

Big Creek Research and Extension Team
University of Arkansas System Division of Agriculture
Quarterly Report – January 1 to March 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 first Quarterly Report of 2017 for the Big Creek Research and Extension Team that details activities and progress made from January 1 through March 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, ephemeral stream, surface runoff sites on Fields 1, 5a, and 12, two interceptor trenches below the slurry holding ponds, and house well for chemical and bacterial analysis.
2. Similar to the last quarter of 2016, the first quarter of 2017 was a relatively dry period, with only one ephemeral gully and one interceptor trench flow event recorded and sampled on February 15th. Upstream and downstream of the C&H Farm, only base flow was recorded in Big Creek during this first quarter of 2017.
3. Nitrogen, P, sediment, and bacteria concentration – flow regime relationships showed that between April 2014 and February 2017, 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 the dominant flow pathways 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 the Big Creek watershed.

Big Creek Science Team

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

Brian Breaker, M.Sc., Surface-Water Specialist, stream flow and constituent collection, analysis, and statistical evaluation of trends.

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

Tim Kresse, M.Sc., Water Quality Specialist, U.S. Geological Survey, natural geochemical evolution of groundwater and separating these processes from anthropogenic sources of contamination

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, Ph.D., 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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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 Creek 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 55' 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

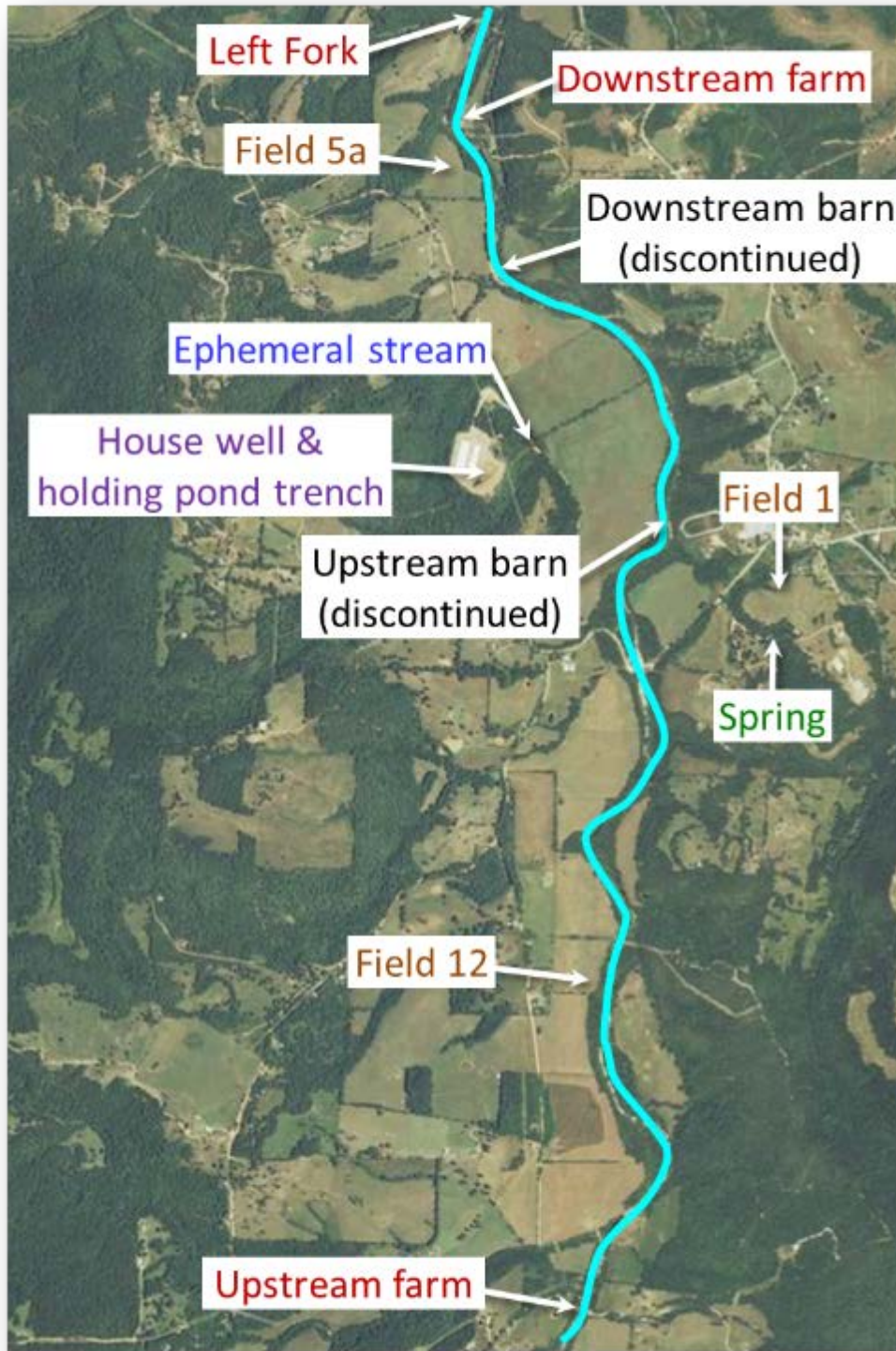


Figure 1. Location of sampling sites for the Big Creek Research and Extension Team project.

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%20Manual_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%20%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 2015 to March 31, 2016 are given in Tables 2, 3, and 4.

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 2016, 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 --		
1/5/2016	1/5/2016	Grab sample									
11:52	15:29	Spring	0.007	0.024	<0.03	0.584	0.63	0.7	1.39	16.0	816.4
13:00	15:29	Upstream	0.008	0.026	<0.03	0.158	0.20	0.5	0.95	67.7	648.8
11:40	15:29	Downstream	0.011	0.026	<0.03	0.419	0.46	0.1	1.13	40.8	648.8
11:30	15:29	Left Fork	0.013	0.028	<0.03	0.427	0.48	0.7	1.51	34.1	686.7
12:02	15:29	Ephemeral	0.007	0.018	<0.03	0.883	1.00	1.2	2.15	32.7	686.7
12:13	15:29	Trench 1	0.003	0.016	<0.03	0.243	0.29	0.9	1.11	1.0	209.8
12:44	15:29	House well	0.008	0.020	<0.03	0.528	0.57	0.9	1.08	<1.0	1.0
1/25/2016	1/25/2016	Grab sample									
11:16	15:25	Spring	0.010	0.022	<0.03	0.565	0.60	0.3	1.27	34.5	1732.9
12:10	15:25	Upstream	0.010	0.022	<0.03	0.068	0.09	1.1	1.52	16.9	290.9
11:00	15:25	Downstream	0.011	0.022	<0.03	0.213	0.24	0.7	1.29	8.6	365.4
10:48	15:25	Left Fork	0.010	0.024	<0.03	0.198	0.25	1.0	1.30	21.1	435.2

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
11:28	15:25	Ephemeral	0.011	0.030	<0.03	0.762	0.87	9.8	3.10	1.0	816.4
11:42	15:25	House well	0.012	0.020	<0.03	0.602	0.55	0.5	2.36	<1.0	<1
2/10/2016	2/10/2016	Grab sample									
12:25	15:26	Spring	0.007	0.040	<0.03	0.634	0.80	17.7	2.70	1.0	325.5
11:15	15:26	Upstream	0.005	0.016	<0.03	0.048	0.11	0.5	1.11	14.5	178.5
11:04	15:26	Downstream	0.005	0.016	<0.03	0.198	0.24	0.9	0.99	4.1	218.7
11:29	15:26	Left Fork	0.003	0.012	<0.03	0.175	0.24	0.8	1.15	7.4	209.8
12:03	15:26	House well	0.007	0.014	<0.03	0.542	0.56	0.1	0.63	<1.0	<1.0
2/24/2016	2/24/2016	Grab sample									
11:05	14:45	Spring	0.010	0.052	<0.03	1.102	1.46	2.8	N.S.	209.8	3930.0
12:16	14:45	Upstream	0.014	0.052	<0.03	0.099	0.28	6.1	N.S.	1203.3	7330.0
10:52	14:45	Downstream	0.015	0.058	<0.03	0.142	0.37	8.3	N.S.	1986.3	6500.0
10:38	14:45	Left Fork	0.015	0.088	<0.03	0.249	0.63	15.6	N.S.	2780.0	14390.0
11:15	14:45	Ephemeral	0.010	0.056	<0.03	0.195	0.40	12.8	N.S.	387.3	4870.0
11:36	14:45	Trench 1	0.005	0.014	<0.03	0.345	0.39	2.1	N.S.	<1.0	9070.0
11:53	14:45	House well	0.010	0.010	<0.03	0.582	0.55	1.3	N.S.	<1.0	<1.0
3/10/2016	3/10/2016	Grab sample									
11:04	15:45	Spring	0.012	0.064	0.11	0.104	0.34	9.5	5.38	285.1	3230.0

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
13:13	15:45	Upstream	0.012	0.048	0.13	0.082	0.20	8.6	2.66	770.1	>2419.2
10:51	15:45	Downstream	0.010	0.044	0.11	0.118	0.25	6.2	2.28	298.7	>2419.2
11:32	15:45	Ephemeral stream	0.006	0.050	0.13	0.918	1.22	26.7	3.12	648.8	8840.0
10:38	15:45	Left Fork	0.013	0.046	0.01	0.154	0.38	8.7	2.64	367.3	2750.0
12:03	15:45	House well	0.011	0.020	0.02	0.562	0.59	0.9	1.19	<1.0	<1.0
11:50	15:45	Trench 1	0.005	0.036	0.10	0.264	0.45	3.5	2.87	2419.2	16690.0
11:46	15:45	Trench 2	0.005	0.054	0.14	1.716	2.35	6.8	6.77	613.1	34480.0
12:41	15:45	Field 12	0.411	0.522	1.17	0.852	4.49	621.5	12.58	410.6	>241920
3/16/2016	3/16/2016	Grab sample									
11:35	15:05	Spring	0.009	0.036	0.01	0.340	0.44	5.7	3.36	75.4	461.1
12:35	15:05	Upstream	0.008	0.034	<0.03	0.060	0.13	0.4	1.10	52.9	579.4
11:23	15:05	Downstream	0.006	0.028	0.01	0.170	0.24	0.9	1.17	81.3	>2419.2
11:50	15:05	Ephemeral stream	0.006	0.022	0.01	0.520	0.54	<6.58	1.75	88.0	461.1
11:13	15:05	Left Fork	0.009	0.032	<0.03	0.190	0.26	0.3	1.45	35.9	980.4
12:22	15:05	House well	0.009	0.022	<0.03	0.550	0.55	<6.58	1.55	<1.0	<1
12:01	15:05	Trench 1	0.003	0.032	0.02	0.331	0.37	<6.58	1.23	101.7	290.9
3/24/2016	3/24/2016	Storm 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
11:50	15:10	Spring	0.015	0.046	0.06	0.172	0.42	13.1	4.95	N.S.	N.S.
12:50	15:10	Upstream	0.011	0.032	0.06	0.040	0.14	4.5	1.60	N.S.	N.S.
11:35	15:10	Downstream	0.011	0.024	<0.03	0.106	0.20	3.9	1.29	N.S.	N.S.
12:10	15:10	Ephemeral stream	0.010	0.012	<0.03	0.531	0.64	1.3	1.44	N.S.	N.S.
11:25	15:10	Left Fork	0.013	0.048	0.09	0.186	0.39	10.7	2.65	N.S.	N.S.
12:34	15:10	House well	0.012	0.014	<0.03	0.565	0.65	0.2	2.72	N.S.	N.S.
12:20	15:10	Trench 1	0.008	0.016	<0.03	0.208	0.20	2.8	1.33	N.S.	N.S.
3/31/2016	3/31/3016	Grab sample									
11:06	15:10	Spring	0.011	0.034	<0.03	0.319	0.52	7.4	25.32	71.7	1553.1
12:45	15:10	Upstream	0.008	0.042	0.08	0.100	0.22	6.1	2.49	186.0	>2419.2
10:45	15:10	Downstream	0.011	0.056	0.08	0.156	0.33	12.4	2.67	365.0	>2419.2
11:16	15:10	Ephemeral stream	0.013	0.656	0.68	1.211	3.05	375.0	12.14	16160.0	198630.0
10:33	15:10	Left Fork	0.013	0.056	0.09	0.199	0.40	11.9	2.59	172.0	3640.0
11:49	15:10	House well	0.010	0.018	<0.03	0.556	0.62	0.2	3.93	1.0	26.2
11:40	15:10	Trench 1	0.004	0.018	<0.03	0.347	0.49	5.5	4.76	4.1	2419.2
11:35	15:10	Trench 2	0.006	0.040	0.06	2.800	3.54	20.9	9.29	7.4	10810.0
12:02	15:10	Field 5a	1.154	1.352	0.27	0.302	1.67	26.5	32.74	24890.0	>241920

