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## **SECTION 3**

### **AFFECTED ENVIRONMENT**

#### **3.1 SOILS**

The *Soil Survey of Frederick County, Maryland* (Natural Resources Conservation Service 2002) shows three soil map units in the project area (Table 3.1 and Figure 3-1). Codorus and Hatboro silt loams are found immediately east of the aqueduct and at the proposed temporary access road crossing the canal prism. The Codorus component makes up 60 percent of this map unit and is moderately well drained. Available water capacity is very high and shrink swell potential is low. This soil is occasionally flooded and is not ponded. The Hatboro component makes up 40 percent of this map unit and is poorly drained. Available water capacity is very high and shrink swell potential is low. This soil is occasionally flooded and is frequently ponded. Lindside silt loam occurs in an area approximately 200 feet east of the aqueduct and 400 feet northwest of the proposed access road. This soil is moderately well drained. Available water capacity is very high and shrink swell potential is low. This soil is frequently flooded and is not ponded. Downsville gravelly loam occurs west of the aqueduct and is well drained. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is not ponded (Natural Resources Conservation Service 2002 and 2006).

#### **3.2 GEOLOGY**

The following description of geology is taken from the *Catoctin Aqueduct Scour Evaluation, Frederick County, Lander, Maryland* prepared by the Maryland State Highway Administration, Engineering Geology Division (MDSHA 2006, see Appendix B) for the NPS.

**TABLE 3.1**  
**SOILS WITHIN THE CATOCTIN AQUEDUCT PROJECT AREA**

<b>Map Unit</b>	<b>Kf</b>	<b>Hazard of Erosion on Roads/Trails</b>	<b>Hydric Soil</b>
Codorus and Hatboro silt loams, 0 to 3% slopes (CgA)	0.37	Slight	No (Codorus) Yes (Hatboro)
Downsville gravelly loam, 3 to 8% slopes (DoC)	0.43	Severe	No
Lindside silt loam, 0 to 3% slopes (LsA)	0.32	Slight	No

Sources: Natural Resources Conservation Service (2002 and 2006).

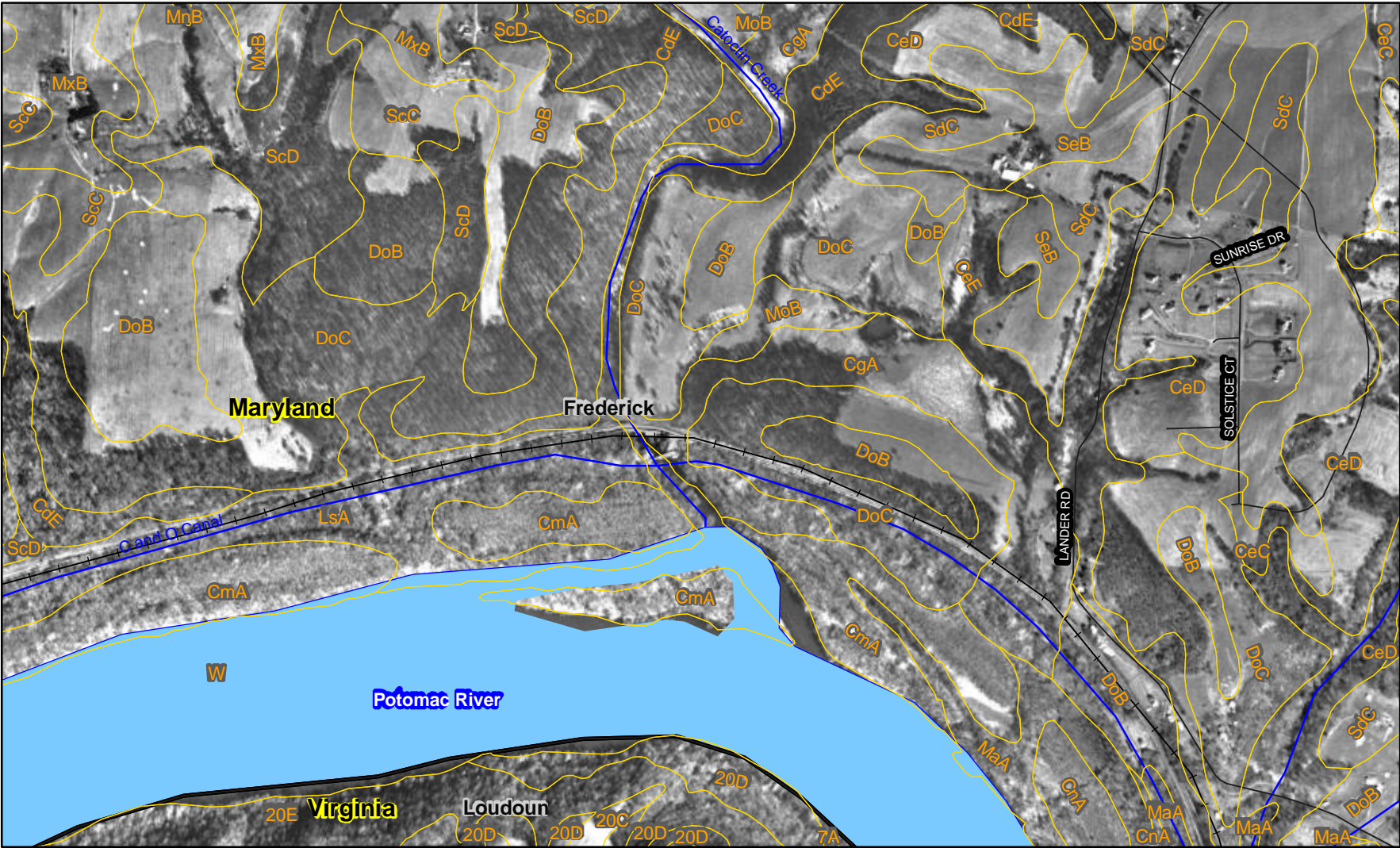
Kf = erosion factor that indicates the susceptibility of a soil's fine-earth fraction to sheet and rill erosion by water. Values can range from 0.02 to 0.69, with higher values indicating higher susceptibility to erosion.

The Catoctin Aqueduct project site is located in the Blue Ridge geological province. The general area is characterized by Neoproterozoic aged rocks (1 to ½ billion years before the present) that have been folded, faulted, and metamorphosed. The folding, faulting, and metamorphism of the Blue Ridge Province is a result of continental drift and the collision of land masses that formed the eastern coast of North America. During this time, intrusions of igneous rock material invaded the area forming multiple diabase dikes. Metamorphic processes of heat and pressure produced the several rock types that are found at the project site. The intermittent upheavals and grinding of rock over this period resulted in a regional shear zone that measures several miles long and wide. Rock types that have resulted from the tectonic forces and metamorphic processes in this area can be classified into three major groups: mylonites; cataclasites; and phyllonites.

