

## Chapter 2



Daniel Lay/USFWS SCA Intern

*Refuge road*

## Affected Environment

### 2.1 Introduction

### 2.2 Physical Landscape

### 2.3 The Cultural Landscape Setting and Land Use History

### 2.4 Climate

### 2.5 Air Quality

### 2.6 Water Resources

### 2.7 Soundscape

### 2.8 Socioeconomic Landscape

### 2.9 Special Status Areas

### 2.10 Refuge Administration

### 2.11 Refuge Natural Resources

### 2.12 Cultural Resources

### 2.13 Public Uses

## 2.1 Introduction

This chapter describes the current and historic physical, biological, and socioeconomic landscape and resources of James River NWR that the proposed management alternatives could affect. Although the chapter title includes the term “affected,” this chapter does not present the effects of the proposed management actions; Chapter 4, “Environmental Consequences,” outlines those effects. Instead, the environment described here serves as the baseline for comparing the management alternatives in Chapter 3, “Alternatives,” and their effects, which are described in Chapter 4, “Environmental Consequences.”

In this chapter, we first describe the regional landscape, including its historical and contemporary influences, and then we describe the refuge and its resources.

## 2.2 The Physical Landscape

### 2.2.1 Watershed Context

The 4,324-acre refuge is located within the greater Chesapeake Bay watershed, the Nation’s largest estuary. The Chesapeake Bay’s drainage basin of 64,000 square miles (165,759 square kilometers) encompasses parts of the states of Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia, and the District of Columbia.

The James River Basin covers 10,265 square miles (26,586 square kilometers) or approximately 24 percent of Virginia’s total area. The largest of Virginia’s Chesapeake Bay watersheds, the James River Basin is divided into eight U.S. Geological Survey (USGS) hydrologic units (HUCs): Upper James, Maury, Upper Middle James, Rivanna, Lower Middle James, Lower James, Appomattox, and Elizabeth. The 8 HUCs are further divided into 109 waterbodies and 298 sixth-order subwatersheds. James River NWR is located entirely within the Lower James River HUC (HUC 02080206) and within two subwatersheds, JL 09 and JL 11 (VDEQ 2012).

The James River is one of several major tributaries of the Chesapeake Bay watershed. The James River is formed by the confluence of the Jackson and Cowpasture Rivers and flows 340 miles from its headwaters in the mountains of Bath and Highland Counties, Virginia, to the Chesapeake Bay. The refuge is located in the lower third of the James River watershed, and the river defines the refuge’s northern boundary. Powell Creek forms much of the refuge’s western boundary, and the Flowerdew Hundred Plantation is its eastern boundary.

In Virginia, riparian ownership ends at the mean low water mark. Accordingly, Federal ownership and refuge management only extends to the mean low water mark of the James River. All activities in the James River and in areas beyond the mean low water mark are under the jurisdiction of the Commonwealth of Virginia (Tittler 2012 personal communication).

### 2.2.2 Geologic Development

James River NWR lies within the Virginia Coastal Plain Physiographic Province of the Atlantic Coastal Plain, as delineated by USGS. Physiographic

provinces are broad-scale subdivisions based on terrain topography, rock type, and geologic structure and history. The Virginia Coastal Plain Physiographic Province consists of a series of terraces, or scarps, sloping downward toward the coast, with each terrace representing a former shoreline. It is the youngest physiographic province in the State and consists primarily of Holocene (11,700 years ago to present) and Pleistocene (2.6 million to 11,700 years ago) age sedimentary deposits of sand, clay, marl, and shell (USGS 1989). Its principle characteristics are a generally low topographic relief, extensive marshes, and tidally influenced rivers and creeks (USFWS 2007b).

The Virginia Coastal Plain Physiographic Province is separated on its western boundary from the Appalachian Piedmont Physiographic Province by the “Fall Line,” a low, east-facing cliff that parallels the Atlantic coastline from New Jersey to the Carolinas. It separates hard Paleozoic (542 to 251 million years ago) metamorphic rocks of the Piedmont to the west from the softer, gently dipping Mesozoic (251 to 66 million years ago) and Tertiary (65 million to 2.6 million years ago) sedimentary rocks of the coastal plain. This erosional scarp, the site of many waterfalls, hosted flume- and water-wheel-powered industries in colonial times and helped determine the location of major cities such as Philadelphia, Baltimore, Washington, and Richmond. Richmond marks the approximate Fall Line on the James River (USFWS 2007b). The Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDCR Natural Heritage) further subdivides the coastal plain region into northern, southern, inner, and outer Virginia coastal plain to account for the area’s rich variety and distinction of natural community types. The James River NWR lies in the southern inner coastal plain region.

## **2.3 The Cultural Landscape Setting and Land Use History**

Known cultural resources from James River NWR date from the Early Archaic period (8,000 to 6,500 B.C.) through the 20th century (Goode et al. 2009). These resources contribute to further understanding Virginia’s history involving American Indian settlements and subsistence, initial exploration of the James River by Europeans beginning in 1607, plantation society, military history, and post-Civil War rural agriculture.

### **2.3.1 Early American Indian and European Influences**

James River NWR has seven archaeological sites that are known to contain American Indian components dating from the Early Archaic through Late Woodland periods (8,000 B.C. through European contact in 1607). The Archaic period is identified by archaeologists as the period when more localized seasonal settlement and subsistence patterns replaced the broad seasonal migration patterns of the earlier Paleo-Indian period (9,500 to 8,000 B.C.). In Virginia, the transition from nomadic to permanent, year-round settlement also increased dramatically during the Archaic period, as evidenced through the presence of stone bowls and small subsurface features (Goode et al. 2009). The innovation of ceramic technology and the emergence of cultivated plants generally identify the transition to the Woodland period. In Virginia, the Woodland period is also characterized by the large-scale exploitation of shellfish, often visible archaeologically through the presence of mounds of discarded shells (Goode et al. 2009).

The archaeological evidence at James River NWR indicates a strong American Indian presence spanning thousands of years prior to European contact (pre-contact) and continuing into the contact period. Pre-contact sites at James River NWR have yielded artifacts including sand, shell or stone tempered ceramics and stone tools including projectile points. At least two of the sites were used repeatedly from the Middle Archaic through the Late Woodland periods (Goode et al. 2009).



Theodore De Bry

*Engraving of Virginia Indians, based on a watercolor by John White in 1585*

Extensive American Indian settlements near James River NWR are well documented in the colonial period. The James River NWR is situated in what was Weyanoke Indian territory when the English established the colony of Jamestown in 1607 (Rountree et al. 2007). The Weyanoke inhabited both sides of the James River in that area. Shortly after Jamestown was established, the English began taking the lands of Tribes along the James River by force, including Paspahugh, in whose territory Jamestown was situated, Kecoughtan, Warraskoyack, Quiyoughcohannock, and Arrohateck. In 1611, Sir Thomas Dale's forces seized the Appamattuck town, the seat of the female leader Opposunoquonuske, at what became Bermuda Hundred. (<http://www.hmdb.org/Marker.asp?Marker=54254>; accessed June 2014 ). Colonial records show that the Weyanoke were living only on the south side of the river by 1612; they survived decades of English attacks but eventually moved south and left the area permanently after an assault in 1644 (Rountree 1990).