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
4/4/2016	4/4/2016	Grab sample									
11:58	15:20	Spring	0.009	0.028	<0.03	0.324	0.42	7.5	1.57	104.7	866.4
12:50	15:20	Upstream	0.008	0.026	<0.03	0.065	0.08	1.7	0.71	8.3	648.8
11:48	15:20	Downstream	0.010	0.026	<0.03	0.176	0.20	1.9	0.98	77.6	1046.2
12:08	15:20	Ephemeral stream	0.008	0.018	<0.03	0.462	0.48	1.3	1.79	12.0	727.0
11:38	15:20	Left Fork	0.009	0.022	<0.03	0.131	0.17	1.5	0.87	44.8	1119.9
12:35	15:20	House well	0.011	0.018	<0.03	0.466	0.48	<6.58	0.94	<1.0	1.0
12:26	15:20	Trench 2	0.004	0.012	<0.03	0.236	0.25	<6.58	0.85	1.0	>2419.2
4/20/2016	4/20/2016	Grab sample									
12:02	15:52	Spring	0.005	0.042	<0.03	0.410	0.55	22.4	1.04	3.1	195.6
13:20	15:52	Upstream	0.003	0.020	<0.03	0.047	0.06	1.9	0.61	185.0	1299.7
11:42	15:52	Downstream	0.004	0.018	<0.03	0.152	0.20	1.2	0.74	38.4	2920.0
12:11	15:52	Ephemeral stream	0.008	0.020	<0.03	0.517	0.66	4.1	0.68	44.3	21430.0
11:30	15:52	Left Fork	0.005	0.020	<0.03	0.157	0.21	2.1	0.84	35.0	6160.0
12:52	15:52	House well	0.005	0.014	<0.03	0.598	0.50	0.5	0.47	1.0	1.0
4/28/2016	4/28/2016	Grab sample									
11:55	15:17	Spring	0.010	0.024	<0.03	0.455	0.63	12.0	N.S.	25.6	>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
13:00	15:17	Upstream	0.009	0.012	<0.03	0.035	0.12	1.2	N.S.	58.6	648.8
11:30	15:17	Downstream	0.010	0.012	<0.03	0.154	0.27	1.5	N.S.	36.4	2149.2
12:31	15:17	House well	0.011	0.008	<0.03	0.481	0.57	0.3	N.S.	<1.0	<1.0
11:25	15:17	Dry Creek	0.010	0.012	<0.03	0.152	0.27	1.0	N.S.	14.8	3050.0
5/2/2016	5/3/2016	Grab sample									
12:25	08:55	Spring	0.008	0.012	<0.03	0.338	0.36	2.2	5.08	88.2	>2419.2
14:29	08:55	Upstream	0.006	0.018	<0.03	0.039	0.10	6.7	1.76	185.0	2419.2
11:43	08:55	Downstream	0.008	0.016	<0.03	0.075	0.16	2.0	1.50	178.9	4720.0
12:38	08:55	Ephemeral stream	0.007	0.016	<0.03	0.468	0.59	1.7	2.56	118.7	5380.0
12:38	08:55	Ephemeral stream	0.008	0.112	0.15	1.794	2.62	61.8	4.07	1046.2	23590.0
11:24	08:55	Left Fork	0.009	0.020	<0.03	0.095	0.20	1.9	2.30	172.6	3640.0
13:27	08:55	House well	0.009	0.016	<0.03	0.551	0.56	0.1	1.94	<1.0	<1
5/10/2016	5/10/2016	Grab sample									
11:15	15:40	Spring	0.008	0.026	<0.03	0.281	0.45	2.9	7.58	410.6	2780.0
12:50	15:40	Upstream	0.007	0.044	0.01	0.070	0.20	6.1	3.10	613.1	4480.0
10:58	15:40	Downstream	0.011	0.060	0.01	0.101	0.31	11.6	2.95	1203.3	7490.0
11:28	15:40	Ephemeral stream	0.195	0.560	0.32	0.649	4.01	1346.7	11.94	579.4	>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
10:35	15:40	Left Fork	0.011	0.072	0.02	0.121	0.37	17.2	3.35	980.4	8230.0
12:08	15:40	House well	0.009	0.008	<0.03	0.533	0.56	0.5	4.39	<1.0	24.9
11:55	15:40	Trench 1	0.002	0.016	<0.03	0.228	0.30	3.9	2.91	13.9	>2419.2
11:45	15:40	Trench 2	0.002	0.038	<0.03	1.706	2.18	5.2	3.72	38.7	>2419.2
12:26	15:40	Field 5a	1.114	1.458	1.69	2.894	6.35	79.9	12.82	22820.0	>2419.2
13:08	15:40	Field 12	0.370	0.666	0.12	0.062	1.03	96.7	6.92	663.0	>2419.2
5/18/2016	5/18/2016	Grab sample									
11:29	15:20	Spring	0.009	0.024	0.01	0.320	0.51	8.7	2.20	45.7	1413.6
13:08	15:20	Upstream	0.007	0.016	<0.03	0.043	0.13	1.4	1.00	85.5	1299.7
11:10	15:20	Downstream	0.009	0.020	0.02	0.117	0.25	1.2	0.98	107.1	>2419.2
11:43	15:20	Ephemeral stream	0.008	0.014	<0.03	0.479	0.63	3.0	0.84	34.1	2419.2
10:57	15:20	Left Fork	0.010	0.016	0.01	0.139	0.27	1.4	1.54	60.1	2620.0
12:50	15:20	House well	0.009	0.010	<0.03	0.488	0.64	0.4	0.95	<1.0	<1.0
12:05	15:20	Trench 1	0.006	0.006	<0.03	0.169	0.22	0.1	0.54	2.0	5200.0
5/26/2016	5/26/2016	Grab sample									
11:45	15:30	Spring	0.008	0.020	<0.03	0.219	0.35	6.2	4.15	344.8	3730.0
13:08	15:30	Upstream	0.007	0.030	<0.03	0.056	0.12	4.2	1.56	238.2	5290.0
11:30	15:30	Downstream	0.009	0.036	<0.03	0.094	0.20	4.6	1.75	547.5	3640.0

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
12:05	15:30	Ephemeral stream	0.052	0.424	0.39	0.858	2.20	350.6	8.58	22470.0	>2419.2
11:20	15:30	Left Fork	0.010	0.048	0.02	0.123	0.24	10.6	2.66	461.1	6890.0
12:51	15:30	House well	0.009	0.012	<0.03	0.564	0.57	0.7	0.93	1.0	7.4
12:38	15:30	Trench 1	0.008	0.006	<0.03	0.217	0.23	1.4	1.29	1.0	4260.0
6/2/2016	6/2/2016	Grab sample									
11:15	14:40	Spring	0.007	0.032	<0.03	0.330	0.47	10.8	2.38	64.1	1986.3
12:26	14:40	Upstream farm	0.007	0.018	<0.03	0.046	0.13	4.1	1.8	224.7	1986.3
11:04	14:40	Downstream farm	0.006	0.018	<0.03	0.106	0.20	1.4	1.8	104.6	3410
11:26	14:40	Ephemeral stream	0.008	0.022	<0.03	0.494	0.63	3.6	2.15	770.1	1986.3
10:52	14:40	Left Fork	0.007	0.022	<0.03	0.117	0.22	1.4	1.40	44.1	1986.3
12:06	14:40	House well	0.008	0.018	<0.03	0.597	0.62	0.7	0.99	<1.0	<1.0
11:35	14:40	Trench 1	0.002	0.018	<0.03	0.124	0.30	8.8	3.01	26.5	393.0
6/7/2016	6/7/2016	Grab sample									
11:25	14:30	Spring	0.011	0.026	<0.03	0.327	0.46	4.6	6.06	140.1	2460.0
12:16	14:30	Upstream farm	0.013	0.018	0.06	0.131	0.14	1.3	2.8	120.1	2720.0
11:10	14:30	Downstream farm	0.012	0.018	0.04	0.123	0.19	1.5	1.94	73.8	2980.0

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
11:37	14:30	Ephemeral stream	0.012	0.024	0.01	0.503	0.65	6.9	3.89	2419.2	7980.0
10:50	14:30	Left Fork	0.009	0.016	0.04	0.124	0.19	0.8	2.08	31.8	3180.0
12:00	14:30	House well	0.011	0.014	0.03	0.500	0.58	0.1	3.06	<1.0	<1.0
6/15/2016	6/15/2016	Grab sample									
11:40	15:00	Spring	0.010	0.016	0.03	0.466	0.65	4.2	<0.18	153.9	1553.1
12:40	15:00	Upstream farm	0.007	0.010	<0.03	0.097	0.15	1.6	0.02	69.1	2310.0
11:25	15:00	Downstream farm	0.008	0.050	0.05	0.181	0.42	25.4	0.38	33.2	4740.0
11:15	15:00	Left Fork	0.009	0.012	0.01	0.198	0.29	2.0	0.94	63.1	8860.0
12:15	15:00	House well	0.008	0.008	<0.03	0.506	0.59	0.7	<0.18	<1.0	<1.0
6/22/2016	6/22/2016	Grab sample									
10:40	14:35	Spring	0.008	0.012	<0.03	0.532	0.60	1.0	<0.18	38.2	1413.6
12:20	14:35	Upstream farm	0.008	0.016	0.02	0.237	0.33	2.3	0.20	455.0	547.5
10:23	14:35	Downstream farm	0.015	0.028	0.04	0.327	0.44	14.9	<0.18	46.4	4570.0
10:08	14:35	Left Fork	0.008	0.018	0.05	0.220	0.37	2.1	0.70	37.9	676.0
11:38	14:35	House well	0.009	0.008	<0.03	0.545	0.58	0.5	<0.18	<1.0	<1.0
6/29/2016	6/29/2016	Grab sample									
10:53	14:00	Spring	0.009	0.083	0.02	0.487	0.73	43.4	1.10	5.2	648.8

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
11:37	14:00	Upstream farm	0.006	0.029	0.06	0.186	0.34	4.6	0.92	55.4	9888.0
10:41	14:00	Downstream farm	0.010	0.021	0.03	0.395	0.47	2.5	0.46	41.3	6310.0
10:25	14:00	Left Fork	0.006	0.023	0.03	0.251	0.35	2.0	0.94	23.5	5200.0
11:12	14:00	House well	0.008	0.014	<0.03	0.569	0.56	0.0	0.23	<1.0	<1.0
7/6/2016	7/6/2016	Grab sample									
6:44	10:16	Spring	0.011	0.027	<0.03	0.465	0.53	9.8	1.15	25.3	4430
7:41	10:16	Upstream farm	0.009	0.023	<0.03	0.221	0.27	5.9	0.66	387.3	12230.0
6:26	10:16	Downstream farm	0.010	0.023	0.01	0.461	0.43	2.1	0.47	39.3	8570.0
6:08	10:16	Left Fork	0.006	0.020	0.04	0.271	0.36	2.7	0.96	248.1	12590.0
7:18	10:16	House well	0.009	0.013	<0.03	0.874	0.96	1.0	0.73	<1.0	13.5
7/13/2016	7/13/2016	Grab sample									
7:53	12:30	Spring	0.003	0.023	<0.03	0.355	0.42	12.3	0.90	71.7	2920
7:33	12:30	Downstream farm	0.006	0.017	<0.03	0.365	0.43	4.3	1.12	129.6	8390.0
7:15	12:30	Left Fork	0.005	0.017	<0.03	0.172	0.29	1.9	0.85	95.9	12360.0
8:34	12:30	House well	0.005	0.011	<0.03	0.627	0.63	0.5	0.09	<1.0	<1.0
7/20/2016	7/20/2016	Grab sample									
7:56	12:05	Spring	0.006	0.024	<0.03	0.298	0.35	9.4	0.55	N.S.	N.S.

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
7:39	12:05	Downstream farm	0.005	0.024	<0.03	0.356	0.44	5.1	3.93	N.S	N.S.
7:25	12:05	Left Fork	0.005	0.013	<0.03	0.197	0.76	2.3	2.21	N.S.	N.S.
8:30	12:05	House well	0.007	0.009	0.02	0.594	0.70	0.1	0.14	N.S.	N.S.
7/27/2016	7/27/2016	Grab sample									
7:38	14:15	Spring	0.001	0.043	<0.03	0.375	0.46	17.6	2.64	55.6	980.4
7:21	14:15	Downstream farm	0.007	0.027	<0.03	0.423	0.47	2.3	1.62	140.8	17260.0
7:02	14:15	Left Fork	0.004	0.021	<0.03	0.255	0.35	3.6	1.79	920.8	15000.0
8:14	14:15	House well	0.006	0.010	<0.03	0.650	0.67	0.1	1.41	<1.0	<1.0
8/3/2016	8/3/2016	Grab sample									
8:03	12:10	Spring	0.006	0.104	<0.03	0.201	0.49	64.8	7.41	65.7	2920
7:43	12:10	Downstream farm	0.013	0.014	<0.03	0.221	0.29	3.2	3.46	115.3	9320.0
7:28	12:10	Left Fork	0.007	0.016	<0.03	0.212	0.32	2.4	2.21	101.4	7430.0
8/16/2016	8/16/2016	Grab sample									
10:58	14:50	Spring	0.007	0.027	0.02	0.223	0.39	7.7	9.89	88.2	5380.0
12:16	14:50	Upstream farm	0.009	0.031	0.03	0.089	0.23	4.6	3.14	248.9	9330.0
10:41	14:50	Downstream farm	0.011	0.039	0.03	0.161	0.33	8.1	2.94	178.2	17820.0

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	14:50	Ephemeral stream	0.011	0.023	0.01	1.365	1.59	2.6	2.47	137.6	154945.0
10:28	14:50	Left Fork	0.012	0.082	0.07	0.118	0.30	19.5	3.64	201.4	14550.0
11:40	14:50	Trench 1	0.005	0.006	0.02	0.130	0.17	0.2	2.14	93.4	48840.0
11:50	14:50	Trench 2	0.004	0.036	0.05	0.344	0.99	1.5	8.98	290.9	198630.0
8/24/2016	8/24/2016	Grab sample									
11:29	15:30	Spring	0.004	0.046	<0.03	0.477	0.97	29.9	2.99	27.8	5630
12:40	15:30	Upstream farm	0.004	0.014	0.03	0.046	0.14	2.0	1.08	72.3	2620.0
10:53	15:30	Downstream farm	0.005	0.016	<0.03	0.122	0.22	3.2	0.85	72.8	7030.0
10:40	15:30	Left Fork	0.004	0.013	0.00	0.045	0.13	1.5	1.62	43.5	6690.0
8/24/2016	8/24/2016	Storm sample									
11:03	15:30	Downstream farm	<0.002	0.109	0.01	0.002	0.42	66.9	5.89	156.5	38730.0
12:05	15:30	Trench 1	<0.002	0.019	0.03	0.033	0.30	8.3	1.99	21.8	3450.0
8/30/2016	8/30/2016	Grab sample									
11:24	14:55	Spring	0.003	0.020	<0.03	0.501	0.58	2.9	3.28	195.6	9090.0
12:35	14:55	Upstream farm	0.003	0.020	<0.03	0.042	0.13	1.7	1.37	102.5	5210.0
11:10	14:55	Downstream farm	0.004	0.020	<0.03	0.116	0.21	1.7	1.19	30.1	5200.0

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
11:00	14:55	Left Fork	0.005	0.021	0.02	0.157	0.28	2.7	2.00	111.2	17850.0
9/7/2016	9/7/2016	Grab sample									
7:58	12:25	Spring	0.003	0.219	0.05	0.514	0.92	142.1	5.37	31.8	18500.0
9:03	12:25	Upstream farm	0.007	0.020	0.01	0.113	0.21	1.9	1.89	195.6	5380.0
7:38	12:25	Downstream farm	0.008	0.059	0.01	0.265	0.46	25.4	1.39	30.9	4790.0
7:23	12:25	Left Fork	0.006	0.021	<0.03	0.151	0.24	2.8	1.58	27.5	10170.0
9/15/2016	9/15/2016	Grab sample									
11:00	14:00	Spring	0.009	0.273	<0.03	0.345	0.83	190.9	13.99	ND	ND
11:20	14:00	Upstream farm	0.012	0.011	<0.03	0.119	0.21	3.2	6.12	ND	ND
10:45	14:00	Downstream farm	0.014	0.016	0.01	0.312	0.42	2.9	5.38	ND	ND
10:32	14:00	Left Fork	0.011	0.014	0.01	0.132	0.25	2.2	5.35	ND	ND
9/28/2016	9/28/2016	Grab sample									
11:25	14:25	Spring	0.005	0.043	0.01	0.427	0.62	22.0	2.70	7540.0	7590.0
12:26	14:25	Upstream farm	0.008	0.016	0.01	0.128	0.21	1.0	1.33	9330.0	2310.0
11:12	14:25	Downstream farm	0.011	0.017	0.01	0.293	0.42	1.6	2.15	7120.0	5210.0
11:00	14:25	Left Fork	0.006	0.011	0.02	0.101	0.22	1.8	1.31	2530.0	3410.0

