



Appomattox River

An Introduction to the Water Resources of Appomattox Court House National Historical Park

Similar to today, the Appomattox River was a dominant feature on the landscape near the trenches of Petersburg on April 2, 1865 when the Confederate Army of Northern Virginia began its final march. The course of the river led the retreat to the west and shielded them from the Union forces. The armies followed the Appomattox up the Piedmont as it transformed from a broad coastal river to small headwater streams. It was in this landscape and along the headwaters of the Appomattox that General Lee and the Confederate Army surrendered to the Union forces. This is now the site of Appomattox Court House National Historical Park (APCO). Though the park was initially established to protect these historically significant areas, it also

conserves a number of ecosystems and associated natural resources. This brief provides an introduction to the water resources of APCO.

Landscape Setting and Land Use

It is important to describe the landscape surrounding APCO to better understand its water resources. The landscape influences the structure and function of associated water bodies. For example, landscape features determine the number and size of streams or wetlands. Landscapes also play an important role in determining the health of streams. Land use is particularly important because it has a large influence on the protection or pollution affecting a stream.

In all, APCO manages 1,696 acres in the headwater region of the Appomattox River. The river is a tributary of the James River within the greater Chesapeake Bay watershed.

APCO is characterized by gently rolling topography, deeply weathered bedrock, and outcrops alongside the Appomattox River floodplain. Soils within APCO tend to be deep, red in color, and consist primarily of clay, silt, and sandy loams.

Within APCO boundaries, the primary land use class is forest (63.1%),

Headwater Streams

- All of the streams in APCO are headwater streams (i.e. they drain small watersheds).
- Healthy headwater streams are generally well-shaded with fully forested riparian communities.
- In aggregate, headwater streams play a major role in nutrient and sediment delivery downstream.
- These small streams can be highly influenced by riparian disturbance and nearby land use.

followed by agriculture (28.3%), wetlands (4.1%) and developed uses (4.0%) (see land use map and table, page 2). The park supports a substantially higher percentage of forested land compared to the contributing watersheds outside APCO. This is important because forested watersheds and buffers around streams have the ability to improve stream conditions. Forests and buffers can remove nutrients, moderate temperature increases, and protect stream habitats. Approximately 100 acres of the park is in wetlands, including state and globally rare wetland communities.