The abutments of the Catoctin Aqueduct are situated on the east and west banks of the Catoctin Creek with east and west piers in the stream channel. Both abutments are built on the hard metadiabase intrusions. Several missing stones from the structures can be seen along the waterline; however, the amount of scour beneath the structures is minimal. The channel bottom the structures rest on is described as being rocky and uneven. The geological foundation of the east pier is similar to that of the bridge abutments. The east pier is built on the hard material of the metadiabase dike. Therefore, little scour was detected beneath the structure. The west pier

SOIL SURVEY OF FREDERICK COUNTY, MARYLAND; LOUDOUN COUNTY, VIRGINIA

Figure 3-1 Catoctin Aqueduct Soils



0 100 200 400 Meters

0 300 600 1,200 1,800 2,400 Feet

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has experienced the most structural deterioration of all the aqueduct components; an extensive void is visible above the waterline. Underwater investigation revealed a void on the east side of the structure that measures approximately eight by three by five feet. The material in the channel at this location is described as being gravel-sized, loose and unstable. The characteristics of the geological formation that the pier is built on correlates to the softer mylonite rock that alternates with greenstone within the shear zones.

The underwater inspection report for the Catoctin Aqueduct describes the Catoctin Creek channel bottom around the aqueduct as rocky bottom with silt (W.J. Castle 2006, see Appendix B). Bedrock is visible throughout much of channel in the vicinity of the aqueduct and several rock outcrops are present.

### **3.3 SURFACE WATER QUALITY**

The Catoctin Aqueduct is located within the Upper Potomac Basin and Catoctin Creek watershed (Maryland 8-digit watershed code: 02140305). The watershed includes approximately 122 square miles, 40 percent of which is forested (MD DNR 2007). The aqueduct crosses Catoctin Creek approximately 1,500 feet upstream of its confluence with the Potomac River. Maryland's Water Quality Standards (Code of Maryland Regulations [COMAR] 26.08.02) designate this section of the Potomac River as Use I-P: Water Contact Recreation, Protection of Aquatic Life, and Public Water Supply. This use designation includes waters that are suitable for direct human contact; fishing; growth and propagation of fish (other than trout), other aquatic life, and wildlife; and agricultural, industrial, and public water supply. This section of Catoctin Creek is designated as Use IV-P: Recreational Trout Waters and Public Water Supply. This designation includes all uses identified for Use I-P in waters that have the potential for or are capable of holding or supporting adult trout for put-and-take fishing and managed as a special fishery by periodic stocking and seasonal catching. However, Catoctin Creek is not currently stocked with trout based on recent stocking schedules published by the Maryland Department of Natural Resources (MD DNR 2005 and 2006a). Furthermore, maximum water temperatures in the lower reaches of Catoctin Creek are too high to support trout year-round or to support trout reproduction. Maryland Water Quality Criteria for Use IV-P waters include, but are not limited to the following:

- Dissolved oxygen – not less than 5 milligrams per liter at any time.

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- pH – Not less than 6.5 or greater than 8.5.
  - Turbidity – may not exceed levels detrimental to aquatic life.
  - Temperature – maximum temperature outside a mixing zone may not exceed 75 degrees Fahrenheit or the ambient temperature of the surface waters, whichever is greater. A thermal barrier that adversely affects salmonid fish (trout) may not be established.

The Catoctin Creek channel ranges from about 80 to 100 feet wide in the immediate vicinity of the aqueduct. Average depths under typical flow conditions in this area range from 2 to over 10 feet. The CSX Railroad crosses Catoctin Creek via a double barrel stone masonry arch viaduct (bridge) approximately 190 feet upstream (north) of the aqueduct. A large, deep pool is located between the railroad viaduct and the aqueduct. Hydraulics of the viaduct and aqueduct likely played a role in formation of this pool. The area below the aqueduct is shallower and can be characterized as a long, flat glide or run. Much of the bottom substrate consists of bedrock or silt over bedrock. Bolder, cobble, and gravel substrate is also present. From the aqueduct, Catoctin Creek flows southeast for approximately 1,500 feet to its confluence with the Potomac River. A side channel of the river meets Catoctin Creek approximately 600 feet downstream of the aqueduct. Lands between the aqueduct and river are part of the C&O Canal NHP and are undeveloped, floodplain forest.

Catoctin Creek is on Maryland's 303(d) list of impaired surface waters based on water quality monitoring data that suggest it does not meet or is not expected to meet water quality standards. The listing is based on bacteria, biological, nutrient, and sediment impairment categories. Potential sources of impairment are noted as unknown, non-point, and natural. Catoctin Creek is listed as Category 5 water quality, which means corrective action in the form of a total maximum daily load might be required to address impairment (MDE 2004b and 2006).

### **3.4 FLOODPLAINS**

Executive Order 11988 *Floodplain Management* requires federal agencies to determine whether a proposed action would occur in the 100-year floodplain and to consider alternatives to avoid adverse effects and incompatible development. The objective is to avoid to the extent

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possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. Director's Order #77-2: Floodplain Management (NPS 2003) specifies NPS processes for complying with Executive Order 11988, but does not apply to historic or archeological structures, sites, or artifacts whose location is integral to their significance. The Catoctin Aqueduct is a historic structure and its location on Catoctin Creek is integral to its significance. Therefore, Director's Order #77-2: Floodplain Management does not apply to the Catoctin Aqueduct.

The August 8, 1980, Flood Insurance Rate Map for Frederick County, Maryland Unincorporated Areas, Community Panel No. 240027 0250 B indicates that the Catoctin Aqueduct is located in a Federal Emergency Management Agency regulated Zone A, which designates areas of the approximate 100-year flood, where base flood elevations and flood hazard factors were not determined. The 100-year flood describes an event with a 1 percent chance of occurring in any given year. The Federal Emergency Management Agency map shows that both the Catoctin Aqueduct and the CSX Railroad structure are within the 100-year flood limits of the Potomac River and Catoctin Creek. No other development is located in the immediate vicinity of the aqueduct, but residential structures and associated outbuildings are located off East Boss Arnold Road near the east bank of Catoctin Creek, more than 3,000 feet upstream (north) of the aqueduct. These structures are outside the 100-year flood limits.