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
10/5/2016	10/5/2016	Grab sample									
10:29	15:40	Spring	0.006	0.513	0.01	0.502	1.40	334.8	4.66	36.8	241920.0
12:01	15:40	Upstream farm	0.009	0.020	<0.03	0.120	0.25	2.1	2.85	770.1	13170.0
10:07	15:40	Downstream farm	0.014	0.043	0.02	0.413	0.58	29.3	3.00	547.1	11690.0
9:54	15:40	Left Fork	0.009	0.023	0.01	0.130	0.29	2.8	2.38	285.1	17820.0
10/13/2016	10/13/2016	Grab sample									
10:46	15:45	Spring	0.018	0.272	0.05	0.623	1.36	148.0	6.09	>2419.2	28090.0
12:46	15:45	Upstream farm	0.015	0.026	<0.03	0.147	0.28	2.7	2.32	3590.0	46110.0
10:29	15:45	Downstream farm	0.033	0.066	0.02	0.614	0.88	9.6	3.90	4640.0	129970.0
11:03	15:45	Ephemeral stream	0.018	0.047	0.03	1.760	1.97	9.7	5.17	>2419.2	21430.0
10:16	15:45	Left Fork	0.091	0.203	0.04	1.071	1.74	24.2	9.30	14010.0	>241920
12:30	15:45	House well	0.008	0.010	0.01	1.166	1.23	0.6	1.35	<1.0	23.3
10/13/2016	10/13/2016	Storm sample									
11:15	15:45	Ephemeral stream	0.067	0.213	0.12	2.732	3.83	61.7	11.10	ND	ND
13:10	15:45	Field 1	0.940	1.231	0.13	0.335	2.36	59.0	16.67	ND	ND
10/20/2016	10/20/2016	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
11:05	15:05	Spring	0.010	0.044	<0.03	0.414	0.56	18.9	11.91	461.1	30760.0
12:03	15:05	Upstream farm	0.010	0.021	<0.03	0.076	0.13	1.1	4.43	3730.0	16640.0
10:48	15:05	Downstream farm	0.014	0.030	0.03	0.327	0.39	2.1	3.11	387.3	5690.0
10:20	15:05	Left Fork	0.008	0.026	0.01	0.146	0.27	1.3	3.95	33.5	17890.0
11:38	15:05	House well	0.009	0.020	0.02	0.739	0.79	0.1	4.56	<1.0	19.7
10/27/2016	10/27/2016	Grab sample									
11:05	15:25	Spring	0.007	0.253	0.03	0.265	0.88	161.1	14.84	61.7	13960.0
11:50	15:25	Upstream farm	0.010	0.021	<0.03	0.046	0.14	1.1	5.87	517.2	5450.0
10:42	15:25	Downstream farm	0.014	0.021	0.01	0.291	0.36	2.1	7.91	45.5	6440.0
10:27	15:25	Left Fork	0.008	0.016	0.02	0.132	0.26	1.9	7.76	48.8	9340.0
11:30	15:25	House well	0.009	0.010	0.01	0.664	0.74	0.9	8.95	<1.0	5.2
11/03/2016	11/03/2016	Grab sample									
9:55	14:20	Spring	0.001	0.483	0.03	0.235	0.89	281.7	15.21	3.1	2419.2
11:10	14:20	Upstream farm	0.003	0.031	0.01	0.071	0.20	2.1	6.81	22.6	3010.0
9:36	14:20	Downstream farm	0.008	0.022	0.03	0.388	0.47	1.7	6.07	1732.9	5200.0
9:14	14:20	Left Fork	0.004	0.026	0.03	0.117	0.26	1.5	9.24	33.1	7380.0

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
10:38	14:20	House well	0.004	0.010	0.02	0.719	0.75	0.4	9.48	1.0	2.0
11/10/2016	11/10/2016	Grab sample									
10:56	14:00	Spring	0.003	0.104	<0.03	0.255	0.50	53.0	3.30	17.1	13760.0
11:33	14:00	Upstream farm	0.011	0.013	0.01	0.073	0.12	1.0	2.29	53.7	>2419.2
10:38	14:00	Downstream farm	0.011	0.021	0.02	0.419	0.48	0.7	2.15	22.6	5040.0
10:18	14:00	Left Fork	0.005	0.013	0.01	0.161	0.23	4.1	2.07	7.4	2560.0
11:10	14:00	House well	0.005	0.009	<0.03	0.574	0.68	0.1	2.16	<1.0	1.0
11/17/2016	11/17/2016	Grab sample									
11:00	13:45	Spring	0.001	0.021	<0.03	0.209	0.32	4.9	2.42	2.0	574.8
11:40	13:45	Upstream farm	0.009	0.020	<0.03	0.057	0.13	0.6	1.84	58.1	3270.0
10:43	13:45	Downstream farm	0.011	0.020	0.01	0.412	0.49	2.5	1.37	18.5	>2419.2
10:20	13:45	Left Fork	0.005	0.011	<0.03	0.195	0.26	0.5	1.77	15.8	2400.0
11:10	13:45	House well	0.006	0.010	0.01	0.660	0.71	0.3	1.57	<1.0	1.0
11/21/2016	11/21/2016	Grab sample									
10:24	14:15	Spring	0.010	0.313	0.04	0.239	0.87	210.2	4.99	135.4	6770.0
11:15	14:15	Upstream farm	0.010	0.019	<0.03	0.125	0.17	1.3	0.68	178.9	3840.0

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
10:05	14:15	Downstream farm	0.012	0.021	0.01	0.466	0.52	1.3	1.23	26.9	>2419.2
9:40	14:15	Left Fork	0.004	0.011	0.01	0.239	0.31	0.4	3.35	11.9	2419.2
10:40	14:15	House well	0.007	0.011	<0.03	0.675	0.75	0.4	1.37	<1.0	<1.0
11/29/2016	11/29/2016	Grab sample									
11:42	15:15	Spring	0.009	0.100	<0.03	0.329	0.68	45.0	8.06	1046.2	13360.0
12:48	15:15	Upstream farm	0.008	0.026	0.01	0.063	0.12	2.1	2.38	235.9	3790.0
11:30	15:15	Downstream farm	0.007	0.027	<0.03	0.146	0.23	4.4	2.11	387.3	7380.0
11:20	15:15	Left Fork	0.004	0.014	<0.03	0.191	0.28	1.1	1.97	57.6	>2419.2
12:36	15:15	House well	0.004	0.011	<0.03	0.598	0.68	0.4	2.67	<1.0	<1.0
Samples analyzed since the last quarterly report											
12/14/2016	12/14/2016	Grab sample									
11:15	14:10	Spring	0.009	0.024	0.12	0.384	0.50	7.2	14.25	10.9	1119.9
11:58	14:10	Upstream farm	0.009	0.017	0.03	0.064	0.08	0.9	4.43	67.6	2650.0
11:03	14:10	Downstream farm	0.013	0.024	0.02	0.199	0.27	1.3	2.05	5.2	>2419.2
10:45	14:10	Left Fork	0.007	0.017	0.02	0.144	0.21	0.9	3.77	13.4	2419.2
11:30	14:10	House well	0.010	0.014	0.03	0.678	0.70	0.3	6.19	<1.0	<1.0
1/5/2017	1/5/2017	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
12:28	15:25	Spring	0.004	0.026	0.04	0.276	0.39	9.5	0.94	74.4	1413.6
13:12	15:25	Upstream farm	0.009	0.014	0.02	0.059	0.09	0.7	0.66	52.0	2419.2
12:00	15:25	Downstream farm	0.012	0.019	0.04	0.257	0.31	1.3	0.55	5.2	1986.3
11:42	15:25	Left Fork	0.006	0.011	0.03	0.229	0.26	0.7	0.85	6.2	1732.9
12:47	15:25	House well	0.008	0.014	0.04	0.610	0.66	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	0.60	33.0	13.31	<1.0	2260.0
11:27	14:30	Upstream farm	0.010	0.016	0.03	0.050	0.14	1.9	4.22	137.6	>2419.2
10:30	14:30	Downstream farm	0.014	0.024	0.02	0.121	0.21	2.5	3.19	60.1	3990.0
10:10	14:30	Left Fork	0.010	0.019	0.03	0.243	0.36	2.6	4.25	55.4	>2419.2
11:00	14:30	House well	0.009	0.013	0.03	0.617	0.69	0.93	7.87	<1.0	<1.0
2/2/2017	2/2/2017	Grab sample									
10:45	14:30	Spring	0.011	0.030	<0.03	0.823	0.89	7.3	5.06	6.3	1732.9
11:20	14:30	Upstream farm	0.009	0.017	<0.03	0.056	0.07	1.1	1.72	41.9	>2419.2
10:30	14:30	Downstream farm	0.014	0.026	0.01	0.160	0.21	5.1	2.21	41.3	>2419.2
10:15	14:30	Left Fork	0.008	0.019	0.01	0.139	0.18	1.1	1.69	17.1	>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
10:57	14:30	House well	0.011	0.031	0.01	0.614	0.78	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	0.57	12.7	8.76	178.5	4350.0
13:30	15:35	Upstream farm	0.009	0.060	0.01	0.132	0.30	5.0	3.04	1986.3	6570.0
11:24	15:35	Downstream farm	0.012	0.082	0.03	0.159	0.42	9.0	3.46	1732.9	11000.0
12:08	15:35	Ephemeral stream	0.020	0.064	0.02	1.323	1.45	3.1	5.06	166.9	5630.0
11:11	15:35	Left Fork	0.015	0.080	0.03	0.314	0.60	17.7	4.66	648.8	11060.0
12:46	15:35	Trench 1	0.004	0.023	0.01	0.141	0.20	1.3	0.45	1.0	1299.7
12:56	15:35	Trench 2	0.004	0.087	0.04	0.486	1.12	6.1	5.99	19.7	42860.0
12:25	15:35	House well	0.008	0.023	0.02	0.649	0.72	0.5	2.07	<1.0	<1.0

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

§ N.S. is No Sample.

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 2016, 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 ---	
1/5/2016									
Upstream	0.008	0.026	<0.03	0.158	0.20	0.5	0.95	67.7	648.8
Downstream	0.011	0.026	<0.03	0.419	0.46	0.1	1.13	40.8	648.8
1/25/2016									
Upstream	0.010	0.022	<0.03	0.068	0.09	1.1	1.52	16.9	290.9
Downstream	0.011	0.022	<0.03	0.213	0.24	0.7	1.29	8.6	365.4
2/10/2016									
Upstream	0.005	0.016	<0.03	0.048	0.11	0.5	1.11	14.5	178.5
Downstream	0.005	0.016	<0.03	0.198	0.24	0.9	0.99	4.1	218.7
2/24/2016									
Upstream	0.014	0.052	<0.03	0.099	0.28	6.1	N.D.	1203.3	7330.0
Downstream	0.015	0.058	<0.03	0.142	0.37	8.3	N.D.	1986.3	6500.0
3/10/2016									
Upstream	0.012	0.048	0.13	0.082	0.20	8.6	2.66	770.1	>2419.2
Downstream	0.010	0.044	0.11	0.118	0.25	6.2	2.28	298.7	>2419.2
3/16/2016									

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Upstream	0.008	0.034	<0.03	0.060	0.13	0.4	1.10	52.9	579.4
Downstream	0.006	0.028	0.01	0.170	0.24	0.9	1.17	81.3	>2419.2
3/24/2016									
Upstream	0.011	0.032	0.06	0.04	0.14	4.5	1.60	N.S.	N.S.
Downstream	0.011	0.024	<0.03	0.106	0.20	3.9	1.29	N.S.	N.S.
3/31/2016									
Upstream	0.008	0.042	0.08	0.100	0.22	6.1	2.49	186.0	>2419.2
Downstream	0.011	0.056	0.08	0.156	0.33	12.4	2.67	365.0	>2419.2
4/4/2016									
Upstream	0.008	0.026	<0.03	0.065	0.08	1.7	0.71	8.3	648.8
Downstream	0.010	0.026	<0.03	0.176	0.20	1.9	0.98	77.6	1046.2
4/20/2016									
Upstream	0.003	0.020	<0.03	0.047	0.06	1.9	0.61	185.0	1299.7
Downstream	0.004	0.018	<0.03	0.152	0.20	1.2	0.74	38.4	2920.0
4/28/2016									
Upstream	0.009	0.012	<0.03	0.035	0.12	1.2	N.D.	58.6	648.8
Downstream	0.010	0.012	<0.03	0.154	0.27	1.5	N.D.	36.4	2149.2
5/2/2016									
Upstream	0.006	0.018	<0.03	0.039	0.10	6.7	1.76	185.0	2419.2
Downstream	0.008	0.016	<0.03	0.075	0.16	2.0	1.50	178.9	4720.0

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
5/10/2016									
Upstream	0.007	0.044	0.01	0.070	0.20	6.1	3.10	613.1	4480.0
Downstream	0.011	0.060	0.01	0.101	0.31	11.6	2.95	1203.3	7490.0
5/18/2016									
Upstream	0.007	0.016	<0.03	0.043	0.13	1.4	1.00	85.5	1299.7
Downstream	0.009	0.020	0.02	0.117	0.25	1.2	0.98	107.1	>2419.2
5/26/2016									
Upstream	0.007	0.030	<0.03	0.056	0.12	4.2	1.56	238.2	5290.0
Downstream	0.009	0.036	<0.03	0.094	0.20	4.6	1.75	547.5	3640.0
6/12/2016									
Upstream	0.007	0.018	<0.03	0.046	0.13	4.1	1.80	224.7	1986.3
Downstream	0.006	0.018	<0.03	0.106	0.20	1.4	1.80	104.6	3410.0
6/7/2016									
Upstream	0.013	0.018	0.06	0.131	0.14	1.3	2.8	120.1	2720.0
Downstream	0.012	0.018	0.04	0.123	0.19	1.5	1.94	73.8	2980.0
6/15/2016									
Upstream	0.007	0.010	<0.03	0.097	0.15	1.6	0.02	69.1	2310.0
Downstream	0.008	0.050	0.05	0.181	0.42	25.4	0.38	33.2	4740.0
6/22/2016									
Upstream	0.008	0.016	0.02	0.237	0.33	2.3	0.20	455.0	547.5