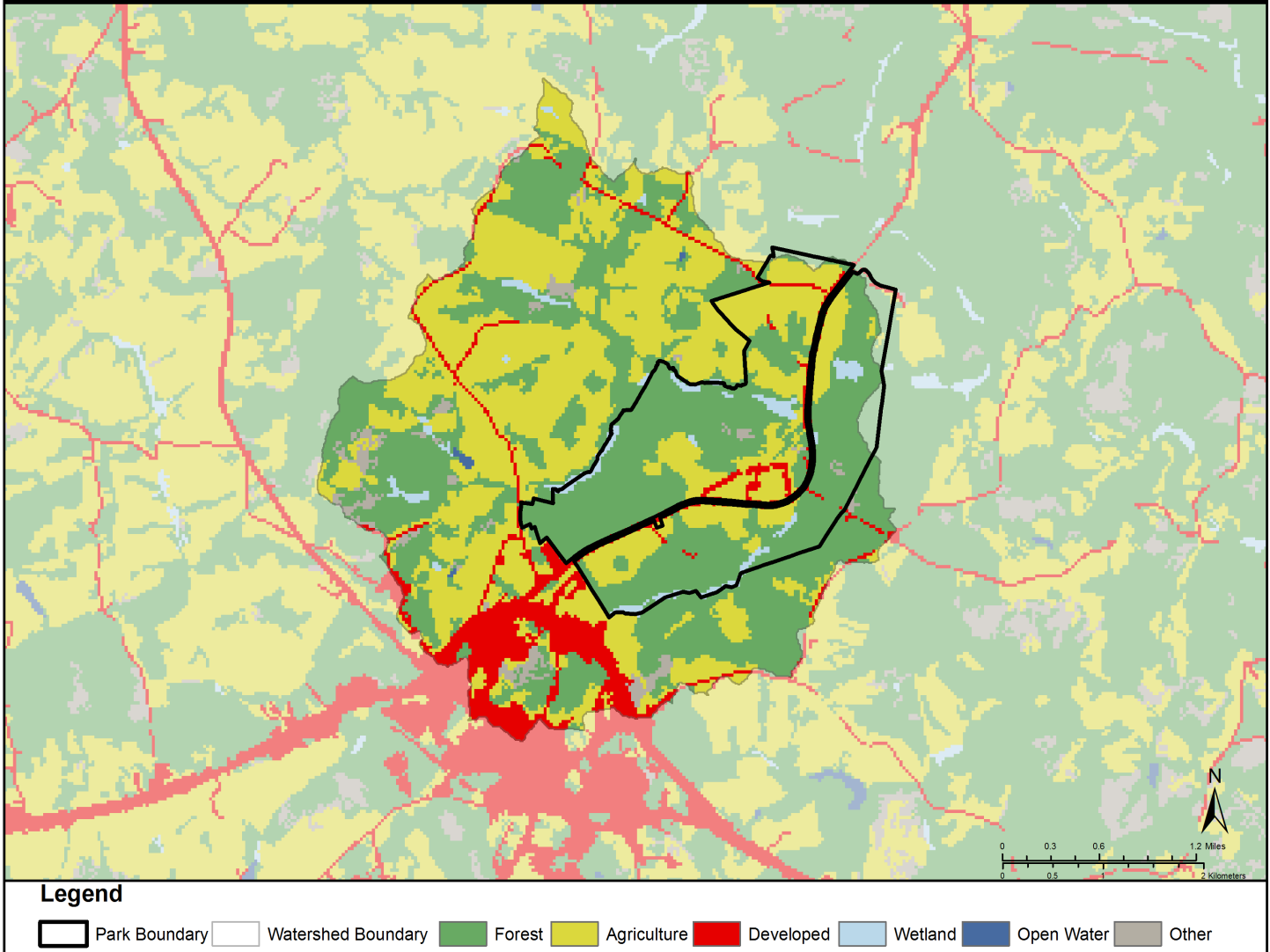
Aquatic Resources

The National Park Service manages approximately 19 km (12 miles) of streams at APCO. As is the case in most watersheds, many of the smallest streams are intermittent and only flow during part of the year.



Plain Run Branch

Appomattox Court House National Historical Park - Land Use



Land Use Type	Within Park		Within Surrounding Watershed		Within 100 m. Riparian Buffer in Surrounding Watershed		Within Chesapeake Bay Watershed	
	%	Area (km ²)	%	Area (km ²)	%	Area (km ²)	%	Area (km ²)
Forest	63.1	4.4	45.8	10.2	58.4	1.1	54.7	91,329
Agriculture	28.3	2.0	40.8	9.1	24.6	0.5	24.6	40,996
Developed	4.0	0.3	9.1	2.0	3.1	0.1	11.0	18,432
Wetland	4.1	0.3	2.1	0.5	13.6	0.3	6.4	10,665
Other	0.5	0.0	2.3	0.5	0.3	0.0	3.3	5,535

Land use map and table. Note that APCO contains a higher percentage of forested lands and wetlands than the surrounding watershed.

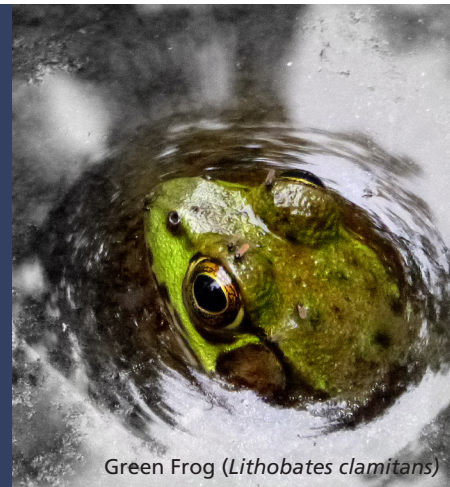
Aquatic Resources continued...

Generally, as these streams channels converge and watersheds increase in size, stream flows become perennial (i.e. year-round). Perennial flows are primarily found in Plain Run Branch and the Appomattox River. All of the streams in APCO are headwater streams (i.e. they drain relatively small watersheds). Headwaters streams play a crucial role in the condition of larger receiving waters downstream. For example, healthy riparian areas in headwater streams can retain excess nutrients and reduce nutrient delivery down-

stream. This benefit can be diminished in streams where land use impacts have altered riparian areas or where impacts cause rainwater to move rapidly from surrounding lands into nearby stream systems (e.g. in urbanized or some agricultural areas). Within APCO, livestock grazing and crop production can increase sedimentation and nutrient delivery downstream. This can also degrade physical habitat for fishes and benthic macroinvertebrates.

Wetlands

Approximately 100 acres of wetlands exist within the park, most being associated with the Appomattox River and its tributaries. Wetlands can serve as natural water “filters” and often support unique biological communities and species. The most common wetland association in APCO is the Piedmont / Mountain Alluvial Forest. APCO is also home to two rare wetland communities, Upland Depression Swamp (globally rare), and the Northern Piedmont / Lower New England Basic Seepage Swamp (state rare). These wetland resources are especially important, and increasingly rare, because substantial wetlands losses have occurred throughout the local area (42% of wetlands were lost from the Appomattox River watershed from 1982 to 1992). The Environmental Protection Agency called attention to this “high level” of wetland loss and attributed urban development as a major threat to aquatic resources within the Appomattox River watershed.