A hydrologic and hydraulic analysis was completed in conjunction with this EA to model existing and proposed flood conditions at the Catoctin Aqueduct (see Appendix C). The hydrologic and hydraulic analysis report provides additional information regarding baseline conditions and includes floodplain maps for the area.

### **3.5 VEGETATION**

The Catoctin Aqueduct is located within a maturing floodplain forest that occupies a swath of land between the Potomac River and the CSX Railroad. This section of the Potomac River supports a wide, flat floodplain with two well-developed alluvial terraces. The upper terrace abuts the C&O Canal towpath. Historically, this area experienced various land uses including grazing, logging, farming, and construction of the canal and railroad. The area between the river and railroad now supports various aged floodplain forest communities.

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While the area between the river and railroad supports a narrow swath of relatively unfragmented forest from Point of Rocks upstream to Brunswick, the forests north and west of the railroad are highly fragmented by agricultural and rural residential lands.

Common canopy and sub-canopy trees in the immediate vicinity of the Catoctin Aqueduct include American sycamore (*Platanus occidentalis*), box elder (*Acer negundo*), tulip popular (*Liriodendron tulipifera*), silver maple (*Acer saccharinum*), and red maple (*Acer rubrum*). Black walnut (*Juglans nigra*) and black locust (*Robinia pseudoacacia*) are also present. Common shrubs include spicebush (*Lindera benzoin*) and pawpaw (*Asimina triloba*). Wiegand (2001) reports that the rarely-flooded upper terrace in this area supports a rich and diverse herb layer including Dutchman's breeches (*Dicentra cucullaria*), several species of violets (*Viola* spp.), bloodroot (*Sanguinaria canadensis*), Virginia bluebells (*Mertensia virginica*), and wild blue phlox (*Phlox divaricata*). The forest in the immediate vicinity of the Catoctin Aqueduct contains numerous large trees and has relatively good structural diversity (e.g., well-developed canopy, sub-canopy, shrub, and herbaceous layers). A closed forest canopy is maintained above the towpath in the project area.

The vegetation within the canal prism is similar to the surrounding forest, with a few exceptions. A majority of the prism is characterized by dense understory vegetation such as spicebush (*Lindera benzoin*). While a few mature trees such as American sycamore (*Plantanus occidentalis*), box elder (*Acer negundo*), tulip popular (*Liriodendron tulipifera*) are growing directly in the canal prism, they primarily occur along the edges of the prism. The CSX Railroad parallels the canal to the north, causing a break in the canopy. Invasive plants such as tree of heaven (*Ailanthus altissima*) and multiflora rose (*Rosa multiflora*) are present in some locations along this edge and within the canal prism. In addition, vegetation was cleared in the canal prism east of the aqueduct in the 1970s to stockpile stones from the collapsed aqueduct. Shrubby vegetation and small trees that grew in this area following establishment of the stockpile was subsequently cleared in 2006 to recover and inventory the stockpiled stones.

Small areas on either side of the Catoctin Aqueduct contain grass that is periodically mowed. Areas along the fringes of the towpath also include narrow swaths of maintained grass and various wildflowers. Vegetation immediately north of the railroad includes upland forests and pasture.

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The Maryland Department of Natural Resources is working to identify those undeveloped lands most critical to the state's long-term ecological health. These lands, referred to as Maryland's green infrastructure, provide the natural foundation needed to support diverse plant and animal populations, and enable valuable natural processes like filtering water and cleaning the air to take place. Maryland's statewide Green Infrastructure Assessment has identified and mapped green infrastructure "hubs", which consist of large blocks of undeveloped forest, and "corridors" that connect the hubs. The assessment also provides an ecological ranking system over the entire state. The Catoctin Aqueduct is located in an area mapped as a green infrastructure hub (MD DNR 2006b). The forested lands in the immediate vicinity of the aqueduct are ranked as high or medium ecological value (MD DNR 2006c).

### **3.6 WETLANDS**

Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (hydrophytes), including swamps, marshes, bogs, and similar areas (33 CFR section 328.3[b]; 40 CFR section 230.3[t]). The park staff is required by federal law, NPS policy, and regulations to protect wetlands from adverse impacts or, when adverse impacts to wetlands cannot be avoided, to minimize degradation or loss by every practicable effort (NPS 2002).

Actions that may reduce or degrade wetlands are governed by the Clean Water Act and Rivers and the Harbors Act (33 U.S. Code Parts 1344 and 403, respectively). At the federal level, the U.S. Army Corps of Engineers regulates activities in navigable waters of the U.S., which includes jurisdictional wetlands. In Maryland, wetlands and associated 25-foot buffers are regulated at the state level by the Maryland Department of the Environment under the Nontidal Wetlands regulations (COMAR 26.23.01). Activities in waters of the State, which include 100-year floodplains, are regulated under Maryland's Construction on Nontidal Waters and Floodplains regulations (COMAR 26.17.04). The U.S. Army Corps of Engineers and Maryland Department of the Environment have established a joint permitting process for regulated activities in wetlands, waters of the U.S., and waters of the State. Applicants submit a *Joint Federal/State Application for the Alteration of any Floodplain, Waterway, Tidal or Nontidal Wetland in Maryland* to the Maryland Department of the Environment. The state agency determines the required permits and distributes the application to the U.S. Army Corps



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of Engineers, as necessary. Frederick County, in which the project area lies, relies on existing state and federal laws for the protection of wetlands and waterways.

A field delineation of wetlands has not been conducted in the project area. Figure 3-2 shows potential wetlands in the vicinity of Catoctin Aqueduct that have been mapped by the Maryland Department of Natural Resources in accordance with the U.S. Fish and Wildlife Service's National Wetlands Inventory program (MD DNR 2006d). These wetlands were mapped by photo interpretation at a scale of 1:12,000. As shown in Figure 3-2, areas south of the C&O Canal towpath are mapped as palustrine forested broad-leaved deciduous, temporarily flooded wetlands and palustrine forested broad-leaved deciduous, seasonally flooded wetlands. Catoctin Creek and the Potomac River are mapped as riverine lower perennial unconsolidated bottom, permanently flooded.

The Maryland Department of Natural Resources mapping does not indicate wetlands within the canal prism in the vicinity of Catoctin Aqueduct. This portion of the canal no longer contains permanent water. Site inspections conducted in October 2006 indicated that small areas of the canal in the project area are seasonally flooded or saturated, and likely meet the criteria to be classified as jurisdictional wetlands (presence of hydrophytes, hydric soils, and hydrology). However, the proposed areas of disturbance in the canal prism were well drained and lacked hydrologic indicators, suggesting that these areas would not be classified as jurisdictional wetlands. Nonetheless, the entire canal prism is considered navigable waters of the U.S. by the U.S. Army Corps of Engineers (personal communication, Joe DaVia, U.S. Army Corps of Engineers, Baltimore District, October 12, 2006) and is within Zone A (100-year floodplain) mapped by the Federal Emergency Management Agency (see Section 3.4). Consequently, proposed activities within the canal prism would be subject to regulation by the U.S. Army Corps of Engineers and Maryland Department of the Environment through the joint federal/state application process described above, regardless of the presence of jurisdictional wetlands. The presence or absence of jurisdictional wetlands would be confirmed during the design and permitting process.