In 1618, Captain Samuel Maycock patented an approximately 1,700-acre plantation along the southern shore of the James River. Maycock's Point, named for him, was located in the present-day James River NWR (Goode et al. 2009). As early as 1705, a ferry across the James River was established at Maycock's Point (Goode et al. 2009). Neighboring land holdings included Powell-Brooke and Flowerdew Hundred, both located adjacent to but outside James River NWR.

### **2.3.2 Historic Occupation of James River NWR over the Past 300 Years**

By the mid-1700s, Virginia was well settled by Europeans along the James River. Plantations were built to support tobacco and corn production from the coast up to Richmond, Virginia. In the early 1800s, a long wharf and warehouse were built on the James River, located partially within the James River NWR. This wharf was used until around 1915 for shipping agricultural products (Goode et al. 2009). During the mid-19th century, settlement within James River NWR was concentrated in the western part of the property and along the James River (Goode et al. 2009).

During the Civil War, land in and around James River NWR was used only intermittently and on a temporary basis. In 1862, Maycock's Point was used by Confederate General Hill to torment Union boat traffic along the James River, with the remains of a battery reported at this location (Goode et al. 2009). After this time, several Federal stations were established along the James River, including at least one near Maycock's Point. In addition, Federal troops passed through James River NWR towards Petersburg after General Ulysses S. Grant's river crossing on to Flowerdew Hundred Plantation in June 1864.

A mill located on Powell Creek that had been damaged during the war was re-opened after the Civil War. It operated until about 1920, fell into disrepair, and collapsed in the 1930s (Goode et al. 2009).

In the early 1900s, large portions of James River NWR were wooded. Development of the property occurred in the 1910s, mainly on the western part of the property. In the early 20th century, an African-American community was located near the intersection of Powell Creek Road (State Route 640) and Bradby Road. Comprised of a school, church, and a few houses, this community was largely demolished by the mid-20th century. One member of the community was a Chickahominy Tribe member named John Bradby, who owned property on the present-day refuge where he lived with his daughter (Goode et al. 2009).

Additional information about specific properties, cultural landscapes, and archaeological resources known to occur on the refuge is provided in section 2.12.

## **2.4 Climate**

### **2.4.1 General Climate Description**

The climate of the middle James River system is humid and subtropical as determined by latitude, topography, prevailing westerly winds, and the influence of the Atlantic Ocean. Prevailing winds are westerly with highest wind speeds in the spring (USFWS 2007b). Average annual temperature fluctuations typically range from a high of approximately 71°F (22°C) to a low of approximately 48°F (9°C). The average monthly temperature ranges from 37°F in January to 83°F in July. Precipitation averages 44 inches (112 cm) annually, with peak rainfall occurring in the summer (see table 2.1). Local annual average relative humidity is 68 percent. Prevailing winds in the spring and summer are from the south-southeast, while those in the fall and winter are from the north-northwest. Local average annual wind speed is 4 mph

(6.44 kph) (<http://www.wunderground.com/history/airport/KPTB>; accessed May 2012). Data available for Hopewell, Virginia (Station 444101) indicates the growing season to be approximately 185 days, and the average annual snowfall is 7.9 inches (20 cm) (SERCC 2012).

**Table 2.1. Monthly Average Temperature and Precipitation for the Refuge Vicinity, 2011**

<b>Month</b>	<b>Average Temperature (in degrees Fahrenheit)</b>	<b>Average Precipitation (in inches)</b>
January	37	1.65
February	48	1.01
March	53	4.47
April	65	1.47
May	70	3.90
June	79	2.61
July	83	7.97
August	80	8.05
September	74	11.13
October	62	2.86
November	55	4.20
December	50	2.30
<b>Annual</b>	<b>40</b>	<b>51.62</b>

(NOAA 2012b)

<sup>1</sup>Data are for the weather station in Hopewell, VA.

## 2.4.2 Global Climate Change and Potential Effects of Climate Change

Global climate change is a significant concern to the Service and to its partners in the conservation community. Climate change is a change in the state of the climate characterized by changes in the mean and/or the variance of its properties, persisting for an extended period, typically decades or longer (IPCC 2007a). There is consensus in the scientific community that climate change is occurring, particularly that the planet is warming and that changes in atmospheric composition are the primary drivers (Bierbaum et al. 2007, USGCRP 2009, EPA 2012). Most scientific papers agree that this warming process has occurred naturally and by means of human activities, primarily economic production activities (Cook et al. 2013, IPCC 2007b).

Increasing greenhouse gases (e.g., water vapor, carbon dioxide, nitrous oxide, methane, ozone) absorb infrared radiation emitted by the Earth's surface, by the atmosphere itself, and by clouds. These gases also trap heat within the surface-troposphere system (IPCC 2007a), heating the Earth's surface and the lower atmosphere. Conservatively, global temperatures are projected to rise between 1.1°F and 7.2°F by the year 2100, relative to 1980 to 1999 levels (IPCC 2007a), and 0.27°F per decade for two centuries after 2100 (Titus and Narayanan 1995).

### General Impacts on Species and Ecosystems

Among the numerous ecological, social, economic, and cultural effects of climate change on species and ecosystems, we believe the following potential climate change impacts are the most relevant to be considered in the management planning process for James River NWR. These potential

impacts may include species range shifts, species extinctions, behavioral or physical changes in species, and shifts in primary productivity periods.

The density of species may change locally and their ranges may shift in response to the need to find areas within their range of tolerance. Plant communities and species adapted to warmer subtropical latitudes are expected to expand and establish beyond the northern edge of their current range (USCCSP 2008). The U.S. Forest Service (USFS) assessed the current and predicted status of 134 tree species following climate change. They combined three global climate or general circulation models to produce high or low averages that can be accessed through an interactive program, the Climate Change Tree Atlas, for displaying the range expansion (or contraction) of suitable habitat for each species by the year 2100 (Prasad et al. 2007-ongoing). Models are provided for common species in the refuge's forests, including loblolly pine, Virginia pine, yellow poplar, American holly, white oak, red oak, flowering dogwood, sweetgum, mockernut hickory, red maple, blackgum, and willow oak. Abundance and distribution of each of the above species is predicted to be affected differently based on different life cycle needs.

According to an analysis of Christmas Bird Count (CBC) data nationwide from the past 40 years, a significant northward shift of winter abundance is occurring among at least 305 bird species in North America (Niven et al. 2009). Of these bird species, 208 shifted north, with 123 species shifting more than 50 miles. Landbirds shifted more than waterfowl or coastal species, with 75 percent of landbirds shifting north an average of 48 miles. Landbirds were further analyzed according to four habitat guilds: woodland, grassland, shrub, and generalist. Woodland birds shifted the most, followed by shrub species, while grassland birds and generalists shifted the least. This study confirmed northward shift of species already suspected, such as red-bellied woodpecker, tufted titmouse, Carolina wren, and northern cardinal, which are all common species at the refuge throughout the year. It may not be possible to separate climate change influences from forest management influences over the 15-year planning horizon of this document.

Changes in phenology (i.e., the timing of such important life history events as flowering, egg laying, and migration) are anticipated. Changes in body sizes and behaviors may occur. Genetic frequencies may shift. In a study that investigated 61 studies on phenology changes of 694 species over the past 50 years, a statistically significant shift toward earlier timing of spring events was evident. Data collected over the last 21 years through a Virginia Commonwealth University (VCU) study indicate that male prothonotary warblers are arriving to the nearby Presquile NWR earlier in the breeding season (an average of one day per year), and the earlier arrival dates are correlated with a rise in average atmospheric temperature on the breeding grounds. Earlier arrival dates may be associated with occupation of better territories and a higher probability of breeding with multiple females (Blem et al. 2007).

