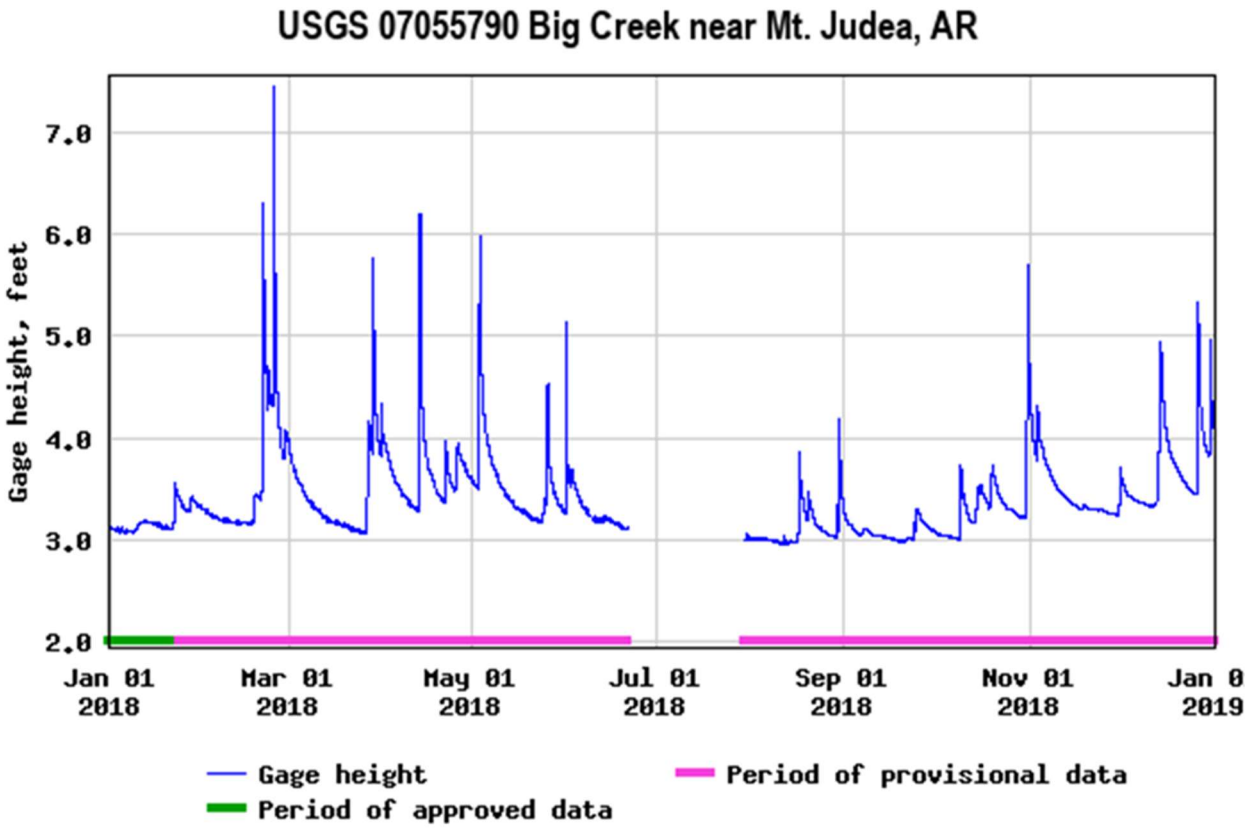


Figure 2. Discharge in Big Creek downstream of the C&H Farm for the period of monitoring; January 1 to September 30, 2018.

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, and 8).

The concentration of dissolved P, total P, nitrate-N, total N, bacteria and chloride with flow in Big Creek below the C&H Farm (Site BC7) for 2018 in Figures 9, 20, and 11.

