

LEVEL ONE WATER-QUALITY INVENTORY AND MONITORING

**APPOMATTOX COURT HOUSE
NATIONAL HISTORICAL PARK (APCO), VIRGINIA**



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INTRODUCTION

The U.S. Geological Survey conducted a Level 1 Water-Quality Inventory and Monitoring (WAQIM) data-collection effort for Appomattox Court House National Historical Park (APCO) from March 1999 through December 1999. The primary objective of the WAQIM program was to provide the National Park Service (NPS) and APCO with at least a nominal inventory of its natural resources and to provide those data in a data-management system consistent with park management needs. Water-quality inventory data (physical, chemical, and biological) were collected from “key” water bodies within the boundaries of APCO. The key water bodies are those waters within park boundaries that are essential to the central cultural, historical or natural resources management themes of the parks or provide habitats to threatened or endangered plants and animals. Data were collected during the fall, winter, spring, and summer over a range of hydrologic conditions. Because of the drought conditions that persisted during the study period, variations in flow between seasons were less pronounced than during normal hydrologic conditions.

Appomattox Court House National Historical Park (APCO) encompasses approximately 1,700 acres of rolling hills in rural central Virginia, located 2 miles northeast of Appomattox, Va. Within this park is where Robert E. Lee, commanding general of the Army of Northern Virginia, surrendered his men to Ulysses Grant, general-in-chief of all United States forces, on April 9, 1865. The park contains two perennial streams: Appomattox River and Plain Run Branch. The headwaters for both water bodies are located just outside of the park. The Appomattox River originates west of the park, flows across the park’s west boundary, and flows out of the park at its east boundary. Plain Run Branch originates to the southwest of the park, flows across the park’s southwest boundary, and flows into the Appomattox River within park boundaries.

Land uses adjacent to the park boundary range from forested to urbanized. Various forms of livestock practices are being used around and within the park boundaries. Potential threats to water-quality in the park include: (1) encroaching development and (2) agricultural activities. Parameters most sensitive to these potential water-quality threats include nutrients and bacteria. Data-collection sites and the parameters analyzed were selected based on the spatial distribution of land-use activities inside and immediately outside of the park’s boundaries and the nature of the potential threats to park water-quality.

DESCRIPTION OF INVENTORY PROCESS

Site Descriptions

The water-quality inventory for APCO included the periodic collection of physical, chemical, and microbiological data from two sites on the Appomattox River and two sites on Plain Run Branch (fig. 1). These sites are: (1) Appomattox River at State Route 656 near Appomattox, Va (0203879450), (2) Appomattox River at East Park Boundary near Appomattox, Va (0203880250), (3) Plain Run Branch at Appomattox, Va (0203880090), and (4) Plain Run Branch at Mouth near Appomattox, Va (0203880175). Data-collection activities were conducted in March, June, September, and December 1999. Appomattox River at State Route 656 near Appomattox, Va (0203879450) is located at the northwest boundary of APCO about 20 feet downstream from SR 656. Surrounding land use includes pasture, agriculture, and light rural development. Access is via SR 656 approximately 0.5 miles north of SR 24. Appomattox River at East Park Boundary near Appomattox, Va (0203880250) is located at the east boundary of

APCO. Stream width is typically less than 25 feet. Surroundings include moderately wooded areas and meadows. Access is via park trail on northeast boundary of park. Plain Run Branch at Appomattox, Va (0203880090) is located at southwest boundary of APCO. Stream width is typically less than 8 feet. Surroundings include light industry, recent excavation, and US 460 upstream. Access is via business/trailer park road 0.5 miles south of SR 24. Plain Run Branch at Mouth near Appomattox, Va (0203880175) is located within APCO boundaries approximately 50 feet upstream from the confluence with the Appomattox River. Stream width is typically less than 20 feet. Surroundings are moderately wooded, with SR 24 located immediately to the west of the stream. Access is via SR 24.