Species with short life cycles, such as insects and annual plants, should have fewer problems adapting to climate change because of their more rapid evolution. Longer-lived species such as trees would experience longer evolution timeframes and thus be less adaptable (Rogers and McCarty 2000). Many animal species time important events in their life cycles, particularly

reproduction, so that young arrive when food sources are available. Changes in other phenological events such as flowering or insect hatching could be disastrous for species that fail to adapt in time. The refuge's resilience to climate change can be increased by providing biologically diverse habitats and connected corridors to a diverse species pool that can utilize the refuge habitats.

Species ranges are expected to shift northward or toward higher elevations as temperatures rise, but responses will likely be highly variable depending on species or taxonomic group. Under these rapidly changing conditions, migration ability, not evolution, will determine which species are able to survive. Species that cannot migrate, such as plants, mussels, and amphibians, are vulnerable to temperature shifts and may be affected in their ability to survive, grow, and reproduce. The Virginia Climate Change Strategy for Species of Greatest Conservation Need predicts that there will be significant challenges for species of greatest conservation need. More than 60 percent of species of greatest conservation need are aquatic and another 15 to 20 percent rely on riparian and wetland habitats. Increased sediment load, turbidity, and inputs of herbicides, fungicides, and insecticides are anticipated in the James River (VDGIF et al. 2009).

Some possible positive effects on vegetation from climate change include increased productivity through longer growing seasons, increased precipitation, and increased carbon dioxide fertilization, which will increase primary production and yield greater biomass and soil inputs. Predicted increase in fire frequency (to a degree) would also be beneficial to native grasses that have deep root systems and suppress hardwood species in the understory. Mature trees should fare better because of developed root systems and higher carbon reserves (Swanston et al. 2011).

#### **Sea Level Rise**

In an effort to address the potential effects of sea level rise on national wildlife refuges, the Service ran the Sea Level Affecting Marshes Model (SLAMM) for most Region 5 refuges. Predicted global sea level rise scenarios range from a conservative estimate of 11.8 to 39.4 inches by 2100, to a moderate estimate of 19.7 to 55.1 inches, and to an upper extreme of 72 inches. The SLAMM report for James River NWR indicates that the refuge is vulnerable to the sea level rise scenarios modeled over the next century with some changes to tidal marsh possibly occurring sooner, by 2025 (Clough and Larson 2010). An increase in sea level rise along the higher ends of projections would inundate much of the refuge's tidal-fresh marshes and tidal swamps; the refuge's dry lands, inland-fresh marshes, and non-tidal swamps are expected to be relatively resilient to sea level rise (Clough and Larson 2010).

#### **Increased Wildfire Frequency and Severity**

One of the effects of climate change in the region is increased wildfire frequency and severity (Scholze et al. 2006). Wildfire regimes have also changed due to long periods of fire suppression, forestry practices, and other land management trends, but higher temperatures and decreased precipitation are fundamental to wildfire intensification. Intensified fire regimes modify fish and wildlife habitats, benefiting some species while harming others. However, the risk of catastrophic fire that causes widespread and permanent damage to current ecosystems increases in

warmer and drier conditions.

The Northeast Region of the USFWS entered into a cooperative agreement with NPS, USFS, and Commonwealth of Virginia's Department of Forestry (VDOT) for wildland fire management and Stafford Act response to improve efficiency by facilitating the coordination and exchange of personnel, equipment, supplies, services, and funds among the agreement signatories. We also have agreements in place with TNC and the VDCR Natural Heritage for fire support (Craig 2012 personal communication).

#### **Other Effects**

Observed changes and documented responses in natural and managed systems resulting from climate change are diverse and include the magnitude, timing, distribution, and type of precipitation, with corresponding effects on surface and groundwater resources (IPCC 2007b). Climate change may alter storm frequency and intensity (Henderson-Sellers et al. 1998, Huntington 2006); result in changes in availability, uptake, and toxicity of contaminants and increased sensitivity of fish and wildlife to contaminants (Noyes et al. 2009); alter wildlife disease transmission dynamics and ranges (Acevedo-Whitehouse and Duffus 2009); and result in additional introductions of new invasive species and spread of present invasive species due to climate change (Mooney and Hobbs 2000).

## **2.5 Air Quality**

The U.S. EPA collects emissions data on three common air pollutants that can negatively affect human health and the environment: carbon monoxide, sulfur dioxide, and particulate matter. The U.S. EPA also collects data on three major promoters of criteria air pollutants: volatile organic compounds, nitrogen oxides, and ammonia. These data are summarized in the Air Quality System database, U.S. EPA's repository of criteria air pollutant monitoring data. This database reports the number of days when air quality was good, moderate, or unhealthy for sensitive groups, by stationed county (counties with air quality monitoring stations).

James River NWR is located in the Richmond-Petersburg Metropolitan Statistical Area (MSA) (<http://www.epa.gov/ozonedesignations/2008standards/rec/region3R.htm>; accessed February 2013). The Virginia Department of Environmental Quality (VDEQ) monitors levels of ozone and particle pollution from several stations in Virginia. Air quality in the Richmond-Petersburg MSA was good for the majority of days during 2012 and met the attainment criteria for various air pollutants (EPA 2013). Air quality is measured on the Air Quality Index (AQI). Only one day was rated as "unhealthy" in 2012 in the Richmond-Petersburg MSA, the result of high ozone levels. The AQI, a measurement of air quality, is calculated from measurements of these pollutants over several hours. A higher rating indicates a higher level of air pollution and consequently, a greater potential for health risk. In the Richmond-Petersburg MSA, there were 11 days of "Unhealthy for Sensitive Groups" AQI scores, all due to ozone, and 57 "Moderate" days due mostly to ozone, but also to nitrogen oxides and particulate matter (EPA 2013). Table 2.2 presents the air quality data for the counties near James River NWR. Note

that data for Prince George County overall do not exist, but data for the nearby city of Hopewell are available and presented in the table. No data for Surry or Sussex Counties, or for any cities within either county, are presently available. Data for the nearest other two counties are presented in table 2.2.

**Table 2.2. Air Quality Data from the EPA's Air Quality System Database for Three Jurisdictions near James River NWR, 2012.**

Location	Direction to Refuge	Days Measured	Number (Percent) of Days in 2012 when Air Quality was		
			Good	Moderate	Unhealthy for Sensitive Groups
City of Hopewell	SE	60	60 (100 percent)	0 (0 percent)	0 (0 percent)
Charles City County	N	366	332 (91 percent)	29 (8 percent)	5 (1 percent)
Chesterfield County	NW	260	221 (85 percent)	36 (14 percent)	3 (1 percent)

(<http://www.epa.gov/airdata>; accessed May 2013)

Within a 10-mile radius of the refuge, there are two air quality monitoring stations (EPA 2011). One station is located approximately 8 miles northwest of James River NWR, at the Shirley Plantation (Site 51-036-0002). The other station is located approximately 9 miles west of James River NWR, at 1000 Winston Churchill Drive in Hopewell (Site 51-670-0010). Sulfur dioxide, nitrogen dioxide, particulate matter 0-2.5 micrometers ( $\mu\text{m}$ ), and ozone are currently monitored at Shirley Plantation; lead and particulate matter 0 to 10  $\mu\text{m}$  are currently monitored at the Hopewell site.