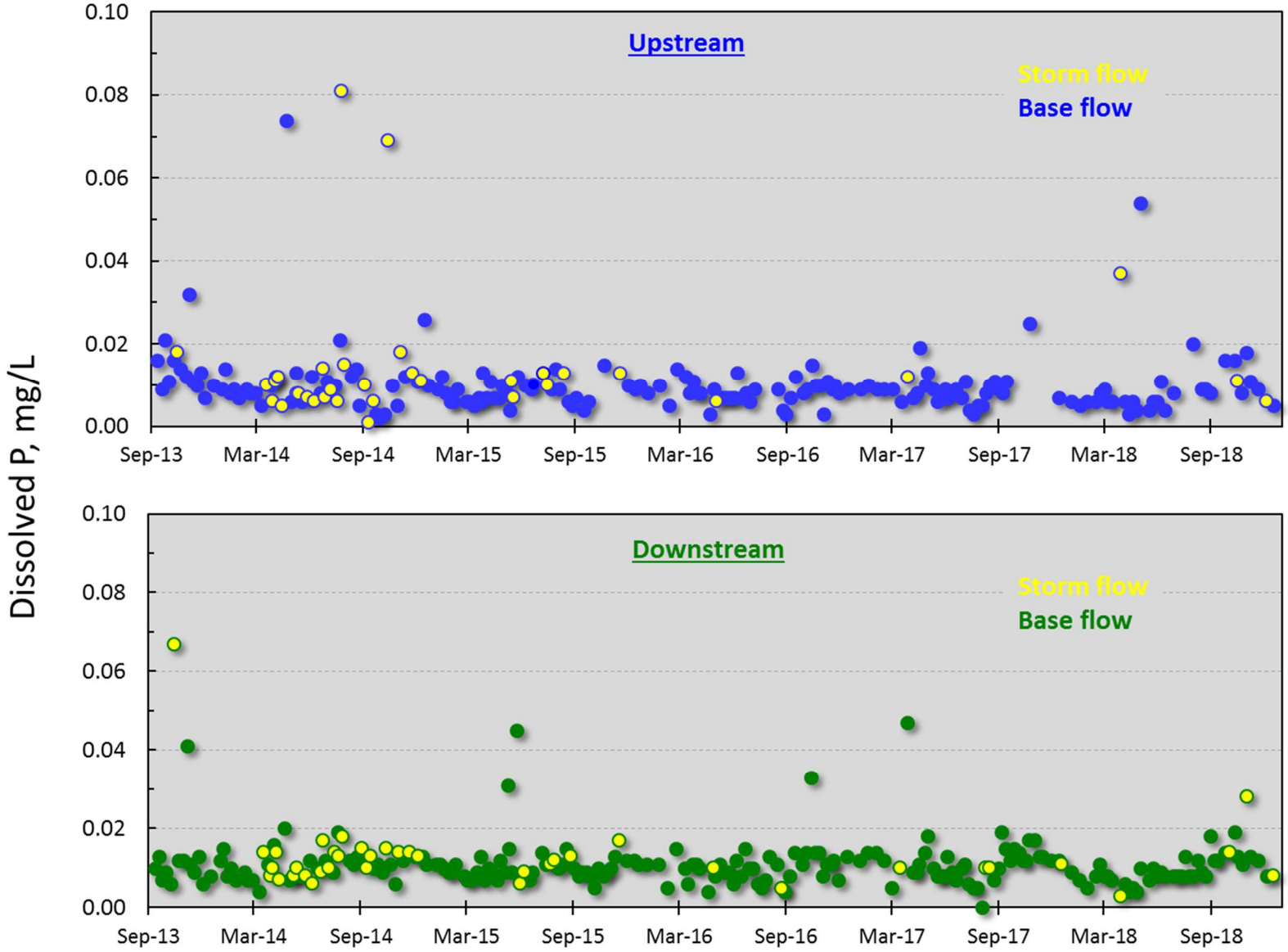


Figure 3. Dissolved P concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

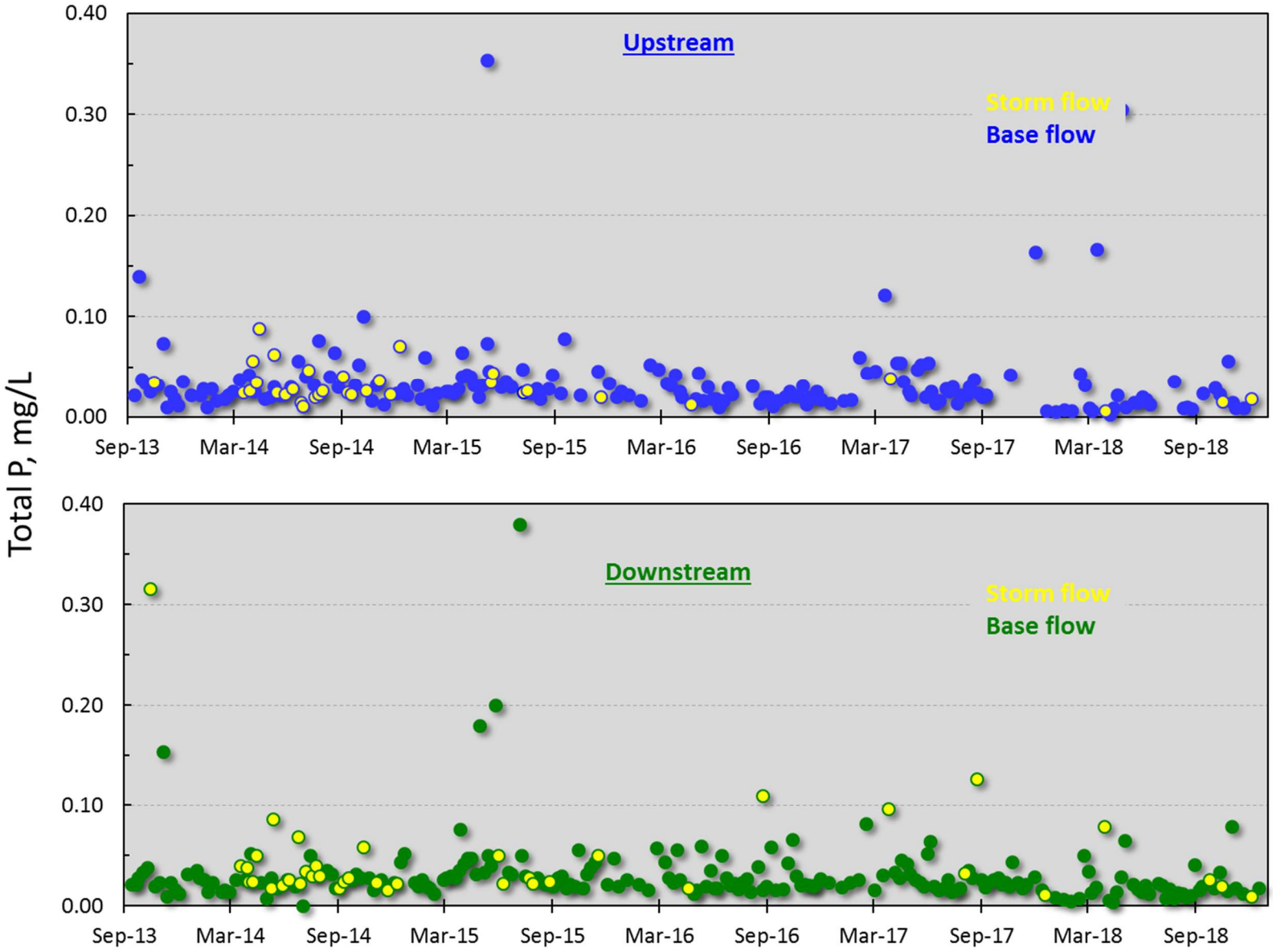