Description of Data Collection

Data-collection and analysis were conducted according to standard USGS protocols (U.S. Geological Survey, 1997, 1998, 1999; Rantz and others, 1982). Stream water-quality samples were collected as point samples or cross-sectional depth-integrated samples, depending on streamflow conditions. Discharge, water temperature, pH, specific conductivity, dissolved oxygen, and alkalinity were measured at every site on every visit. Water samples were collected and analyzed for nutrients and bacteria at every site on every visit. Samples were collected and analyzed for major ion and trace element analysis on one visit. Also, during each data-collection trip, quality control/quality assurance (QA/QC) samples were collected and analyzed to insure data quality. Field blanks and duplicate samples were routinely employed for all analytical methods.

Table 1. Data-collection schedule

Parameter	Data collection period			
	March 1999	June 1999	September 1999	December 1999
Field parameters	X	X	X	X
Fecal bacteria	X	X	X	X
Nutrients	X	X	X	X
Major Ions				X
Trace elements		X		

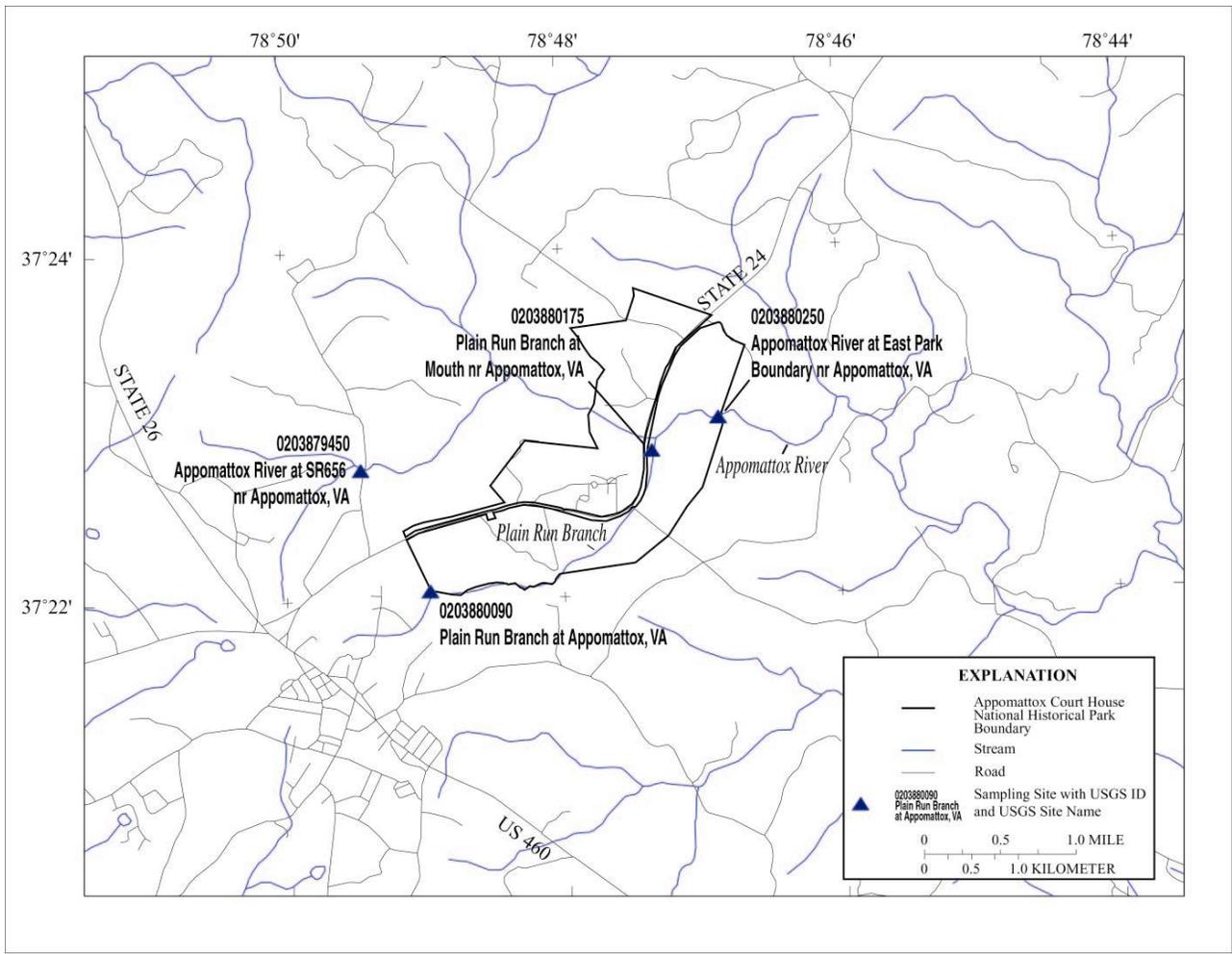


Figure 1. Map of study area and data-collection sites.