Green Frog (*Lithobates clamitans*)

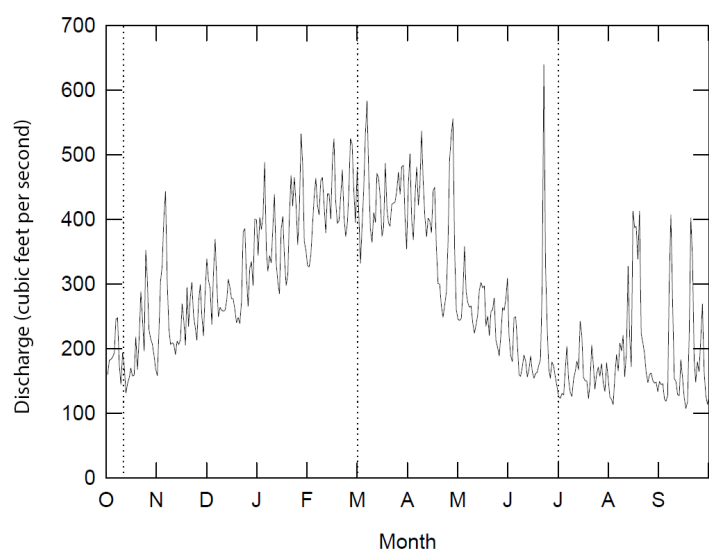
Aquatic Resources continued...

Despite the risks associated with agricultural land uses, biological sampling indicates that APCO streams currently support a relatively rich faunal diversity. Over 25 species of fishes and 19 species of amphibians have been documented. These include a Virginia species of special concern (the mole salamander (*Ambystoma talpoideum*)). Fishes include game and non-game species. Notably, a diversity of darters (Percidae, 4 species) and nest builders (e.g., bluehead chub, central stoneroller) have been found. Many of these species require high-quality habitat free from sedimentation. A total of 67 genera of benthic macroinvertebrates have been documented in APCO, and benthic macroinvertebrate monitoring indicates good ecological condition.

Water Quality Assessments

Limited water quality sampling at APCO in the past indicates moderately healthy stream conditions. Mercury contamination and high levels of fecal coliform (i.e. bacteria) have been observed. During the 2014 assessment cycle, the Commonwealth of Virginia found that the upper Appomattox River failed to meet recreational standards due to bacterial pollution (see Water Quality Impairment box and Map, page 4). There is also some concern regarding erosion and sedimentation associated with agricultural activities and development.

Most recently, the Mid-Atlantic Network Inventory and Monitoring Program (MIDN), has been monitoring water



Hydrograph

The figure above shows a representative hydrograph that reveals patterns of stream discharge (cubic feet per second) for waters in APCO. There is a trend of increasing flow from mid-October to February, followed by a trend of decreasing flow from March – June. The lowest flow period is from July to mid-October. These patterns help interpret stream conditions throughout the year. For example, during low flow periods, dissolved oxygen readings are generally lower. This occurs due to lower stream flows, higher seasonal air and water temperatures, and other associated ecosystem processes.



Water Quality Sampling

Long-term monitoring of water resources in APCO

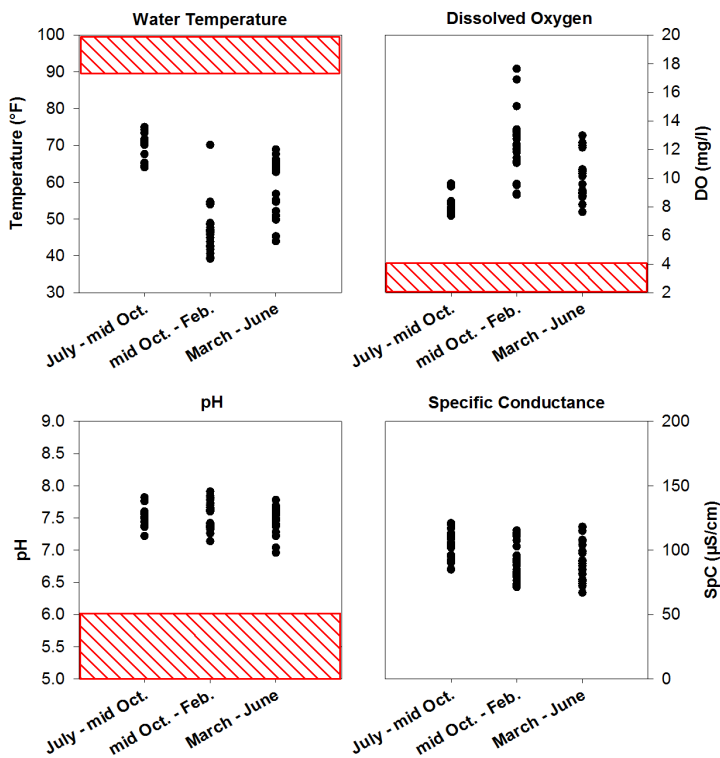
In an effort to monitor the status and trends of wadeable streams at APCO, the Mid-Atlantic Inventory and Monitoring Program (MIDN) has established several long-term monitoring sites. Sites were placed in streams of significant value as determined by APCO and MIDN staff. Three sites are currently monitored by MIDN in APCO: the Appomattox River near HWY 24, Plain Run Branch near its confluence with the Appomattox River, and the Appomattox River at the park’s downstream boundary.