Figure 3-2  
Wetlands in the Vicinity of  
Catoctin Aqueduct


C&O Canal NHP  
Frederick County, MD

## Legend

— C&O Canal Towpath


## Wetlands


 Wetlands of  
Special Concern

 PEM1/FO1C  
Palustrine Emergent Persistent /  
Forested Broad-Leaved Deciduous  
Seasonally Flooded

 PFO1A  
Palustrine Forested Broad-Leaved  
Deciduous, Temporarily Flooded

 PFO1C  
Palustrine Forested Broad-Leaved  
Deciduous, Seasonally Flooded

 R2UBH  
Riverine Lower Perennial  
Unconsolidated Bottom  
Permanently Flooded

 R2US1C  
Riverine Lower Perennial  
Unconsolidated Shore  
Seasonally Flooded

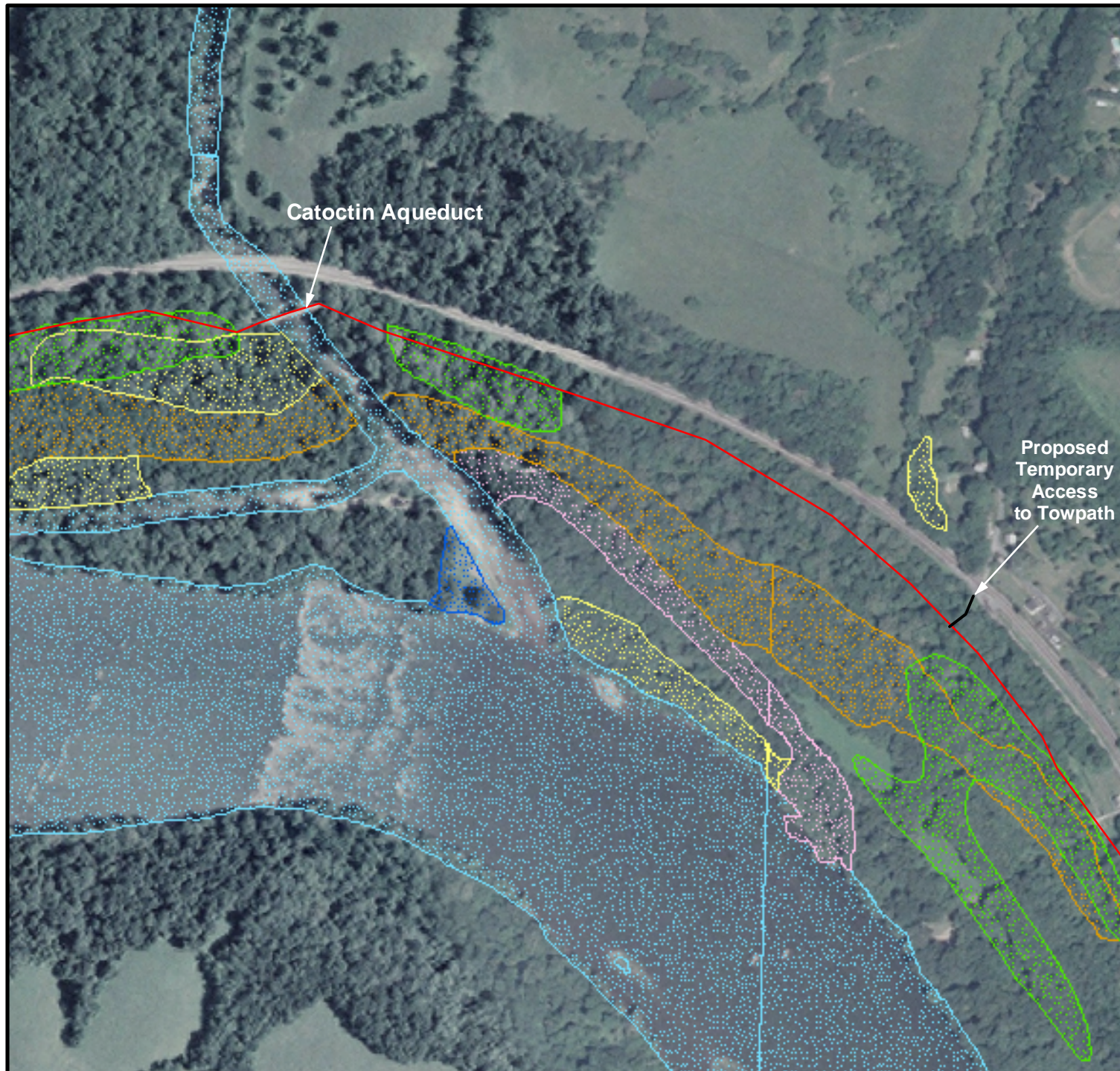
Sources: NWI Wetlands  
2005 USDA Aerial Photography

0 125 250 500  
Feet

1 inch equals 500 feet

Scale: 1:6,000  
Created By: Parsons  
File: Wetlands.mxd  
Date: 1/8/2007

**PARSONS**



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In Maryland certain wetlands with rare, threatened, or endangered species or unique habitat receive special attention. The COMAR (26.23.06) identifies these Wetlands of Special State Concern and affords them certain protections including a 100-foot buffer from development. The Maryland Department of the Environment is responsible for identifying and regulating these wetlands. In general, the U.S. Fish and Wildlife Service's National Wetlands Inventory wetlands provide the basis for identifying these special wetlands. Additional information, determined from field inspections, is used to identify and classify these areas. Review of geographic information system data obtained from the Maryland Department of Natural Resources (MD DNR 2006d) indicates that two areas mapped as Wetlands of Special State Concern are located in the immediate vicinity of the project area and that their 100-foot buffers might extend into the project area. Boundaries of these Wetlands of Special State Concern and their 100-foot buffers would be confirmed during the design and permitting process.