The Shirley Plantation monitoring station, VDEQ site designator 75-B, is located approximately 8 miles upstream of the refuge on the James River. It continuously monitors ozone, nitrogen oxide, and sulfur dioxide levels and records values hourly. In 2012, Charles City County had 14 days when air quality monitors recorded ozone concentrations greater than 76 parts per billion (ppb), the health-based air quality standard. Of these instances, seven were in June, four in July, two in August, and one in late May. However, no days in 2012 had a daily average concentration above this threshold; the highest recorded average was 62 ppb.

Located to the west of the refuge, the city of Hopewell is heavily industrialized (<http://www.epa.gov/myenv>; accessed July 2013). During the spring and summer, prevailing winds coming from the west and south-southwest could blow emissions from industrial facilities in Hopewell directly over the refuge. These emissions could pose a threat to plant and wildlife as particulates and other contaminants settle on the refuge (USFWS 2013a). Emissions from industrial sites within 15 miles of the refuge include a broad spectrum of chemicals and metals.

The VDEQ collected data on the long-term cancer and non-cancer risk exposure to the air quality in the Hopewell area using three monitoring stations for 3 years (McMurray and Anthony 2010). All three sites exceeded the benchmark estimated risk probability, which is the chance that a person living near a source would have health risks if exposed to a maximum pollutant concentration for 70 years (EPA 1989). The most important carcinogenic chemicals detected were carbon tetrachloride and formaldehyde.

A suite of non-carcinogenic chemicals were also measured to determine the risk that a person living near the area would develop some negative effect to their health due to exposure to these chemical concentrations. All three sites had a risk level that exceeded the probability of a person developing non-carcinogenic health effects; however, when compared to the rest of the State, the Hopewell area is very similar to other urban areas. The non-carcinogenic compound of greatest concern is acrolein.

According to VDEQ's Division of Air Program Coordination, Charles City, Henrico, Hanover, Chesterfield, and Prince George Counties all are within an ozone maintenance and emission control area for oxides of nitrogen and volatile organic compounds.

Real-time air quality information for the sites in the refuge vicinity are available on the VDEQ's website ([http://vadeq.ipsmtx.com/cgi-bin/aqi\\_map.pl?metro01\\_aqi.png](http://vadeq.ipsmtx.com/cgi-bin/aqi_map.pl?metro01_aqi.png); accessed February 2013).

## 2.6 Water Resources

The 3-mile segment of the James River bordering the refuge to the north is tidal, as are the lower stretches of Powell Creek and Flowerdew Hundred Creek. Average daily amplitudes are approximately 3 feet (0.9 meters). Rain, wind, or full moon tides can cause the river to fluctuate several feet (1 meter) from normal. In refuge vicinity, the river is slightly brackish with salinities ranging from a high of about 25 parts per million (ppm) in the summer to a low of 10 ppm in the winter (USFWS 2004a).

### 2.6.1 Groundwater Quality and Quantity

The Coastal Plain region is the only one in Virginia that is composed mostly of unconsolidated deposits, primarily alternating layers of sand, gravel, shell, rock, silt, and clay. In many places, a shallow unconfined aquifer system lies above relatively impermeable clay beds and is the source of water for hundreds of domestic and other small capacity wells. More groundwater is stored in these very permeable materials than in any other province in the State. The Columbia Aquifer, also known as the water table aquifer, is the uppermost aquifer and is unconfined throughout its extent. It ranges in thickness from 10 to 80 feet and is present only in the central and eastern portions of the region. The top of the aquifer, or the water table, can vary in depth with precipitation and location from just a few feet to 50 feet below the surface. The Columbia Aquifer serves as a reservoir of recharge to the underlying confined aquifers and is an important source of water for rural and domestic users.

As of February 2013, VDEQ is consolidating water well information collected by different State and Federal agencies for a variety of purposes. The number of wells on lands adjacent to the refuge is currently unknown. Any wells that are present can be assumed to be widely used. According to VDEQ (2012c), 3 out of every 10 Virginians use groundwater for their daily water supply. The Coastal Plain physiographic province, where the refuge is located, has abundant, highly used groundwater. However, the potential for groundwater pollution is also high due to geology and population density.

The refuge has one artesian groundwater well, located south of the

equipment shed, which supplies water to spigots at the equipment shed and restroom facility in the hunter check station. Since 2009, the Commonwealth of Virginia Department of General Services has conducted tests on the groundwater well; results indicate an absence of the potentially harmful bacterium, *Escherichia coli* (*E. coli*), found in sewage. Additionally, the Service requires that wells be tested quarterly for total bacteria and annually for nitrates, nitrites, lead, and copper (Guiel 2011 personal communication); results of these tests indicate levels of these constituents are at acceptable levels. Four punch wells and two shallow dug wells are located on the refuge but are not currently in use.

The refuge's groundwater withdrawal well and septic system outflow system are maintained in good working condition and support refuge operations and limited public use on the refuge.

## 2.6.2 Surface Water Quality

Currently 53 percent of the James River's streams are categorized as in good or excellent condition. According to the James River Association's (JRA) State of the James River 2013 report, the overall river health score for the James River has increased 2 percent since 2011. Stream condition and tidal water quality have declined, while submerged aquatic vegetation (SAV) and riparian forests have improved or not declined in recent years. Many streams are still under moderate to severe stress. The tidal James River continues to have excessive algae growth and poor water clarity, meeting the State standard only 10 percent of the time (JRA 2013).

Pollution continues to be the greatest threat to the James River and is tied directly to the decrease in stream condition and tidal water quality. Together, sediment, nitrogen, and phosphorous pollution to the James River and its tributaries can lead to low dissolved oxygen levels, lower water clarity, and algal blooms, which degrade aquatic habitats. Additional best management practices for erosion control could help to reduce sediment loadings to the James River, while reductions in point source nutrients could help to reduce phytoplankton concentrations in the James River (VDEQ 2005).

Water quality, when assessed by biological parameters, presented a varied picture for the James River. Measures of the phytoplankton community were poor to fair throughout much of the river. Benthic organisms, invertebrates that live on the bottom on streams and rivers, met water quality goals at most stations in the main stem of the James River except at one station located 45 miles downstream from the refuge and one station 8 miles upstream of the refuge (VDEQ 2005).

Data on dissolved oxygen, pH, and *E. coli* levels were recorded in Powell Creek along the southwest edge of the refuge from May 9, 2006 to October 3, 2007 (Frederickson 2007 personal communication). Dissolved oxygen levels ranged from a low of 4.6 ppm to a high of 12.2 ppm, with an average of 7.5 ppm. Oxygen levels below 4.0 ppm stress aquatic life. Oxygen depletion is also a major source of fish kills. The pH levels ranged from a low of 6.2 to a high of 7.7, with an average of 7.1 (<http://mddnr.chesapeakebay.net/eyesonthebay/whatsitmean.cfm>; accessed January 2014). These levels represent pH values that would not be stressful to aquatic life. Levels of *E. coli* ranged from a low of 11 colony forming units per 100 milliliters (CFU/100 ml) to a high of 280 CFU/100 ml, with an average

of 81.9 CFU/100 ml, which is below the State standard of 235 CFU/100 ml and indicates that these waters are safe for recreation.

SAV is a critically important component of the aquatic environment in the Chesapeake Bay; its presence and healthiness are indicators of good water quality. SAV covered 55 percent of the 3,408-acre goal set for the James River, a 6 percent increase from 2011 (JRA 2013). Although SAV is thriving in many of the tidal tributaries to the James River and above the Fall Line, there are no SAV beds anywhere on the main stem of the James River from Richmond to the James River Bridge in Newport News (JRA 2011).