Figure 4. Total P concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

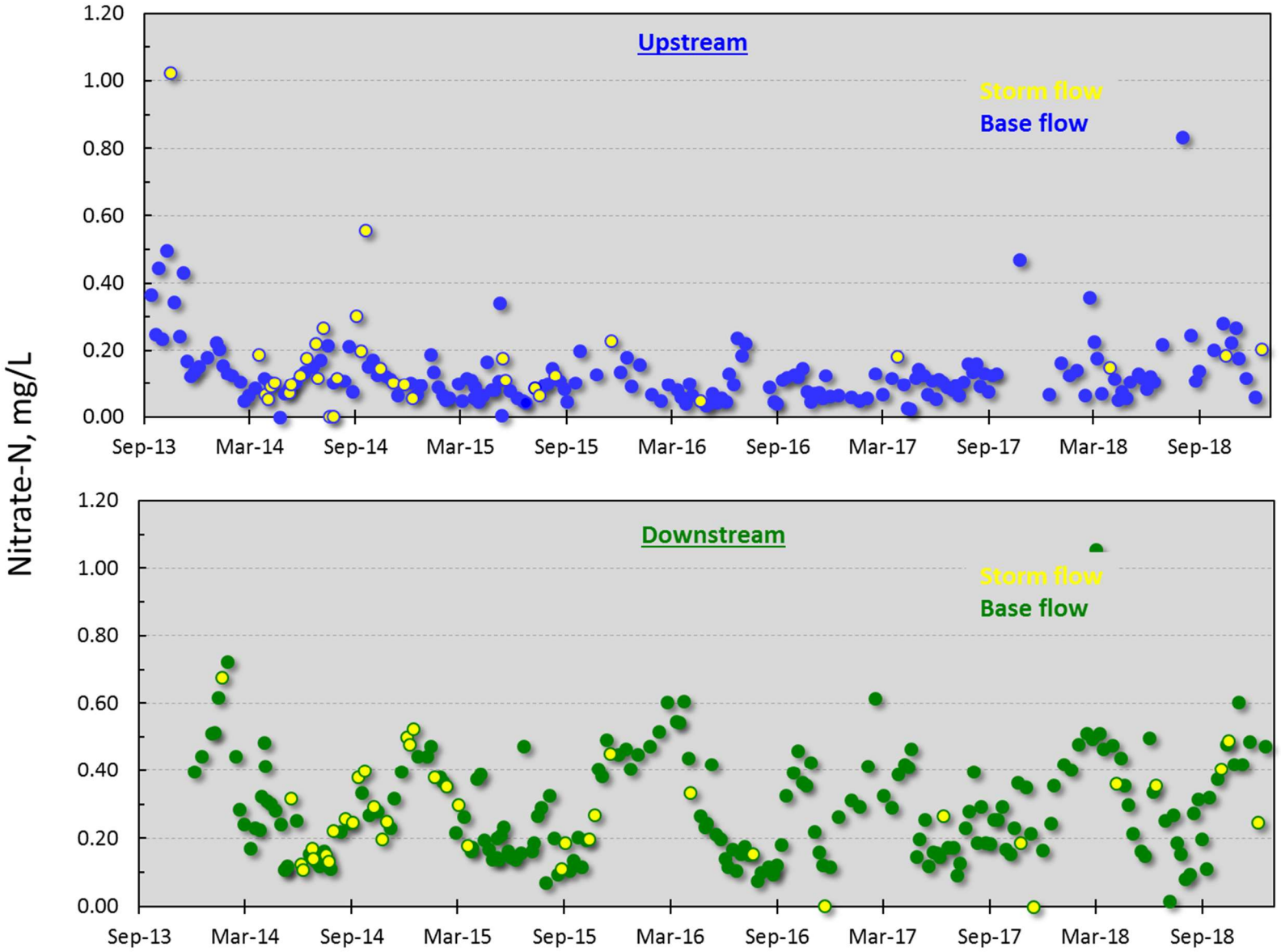


Figure 5. Nitrate-N concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