### **3.7 WILDLIFE AND AQUATIC LIFE**

The maturing floodplain forests in the vicinity of the Catoctin Aqueduct provide a relatively large block of undisturbed habitat that is used by a variety of wildlife species. Terrestrial wildlife species that occur in the area include white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), eastern gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), opossum (*Didelphis virginiana*), eastern cottontail (*Sylvilagus floridanus*), and red fox (*Vulpes vulpes*). Many species of reptiles and amphibians such as five-lined skink (*Eumeces fasciatus*), black rat snake (*Elaphe obsoleta*), common garter snake (*Thamnophis sirtalis*), eastern box turtle (*Terrapene carolina*), American toad (*Bufo americanus*), and eastern red-backed salamander (*Plethodon cinereus*) are common throughout the park and region.

Bird species that migrate through or nest in the habitats along the C&O Canal include warblers (*Parulidae*), thrushes (*Turdidae*), and numerous other neotropical migratory species (species that breed in North America and winter south of the United States). Common, year-round bird species include Carolina chickadee (*Poecile carolinensis*), mourning dove (*Zenaidura macroura*), house wren (*Troglodytes aedon*), northern cardinal (*Cardinalis cardinalis*), American crow (*Corvus brachyrhynchos*), and European starling (*Sturnus vulgaris*). A variety of waterfowl, herons, and raptors use the habitats along the Potomac River and Catoctin Creek.

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As discussed in Section 3.5, the floodplain forests in the general project area are maturing, relatively un-fragmented, and exhibit good structural diversity (e.g., well developed canopy, sub-canopy, and shrub layers). Therefore, these forests likely provide important habitat for forest interior dwelling bird species, some of which are also neotropical migrants. Many forest interior species and neotropical migrants have experienced population declines throughout Maryland and the eastern United States. The immediate project area is located close to the forest edge formed by the railroad to the north. As a result, the project area is lower quality forest interior dwelling bird habitat than the forest interior to the south, but is still important habitat for a number of migratory birds. The Migratory Bird Treaty Act prohibits take (i.e., wounding, killing, etc.) of migratory birds, including eggs and occupied nests, even when such activities are unintentional. Executive Order 13186 *Responsibilities of Federal Agencies to Protect Migratory Birds* directs federal agencies to design migratory bird habitat and population conservation measures into agency plans and planning processes; evaluate the effects of actions and agency plans on migratory birds; and develop and use practices that will lessen the amount of unintentional take.

Catoctin Creek and the Potomac River support a variety of aquatic life and a recreational fishery. Common fish species in both systems include smallmouth bass (*Micropterus dolomieu*), channel catfish (*Ictalurus punctatus*), redbreast sunfish (*Lepomis auritus*), bluegill (*Lepomis macrochirus*), American eel (*Anguilla rostrata*), white sucker (*Catostomus commersoni*), and common carp (*Cyprinus carpio*). Common aquatic invertebrates include caddisflies, mayflies, stoneflies, midges, aquatic worms, and crayfish.

### **3.8 RARE, THREATENED, AND ENDANGERED SPECIES**

Table 3.2 provides a list of rare, threatened, and endangered species that have been documented in the general vicinity of Catoctin Aqueduct. During the scoping process for this EA, the U.S. Fish and Wildlife Service indicated that except for occasional transient individuals, no federally proposed or listed endangered or threatened species are known to exist in the project impact area. The Maryland Department of Natural Resources, Wildlife and Heritage Service indicated during the scoping process that populations of white trout lily (*Erythronium albidum*) and Shumard's oak (*Quercus shumardii*), both state-listed threatened species, have been documented very close to the project site. In addition, the Maryland



**TABLE 3.2**

**RARE, THREATENED, AND ENDANGERED SPECIES DOCUMENTED  
IN THE GENERAL VICINITY OF THE CATOCTIN AQUEDUCT**

<b>Species Name</b>	<b>Common Name</b>	<b>Federal Status</b>	<b>State Status</b>
<b>Plants</b>			
<i>Ammannia coccinea</i>	Scarlet ammannia	None	Rare
<i>Arisaema dracontium</i>	Green dragon	None	None <sup>(1)</sup>
<i>Cynanchum laeve</i>	Honeyvine	None	None <sup>(1)</sup>
<i>Ellisia nyctelea</i>	Nyctelea	None	None <sup>(1)</sup>
<i>Erythronium albidum</i>	White trout lily	None	Threatened
<i>Hasteola suaveolens</i>	Sweet-scented indian-plantain	None	Endangered
<i>Hibiscus laevis</i>	Halberd-leaved rose-mallow	None	Watch list
<i>Hydrastis canadensis</i>	Goldenseal	None	Threatened
<i>Smilacina stellata</i> <sup>(2)</sup>	Star-flowered false Solomon's-seal	None	Endangered
<i>Monarda clinopodia</i>	Basal bee-balm	None	Watch list
<i>Phacelia purshii</i>	Miami-mist	None	Watch list
<i>Quercus shumardii</i>	Shumard's oak	None	Threatened
<i>Ruellia strepens</i>	Rustling wild-petunia	None	Endangered
<b>Mussels</b>			
<i>Alasmidonta varicosa</i>	Brook floater	None	Endangered
<i>Strophitus undulatus</i>	Squawfoot	None	In need of conservation

Sources: Maryland Department of Natural Resources letter dated December 7, 2006 (Appendix D), Wiegand 2001, personal communication, Richard Wiegand, March 28, 2007, and Wiegand (2008).

<sup>(1)</sup>Reported as watch list in Wiegand (2001), but is not listed in the current version of *Rare, Threatened, and Endangered Plants of Maryland* (MD DNR 2003).

<sup>(2)</sup>Reported as *Maianthemum stellatum* in Wiegand (2001).

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Wildlife and Heritage Service has documented other state-listed rare, threatened, and endangered plants on or in the immediate vicinity of the project site during recent inventories (Table 3.2) (Wiegand 2001, 2008; personal communication, Richard Wiegand, March 28, 2007). The specific documented locations are not provided in this EA because that information is considered sensitive. Records also exist for two rare mussels downstream from the project site in the Potomac River. The brook floater (*Alasmodonta varicosa*) is a state-listed endangered species and the squawfoot (*Strophitus undulatus*) is a species with "in need of conservation" state status. Consultation correspondence from the U.S. Fish and Wildlife Service and Maryland Department of Natural Resources are provided in Appendix D.

The Maryland Wildlife and Heritage Service conducted additional surveys during 2007 to determine the presence or absence of state-listed plants in the project area and to accurately identify their locations in the general vicinity of the project area. A small population of white trout lily was found on the fringe of the project area. This population was documented more than 20 years ago and its continued existence was confirmed by field surveys in 2007. A very small population of star-flowered false Solomon's-seal was found in the same area during 2007. No other rare plants were documented in the project area during the 2007 surveys (Wiegand 2008).