Current and historical SAV monitoring data indicate that the James River adjacent to the refuge has not supported SAV at any time between 1971, when monitoring began, and 2011. SAV does not occur along this section of the James River due to polluted and turbid conditions of the water (VIMS 2013). In 2005, a small section of Flowerdew Hundred Creek, just outside the refuge's southeast corner, became vegetated with SAV. This patch has increased in size on an annual basis, growing downstream towards the river, but has not moved further inland into the headwaters of the creek. Powell Creek, along the refuge's western border, has also seen yearly increases in SAV since 2006, when it was first observed. In 2011, SAV was observed to cover the headwaters between 70 and 100 percent in fragmented patches just east of Garysville, on the refuge's southwest corner and throughout the majority of Powell Creek all the way to its mouth at the James River. A small section of the stream, approximately 0.6 miles in length around Eelbank Point, had no observed SAV (VIMS 2013).



Meghan Powell/USFWS

*Tributary to Flowerdew Hundred Creek*

### 2.6.3 Impaired Waterways

In March 2012, VDEQ updated the 305(b)/303(d) Water Quality Assessment Integrated Reports for 2005 to 2010 (VDEQ 2012). The report combined both the 305(b) Water Quality Assessment and the 303(d) Report on Impaired Waters for each major river basin. It describes segments of streams, lakes, and estuaries that violate water quality standards and details the pollutant responsible for these violations, as well as the cause and source of the pollutant, if known. If a waterbody contains more pollutants than allowed by the water quality standards, it will not support one or more of its designated uses. Such waters are considered to have “impaired” water quality. Designated use impairments that were assessed within the watershed include aquatic life, fish consumption, public water supply, recreation, and wildlife, and they are expressed in terms of “river miles” (VDEQ 2010).

The 3-mile segment of the James River bordering the refuge to the north is listed as an impaired waterway for aquatic life and fish consumption uses, due to inadequate benthic community scores and elevated levels of polychlorinated biphenyl (PCB) in fish tissues (VDEQ 2012). In 2011, VDEQ initiated a study of PCBs in the James River in the stretch from Richmond to the Hampton Roads Bridge Tunnel using high resolution/low detection methods. These data have not been published but will be used to establish 2014 total maximum daily load (TMDL) PCBs in the James River (VDEQ 2012). A TMDL is a reduction plan that defines the limit of a pollutant(s) that a waterbody can receive and still meet water quality standards.

Two segments of stream within the Powell Creek subwatershed and Flowerdew Hundred Creek are 303(d) listed as impaired waterways (VDEQ 2010). A small pond and 1.59 stream miles of a tributary at the headwaters of Powell Creek are listed as impaired due to the presence of *E. coli* from an unspecified nonpoint source. The headwaters to the tidal limit of Powell Creek (7.6 stream miles) are not listed as impaired waterways; however, the estuarine area (0.4 square miles) of Powell Creek following the western border of the refuge is 303(d) listed as impaired due to the presence of noxious aquatic plants, organic enrichment, and oxygen depletion. Among the probable sources contributing to its impairment are agriculture, atmospheric deposition of nitrogen, clean sediments entering the waterway, industrial point source discharges, natural plant and wildlife nutrient cycling, loss of riparian habitat, municipal discharges and/or sewage, and stormwater. Numerous tidal areas in the lower James River watershed, including both Powell Creek and Flowerdew Hundred Creek, are 303(d) listed as impaired due to organic enrichment and oxygen depletion. TMDLs have not yet been established for these waterways.

### 2.6.4 Chemical Pollution in Waters and Wildlife

The historic and potential for future chemical pollution of the waters to impact refuge wildlife are noteworthy. Of particular concern is potential contamination of food sources for the bald eagle and waters used in support of refuge operations and public use.

#### DDT

The use of dichlorodiphenyltrichloroethylene (DDT), an organochlorine insecticide, was the primary factor that contributed to the decline of bald eagle populations throughout North America during the 1960s.

Environmental concern about the potential impacts of indiscriminate application of chemicals, especially DDT, grew during the 1960s. DDT was banned for agricultural use worldwide by the 2001 Stockholm Convention on Persistent Organic Pollutants. However, the use of DDT is still permitted in small quantities in countries that need it.

In 1993, a study was conducted to determine if fish in the James River were contaminated by DDT-related pollutants and other pollutants, and if so, if that contamination was posing a possible threat to the James River bald eagle concentration area (Morse et al. 1993). The study analyzed metals, pesticides, polycyclic aromatic hydrocarbons (PAH), and PCBs in live and dead gizzard shad and white catfish. Arsenic, cadmium, copper, and lead concentrations in fish tissue were found to be above the national 85th percentile concentrations obtained through the National Contaminants Biomonitoring Program. Dichlorodiphenyldichloroethylene (DDE), cis-nonachlor, trans-nonachlor, and PCB concentrations were also above the 85th percentile concentrations. At that time, the concentration levels were high enough to cause concern for the stability of bald eagle populations of the James River. The study recommended that fish contaminants continue to be monitored, and that a sediment monitoring program be started as well as an eaglet blood monitoring program (Morse et al. 1993).

### **Kepone**

From 1966 to 1975, the James River and its tributaries from Richmond to Newport News were polluted with Kepone, a chlorinated hydrocarbon insecticide that was produced by the Allied Chemical Company. Since 1975, VDEQ has continually monitored Kepone levels in the James River, the major areas of concern being Kepone levels in the water column, finfish, and sediment of the James River and its tributaries, and in the groundwater in Hopewell. Water column monitoring was discontinued in 1981 after continuous non-detectable results were collected. Since that time, Kepone levels in finfish, ground water, and sediment have decreased. The Virginia Department of Health has established a level of concern of 0.30 ppm Kepone in fish-filet samples. Since 1996, no fish-filet samples from the lower James River have exceeded this level. (VDEQ 2012).

### **Pollution Potential**

Near-surface sources of contamination have the potential to impact groundwater supplies in the upper 100 feet of the coastal plain's shallow regional aquifer, the aquifer from which drinking water is withdrawn in support of refuge operations and public use ([http://pubs.usgs.gov/wri/wri034278/wri03\\_4278.pdf](http://pubs.usgs.gov/wri/wri034278/wri03_4278.pdf); accessed May 2013). The pollution potential in the uppermost unconfined aquifer is high because of the permeability coupled with the high population density and agricultural activities in the area (USFWS 2013a). Based on a review of literature and Virginia Water Control Board records, and other research, there are seven high priority threats to groundwater in Southeastern Virginia: septic systems, underground storage tanks, spills and improper disposal of hazardous materials, surface waste impoundments, landfills, pesticide and fertilizer applications, and saltwater encroachment (USFWS 2013a).

The USFWS evaluated various contaminant sites for the potential risk to trust resources utilizing James River NWR (USFWS 2013a). More than 1,000 sites identified by EPA's data management systems as potential sources of

contaminants were reviewed. However, it was determined that the majority of the 1,000 sites were not of concern to the refuge for various reasons, including distance from the refuge and the improbability of contaminants reaching the refuge, minimally toxic materials are released in small quantities, and operational status. The following sites were retained as part of the contaminant assessment process as contributors to poor water quality in the James River and tributaries: Chesterfield Power, Hercules Hopewell Plant, Honeywell International Inc., Rocktenn, Hopewell Cogeneration Facility and Power Station, Hopewell Wastewater Treatment Plant, Philip Morris, and Proctors Creek Wastewater Treatment Plant (USFWS 2013a). Contaminant concerns in the future will most likely be related to the potential for a spill event to occur in the James River, potentially contaminated areas identified above for which little or no data exists on the presence of contaminants and potential contaminant threats associated with the site, and proposed development in the vicinity of the refuge.