At each of these sites, water temperature, specific conductance, pH, and dissolved oxygen concentrations are measured. Additionally, qualitative observations on site and stream condition are recorded including weather and discharge stage. In some sites, data on benthic macroinvertebrates is also collected.

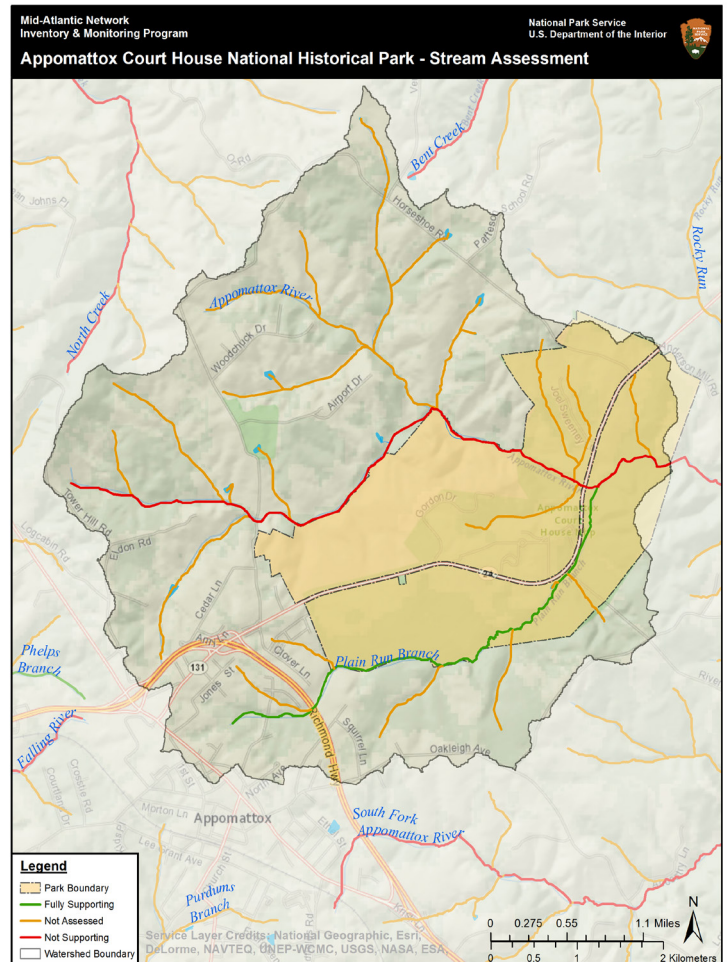
Water Quality Assessments continued...

quality and stream conditions, as well as a benthic macroinvertebrates, in order to assess stream conditions at APCO. As of the publication date of this document, no measured parameters indicated an impaired status with respect to state standards (see Water Quality Impairment box below).

Despite relatively healthy aquatic ecosystems in APCO, continued development and agricultural uses in the watershed may degrade water quality conditions in the future. For additional information, please visit https://science.nature.nps.gov/im/units/midn/monitor/water_quality.cfm.



Scatterplots of water quality parameters in APCO (above). See "Water Quality Impairment" box below for details.



APCO stream assessment map (above). See "Water Quality Impairment" box to left for details.

Water Quality Impairment

Generally speaking, when discussing water quality, the term "impairment" refers to the failure to meet standards established by individual states as required by the Clean Water Act. The figures above show scatterplots for "core" water quality parameters measured in APCO by MIDN (2010-2013). The data are grouped by hydrologic season (see "Hydrograph" box on page 3). Each dot represents a data point. Red hatched areas in the figure indicate where impairment occurs as determined by the Commonwealth of Virginia. (At present, there is no impairment threshold for specific conductance). Based on MIDN data, none of the sites are currently impaired for these parameters. However the Appomattox River does fail to meet state standards for recreation uses due to bacterial contamination (see map, right). It is likely that this contamination occurs due to failing septic systems, livestock, or other sources.



Photos by James Kaval (green frog, page 3) and the National Park Service.

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Parks monitored: Appomattox Court House NHP • Booker T. Washington NM
• Eisenhower NHS • Fredericksburg & Spotsylvania NMP • Gettysburg NMP •
Hopewell Furnace • NHS Petersburg NB • Richmond NBP • Valley Forge NHP