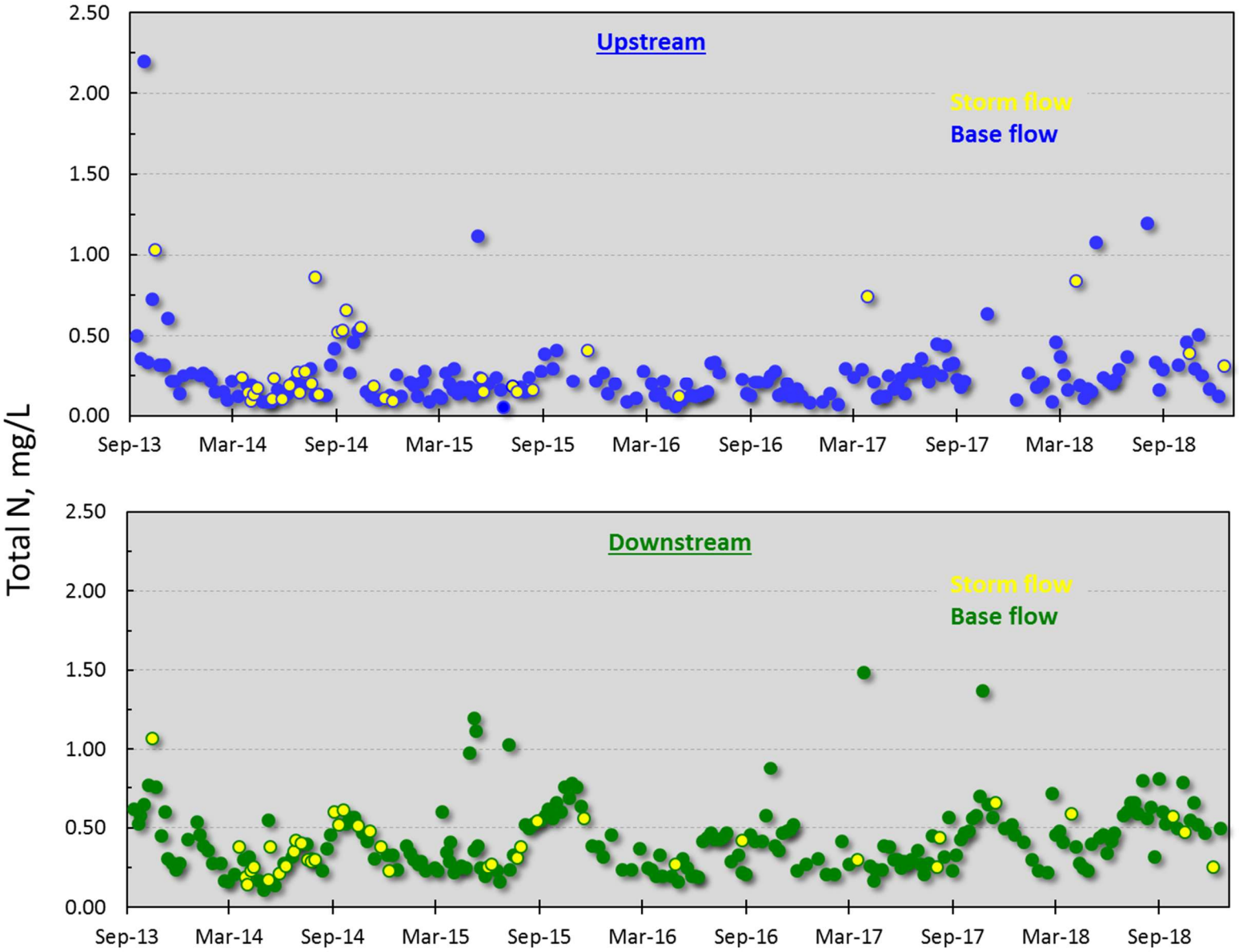


Figure 6. Total N concentration at **the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.**