## 2.7 Soundscape

Noise has the potential to impact wildlife populations and the human experience on the refuge. The landscape surrounding James River NWR is comprised of large tracts of forested riparian areas and agriculture lands. Limited gunshots can be heard from adjacent properties during hunting seasons and from a range located west of the refuge.

The natural soundscape of James River NWR is an important natural feature that contributes to the visitor's experience at the refuge. The natural sounds of the refuge change seasonally with vegetation changes and migration, but include the rustling and crunching of leaves, the snapping of twigs, the barking of squirrels, and the drumming of woodpeckers. The calls of a wide variety of birds and frogs add a harmony of pitches and melodies, wind whistles through the forests, and waves may lap gently against the shore or crash into the gravel shores with a dull roar. The natural soundscape of James River NWR is serene and calm, explaining to the listening visitor a great amount of detail about the surrounding ecosystem and wildlife.



*Children hiking*

USFWS

The major human activities that contribute to the soundscape of James River NWR include boat traffic (both recreational and barges), infrequent gunshots during the fall hunting seasons in the areas adjacent to the refuge boundaries, and occasional refuge visitors. The James River supports recreational boating and barge traffic carrying materials up and down the river. Large ships and tugs can occasionally be heard on the main stem of the river from the refuge shore. Bass boats can occasionally be heard within Powell Creek and Flowerdew Hundred Creek. Road traffic from Routes 10, 639, and 640 can be heard, more so during winter, because full foliage in the summer months helps to absorb sound.

Species that occupy the interior of the refuge are likely buffered from any human sound sources that would have a negative impact on their lifecycle. The refuge has a limited trail system, which helps to minimize disturbance from visitors on the refuge.

## **2.8 Socioeconomic Landscape**

### **2.8.1 Regional Socioeconomic Setting**

#### **Regional Demographics**

According to the U.S. Census Bureau (USCB), James River NWR is located within the Richmond MSA. In addition to the city of Richmond, this region includes Prince George County, where James River NWR is located, and the adjacent counties of Charles City, and Chesterfield, and the cities of Colonial Heights, Hopewell, and Petersburg. The city of Hopewell is located 8 miles northwest of the refuge, and Richmond, the largest city in Virginia, is located 30 miles northwest. Surry County, located southeast of the refuge, is located within the Norfolk/Virginia Beach/Newport News MSA.

With its location within the Richmond MSA and close proximity to the population centers of Richmond, Petersburg, Hopewell, and Colonial Heights, James River NWR is considered an urban refuge. According to the Service's Urban Wildlife Refuge Initiative, existing refuges that are located within a 25-mile radius of urban areas are to provide public use benefits associated with fish and wildlife resources that include, but are not limited to, bird watching, fishing, scientific research, environmental education, open space in an urban setting, and protection of cultural resources

(<http://americaswildlife.org/wp-content/uploads/2011/03/Urban-Initiative-Fact-Sheet.pdf>; accessed November 2013).

To understand the constituency that comprises the urban refuge area, table 2.3 provides the regional population demographics, and table 2.4 describes the racial, economic, and linguistic characteristics for the adjacent jurisdictions.

**Table 2.3. Regional Population Demographics**

Jurisdiction	Population	Population Density (people per square mile)	Median Age	Population Change Between 2000 and 2010 <sup>1</sup>
Virginia	8,001,024	203	37.5	+ 13.0 percent
City of Richmond	204,214	3,415	32.0	+ 3.3 percent
City of Hopewell	22,591	2,198	36.5	+ 1.1 percent
City of Petersburg	32,420	1,414	39.8	-3.9 percent
Colonial Heights	17,411	2,315	41.9	+ 3.0 percent
Prince George County	35,725	135	38.0	+ 8.1 percent
Charles City County	7,256	40	46.6	+ 4.8 percent
Chesterfield County	316,236	747	37.6	+ 21.7 percent
Surry County	7,058	25	45.0	+ 3.4 percent

(USCB 2000, 2010a-c)

<sup>1</sup>Population change from 2000 to 2010 is derived by dividing the difference between the population in Census 2010 and the Census 2000 estimates base by the Census 2000 estimates base.

**Table 2.4. Regional Racial, Economic, and Linguistic Demographics**

Jurisdiction	Majority Ethnic Population/ Percentage	Minority Population <sup>1</sup>	Low-income Population <sup>2</sup>	Linguistically Isolated Population <sup>3</sup>
Virginia	White/ 72.4 percent	27.6 percent	10.7 ± 0.1 percent	2.7 ± 0.1 percent
City of Richmond	Black or African-American/ 50.6 percent	49.4 percent	23.7 ± 1.2 percent	1.9 ± 0.2 percent
City of Hopewell	White/ 55.4 percent	44.6 percent	20.1 ± 3.2 percent	1.3 ± 1.0 percent
City of Petersburg	Black or African-American/ 79.1 percent	20.9 percent	21.8 ± 2.7 percent	0.8 ± 0.5 percent
Colonial Heights	White/ 82.3 percent	17.7 percent	7.1 ± 2.1 percent	1.1 ± 0.6 percent
Prince George County	White/ 61.1 percent	38.9 percent	6.5 ± 1.7 percent	0.9 ± 0.6 percent
Charles City County	Black or African-American/ 48.4 percent	51.6 percent	8.9 ± 2.2 percent	0.0 ± 1.4 percent
Chesterfield County	White/ 68.3 percent	38.9 percent	6.1 ± 0.6 percent	2.2 ± 0.2 percent
Surry County	White/ 51.3 percent	48.7 percent	8.5 ± 3.3 percent	0.3 ± 0.4 percent

(USCB 2009, 2010d, 2011)

<sup>1</sup>Minority population includes persons who identified themselves and members in their households as members of the following groups:

- One Race: American Indian and Alaska Native; Asian; Black or African American; Hispanic; Native Hawaiian and Other Pacific Islander; White; or some other race.
- Two or More Races: Any combination of two or more of these race categories.

<sup>2</sup>Low-income population includes the percentage (and percent margin of error) of people whose income over the past 12 months is below the poverty level.

<sup>3</sup>Linguistically isolated population, defined as persons who indicated that they speak English less than "very well," is based on the percentage (and percent margin of error) of households.



LaVonda Walton/USFWS

*Children birdwatching*

Prince George County's population density is less than that for the State and the cities of Richmond and Hopewell, but more than Charles City County, which is on the north side of the James River, opposite the refuge. The county median age is generally the same as that of Virginia and Hopewell, but slightly less than Richmond and nearly 10 years less than Charles City County. A growing area, Prince George County's population increase of approximately 8 percent is greater than that of all the surrounding jurisdictions. The majority of the population identifies as white, which is also the majority demographic for Hopewell. With only 6.5 percent of the population identifying as low income, Prince George County is the most affluent of the jurisdictions around the refuge.