### **3.9 CULTURAL RESOURCES**

#### **3.9.1 Background Information on Historic Properties**

As defined in the National Historic Preservation Act and its implementing regulations (36 CFR 800), historic properties are those buildings, landscapes, sites, districts, artifacts, and remains that are related to culturally significant places and events, and that are listed in or eligible for inclusion in the National Register of Historic Places. The significance of historic properties is judged by the property's ability to meet the four criteria for inclusion in the National Register of Historic Places, which include:

- Association with events that made a significant contribution to the patterns of our history;
- Association with the lives of persons significant in our past;

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- Sites that embody characteristics of a type, period, or methods of construction or that represent the work of a master, possess high artistic value, or represent a distinguishable entity; or
  - Have yielded or may be likely to yield, information important to prehistory or history.

Properties may be eligible for the National Register for contribution at the national, state, or local level.

### **3.9.2 Cultural Context**

#### **Prehistoric Period**

The region of the Catoctin Aqueduct has been occupied for more than 10,000 years. The prehistoric period is traditionally divided into three major temporal periods on the basis of changes in technology and subsistence. These periods are the Paleoindian (*ca.* 10,000 to 8000 B.C.), the Archaic (*ca.* 8000 to 1000 B.C.), and the Woodland (*ca.* 1000 B.C. to A.D. 1600).

During the Paleoindian Period, the region would have been characterized by open grasslands interspersed with forested zones. These habitats would have been suitable for a high density of grazing and browsing fauna, including the now-extinct megafauna. These herds were hunted along with smaller game, and the Paleoindians' diet was supplemented by a variety of plant resources. The characteristic artifact of this period is the fluted point, often made of chert, jasper, or other cryptocrystalline rock. These points, used to tip spears, are relatively rare in the Mid-Atlantic region, one having been recovered from the broad vicinity of the study area in Arlington, Virginia and two known from the District of Columbia. Their rarity indicates a sparse, sporadic occupation during the Paleoindian Period. Paleoindian artifacts have been identified at sites along the Potomac River (Barse and Weubber 2002; Dent 1991, 1995).

Archaic Period subsistence is characterized by hunting and foraging, and an increasing population density. There was a gradual rise in sea level during this period, accompanying the retreat of the continental ice sheets. This transformed the open grasslands into oak-hickory forests with lowland flooding and marsh formation. The changing environment supported a denser, more varied floral and faunal base. The new marshes became an important focus of

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activity during the Middle Archaic Period, becoming the locus of seasonally specialized procurement areas. During the Late Archaic Period, the rate of sea level rise slowed, resulting in riverine and estuarine environments stable enough to support significant populations of shellfish and finfish. This allowed increased sedentism, as people moved to these riverine and estuarine environments to exploit finfish and shellfish resources. This sedentism is characterized by the appearance of the large, heavy steatite (soapstone) bowls in the artifact assemblage.

Pottery first appeared in the region around 1000 B.C. This innovation defined the beginning of the Woodland Period in this region, which is characterized by increased sedentism, the development of horticulture, and increasingly efficient resource exploitation. By the Late Woodland Period, horticulture played a significant role in the total subsistence system and allowed the establishment and maintenance of permanent year-round settlements. Sedentary villages were established near the fertile soils of the riverine floodplains. Smaller, less permanent sites in a variety of settings indicated that other resources still were being exploited. Fish weirs and other types of special use sites indicate continued reliance on wild resources despite increasing dependence on agriculture (Hahn 1999; Southworth *et al.* n.d.).

## **Historic Period**

Although Europeans began settling in Maryland in 1634, they did not begin moving into the area of what is now Frederick County until the early 1700s (Hornum 2003). The first settlement in the area was a trading post at the mouth of the Monocacy River run by two Frenchmen in 1700. Charles Carroll, a future signer of the Declaration of Independence, founded Carrollton Manor, a 10,000-acre property along the Monocacy and Potomac Rivers in the 1720s. German, English, and Scots-Irish settlers moved into the area, and the population was large enough that Frederick County was created in 1748. Prior to 1800, settlements along the Potomac River usually occurred along regional roads near ferry or ford crossings of the Potomac. Ferries were present on the river to the northwest and south of the site, at Nolands, Spinks/Claphams, and Whites Ferries.

The construction of the C&O Canal and the adjacent Baltimore and Ohio (B&O) Railroad resulted in the prosperity of the small river towns during the nineteenth century. Villages sprang up at basins and locks along the canal, providing a variety of services to the passing canal boats and serving as points of entry for local products to move into the canal



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shipping system. Taverns, mills, stores, and other commercial enterprises were common at these locations.

The C&O Canal began as a commercial effort to link the Potomac and Ohio River valleys. The ambitious canal project began at Washington, D.C. in 1828 and eventually halted at Cumberland, Maryland in 1850. The construction of the canal was besieged with funding problems and labor unrest and never realized its full potential, probably due to the construction of the B&O Railroad, which was the first steam-operated commercial railroad built in the United States. Construction of the railroad also began in 1828 from the Baltimore metropolitan area to Point of Rocks, Maryland, and the main line of the railroad extended from there westward along the Potomac River.

The C&O Canal was hotly contested by the Union and Confederacy forces during the Civil War. A Union gun emplacement that guarded the Catoctin Aqueduct and the B&O Railroad is located on a hill north of the project area (Biemiller 2006).

The potential for historic period remains adjacent to the C&O Canal include seventeenth- and eighteenth-century trading posts, fords, ferry landings, industrial structures, warehouse, and farmsteads. Nineteenth-century maps testify to the potential for historic period archeological sites along the canal itself such as Civil War era camps and picket posts. Anticipated resources would include temporary camps of canal workers, non-extant canal support structures, and the remains of businesses that sprang up along the canal or the military road that preceded it.

### **3.9.3 Previous Investigations**

According to data compiled in the NPS's Archeological Site Management Information System (ASMIS), National Capital Region (NCR), there are a total of 225 archeological sites in the C&O Canal NHP, including 13 in the District of Columbia, 84 in Montgomery County, 21 in Frederick County, 73 in Washington County, and 34 in Allegany County. Six sites are within the project area: the Little Catoctin Creek Site (18FR32), the Catoctin Creek Site (18FR33), the Lander 1 Site (18FR35), the Lander 2 Site (18FR36), the Lander 3 Site (18FR37), and the Catoctin-Lander Rock Shelter Site (18FR7).