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Downstream	0.015	0.028	0.04	0.327	0.44	14.9	<0.18	46.4	4570.0
6/29/2016									
Upstream	0.006	0.029	0.06	0.186	0.34	4.6	0.92	55.4	9888.0
Downstream	0.010	0.021	0.03	0.395	0.47	2.5	0.46	41.3	6310.0
7/6/2016									
Upstream	0.009	0.023	<0.03	0.221	0.27	5.9	0.66	387.3	12230.0
Downstream	0.010	0.023	0.01	0.461	0.43	2.1	0.47	39.3	8570.0
8/16/2016									
Upstream	0.009	0.031	0.03	0.089	0.23	4.6	3.14	248.9	9330.0
Downstream	0.011	0.039	0.03	0.161	0.33	8.1	2.94	178.2	17820.0
8/24/2016									
Upstream	0.004	0.014	0.03	0.046	0.14	2.0	1.08	72.3	2620.0
Downstream	0.005	0.016	<0.03	0.122	0.22	3.2	0.85	72.8	7030.0
8/30/2016									
Upstream	0.003	0.020	<0.03	0.042	0.13	1.7	1.37	102.5	5210.0
Downstream	0.004	0.020	<0.03	0.116	0.21	1.7	1.19	30.1	5200.0
9/7/2016									
Upstream	0.007	0.020	0.01	0.113	0.21	1.9	1.89	195.6	5380.0
Downstream	0.008	0.059	0.01	0.265	0.46	25.4	1.39	30.9	4790.0
9/15/2016									

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
Upstream	0.012	0.011	<0.03	0.119	0.21	3.2	6.12	ND	ND
Downstream	0.014	0.016	0.01	0.312	0.42	2.9	5.38	ND	ND
9/28/2016									
Upstream	0.008	0.016	0.01	0.128	0.21	1.0	1.33	9330.0	2310.0
Downstream	0.011	0.017	0.01	0.293	0.42	1.6	2.15	7120.0	5210.0
10/5/2016									
Upstream	0.009	0.020	<0.03	0.120	0.25	2.1	2.85	770.1	13170.0
Downstream	0.014	0.043	0.02	0.413	0.58	29.3	3.00	547.1	11690.0
10/13/2016									
Upstream	0.015	0.026	<0.03	0.147	0.28	2.7	2.32	3590.0	46110.0
Downstream	0.033	0.066	0.02	0.614	0.88	9.6	3.90	4640.0	129970.0
10/20/2016									
Upstream	0.010	0.021	<0.03	0.076	0.13	1.1	4.43	3730.0	16640.0
Downstream	0.014	0.030	0.03	0.327	0.39	2.1	3.11	387.3	5690.0
10/27/2016									
Upstream	0.010	0.021	<0.03	0.046	0.14	1.1	5.87	517.2	5450.0
Downstream	0.014	0.021	0.01	0.291	0.36	2.1	7.91	45.5	6440.0
11/3/2016									
Upstream	0.003	0.031	0.01	0.071	0.20	2.1	6.81	22.6	3010.0
Downstream	0.008	0.022	0.03	0.388	0.47	1.7	6.07	1732.9	5200.0

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
11/10/2016									
Upstream	0.011	0.013	0.01	0.073	0.12	1.0	2.29	53.7	>2419.2
Downstream	0.011	0.021	0.02	0.419	0.48	0.7	2.15	22.6	5040.0
11/17/2016									
Upstream	0.009	0.020	<0.03	0.057	0.13	0.6	1.84	58.1	3270.0
Downstream	0.012	0.020	0.01	0.412	0.49	2.5	1.37	18.5	>2419.2
11/21/2016									
Upstream	0.010	0.019	0.00	0.125	0.17	1.3	0.68	178.9	3840.0
Downstream	0.012	0.021	0.01	0.466	0.52	1.3	1.23	26.9	>2419.2
11/29/2016									
Upstream	0.008	0.026	0.01	0.063	0.12	2.1	2.38	235.9	3790.0
Downstream	0.007	0.027	<0.03	0.146	0.23	4.4	2.11	387.3	7380.0
Samples analyzed since the last Quarterly Report									
12/14/2016									
Upstream	0.009	0.017	0.03	0.064	0.08	0.9	4.43	67.6	2650.0
Downstream	0.013	0.024	0.02	0.199	0.27	1.3	2.05	5.2	>2419.2
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									

Sample location	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
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

¶ Values preceded by ‘<’ were reported by the analytical laboratory as zero and the Minimum detection limit is given.

§ N.S. is No Sample.

† N.D. is No Data.

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, 2015, 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									
1/5/2016	0.007	0.018	<0.03	0.883	1.00	1.2	2.15	32.7	686.7
1/25/2016	0.011	0.030	<0.03	0.762	0.87	9.8	3.10	1.0	816.4
2/24/2016	0.010	0.056	<0.03	0.195	0.40	12.8	N.D.	387.3	4870.0
3/10/2016	0.006	0.050	0.13	0.918	1.22	26.7	3.12	648.8	8840.0
3/16/2016	0.006	0.022	0.01	0.520	0.54	<6.58	1.75	88.0	461.1
3/24/2016	0.010	0.012	<0.03	0.531	0.64	1.3	1.44	N.S.	N.S.
3/31/2016	0.013	0.656	0.68	1.211	3.05	375.0	12.14	16160.0	198630.0
4/4/2016	0.008	0.018	<0.03	0.462	0.48	1.3	1.79	12.0	727.0
4/20/2016	0.008	0.020	<0.03	0.517	0.66	4.1	0.68	44.3	21430.0
5/2/2016	0.007	0.016	<0.03	0.468	0.59	1.7	2.56	118.7	5380.0
5/10/2016	0.195	0.560	0.32	0.649	4.01	1346.7	11.94	579.4	241920.0
5/18/2016	0.008	0.014	<0.03	0.479	0.63	3.0	0.84	34.1	2419.2
5/26/2016	0.052	0.424	0.39	0.858	2.20	350.6	8.58	22470.0	241920.0
6/2/2016	0.008	0.022	0.03	0.494	0.63	3.6	2.15	770.1	1986.3

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
6/7/2016	0.012	0.024	0.01	0.5	0.7	6.9	3.89	2419.2	7980
8/16/2016	0.011	0.023	0.01	1.365	1.59	2.6	2.47	137.6	154945.0
10/13/2016 (grab sample)	0.018	0.047	0.03	1.760	1.97	9.7	5.17	>2419.2	21430.0
10/13/2016 (storm sample)	0.067	0.213	0.12	2.732	3.83	61.7	11.10	N.D.	N.D.
Samples analyzed since the last quarterly report									
2/15/2017	0.020	0.064	0.02	1.323	1.45	3.1	5.06	166.9	5630.0
House well									
1/5/2016	0.008	0.020	<0.03	0.528	0.57	0.9	1.08	<1.0	1.0
1/25/2016	0.012	0.020	<0.03	0.602	0.55	0.5	2.36	<1.0	<1
2/10/2016	0.007	0.014	<0.03	0.542	0.56	0.1	0.63	<1.0	<1.0
2/24/2016	0.010	0.010	<0.03	0.582	0.55	1.3	N.S.	<1.0	<1.0
3/10/2016	0.011	0.020	0.02	0.562	0.59	0.9	1.19	<1.0	<1.0
3/16/2016	0.009	0.022	<0.03	0.550	0.55	0.0	1.55	<1.0	<1
3/24/2016	0.012	0.014	<0.03	0.565	0.65	0.2	2.72	N.S.	N.S.
3/31/2016	0.010	0.018	<0.03	0.556	0.62	0.2	3.93	1.0	26.2
4/4/2016	0.011	0.018	<0.03	0.466	0.48	<6.58	0.94	<1.0	1.0
4/20/2016	0.005	0.014	<0.03	0.598	0.50	0.5	0.47	1.0	1.0
4/28/2016	0.011	0.008	<0.03	0.481	0.57	0.3	N.S.	<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
5/2/2016	0.009	0.016	<0.03	0.551	0.56	0.1	1.94	<1.0	<1
5/10/2016	0.009	0.008	<0.03	0.533	0.56	0.5	4.39	<1.0	24.9
5/18/2016	0.009	0.010	<0.03	0.488	0.64	0.4	0.95	<1.0	<1.0
5/26/2016	0.009	0.012	<0.03	0.564	0.57	0.7	0.93	1.0	7.4
6/2/2016	0.008	0.018	<0.03	0.597	0.62	0.7	0.99	<1.0	<1.0
6/7/2016	0.011	0.014	0.03	0.500	0.58	0.1	3.06	<1.0	<1.0
6/15/2016	0.008	0.008	<0.03	0.506	0.59	0.7	<0.18	<1.0	<1.0
6/22/2016	0.009	0.008	<0.03	0.545	0.58	0.5	<0.18	<1.0	<1.0
6/29/2016	0.008	0.014	<0.03	0.569	0.56	<6.58	0.23	<1.0	<1.0
7/6/2016	0.009	0.013	<0.03	0.874	0.96	1.0	0.73	<1.0	13.5
7/13/2016	0.005	0.011	<0.03	0.627	0.63	0.5	0.09	<1.0	<1.0
7/20/2016	0.007	0.009	0.02	0.594	0.70	0.1	0.14	N.S.	N.S.
7/27/2016	0.006	0.010	<0.03	0.650	0.67	0.1	1.41	<1.0	<1.0
10/13/2016	0.008	0.010	0.01	1.166	1.23	0.6	1.35	<1.0	23.3
10/13/2016	0.009	0.020	0.02	0.739	0.79	0.1	4.56	<1.0	19.7
10/27/2016	0.009	0.010	0.01	0.664	0.74	0.9	8.95	<1.0	5.2
11/03/2016	0.004	0.010	0.02	0.719	0.75	0.4	9.48	1.0	2.0
11/10/2016	0.005	0.009	<0.03	0.574	0.68	0.1	2.16	<1.0	1.0
11/17/2016	0.006	0.010	0.01	0.660	0.71	0.3	1.57	<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
11/21/2016	0.007	0.011	<0.03	0.675	0.75	0.4	1.37	<1.0	<1.0
11/29/2016	0.004	0.011	<0.03	0.598	0.68	0.4	2.67	<1.0	<1.0
Samples analyzed since the last quarterly report									
12/14/2016	0.010	0.014	0.03	0.678	0.70	0.3	6.19	<1.0	<1.0
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
Interceptor Trench 1 (South)									
1/5/2016	0.003	0.016	<0.03	0.243	0.29	0.9	1.11	1.0	209.8
2/24/2016	0.005	0.014	<0.03	0.345	0.39	2.1	N.D.	<1.0	9070.0
3/10/2016	0.005	0.036	0.10	0.264	0.45	3.5	2.87	2419.2	16690.0
3/16/2016	0.003	0.032	0.02	0.331	0.37	<6.58	1.23	101.7	290.9
3/24/2016	0.008	0.016	<0.03	0.208	0.20	2.8	1.33	N.S.	N.S.
3/31/2016	0.004	0.018	<0.03	0.347	0.49	5.5	4.76	4.1	2419.2
5/10/2016	0.002	0.016	<0.03	0.228	0.30	3.9	2.91	13.9	2419.2
5/18/2016	0.006	0.006	<0.03	0.169	0.22	0.1	0.54	2.0	5200.0
5/26/2016	0.008	0.006	<0.03	0.217	0.23	1.4	1.29	1.0	4260.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
6/2/2016	0.002	0.018	<0.03	0.124	0.30	8.8	3.01	26.5	393.0
8/16/2016	0.005	0.006	0.02	0.130	0.17	0.2	2.14	93.4	48840.0
8/24/2016	<0.002	0.019	0.03	0.033	0.30	8.3	1.99	21.8	3450.0
8/16/2016	0.005	0.006	0.02	0.130	0.17	0.2	2.14	93.4	48840.0
8/24/2016	<0.002	0.019	0.03	0.033	0.30	8.3	1.99	21.8	3450.0
Samples analyzed since the last quarterly report									
2/15/2017	0.004	0.023	0.01	0.141	0.20	1.3	0.45	1.0	1299.7
Interceptor Trench 2 (North)									
2/24/2016	0.005	0.066	0.13	6.298	7.02	9.7	4.27	30.1	18720.0
3/10/2016	0.005	0.054	0.14	1.716	2.35	6.8	6.77	613.1	34480.0
3/31/2016	0.006	0.040	0.06	2.800	3.54	20.9	9.29	7.4	10810.0
4/4/2016	0.004	0.012	<0.03	0.236	0.25	<6.58	0.85	1.0	2419.2
5/10/2016	0.002	0.038	<0.03	1.706	2.18	5.2	3.72	38.7	1553.0
8/16/2016	0.004	0.036	0.05	0.344	0.99	1.5	8.98	290.9	198630.0
Samples analyzed since the last quarterly report									
2/15/2017	0.004	0.087	0.04	0.486	1.12	6.1	5.99	19.7	42860.0
No flow									
Left Fork									