PRINCIPAL INVESTIGATORS

The principal investigators of the WAQIM program included staff of the U.S. Geological Survey (USGS), Water Resources Division (WRD) district office in Richmond, Virginia. Michael E. Lewis, Supervisory Hydrologist, supervised all work. J. Michael Gearheart, Hydrologic Technician, implemented all fieldwork. All water-quality samples collected as part of the inventory, with the exception of bacteriological samples, were submitted for analysis to the USGS National Water Quality Laboratory (NWQL) in Denver, Colorado. Bacteriological samples were processed by field personnel at each site and analyzed in the Richmond, Virginia office of the USGS.

WATER-QUALITY RESULTS

Tables 2-6 provide all physical, microbiological, and chemical data collected as part of the APCO WAQIM project. All data are also provided in a Microsoft Excel spreadsheet (WQDATA.XLS). In addition to the water-quality data spreadsheet, three additional supporting documents are included on the attached 3.5-inch diskette: (1) PARAMETER.DOC; (2) STATION.XLS; AND (3) README.DOC. "PARAMETER.DOC" is a Microsoft Word file that explicitly defines each water-quality parameter included in the following tables and in the water-quality data spreadsheet. "STATION.XLS" is a Microsoft Excel file that contains specific location data for each site where water-quality data was collected. "README.DOC" is a Microsoft Word file that contains basic information related to the project such as contact information for those who conducted the work and analyzed the samples.

Table 2. Field parameter data

[ft³/s, cubic feet per second; °C, degrees Celsius; μ S/cm, microsiemens per centimeter at 25 °C; mg/L, milligrams per liter; mg/L as CaCO₃, milligrams per liter as calcium carbonate; <, less than; --, no data]

Date	Time	Discharge (ft ³ /s)	Water temperature (°C)	pH (units)	Specific conductance (μ S/cm)	Dissolved oxygen (mg/L)	Alkalinity (mg/L as CaCO ₃)
Appomattox River at SR656 near Appomattox, VA (0203879450)							
March 1, 1999	12:30	1.4	7.0	7.3	56	11.2	16
June 29, 1999	10:05	0.426	20.8	6.8	68	5.8	21.0
Sept 29, 1999	11:20	2.97	19.2	6.7	70	7.7	20.9
Dec 09, 1999	8:25	0.718	5.9	6.9	58	11.0	--
Appomattox River at East Park Boundary near Appomattox, VA (0203880250)							
March 1, 1999	15:00	6.8	6.9	7.5	76	13.9	21
June 28, 1999	12:55	1.97	24.5	7.4	93	6.5	35.1
Sept 29, 1999	14:30	16.1	19.0	6.9	86	8.2	23.5
Dec 09, 1999	11:10	3.83	4.7	7.5	82	12.1	32
Plain Run Branch at Appomattox, VA (0203880090)							
March 02, 1999	8:50	0.14	5.5	6.9	94	10.6	20
June 29, 1999	15:15	0.081	26.8	6.6	123	7.3	33.5
Sept 30, 1999	8:30	2.72	16.4	7.1	111	8.8	36.9
Dec 08, 1999	13:10	0.108	8.9	6.8	97	12.0	33.2
Plain Run Branch at Mouth near Appomattox, VA (0203880175)							
March 02, 1999	11:45	1.3	5.8	7.5	93	13.1	26
June 29, 1999	17:25	0.357	23.9	7.5	106	5.4	39.6
Sept 30, 1999	11:40	14.8	16.8	7.0	73	9.0	20.0
Dec 08, 1999	15:40	0.862	7.1	7.8	97	11.5	38.5

Table 3. Bacteria data.