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A three-year archeological survey of the easternmost 59 miles of the C&O Canal NHP was conducted from 2003 through 2005 by the Louis Berger Group, Inc. (Fiedel *et al.* 2005). This investigation entailed a wide range of research activities, including archival documentary and cartographic research; geoarcheological auger testing; examination of artifact collections; informant interviews; archeological field investigations at varying levels of intensity (walkover reconnaissance, controlled surface collection, shovel testing, and unit excavation); and laboratory processing and analysis. The estimated area of the 59-mile park segment is 5,700 acres. Of this total area, approximately 1,200 acres were actually surveyed using one or more of these survey methods. Sixteen new sites were identified and recorded; additional fieldwork was conducted in the immediate vicinity of 14 previously known sites.

This study emphasized the importance of discovering sites with multiple deeply buried cultural components, separated by alluvial sediments, guided by a program of geoarcheological survey of the landscapes along the Potomac River. Eleven loci were identified in floodplain areas along the Potomac where auger tests encountered buried A-horizons with either charcoal or artifacts indicative of probable prehistoric occupations. Auger test results were verified by excavation of stratified cultural components at a number of sites. The most important finds were made at the Tuscarora Creek Site (18FR798), where an Early Archaic component was dated to ca. 10,400 calendar years before present, and at the Broad Run Site (18MO572), where a Savannah River complex occupation zone was dated to ca. 4200 calendar years before present.

#### **3.9.4 Archeological Resources**

The archeological survey conducted from 2003 through 2005 included documentary research, cartographic research, walkover reconnaissance, and limited geoarcheological auger testing (total of three auger tests) from Lock 29 (C&O Canal Milepost 50.6) to Catoctin Creek (Milepost 51.1). No prehistoric archeological sites have been recorded within the project area. One prehistoric site (18FR33) occurs in the immediate vicinity of the project area. Surface artifacts observed at this site during the 2003 through 2005 investigations include a few flakes, a rhyolite biface, a chert flake, a stone bowl fragment and a small cord-marked sherd, suggesting a Woodland or possibly Terminal Archaic occupation (Fiedel *et al.* 2005:Volume II:152). Site 18FR33 has not been evaluated to determine its eligibility for listing in the National Register of Historic Places (Fiedel *et al.* 2005:Volume II:178).

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Limited geoarcheological testing (total of three auger tests) was conducted outside the project area on the Potomac River floodplain terrace during the 2003 through 2005 investigations. Testing immediately west of the mouth of Catoctin Creek and just east of Site 18FR33 indicated buried A-horizons and potential for prehistoric deposits (approximate depth: 49-85 cm) (Fiedel *et al.* 2005:Volume II:152; Wagner 2005:62). No evidence of buried deposits was observed east of the mouth of Catoctin Creek (Fiedel *et al.* 2005:Volume II:152; Wagner 2005:62).

Previous surface and subsurface disturbance associated with construction of the C&O Canal and B&O Railroad precludes the potential for intact prehistoric archeological deposits within much of the project area. The proposed location of the access road leading from the towpath to the eastern bank of Catoctin Creek is the only part of the project area that might not have been disturbed by construction of the canal and towpath. However, the sloping topography in this area suggests low potential for prehistoric deposits.

No historic archeological sites or projected historic sites of particular interest were identified within or in the immediate vicinity of the project area during the 2003 through 2005 investigations (Fiedel *et al.* 2005:Volume II:6). However, isolated historic artifacts associated with canal construction and operation might be present in the project area. The potential for intact historic artifacts in much of the project area is limited by previous surface and subsurface disturbance in the immediate vicinity of the Catoctin Aqueduct. Areas around the aqueduct were disturbed during previous aqueduct stabilization work; construction of the pedestrian bridge and Bailey bridge; construction of water diversion berms within the canal prism on both sides of the aqueduct; and recovery and stockpiling of aqueduct stones following the 1973 collapse. Any historic artifacts within the canal prism are likely buried under several inches of sediment.

### **3.9.5 Cultural Landscape**

The C&O Canal NHP possesses both natural and man-made elements that together constitute a cultural landscape. Important features such as the canal prism, towpath, ancillary support structures, historic vegetation patterns, and elements of the historic circulation system, such as paths, roads, and fences, are all important features that make up the cultural landscape. Alterations to any of these features have the potential to affect the historic character of the landscape. However, alterations that were made during the period of significance for the canal,

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which was the entire time the canal was in operation, do not distract from the historic character of the landscape. Rather, such changes represent the historic evolution of the property.

Character-defining features of the cultural landscape in the project area include the Catoctin Aqueduct, canal prism, and towpath. The cultural landscape in the project area has changed substantially since the C&O Canal ceased operations in 1924. The Catoctin Aqueduct partially collapsed in 1973, diminishing its historic integrity and altering the cultural landscape. The Bailey bridge that currently carries the towpath over Catoctin Creek and the remains (abutments) of a pedestrian bridge detract from the cultural landscape. In addition, this portion of the C&O Canal no longer contains permanent water and natural forest vegetation has grown in the canal prism.

### **3.9.6 Architectural Resources**

The C&O Canal was listed on the National Register of Historic Places in 1971 and the listing was updated in 1979. The canal was constructed between 1828 and 1850 to facilitate commerce between the Potomac and Ohio River valleys and extends 184.5 miles from Washington, D.C. to Cumberland, Maryland. The NRHP-listed Historic District includes the entire length of the canal and towpath and all associated canal-related structures, including bridges, culverts, aqueducts, wasteweirs, turning basins, locks, and lock houses. Contributing features to the Historic District in the project area include the Catoctin Aqueduct remnant, the towpath, the canal prism, a wasteweer, and a culvert (Table 3.3) (NPS 1979, 2006).

The Catoctin Aqueduct, which was constructed from 1832 to 1834, served as part of the C&O Canal system. It is listed in the National Register of Historic Places as a ruin and is on the NPS List of Classified Structures (identification number 011663). The stone masonry aqueduct contributes to the C&O Canal Historic District for its architecture, engineering, commerce, transportation, conservation, and military histories. The stone masonry construction is a character-defining aspect of the aqueduct. Considered one of the C&O Canal's most beautiful structures, the Catoctin Aqueduct was one of the few with an elliptical center arch.