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
1/5/2016	0.013	0.028	<0.03	0.427	0.48	0.7	1.51	34.1	686.7
1/25/2016	0.010	0.024	<0.03	0.198	0.25	1.0	1.30	21.1	435.2
2/10/2016	0.003	0.012	<0.03	0.175	0.24	0.8	1.15	7.4	209.8
2/24/2016	0.015	0.088	<0.03	0.249	0.63	15.6	N.D.	2780.0	14390.0
3/10/2016	0.013	0.046	0.01	0.154	0.38	8.7	2.64	367.3	2750.0
3/16/2016	0.009	0.032	<0.03	0.190	0.26	0.3	1.45	35.9	980.4
3/24/2016	0.013	0.048	0.09	0.186	0.39	10.7	2.65	N.S.	N.S.
3/31/2016	0.013	0.056	0.09	0.199	0.40	11.9	2.59	172.0	3640.0
4/4/2016	0.009	0.022	<0.03	0.131	0.17	1.5	0.87	44.8	1119.9
4/20/2016	0.005	0.020	<0.03	0.157	0.21	2.1	0.84	35.0	6160.0
5/2/2016	0.009	0.020	<0.03	0.095	0.20	1.9	2.30	172.6	3640.0
5/10/2016	0.011	0.072	0.02	0.121	0.37	17.2	3.35	980.4	8230.0
5/18/2016	0.010	0.016	0.01	0.139	0.27	1.4	1.54	60.1	2620.0
5/26/2016	0.010	0.048	0.02	0.123	0.24	10.6	2.66	461.1	6890.0
6/2/2016	0.007	0.022	0.00	0.117	0.22	1.4	1.40	44.1	1986.3
6/7/2016	0.009	0.016	0.04	0.124	0.19	0.8	2.08	31.8	3180.0
6/15/2016	0.009	0.012	0.01	0.198	0.29	2.0	0.94	63.1	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
6/22/2016	0.008	0.018	0.05	0.220	0.37	2.1	0.70	37.9	676.0
6/29/2016	0.006	0.023	0.03	0.251	0.35	2.0	0.94	23.5	5200.0
7/6/2016	0.006	0.02	0.04	0.271	0.36	2.7	0.96	248.1	12590.0
7/13/2016	0.005	0.017	<0.03	0.172	0.29	1.9	0.85	95.9	12360.0
7/20/2016	0.005	0.013	<0.03	0.197	0.76	2.3	2.21	N.S.	N.S.
7/27/2016	0.004	0.021	<0.03	0.255	0.35	3.6	1.79	920.8	15000.0
8/3/2016	0.007	0.016	<0.03	0.212	0.32	2.4	2.21	101.4	7430.0
8/16/2016	0.012	0.082	0.07	0.118	0.30	19.5	3.64	201.4	14550.0
8/24/2016	0.004	0.013	<0.03	0.045	0.13	1.5	1.62	43.5	6690.0
8/30/2016	0.005	0.021	0.02	0.157	0.28	2.7	2.00	111.2	17850.0
9/7/2016	0.006	0.021	<0.03	0.151	0.24	2.8	1.58	27.5	10170.0
9/15/2016	0.011	0.014	0.01	0.132	0.25	2.2	5.35	ND	ND
9/28/2016	0.006	0.011	0.02	0.101	0.22	1.8	1.31	2530.0	3410.0
10/5/2016	0.009	0.023	0.01	0.130	0.29	2.8	2.38	285.1	17820.0
10/13/2016	0.091	0.203	0.04	1.071	1.74	24.2	9.30	14010.0	>241920
10/20/2016	0.008	0.026	0.01	0.146	0.27	1.3	3.95	33.5	17890.0
10/27/2016	0.008	0.016	0.02	0.132	0.26	1.9	7.76	48.8	9340.0

Date sample collected	Dissolved P	Total P	Ammonia-N	Nitrate-N	Total N	Total suspended solids	Dissolved Organic C	E. coli	Total coliform
11/03/2016	0.004	0.026	0.03	0.117	0.26	1.5	9.24	33.1	7380.0
11/10/2016	0.005	0.013	0.01	0.161	0.23	4.1	2.07	7.4	2560.0
11/17/2016	0.005	0.011	<0.03	0.195	0.26	0.5	1.77	15.8	2400.0
11/21/2016	0.004	0.011	0.01	0.239	0.31	0.4	3.35	11.9	2419.2
11/29/2016	0.004	0.014	<0.03	0.191	0.28	1.1	1.97	57.6	>2419.2
Samples analyzed since the last quarterly report									
12/14/2016	0.007	0.017	0.02	0.144	0.21	0.9	3.77	13.4	2419.2
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
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
Field 1									
10/13/2016	0.940	1.231	0.13	0.335	2.36	59.0	16.67	N.S.	N.S.
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	N.S.	N.S.
5/10/2016	1.114	1.458	1.69	2.894	6.35	79.9	12.82	N.S.	N.S.

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 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	N.S.	N.S.
5/10/2016	0.370	0.666	0.12	0.062	1.03	96.7	6.92	N.S.	N.S.
No samples analyzed since the last quarterly report									

¶ Values preceded by ‘<’ were reported by the analytical laboratory as zero and the minimum detection limit is given.

§ N.S. 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.

† N.D. is No Data.

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, electrical conducting, and total solids concentration of water samples collected at upstream, downstream, spring, ephemeral stream, house well and trench sites, initiated at the beginning of 2015, with those collected since the last report noted.

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
		----- mg/L -----		μS/cm	mg/L
Upstream					
1/5/2016	7.5	40	1.34	102	62.5
1/25/2016	8.2	46	1.50	115	65.0
2/10/2016	8.6	54	1.69	141	60.0
2/24/2016	7.2	66	1.20	102	97.5
3/10/2016	7.6	38.0	1.268	84.5	60.0
3/16/2016	6.7	38.0	1.252	88.3	52.5
3/24/2016	7.7	46.0	1.825	103.3	56.5
3/31/2016	7.3	30.0	0.933	65.8	235.0
4/4/2016	7.4	40.0	1.163	86.9	55.0
4/20/2016	8.0	58.0	1.405	125.7	65.0
4/29/2016	8.1	66.0	1.373	134.8	72.5
5/3/2016	7.7	38.0	1.150	83.7	52.5
5/10/2016	7.6	32.0	0.914	67.6	57.5
5/18/2016	8.0	48.0	1.228	102.8	57.5
5/26/2016	7.8	76.0	1.045	78.4	50.0
6/2/2016	7.9	68.0	1.298	105.4	75.0

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
6/7/2016	8.1	58.0	2.722	128.3	77.5
6/15/2016	8.3	72.0	1.471	150.3	77.5
6/22/2016	8.1	88.0	1.695	182.3	112.5
6/29/2016	7.4	110.0	2.176	203.0	112.5
7/6/2016	7.5	106.0	1.821	212.0	117.5
8/16/2016	7.7	40.0	1.092	88.1	60.0
8/24/2016	8.3	54.0	1.513	121.7	95.0
8/30/2016	8.2	64.0	1.088	143.3	70.0
9/7/2016	7.9	82.0	1.601	176.0	97.5
9/15/2016	8.0	98.0	1.287	206.0	111.1
9/28/2016	8.1	84.0	1.804	217.0	113.3
10/5/2016	7.9	94.0	1.831	230.0	110.0
10/13/2016	7.8		2.540	225.0	242.5
10/20/2016	7.9		2.017	235.0	117.8
10/27/2016	8.0		2.139	299.0	117.5
11/3/2016	7.6		2.330	260.0	
11/10/2016	8.0		2.446	233.0	
11/17/2016	8.0		2.455	272.0	
11/21/2016	8.0		2.314	101.0	
11/29/2016			2.087		
Samples analyzed since the last quarterly report					
12/14/2016	8.3		2.140	129.0	
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	

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
Downstream					
1/5/2016	7.5	60	2.17	158	92.5
1/25/2016	8.0	80	2.00	191	95.0
2/10/2016	8.0	94	2.36	214	102.5
2/22/2016	7.5	80	1.48	156	110.0
3/10/2016	7.3	54.0	1.481	126.1	80.0
3/16/2016	7.1	60.0	1.500	137.6	75.0
3/24/2016	7.3	68.0	1.827	156.8	79.0
3/31/2016	7.3	48.0	1.043	95.9	50.0
4/4/2016	7.4	66.0	1.563	138.6	80.0
4/20/2016	7.3	92.0	1.903	187.0	105.0
4/29/2016	7.7	100.0	2.052	199.1	107.5
5/3/2016	7.8	60.0	1.197	130.5	87.5
5/10/2016	7.6	44.0	0.856	93.5	75.0
5/18/2016	7.8	74.0	1.482	154.5	82.5
5/26/2016	7.7	34.0	0.941	114.1	72.5
6/2/2016	8.0	48.0	1.447	154.8	100.0
6/7/2016	7.8	88.0	1.698	176.8	97.5
6/15/2016	7.9	108.0	2.525	205.0	115.0
6/22/2016	7.8	120.0	2.406	230.0	145.0
6/29/2016	7.5	132.0	2.971	259.0	322.5
7/6/2016	7.4	136.0	2.960	262.0	157.5
7/13/2016	7.4	130.0	2.549	289.0	137.5
7/20/2016	7.7	138.0	2.726	305.0	145.0
7/27/2016	7.5	134.0	2.599	286.0	150.0
8/3/2016	7.9	144.0	1.845	258.0	137.5

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
8/16/2016	7.7	60.0	1.255	128.9	82.5
8/24/2016	7.8	84.0	1.368	174.8	97.5
8/24/2016			1.152	122.8	97.5
8/30/2016	7.8	88.0	1.435	193.5	97.5
9/7/2016	7.9	112.0	2.143	240.0	125.0
9/15/2016	7.9	126.0	1.918	265.0	137.8
9/28/2016	7.8	124.0	2.272	281.0	142.2
10/5/2016	7.8	122.0	2.708	288.0	140.0
10/13/2016	7.6		2.799	264.0	152.5
10/20/2016	7.2		2.791	314.0	157.8
10/27/2016	7.6		2.805	304.0	150.0
11/3/2016	7.2		3.074	313.0	
11/10/2016	7.8		3.330	311.0	
11/17/2016	7.8		3.203	366.0	
11/21/2016	7.8		3.272	139.0	
11/29/2016			2.481		
Samples analyzed since the last quarterly report					
12/14/2016	7.8		2.597	206.0	
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	
Spring					
3/10/2016			1.109	359.0	210.0
3/16/2016			2.038	516.0	250.0
3/24/2016			1.939	446.0	214.0

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
3/31/2016			1.324	414.0	45.0
4/4/2016			1.971	506.0	272.5
4/20/2016			2.111	554.0	300.0
4/29/2016			2.234	522.0	285.0
5/3/2016			1.879	486.0	275.0
5/10/2016			1.190	417.0	245.0
5/18/2016			2.206	493.0	275.0
5/26/2016			1.370	450.0	250.0
6/2/2016			2.111	512.0	285.0
6/7/2016			2.348	503.0	280.0
6/15/2016			2.523	526.0	305.0
6/22/2016			2.659	543.0	322.5
6/29/2016			2.864	545.0	322.5
7/6/2016			2.749	533.0	267.5
7/13/2016			2.661	272.0	292.5
7/20/2016			2.271	594.0	292.5
7/27/2016			2.424	593.0	297.5
8/3/2016			2.151	541.0	280
8/16/2016			1.435	434.0	242.5
8/24/2016			2.644	556.0	312.5
8/30/2016			2.710	604.0	310.0
9/7/2016			2.822	598.0	322.5
9/15/2016			2.040	590.0	322.2
9/28/2016			2.785	652.0	328.9
10/5/2016			2.272	644.0	315.0
10/13/2016			1.899	455.0	127.5
10/20/2016	6.9		2.528	674.0	331.1

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
10/27/2016	7.2		2.525	637.0	315.0
11/3/2016	6.9		2.361	619.0	
11/10/2016	7.2		2.402	605.0	
11/17/2016	7.1		2.367	695.0	
11/21/2016	7.0		2.433	259.0	
11/29/2016			2.472		
Samples analyzed since the last quarterly report					
12/14/2016	6.9		2.320	519.0	
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	
Ephemeral Stream					
1/5/2016			2.908	368.0	
1/25/2016			3.454	392.0	
2/24/2016			2.427	264.0	
3/10/2016			2.530	288.0	
3/16/2016			2.427	356.0	
3/24/2016			3.467	399.0	
3/31/2016			3.366	153.2	
4/4/2016			2.544	330.0	
4/20/2016			2.758	380.0	
5/2/2016			2.068	329.0	
5/2/2016			2.571	241.0	
5/10/2016			1.617	143.3	
5/18/2016			2.726	360.0	

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
5/26/2016			2.031	194.5	
6/2/2016			2.733	359.0	
6/7/2016			2.930	344.0	
8/16/2016			3.309	357.0	
10/13/2016	7.2		3.546	393.0	225.0
Samples analyzed since the last quarterly report					
2/15/2017	7.7		3.366	270.0	
House well					
1/5/2016			4.855	439	215.0
1/25/2016			5.278	462	242.5
2/10/2016			5.273	468	215.0
2/24/2016			5.237	447	242.5
3/10/2016			5.366	458	237.5
3/16/2016			4.993	482	240.0
3/24/2016			5.265	484	219.0
3/31/2016			5.023	409	220.0
4/4/2016			4.735	414	210.0
4/20/2016			5.475	417	227.5
4/28/2016			4.671	417	247.5
5/2/2016			5.316	441	237.5
5/10/2016			5.234	411	237.5
5/18/2016			4.450	420	232.5
5/26/2016			5.649	426	220.0
6/2/2016			5.450	409	182.5
6/7/2016			4.670	416	220.0
6/15/2016			4.394	414	242.5
6/22/2016			5.173	424	260.0

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
6/29/2016			5.557	432	172.5
7/6/2016			5.811	391	237.5
7/13/2016			5.021	561	220.0
7/20/2016			5.561	447	230.0
7/27/2016			5.230	467	227.5
10/13/2016			6.988	476.	245.0
10/20/2016	7.6		6.421	495	244.4
10/27/2016	7.9		6.132	501	142.5
11/3/2016	7.6		5.560	479	
11/10/2016	7.6		5.858	473	
11/17/2016	7.6		5.655	544	
11/21/2016	7.5		5.576	209	
11/29/2016			5.721		
12/14/2016	7.4			411	
Samples analyzed since the last quarterly report					
1/5/2017	7.8		5.371	421.0	
1/19/2017	7.4		5.234		
2/2/2017	7.5		5.290	420.0	
2/15/2017	7.6		5.401	397.0	
Trench 1					
1/5/2016			1.61	161	82.5
2/24/2016			1.16	162	102.5
3/10/2016			1.019	173.7	117.5
3/16/2016			1.451	226.0	120.0
3/24/2016			1.732	229.0	99.0
3/31/2016			1.280	167.9	100.0

Date	pH	Alkalinity	Chloride	Electrical conductivity	Total dissolved solids
5/10/2016			1.122	226.0	130.0
5/19/2016			0.405	196.5	115.0
5/18/2016			1.653	234.0	125.0
5/26/2016			1.421	262.0	142.5
6/2/2016			1.229	320	192.5
8/16/2016			2.051	293	130.0
8/24/2016			1.259	318	170.0
Samples analyzed since the last quarterly report					
2/15/2017	8.0		2.344	397.0	
Trench 2					
3/11/2015			1.77	159	140.8
3/19/2015			1.04	168	104.9
3/26/2015			0.78	135	160.9
5/11/2015			0.41	165	88.5
5/26/2015			0.93	284	141.3
12/14/2016			1.00	148	110.0
2/24/2016			0.99	144	122.5
3/10/2016			0.349	106.8	80.0
3/31/2016			0.424	134.5	87.5
4/4/2016			1.4	192.1	107.5
8/16/2016			0.597	219	117.5
No samples analyzed since the last quarterly report					
2/15/2017	8.0		1.164	135.0	

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 5, 6, 7, 8, 9, 10, and 11).