[col/100 ml; colonies per 100 milliliters; e, estimated value; >, greater than; K, non-ideal colony count]

Date	Time	Total coliform (col/100 ml)	Fecal coliform (col/100 ml)	Fecal streptococcus (col/100 ml)
Appomattox River at SR656 near Appomattox, VA (0203879450)				
March 1, 1999	12:30	410	330	340
June 29, 1999	10:05	2,900	1,500	2,500
Sept 29, 1999	11:20	3,200	1,900	3,200
Dec 09, 1999	8:25	440K	320K	520K
Appomattox River at East Park Boundary near Appomattox, VA (0203880250)				
March 1, 1999	15:00	240	190	100
June 28, 1999	12:55	1,300	190	230
Sept 29, 1999	14:30	5,300	850	2,700
Dec 09, 1999	11:10	112	55	43
Plain Run Branch at Appomattox, VA (0203880090)				
March 02, 1999	8:50	220e	20K	37K
June 29, 1999	15:15	260	67	>100
Sept 30, 1999	8:30	5,800	1,200	2,200
Dec 08, 1999	13:10	48	12K	16K
Plain Run Branch at Mouth near Appomattox, VA (0203880175)				
March 02, 1999	11:45	110K	43K	10K
June 29, 1999	17:25	920	170	260
Sept 30, 1999	11:40	6,200	850	2,100
Dec 08, 1999	15:40	62	7K	25K

Table 4. Nutrient data

[mg/L, milligrams per liter; N, nitrogen; P, phosphorous; < less than; e, estimated value]

Date	Time	Nitrogen, nitrite, dissolved (mg/L as N)	Nitrogen, nitrate + nitrite, dissolved (mg/L as N)	Nitrogen, ammonia, dissolved (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, ammonia + organic, dissolved (mg/L as N)
Appomattox River at SR656 near Appomattox, VA (0203879450)						
March 1, 1999	12:30	0.01	0.35	<0.02	0.3	0.2
June 29, 1999	10:05	<0.01	0.52	0.05	0.3	<0.1
Sept 29, 1999	11:20	<0.01	0.22	0.05	0.7	0.4
Dec 09, 1999	8:25	<0.01	0.39	0.03	0.2	0.2
Appomattox River at East Park Boundary near Appomattox, VA (0203880250)						
March 1, 1999	15:00	0.02	0.28	<0.02	0.2	0.1
June 28, 1999	12:55	<0.01	0.48	0.02	0.2	0.1
Sept 29, 1999	14:30	<0.01	0.26	<0.02	0.4	0.3
Dec 09, 1999	11:10	<0.01	0.39	<0.02	0.2	0.1
Plain Run Branch at Appomattox, VA (0203880090)						
March 02, 1999	8:50	0.01	0.89	<0.02	0.06e	0.06e
June 29, 1999	15:15	<0.01	0.65	0.04	0.2	0.2
Sept 30, 1999	8:30	<0.01	0.49	<0.02	0.5	0.4
Dec 08, 1999	13:10	<0.01	0.90	<0.02	0.2	0.08e
Plain Run Branch at Mouth near Appomattox, VA (0203880175)						
March 02, 1999	11:45	0.01	0.14	<0.02	0.1	0.08e
June 29, 1999	17:25	<0.01	0.38	0.02	0.1	0.07e
Sept 30, 1999	11:40	<0.01	0.14	<0.02	0.4	0.3
Dec 08, 1999	15:40	<0.01	0.19	<0.02	0.1	0.07e

Table 4. Nutrient data--Continued.

[mg/L, milligrams per liter; N, nitrogen; P, phosphorous; < less than; e, estimated value]