**TABLE 3.3**  
**CONTRIBUTING FEATURES OF THE CHEASAPEAKE AND OHIO CANAL**  
**HISTORIC DISTRICT LOCATED IN THE CATOCTIN AQUEDUCT PROJECT AREA**

<b>Feature Name</b>	<b>Location (Milepost)</b>	<b>Description</b>	<b>Materials</b>	<b>Construction Date</b>
Towpath	51 - 52	8 - 12 foot wide berm with graveled path	Earthen substructure Earthen superstructure	1832 - 1834
Canal Prism	51 - 52	60 feet wide; 8 feet deep	Earthen/stone substructure Earthen/stone superstructure	1832 - 1834
Wasteweir	51.05	8.5 feet high with 3 openings; 12 inch concrete slab at towpath level; original dry laid stone at either end of the weir; wood bracing in weir	Stone/concrete substructure Stone/concrete superstructure	1900
Culvert #79 (Sugartree Branch)	51.09	10 foot span with 5 foot radius	Sandstone/brownstone substructure Sandstone/brownstone superstructure	1835
Catoctin Aqueduct	51.53	130 feet long; 28 feet wide (21 foot wide canal and 7 foot wide towpath); originally three arches: side arches were 20 feet long and middle elliptical arch was 40 feet long; remnants of iron railing	Stone substructure Stone/iron/steel superstructure	1832 - 1834

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The Catoctin Aqueduct is unique among canal aqueducts because of its crooked approach and the fact that it was the site of the first concurrent and adjacent crossing of a major Potomac River tributary by arch rivals, the Chesapeake and Ohio Canal Company and the B&O Railroad. The Catoctin Aqueduct was nicknamed the "crooked aqueduct" due to the sharp curves in the canal at each end of the structure. The structure fell into a progressive deteriorated state upon closure of the canal operations in 1924. It had a major failure in 1973 when a considerable portion of the weakened structure collapsed into Catoctin Creek.

A double barrel stone masonry arch viaduct, currently operated by CSX Railroad, is located in the project area approximately 190 feet upstream (north) of the Catoctin Aqueduct. The B&O Railroad Company was chartered in 1827; the portion of the rail line in the project area was constructed in 1834 (Dunlap 2000). Railroad stations, bridges, tunnels, road arches, and viaducts associated with the railroad have been considered individually NRHP-eligible. However, no NRHP-eligible or listed resources associated with the B&O Railroad are located in the project area.

### **3.9.7 Historic Material**

Historic material includes the physical elements that were combined or deposited to form a property. After the 1973 collapse of the western and center arches of the Catoctin Aqueduct, many of the original dressed stones were recovered from Catoctin Creek, stockpiled in the canal prism east of the aqueduct, and covered with soil. An inventory conducted by the NPS in October 2006 indicated that a majority of the stockpiled stone was from the aqueduct's south elevation (Appendix A).

## **3.10 VISITOR USE AND EXPERIENCE**

The C&O Canal NHP annually hosts millions of visitors (about 3 million in 2005) who come to enjoy its many natural and cultural attributes. The park, paralleling the Potomac River from Washington, D.C., to Cumberland, Maryland, provides easy access for daily users and overnight campers. Park amenities and facilities include interpretive centers, boat ramps, campgrounds, picnic areas, and parking areas. Although the park is open year-round, over 70 percent of visitation occurs between April and October (NPS 2005).

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The designated access point that is closest to the Catoctin Aqueduct is located at Lander (also referred to as Catoctin Station), which is approximately 0.5 miles southeast of the aqueduct. This access point is reached via Maryland Route 464 and Lander Road, and includes parking areas, a boat ramp, the Lander Lock House, and Lock 29. Visitors come to this area to hike, bike, and ride horses on the towpath; fish and boat on the Potomac River; camp at the Bald Eagle Island hiker-biker campsite to the south; and study the historic aspects of the canal and its operation. The NPS does not collect visitor use statistics for the Lander access or Catoctin Aqueduct, but visitation is expected to follow seasonal patterns observed for the entire park. Season, weather, day of the week, and Potomac River flow conditions are likely the key factors that influence the number of visitors that access the park at Lander on any given day.

The Catoctin Aqueduct is located in Section 11 of the park, which is classified as Zone D – Short-Term Remote Zone. Critical characteristics of the desired visitor experience in this area and at the Catoctin Aqueduct include finding solitude in a natural setting and interpreting the C&O Canal's history. Visitors to the Catoctin Aqueduct include those that specifically come to study the structure's historical aspects; towpath users; and paddlers on Catoctin Creek. The aqueduct is also visible to rail commuters while crossing Catoctin Creek on the railroad viaduct approximately 190 feet upstream and outside of the park boundaries. Factors that currently detract from visitor experience include diminished historic integrity of the aqueduct, presence of the metal Bailey bridge, and other visual intrusions to the cultural landscape. While an interpretive wayside provides visitors with information about the Catoctin Aqueduct, many visitors likely do not fully notice the aqueduct ruins beneath the Bailey bridge or fully appreciate its history. Consequently, opportunities to understand and appreciate the canal's history are being missed.

### **3.11 PARK OPERATIONS**

The National Park Service is responsible for maintaining the entire length of C&O Canal NHP. The park has designated access points that serve maintenance, law enforcement, river rescue, emergency medical, interpretive ranger, and other support staff. The park has approximately 100 full-time-equivalent employees, including maintenance personnel, and an annual operations and maintenance budget of approximately \$7.8 million. Routine park operations at and in the immediate vicinity of the Catoctin Aqueduct include towpath maintenance; grass cutting and tree/vegetation maintenance around the aqueduct; inspections of

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the aqueduct ruins and Bailey bridge; and maintenance of the Bailey bridge, including cyclic painting and replacement deck boards.

### **3.12 PUBLIC HEALTH AND SAFETY**

The C&O Canal NHP is responsible for maintaining safe conditions for park visitors and its employees. This not only applies to providing safe facilities, utilities, and grounds within the park, but also includes NPS program and project operations. The towpath and Bailey bridge at the Catoctin Aqueduct provide a safe crossing of Catoctin Creek for hikers, bikers, and horse back riders, as well as access for law enforcement, river rescue, and emergency medical. While park policies prohibit direct visitor access to historic ruins, unauthorized access to unstable portions of the Catoctin Aqueduct ruins is a safety risk.

### **3.13 SOCIOECONOMIC ENVIRONMENT**

The Catoctin Aqueduct is located in Frederick County, Maryland, which had an estimated total population of 220,701 in 2005 (U.S. Census Bureau 2006). Tourism is an important component of Frederick County's economy, with visitors spending approximately \$251 million in 2003 (Frederick News-Post 2005). Many visitors come to the area to enjoy the county's natural and historic environment, which includes the C&O Canal NHP. The county's historic sites and museums are among the top tourist stops. Organizations such as the Tourism Council of Frederick County, Inc. and the Frederick Historic Sites Consortium (a program of the Tourism Council) actively promote cultural tourism in the county.