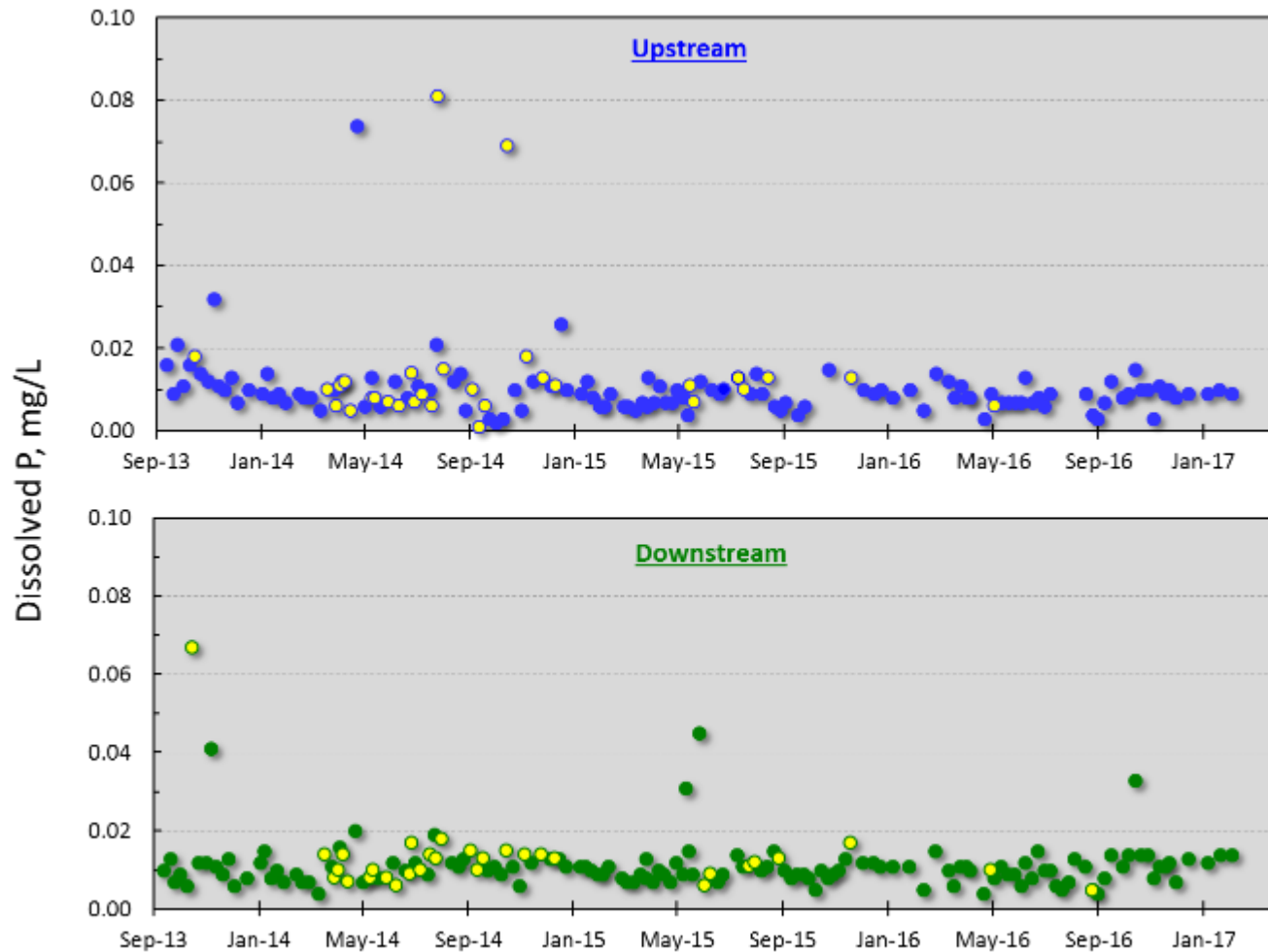


Figure 2. Dissolved P concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

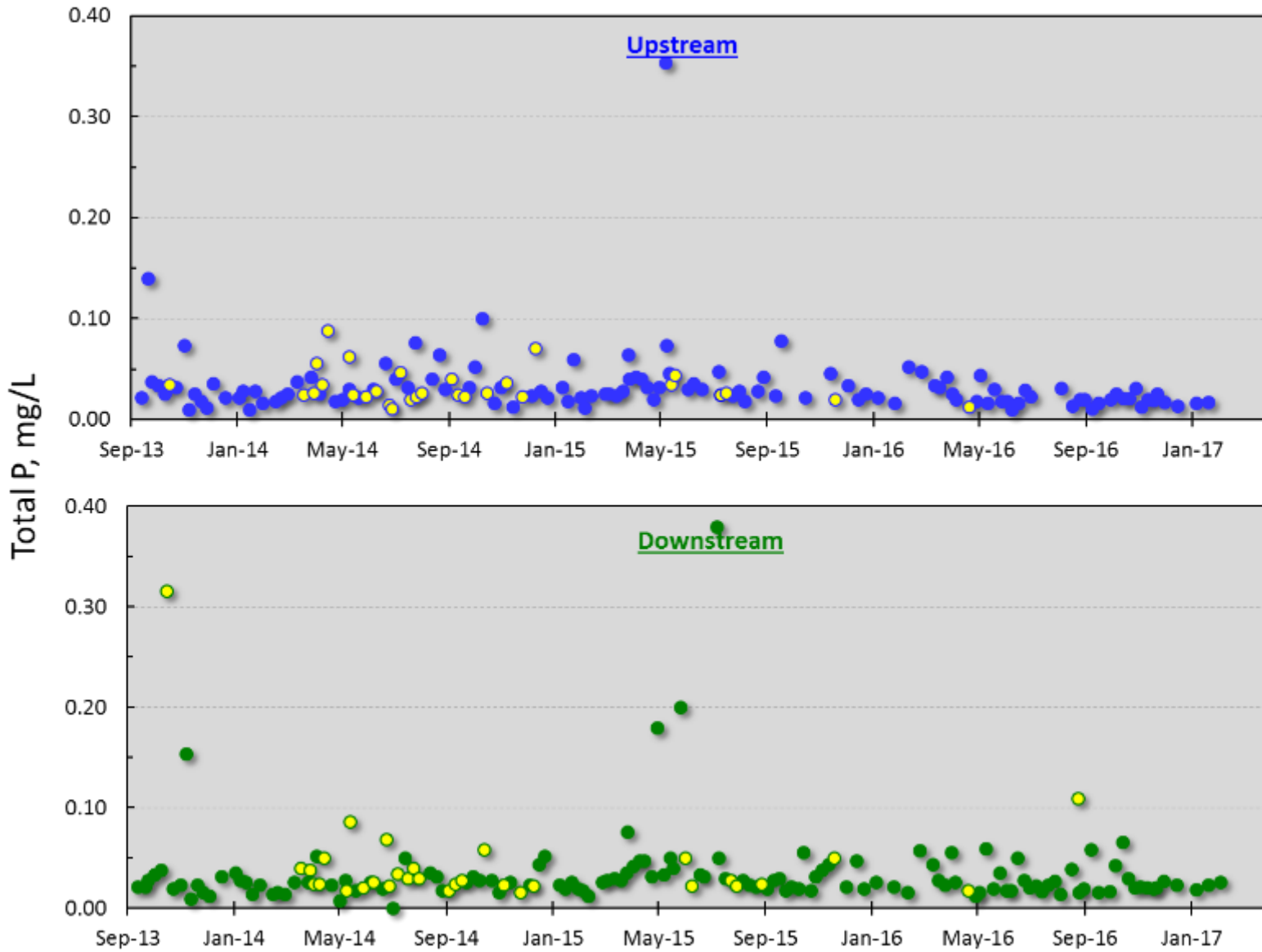


Figure 3. Total P concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

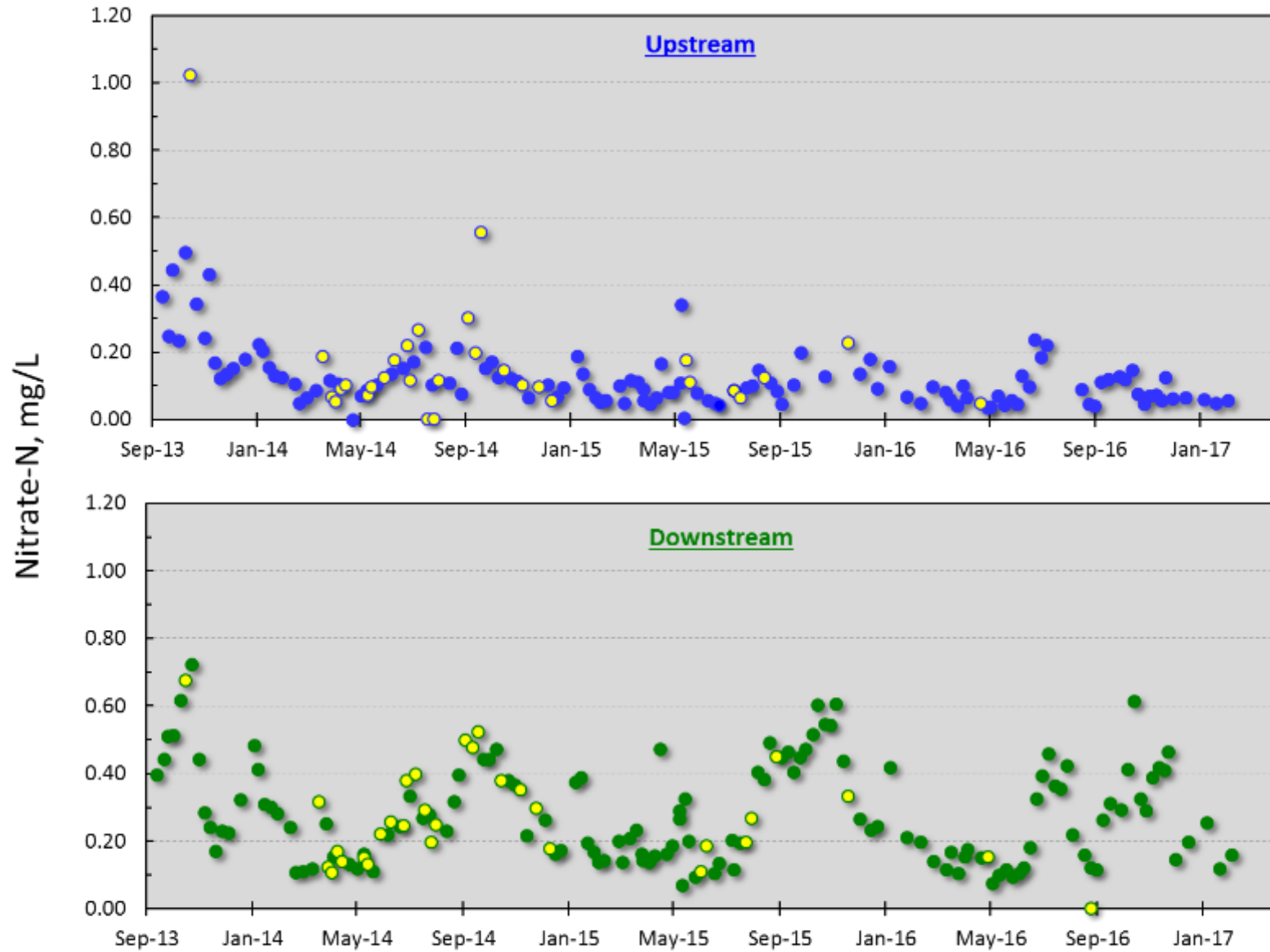


Figure 4. Nitrate-N concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

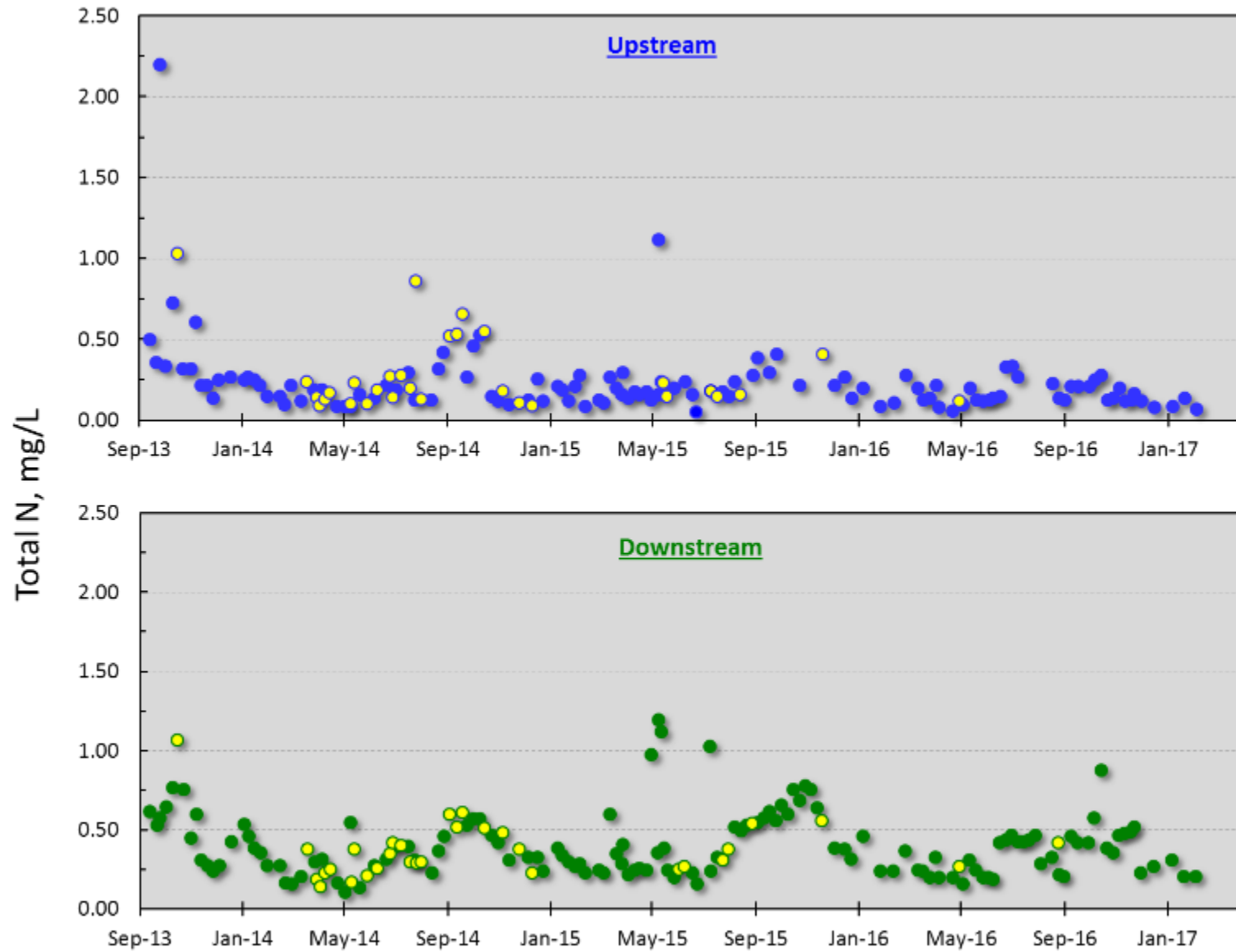


Figure 5. Total N concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

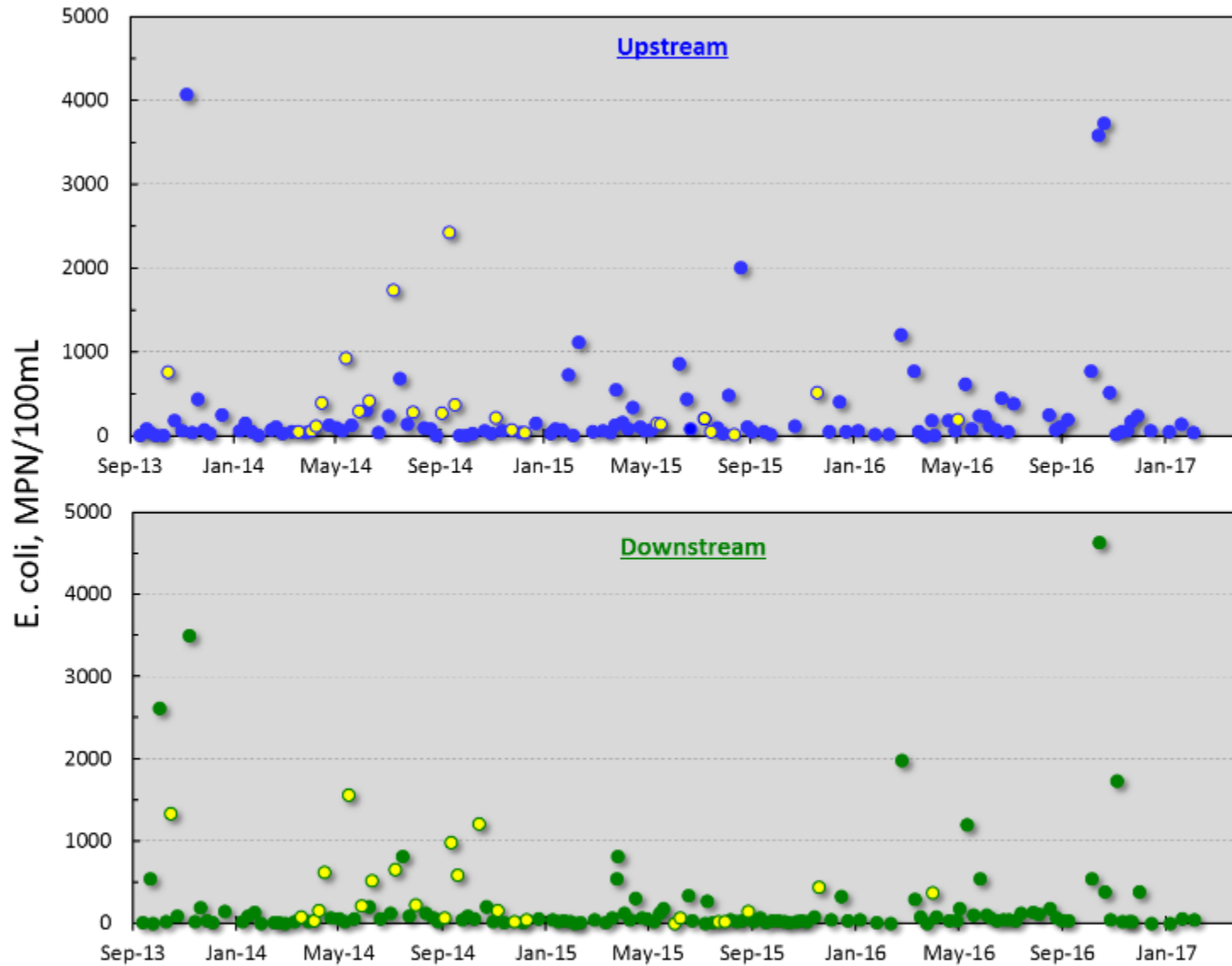


Figure 6. E. coli numbers at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

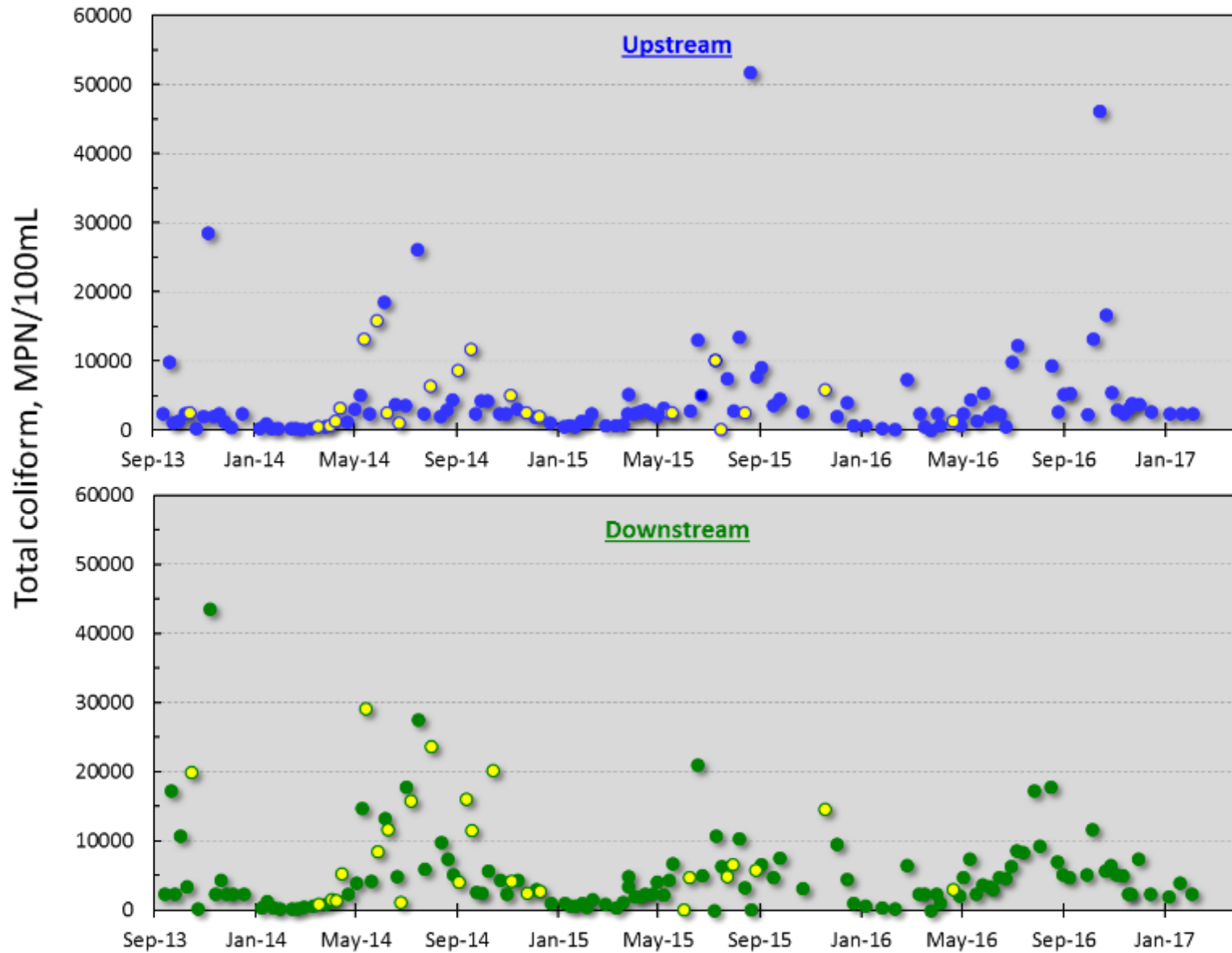


Figure 7. Total coliform numbers at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

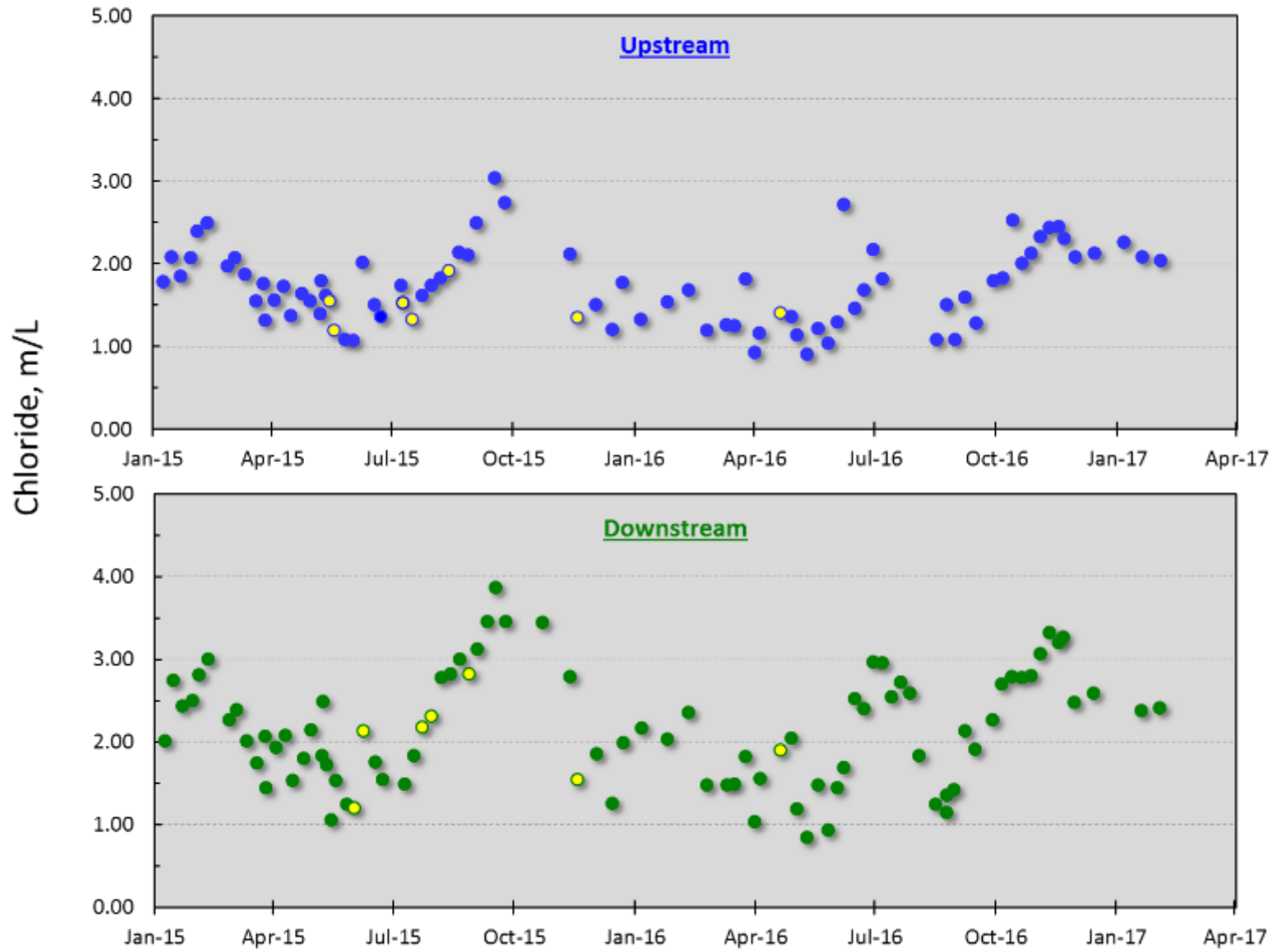


Figure 8. Chloride concentration at the Big Creek monitoring site up- and downstream of the C&H Farm, Newton County, AR.

Geometric Mean Concentrations as a Function of Big Creek Flow

Big Creek flows were classified as base, intermediate or storm flows using hydrographs provided by the United States Geological Survey (USGS – see https://nwis.waterdata.usgs.gov/ar/nwis/uv?cb_00060=on&format=gif_default&site_no=07055790&period=&begin_date=2014-04-16&end_date=2017-04-10). Base flows were assessed by lower, level plateaus of the hydrograph curve, while storm flows were determined by sharp, elevated peaks within the hydrograph. Intermediate flows were determined as being between base and storm and located mid-slope as storm flows descended to base flows on the curve. If the hydrograph for a certain sampling event had pronounced peaks, but did not vary significantly in discharge, the resulting flow was characterized as base flow. There were 102 base, 5 intermediate, and 21 storm flow samples in Big Creek at the site upstream of the C&H Farm and 111, 9, and 21 base, intermediate, and storm flow events, respectively, at the site downstream of the C&H farm between April 2014 and February 2017.

The geometric mean concentrations of analytes measured under each flow condition between April 2014 and February 2017 are presented for Big Creek sites upstream and downstream of the C&H Farm operation in Figure 9 for dissolved and total P, Figure 10 for nitrate-N and total N, Figure 11 for suspended sediment, and Figure 12 for E. coli and total coliform. These relationships provide insight into the dominant flow pathways for P, N, sediment, and bacteria transport in this watershed.

There is an increase in dissolved and total P concentration at both sites with an increase in flow regime (Figure 9), due to an increasing contribution of surface runoff, with greater P concentration, as stream flow increases from base to storm flow. In contrast, nitrate-N and total N concentration increases as flow regime decreases, due to the greater contribution of groundwater flow, with elevated nitrate-N than surface runoff (Figure 10). As expected suspended sediment transport is greater with storm flow, where flows have higher energies and erosivity (Figure 11). Finally, bacteria transport tends to be greater during storm than base flow events at both up and downstream sites (Figure 12). Averaged for storm and base flow, E. coli was greater at the up than downstream site, while there was an opposite trend for coliform concentrations (Figure 12).

Better understanding these flow – concentration relationships in Big Creek with help identify and target effective conservation measures aimed at minimizing P, N, sediment, and bacterial loss and input to Big Creek.