### **Land Use**

James River NWR is located within Prince George County's Rural Conservation Planning Area, which is the county's designated conservation area (Prince George County Planning Commission 2012). The county has adopted regulations and policies to achieve conservation and preservation objectives within Rural Conservation Planning Areas. Land use immediately to the east, south, and west of James River NWR is almost exclusively agriculture (Prince George County Planning Commission 2007). There is a small industrial area on the western border of the refuge, known as the Hitch Sand and Gravel site. Further west, the area is single-family residential.

James River NWR is part of one of the county's five critical environmental areas. These areas have been legislatively defined by the county as "areas of natural, scenic and historic value, including, but not limited to, wetlands, marshlands, shorelands, and floodplains of rivers, lakes and streams, wilderness and wildlife habitats, historic buildings and areas" (Prince George County Planning Commission 2012).

The Prince George County 2012 update to its comprehensive plan includes a future land use map that is generally consistent with the existing land use surrounding the refuge. The town of Garysville, the location of the

Flowerdew Hundred Plantation, is designated as a neighborhood commercial area on the future land use map. This land use category designates those areas where small-scale commercial uses, which provide goods and services designed to meet the needs of the surrounding residential community, are encouraged (Prince George County Planning Commission 2012).

### **Employment**

Virginia's well-developed transportation system and central location along the Atlantic Coast provides access to major markets throughout the United States. Nearly 50 percent of the Nation's population and 50 percent of the manufacturing activity are within 500 miles of Richmond, and the Richmond MSA is a leading manufacturing, finance, trade, and corporate headquarters center in Virginia (VEDP 2008).

In 2005, Forbes Magazine ranked the Richmond area as one of the best places for business and careers in the U.S., primarily due to its highly educated labor force and relatively low business codes. Other areas of the economy that have developed recently include pharmaceuticals, insurance, advertising, biotechnology, education, tourism, health services, and semi-conductors. In 2009, travel and tourism was the fifth largest industry by nonfarm employment in Virginia, with travelers spending \$17.7 billion (VTC 2010). Visitor centers that promote local tourism occur in the cities of Richmond, Petersburg, and Hopewell.

Prince George County is a predominantly rural county, with a designated growth area on the western portion influenced by the southeast metropolitan Richmond area. The largest employment category in Prince George County is services, with manufacturing, and retail and wholesale trade, ranking second and third, respectively. The major industrial employers include distribution facilities for Food Lion, Standard Motor Products, Perdue, Ace Hardware, as well as the Crosspointe Rolls-Royce manufacturing facility. Fort Lee is the major public-sector employer. Commercial farming is a secondary economic factor in the county. Chief crops are soybeans, wheat, corn, and forage (hay), and livestock includes cattle, beef cows, and milk cows (<http://www.nass.usda.gov>; accessed January 2013).

Nearly 75 percent of the county is comprised of forested areas, owned primarily by private individuals or private corporations. Of the 98 timber-producing localities in Virginia, Prince George County ranked 21st in total value of timber products in 2007. These products had an average annual harvest value exceeding \$3.6 million in 2006. Direct and indirect forestry-related employment in the Tri-Cities area exceeded 2,000 jobs in 2007 with a total harvest value in excess of \$73 million (<http://www.princegeorgeva.org/Index.aspx?page=601>; accessed January 2013).

## **2.8.2 Refuge Contributions to the Local Economies**

Recreational visitors to the refuge can affect local income and employment. According to the 2007 "Banking on Nature" report compiled by Service economists, the Refuge System is a major economic engine for local communities (Carver and Caudill 2007). Since the refuge establishment in 1991, visitation has fluctuated with onsite staffing. Visitation estimates have ranged from 1,228 in 1994 to 270 in 2006. Average visitation during the last 8 years (2005 to 2012) is generally around 400 visitors annually (Brame 2013

personal communication). In general, approximately 80 percent of visitors to James River NWR live within a 30-mile radius of the refuge. In 2006, total visitor recreation expenditures at James River NWR were \$17,600, of which 60 percent represented non-residents (Carver and Caudill 2007).

James River NWR further contributes to the regional economy through direct expenditures and refuge revenue sharing payments to Prince George County. National wildlife refuges also contribute to local economies through shared revenue payments. Under the provisions of the Refuge Revenue Sharing Act (the Act of June 15, 1935; 16 U.S.C. 715s), the Service pays an annual refuge revenue sharing payment to counties that contain lands the Service administers. The exact amount of the annual payment depends on Congressional appropriations, which in recent years have tended to be less than the amount to fully fund the authorized level of payments. Recent revenue sharing payments for James River NWR to Prince George County between 2005 and 2012 are presented in table 2.5.

**Table 2.5. Revenue Sharing Payments to Prince George County, Fiscal Years 2005 to 2012**

<b>Year</b>	<b>Acres</b>	<b>Full Payment</b>	<b>Actual Payment</b>	<b>Percent of Full Payment</b>
2005	4,199.58	\$44,385	\$20,660	46.5 percent
2006	4,199.58	\$44,385	\$19,121	43.1 percent
2007	4,199.58	\$44,385	\$19,121	43.1 percent
2008	4,199.58	\$44,385	\$18,490	41.7 percent
2009	4,199.58	\$44,385	\$14,345	32.3 percent
2010	4,323.72	\$126,138	\$13,480	30.4 percent
2011	4,323.72	\$126,138	\$26,993	21.4 percent
2012	4,323.72	\$126,138	\$28,925	22.9 percent

The refuge also contributes indirectly to the economy of Prince George County and the Richmond MSA by protecting wildlife habitat in perpetuity.

## **2.9 Special Status Areas**

### **2.9.1 Federally Designated Special Status Areas**

Federally designated special status areas include wilderness areas, wild and scenic rivers, national parks, national trails, national natural landmarks, research natural areas, experimental research areas, world heritage sites, biosphere reserves, national marine sanctuaries, Class I and Class II clean air areas, and critical habitat for endangered, threatened, and rare species management. Designated areas within a 5-mile radius of the refuge are highlighted below.

#### **Wilderness Area**

As part of the planning process, we also evaluated all the federally owned (in fee title) lands on the refuge for their possible inclusion into the National Wilderness Preservation System. We completed a wilderness review for this CCP, with the recommendation that we not proceed further with a wilderness study because we determined that refuge lands do not meet the criteria for eligibility. Appendix E presents the results of our assessment.

The closest designated wilderness area to the refuge is the Three Ridges

Wilderness, which is located approximately 100 miles northwest of the refuge in the George Washington National Forest in Nelson County, Virginia.

### **National Wild and Scenic Rivers**

The National Wild and Scenic Rivers Act (16 U.S.C. 1271-1287) established a process for identifying free-flowing rivers deserving of Federal protection to preserve them and their immediate environments for the use and enjoyment of present and future generations. NPS compiles and maintains the Nationwide Rivers Inventory, which is a register of river segments that potentially qualify as national wild, scenic, or recreational river areas.

Service planning policy requires us to conduct a wild and scenic river review during the CCP process if applicable. The nearest river segment that has the potential for national wild and scenic river designation is a portion of the James River that begins upriver from James River NWR, at Hopewell City to Mogsarts Beach in Isle of Wight County, Virginia. This 62-mile segment is one of the most significant historic, relatively undeveloped rivers in the entire Northeast Region (NPS 2009). However, we did not conduct a wild and scenic river review for James River NWR because this potentially eligible segment is adjacent to the refuge and not within the refuge boundary.