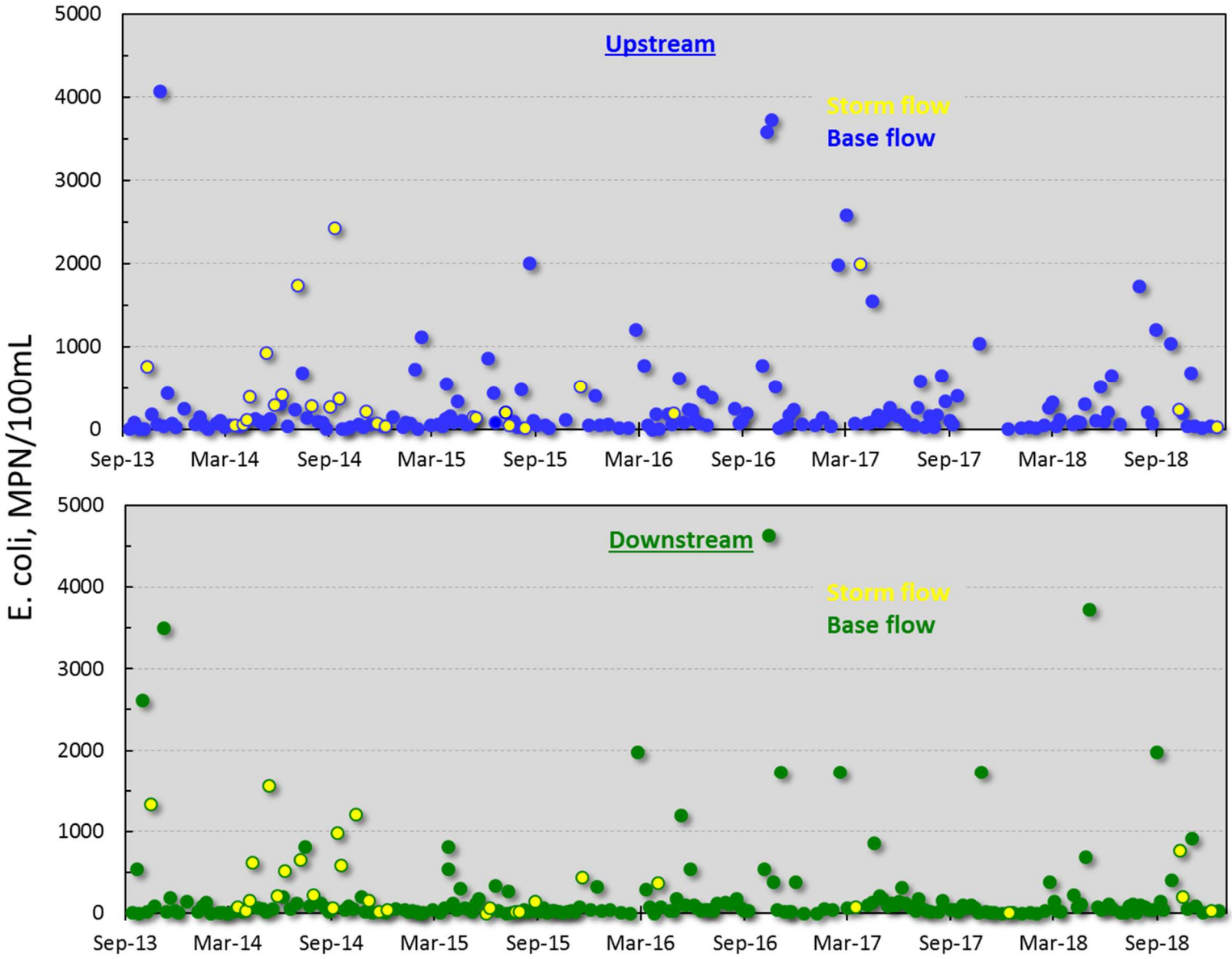


Figure 7. E. coli numbers at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