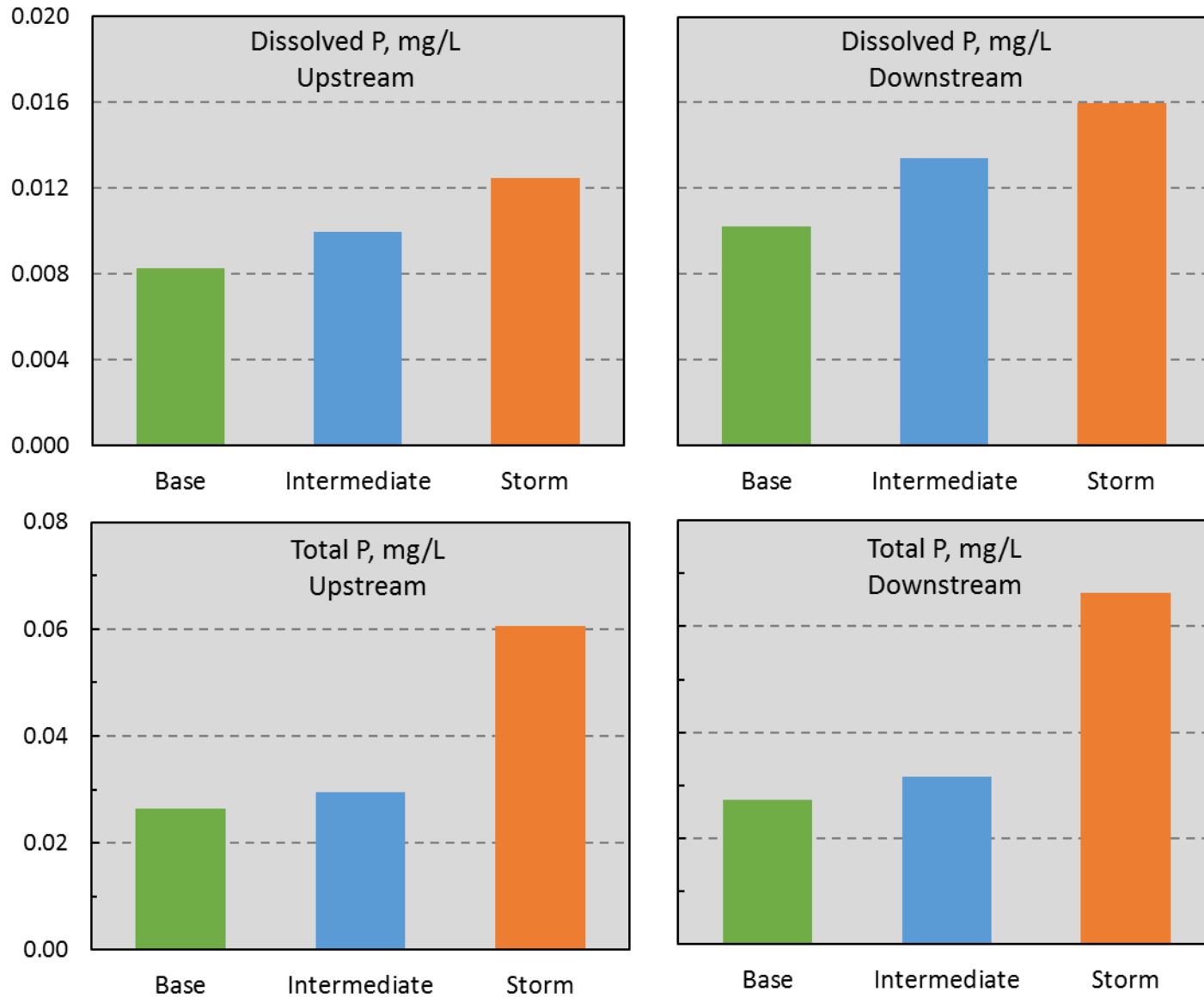


Figure 9. Geomean dissolved and total P concentration as a function of flow regime in Big Creek upstream and downstream of the C&H Farm, Newton County, AR.

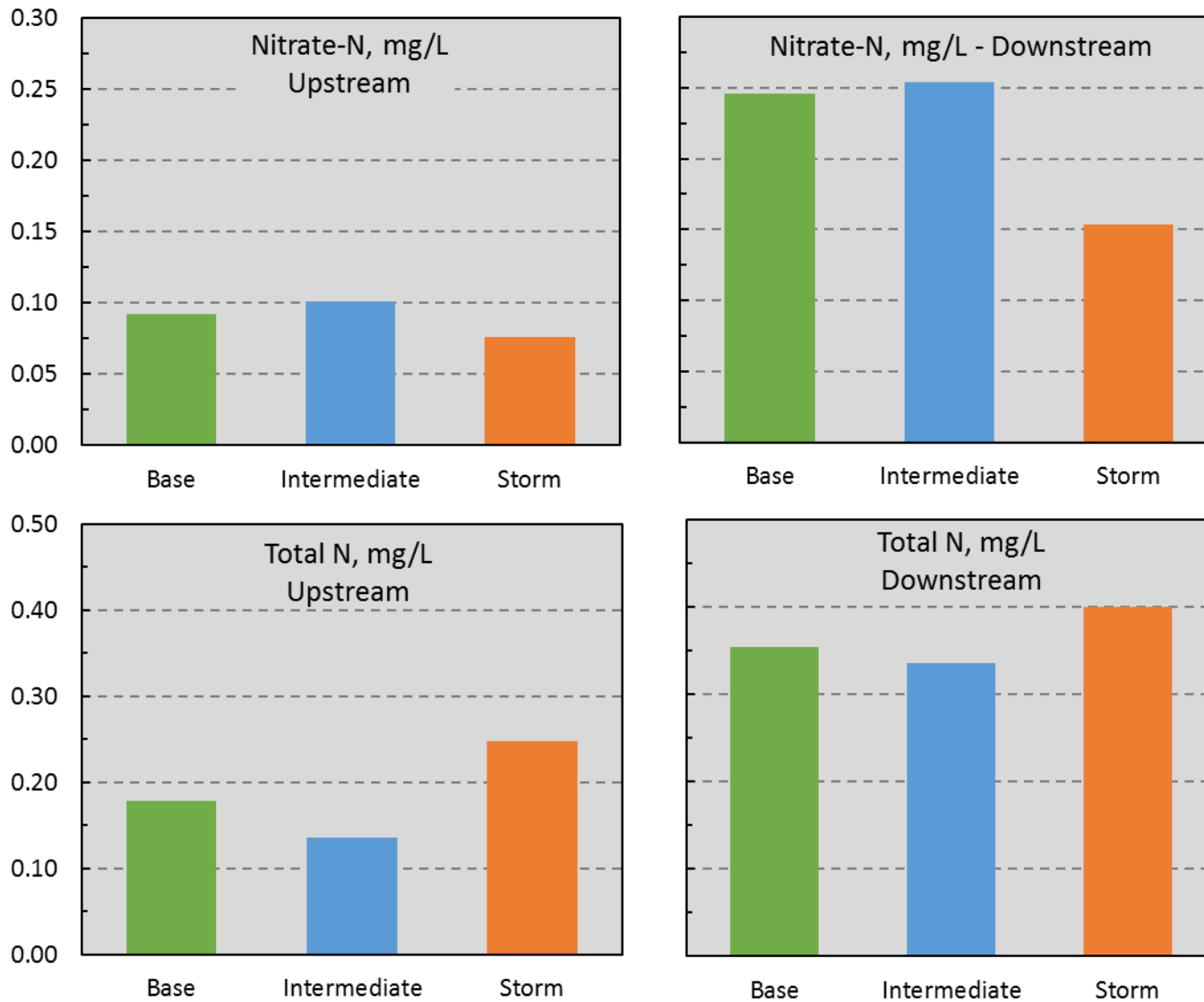


Figure 10. Geomean nitrate-N and total N concentration as a function of flow regime in Big Creek upstream and downstream of the C&H Farm, Newton County, AR.

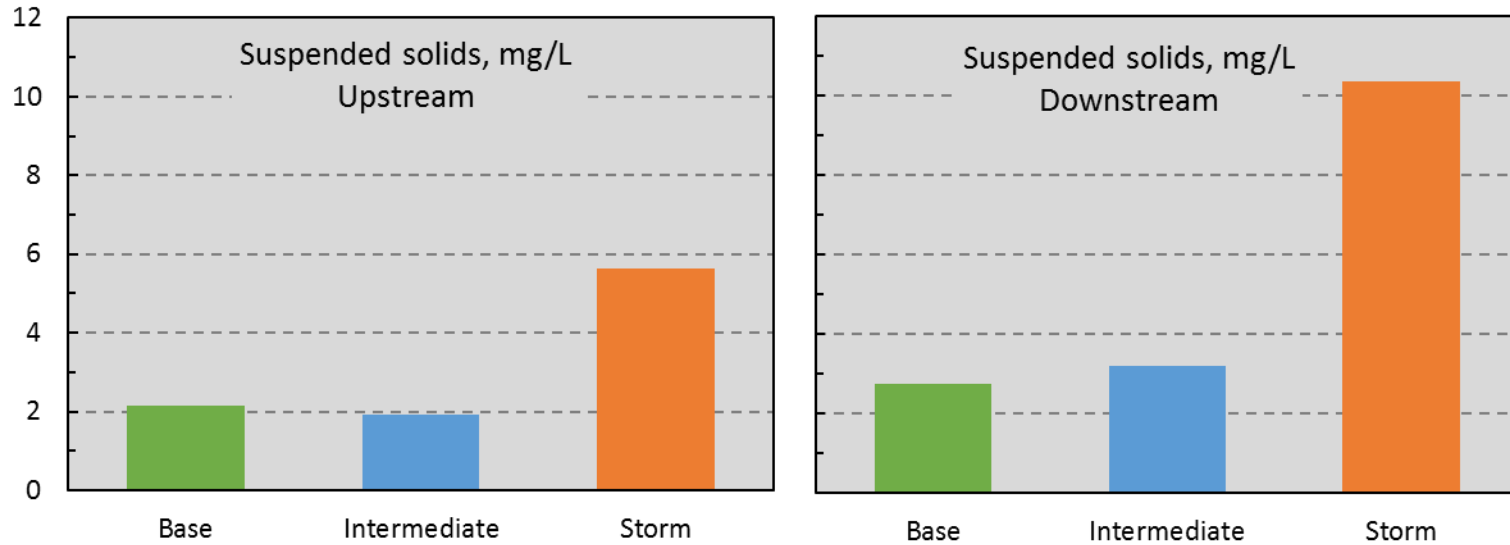


Figure 11. Geomean suspended solid concentration as a function of flow regime in Big Creek upstream and downstream of the C&H Farm, Newton County, AR.

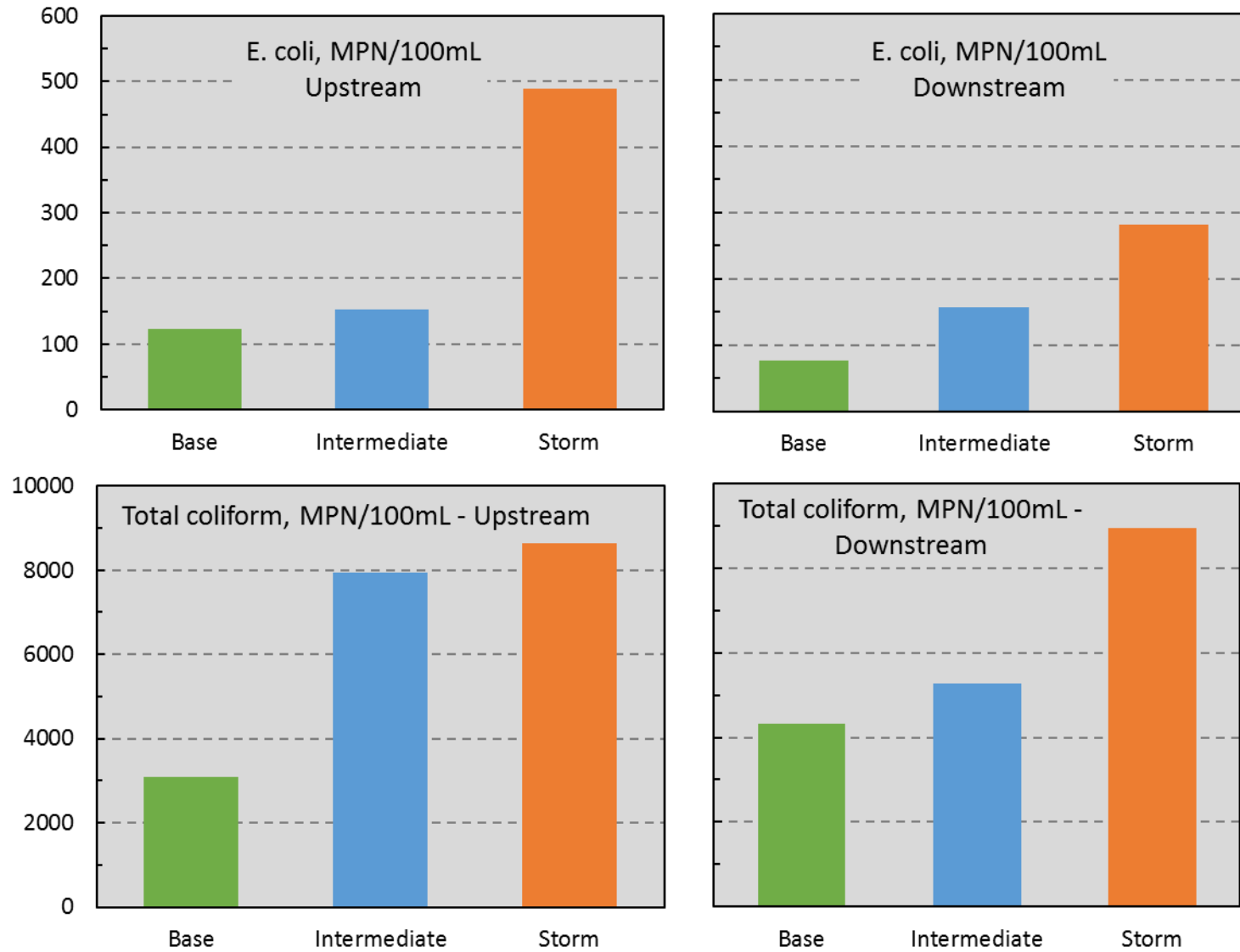


Figure 12. Geomean E. coli and total coliform concentration as a function of flow regime in Big Creek upstream and downstream of the C&H Farm, Newton County, AR.



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