Date	Time	Phosphorus, total (mg/L as P)	Phosphorus, dissolved (mg/L as P)	Orthophosphate, dissolved (mg/L as P)
Appomattox River at SR656 near Appomattox, VA (0203879450)				
March 1, 1999	12:30	0.027	0.009	<0.01
June 29, 1999	10:05	0.028	0.01	0.01
Sept 29, 1999	11:20	0.085	0.029	0.02
Dec 09, 1999	8:25	0.016	0.008	<0.01
Appomattox River at East Park Boundary near Appomattox, VA (0203880250)				
March 1, 1999	15:00	0.018	0.006	<0.01
June 28, 1999	12:55	0.027	0.01	0.01
Sept 29, 1999	14:30	0.053	0.017	0.01
Dec 09, 1999	11:10	0.009	0.006	<0.01
Plain Run Branch at Appomattox, VA (0203880090)				
March 02, 1999	8:50	0.007	<0.004	<0.01
June 29, 1999	15:15	0.017	<0.004	<0.01
Sept 30, 1999	8:30	0.043	0.013	<0.01
Dec 08, 1999	13:10	0.014	<0.006	<0.01
Plain Run Branch at Mouth near Appomattox, VA (0203880175)				
March 02, 1999	11:45	0.01	<0.004	<0.01
June 29, 1999	17:25	0.012	0.008	0.01
Sept 30, 1999	11:40	0.042	0.011	0.02
Dec 08, 1999	15:40	0.006e	0.003e	<0.01

Table 5. Major-element data.
 [mg/l, milligrams per liter, <, less than; --, no data]

Date	Time	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Alkalinity (mg/L as CaCO ₃)	Sulfate, dissolved (mg/L as SO ₄)
Appomattox River at SR656 near Appomattox, VA (0203879450)							
March 1, 1999	12:30	--	--	--	--	16	--
June 29, 1999	10:05	--	--	--	--	21.0	--
Sept 29, 1999	11:20	--	--	--	--	20.9	--
Dec 09, 1999	8:25	4.3	2.1	3.4	1.5	23	1.4
Appomattox River at East Park Boundary near Appomattox, VA (0203880250)							
March 1, 1999	15:00	--	--	--	--	21	--
June 28, 1999	12:55	--	--	--	--	35.1	--
Sept 29, 1999	14:30	--	--	--	--	23.5	--
Dec 09, 1999	11:10	7.3	3.4	4.1	1.4	32	2.2
Plain Run Branch at Appomattox, VA (0203880090)							
March 02, 1999	8:50	--	--	--	--	20	--
June 29, 1999	15:15	--	--	--	--	33.5	--
Sept 30, 1999	8:30	--	--	--	--	36.9	--
Dec 08, 1999	13:10	11	2.2	4.8	1.2	33.2	2.1
Plain Run Branch at Mouth near Appomattox, VA (0203880175)							
March 02, 1999	11:45	--	--	--	--	26	--
June 29, 1999	17:25	--	--	--	--	39.6	--
Sept 30, 1999	11:40	--	--	--	--	20.0	--
Dec 08, 1999	15:40	9.9	3.8	4.7	1	38.5	4.0

Table 5. Major-element data—Continued.
 [mg/l, milligrams per liter, <, less than; --no data]

Date	Time	Chloride, dissolved (mg/l as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO ₂)
Appomattox River at SR656 near Appomattox, VA (0203879450)				
March 1, 1999	12:30	--	--	--
June 29, 1999	10:05	--	--	--
Sept 29, 1999	11:20	--	--	--
Dec 09, 1999	8:25	3.1	<0.1	18
Appomattox River at East Park Boundary near Appomattox, VA (0203880250)				
March 1, 1999	15:00	--	--	--
June 28, 1999	12:55	--	--	--
Sept 29, 1999	14:30	--	--	--
Dec 09, 1999	11:10	3.6	<0.1	23
Plain Run Branch at Appomattox, VA (0203880090)				
March 02, 1999	8:50	--	--	--
June 29, 1999	15:15	--	--	--
Sept 30, 1999	8:30	--	--	--
Dec 08, 1999	13:10	7.5	<0.1	9.5
Plain Run Branch at Mouth near Appomattox, VA (0203880175)				
March 02, 1999	11:45	--	--	--
June 29, 1999	17:25	--	--	--
Sept 30, 1999	11:40	--	--	--
Dec 08, 1999	15:40	4	<0.1	21

SELECTED REFERENCES

U.S. Geological Survey, 1997, 1998, 1999, National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9.

Rantz, S.E., and others, 1982, Measurement and computation of streamflow--v. 1, Measurement of stage and discharge, *with a section on Discharge - Current-meter method*: U.S. Geological Survey Water-Supply Paper 2175, p. 80-183.