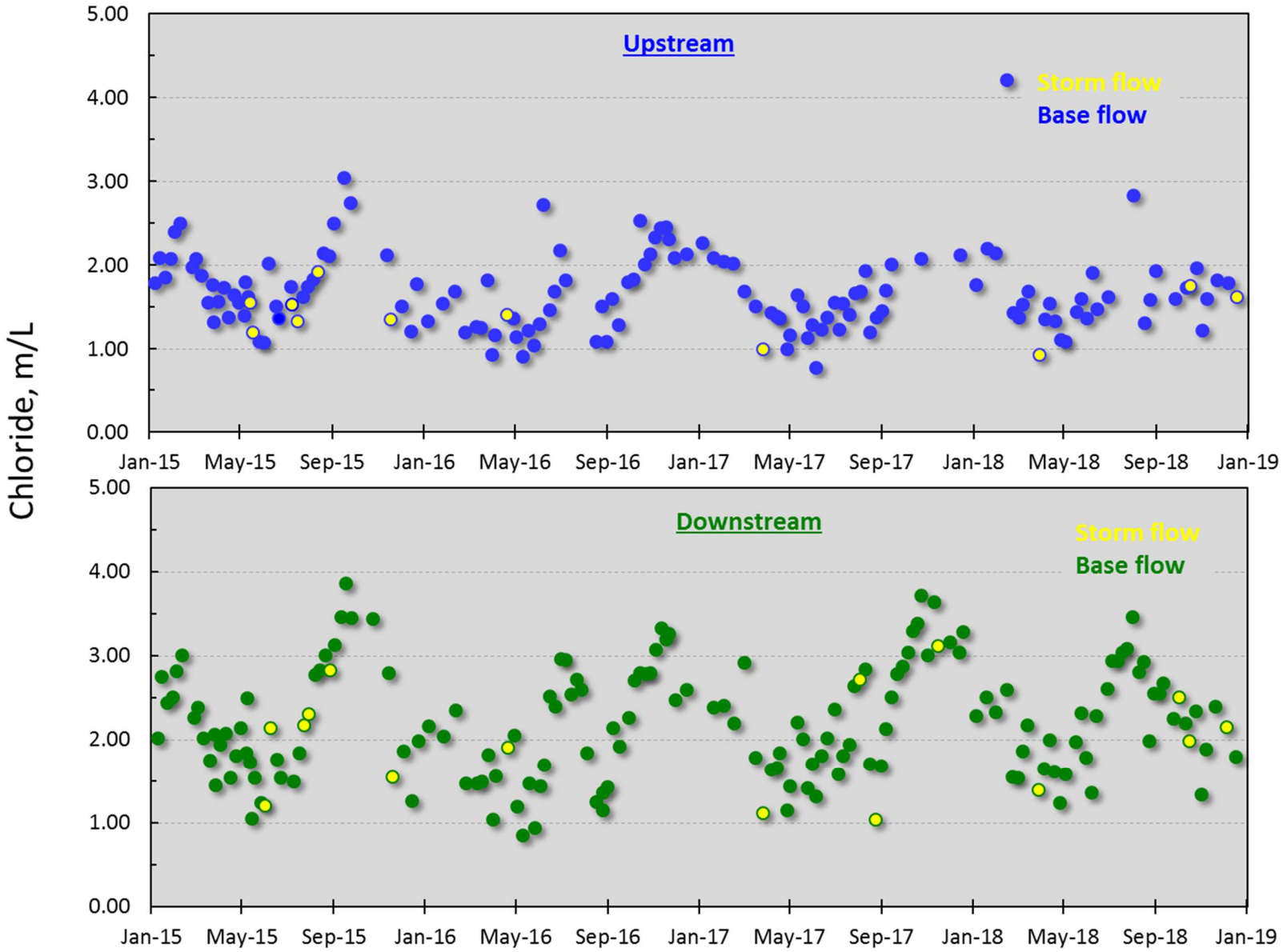


Figure 8. Chloride concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

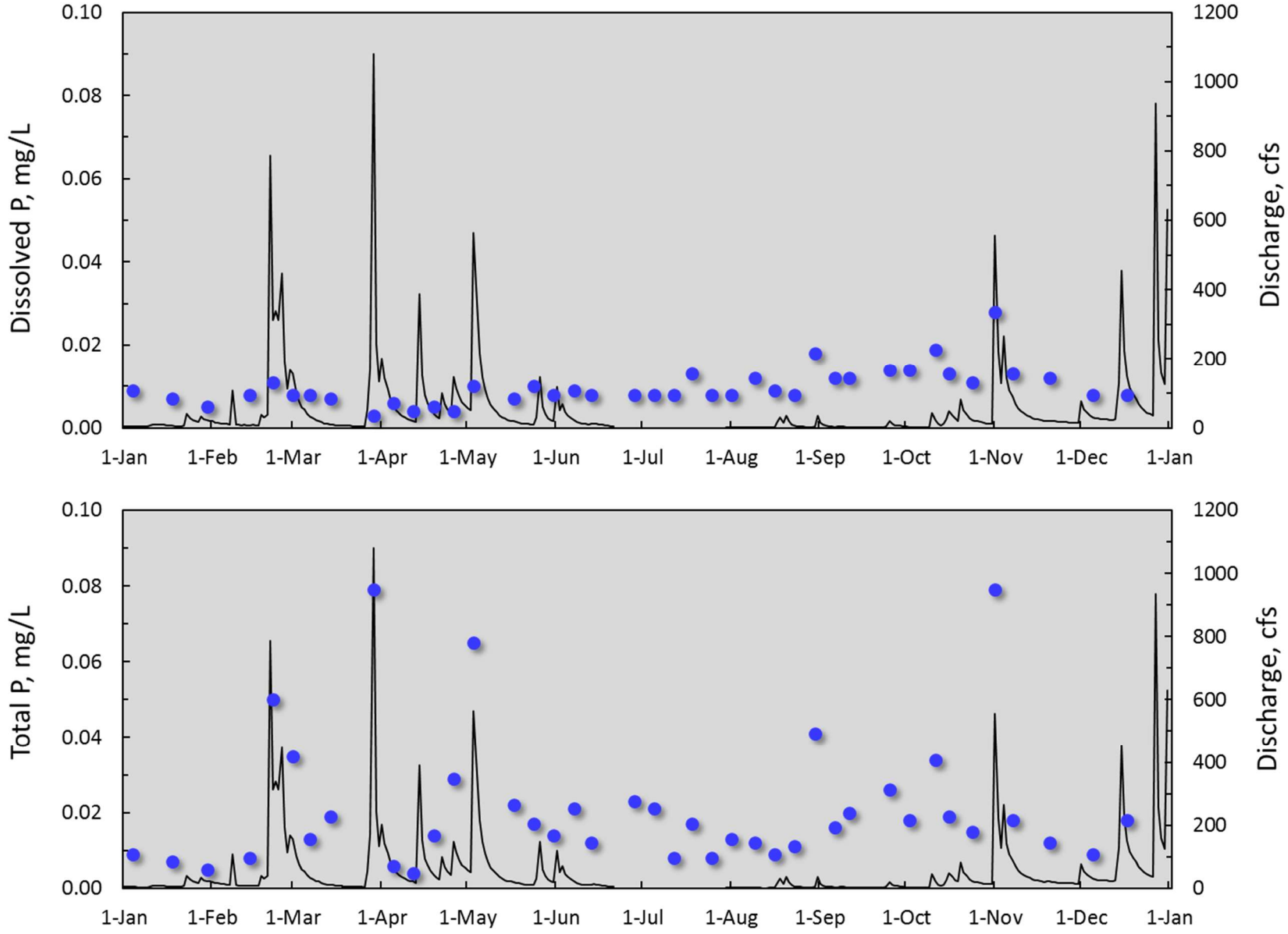
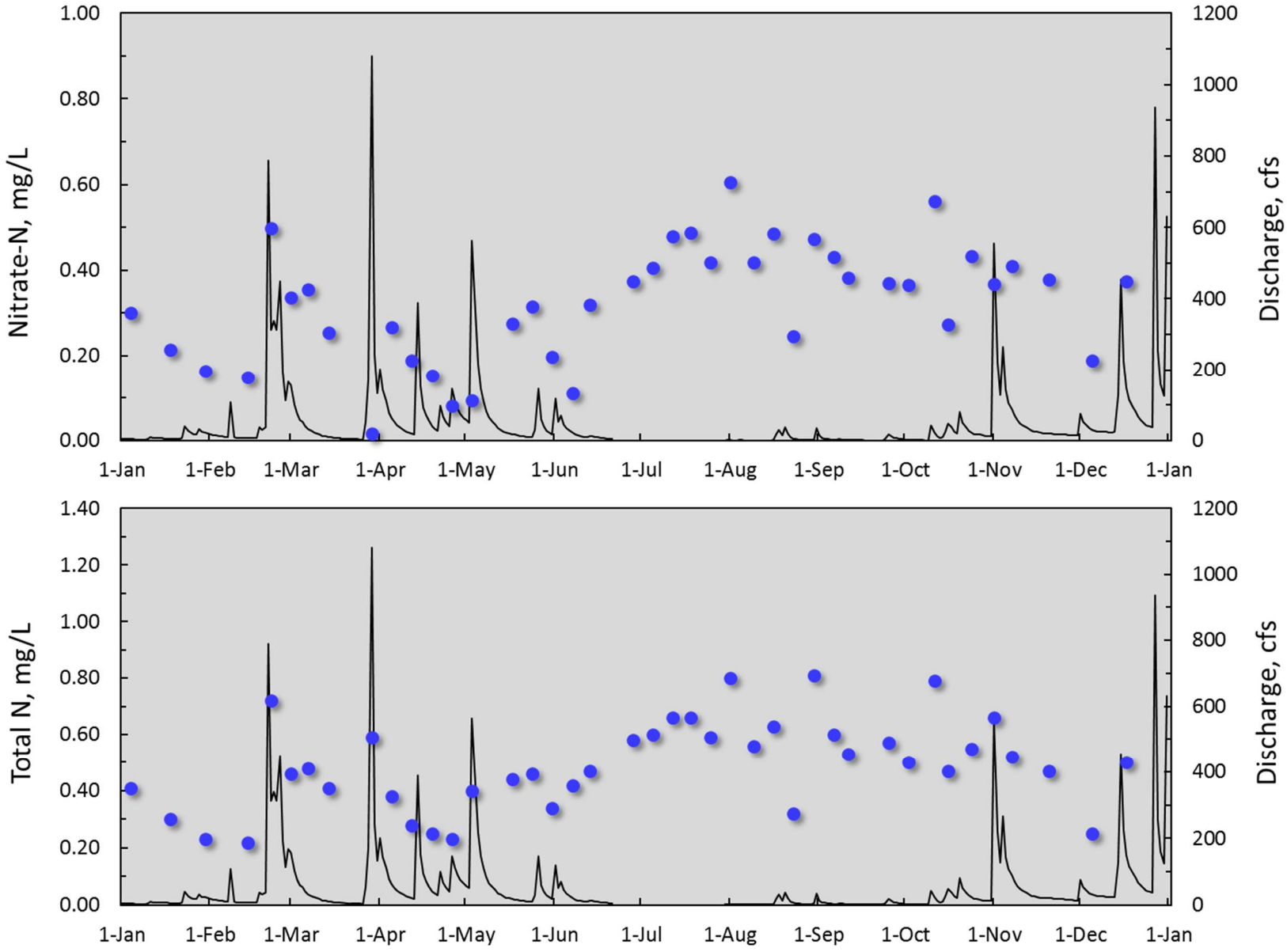

Dissolved P, mg/L
Discharge, cfs
0.10
0.08
0.06
0.04
0.02
0.00
1200
1000
800
600
400
200
0
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
1-Jan
Total P, mg/L
Discharge, cfs
0.10
0.08
0.06
0.04
0.02
0.00
1200
1000
800
600
400
200
0
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
1-Jan

Figure 9. Dissolved and total P concentration and discharge at the Big Creek monitoring site downstream of the C&H Farm, Newton County, AR for 2018.


Nitrate-N, mg/L
Discharge, cfs
1.00
0.80
0.60
0.40
0.20
0.00
1200
1000
800
600
400
200
0
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
1-Jan
Total N, mg/L
Discharge, cfs
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1200
1000
800
600
400
200
0
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
1-Jan

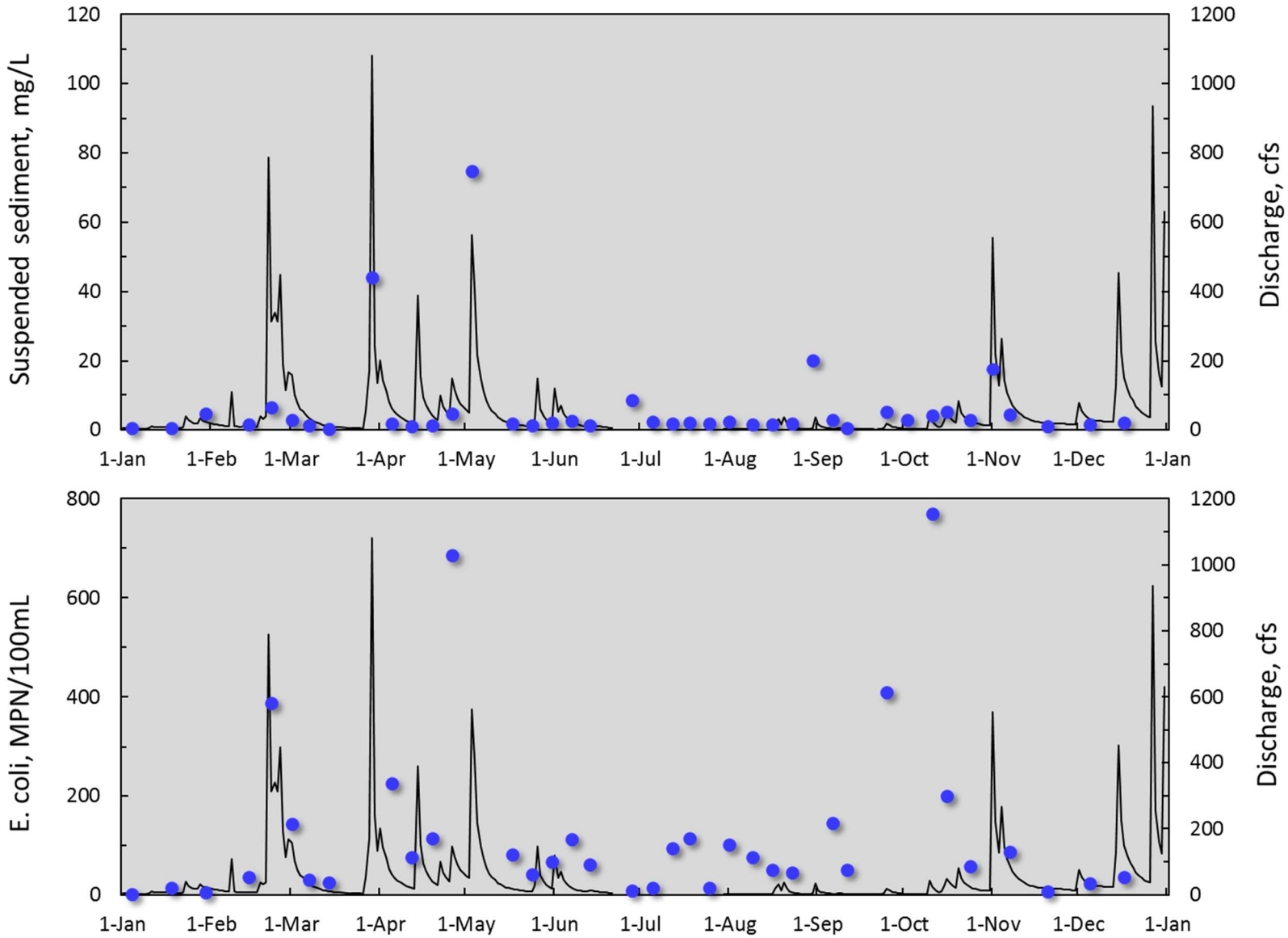


Figure 10. Nitrate-N and total N concentration and discharge at the Big Creek monitoring site downstream of the C&H Farm, Newton County, AR for 2018.