### **National Fish Hatchery**

The Harrison Lake National Fish Hatchery (hatchery) is located in Charles City, along Herring Creek on the north side of the James River and is managed by the Service. The 444-acre hatchery plays a key role in the Service's efforts to protect and restore declining and imperiled populations of migratory fish and other aquatic species of Atlantic Coast watersheds by rearing American shad, river herring, and striped bass. Hatchery staff are working closely with VDGIF to culture imperiled and declining freshwater mussel species for recovery and restoration efforts. Co-located at the hatchery is the USFWS Virginia Fisheries Coordinators Office, whose duties include supporting funding and Atlantic sturgeon research. The hatchery grounds offer opportunities for recreational fishing, boating, hiking, wildlife watching, and picnicking.

### **National Parks**

There are no portions of any National Parks within a 5-mile radius of James River NWR.

### **National Historical Trails and Watertrails**

The refuge is located on the James River segment of the Captain John Smith Chesapeake NHT, within the Chesapeake Bay Gateways and Watertrails Network (CBGN). In October 2010, the Service and NPS signed a Memorandum of Understanding (MOU) regarding cooperation and collaboration on a variety of efforts within the Chesapeake Bay watershed, including the Captain John Smith Chesapeake NHT and CBGN.

#### *Captain John Smith Chesapeake NHT*

In 2011, refuge staff actively participated on the interagency planning team to develop the James River Segment Trail Plan (NPS 2011). Five initial focus areas were identified along the James River segment because they have resources and stories associated with Smith's explorations; American Indian cultures of the time; significant, evocative 17th century landscapes. Additionally, the focus areas have a variety of immersive visitor experiences,

including a key anchor site that already provides for public access and key visitor amenities, receives high visitation, and has the potential for significantly contributing to trail themes in concert with existing programming. The availability of key visitor amenities and comparatively low visitation at James River NWR disqualified it from being considered among the first five focus areas. If additional visitor services were to be provided at the refuge, it could become a new focus area site along the James River segment. Passive water access for canoes and kayaks are lacking on the southern banks of the James River.

*Chesapeake Bay Gateways and Watertrails Network (CBGN)*

Established by Congress in 1998, the CBGN is a partnership of parks, wildlife refuges, historic sites, museums, historic vessels, environmental education centers, information centers, byways, and water trails that provides people with opportunities for meaningful Chesapeake Bay experiences. The primary goal of the CBGN as envisioned by Congress is to foster citizen stewardship of the Chesapeake Bay. The Chesapeake Bay Office of the NPS administers the CBGN program, officially designating gateways, and providing technical and financial assistance. If additional visitor services were to be provided at the refuge, it could become a new site in the CBGN.

**National Historic Landmarks**

*Westover Plantation*

Located adjacent to the refuge on the north bank of the James River is Westover Plantation, one of Virginia's oldest and grandest plantation mansions and a National Historic Landmark. It is considered by some as America's premier example of colonial Georgian architecture and the quintessential James River plantation house

(<http://www.nps.gov/history/nr/travel/jamesriver/wes.htm>; accessed January 2013). It is the ancestral seat of the Byrd family in Virginia. Built by William Byrd II (1674-1744), a planter, public official, and author, the 2½-story brick mansion (c. 1730-1734) of early Georgian style is notable for the quality of its construction and for its completeness of design. Byrd is especially noted for his posthumously published letters and diaries (<http://tps.cr.nps.gov/nhl/detail.cfm?ResourceId=702&ResourceType=Building>; accessed January 2013). The VDHR holds a preservation easement on the property.

*Upper Weyanoke Plantation*

First inhabited by the Weanoc Indians, the Tribe that gave the Weyanoke peninsula its name, the site of the Upper Weyanoke plantation was settled by English colonists during the 17th century and has been continuously occupied ever since. During the 18th century and early 19th century, the locally prominent Minge family owned the property, as well as others on the Weyanoke peninsula, such as North Bend. The 1½-story, early 19th century brick cottage is thought to have been built by John Minge as a two-room dependency to a now vanished main dwelling. The grounds of Upper Weyanoke also include a Greek Revival-style residence built in 1859 for Robert Douthat. The 2-story brick home has a side-hall plan typically utilized in urban homes, rather than rural plantation houses

(<http://www.nps.gov/nr/travel/jamesriver/upp.htm>; accessed January 2013).

## 2.9.2 State or Local Government Designated Areas

### Virginia Scenic Rivers

The Virginia Scenic Rivers Act of 1970 created a Statewide program to protect and preserve rivers, or sections of rivers, having natural or scenic beauty and cultural and historic interest. The Code of Virginia (§10.1-402) provides that the VDCR may fully review and make recommendation to Federal, State, and local agencies regarding the planning for use and development of water and related land resources so that scenic rivers resources are protected.

Since 1975, more than 650 river miles on 24 rivers have been recognized (VDCR 2012). An additional 13 rivers have been evaluated and found to qualify for scenic river designation. James River NWR is located along a section of the James River (Segment 48: James River-Orleans Street (extended) to Surry County) that has been evaluated and found worthy of designation, but has yet to be designated (VDCR 2007).

### Chesapeake Bay Preservation Areas

Under the Chesapeake Bay Preservation Act (Bay Act) (Virginia Code §10.1-1200 et seq.), counties, cities, and towns in tidewater Virginia have been required to enact programs designed to improve water quality in the bay through the mitigation of the impacts of development and redevelopment on sensitive environmental features such as streams, wetlands, floodplains, and highly erodible and highly permeable soils.

Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) have been designated in each locality; these areas consist of groupings of sensitive environmental features. RPA features, which include tidal wetlands, certain non-tidal wetlands, tidal shores, and buffer areas, are the most sensitive; in general, only water-dependent uses may be constructed in a resource protection area. RMA features, which include highly erodible soils, highly permeable soils, and certain non-tidal wetlands, are less sensitive than resource protection areas features. Development in a RMA requires that activities meet certain performance criteria designed to mitigate negative environmental impacts.

As defined by the county ordinance (Prince George County Code of Ordinances, Chapter 90, Article XIV A, Chesapeake Bay Protection), RPAs on the refuge are "lands adjacent to water bodies with perennial flow that have an intrinsic water quality value due to the ecological and biological processes they perform or are sensitive to impacts which may result in significant degradation to the quality of state waters." In their natural condition, these lands provide for the removal, reduction, or assimilation of sediments, nutrients and potentially harmful or toxic substances in runoff entering the bay and its tributaries, and minimize the adverse effects of human activities on State waters and aquatic resources (<http://www.princegeorgeva.org/Index.aspx?page=1010>; accessed January 2013).

RPAs include:

- Tidal wetlands.
- Nontidal wetlands connected by surface flow and contiguous to tidal

wetlands or water bodies with perennial flow.

- Tidal shores.
- Other lands considered necessary to protect the quality of State waters.
- A buffer area not less than 100 feet in width located adjacent to and landward of the components in the RPA, and along both sides of any water body with perennial flow.

RMA's are lands that are part of the Chesapeake Bay Preservation Area but are not classified as part of the resource protection area. RMA's include land types that, if improperly used or developed, have the potential for causing significant water quality degradation or for diminishing the functional value of the RPA. The RMA is contiguous to the entire inland boundary of the refuge RPA and includes the following categories of land:

- Floodplains.
- Highly erodible soils, including steep slopes.
- Highly permeable soils.
- Nontidal wetlands not included in the RPA.
- Other lands considered necessary to protect the quality of State waters.

Areas within the refuge that do not qualify as RPA's are classified as RMA's, based on the above criteria.

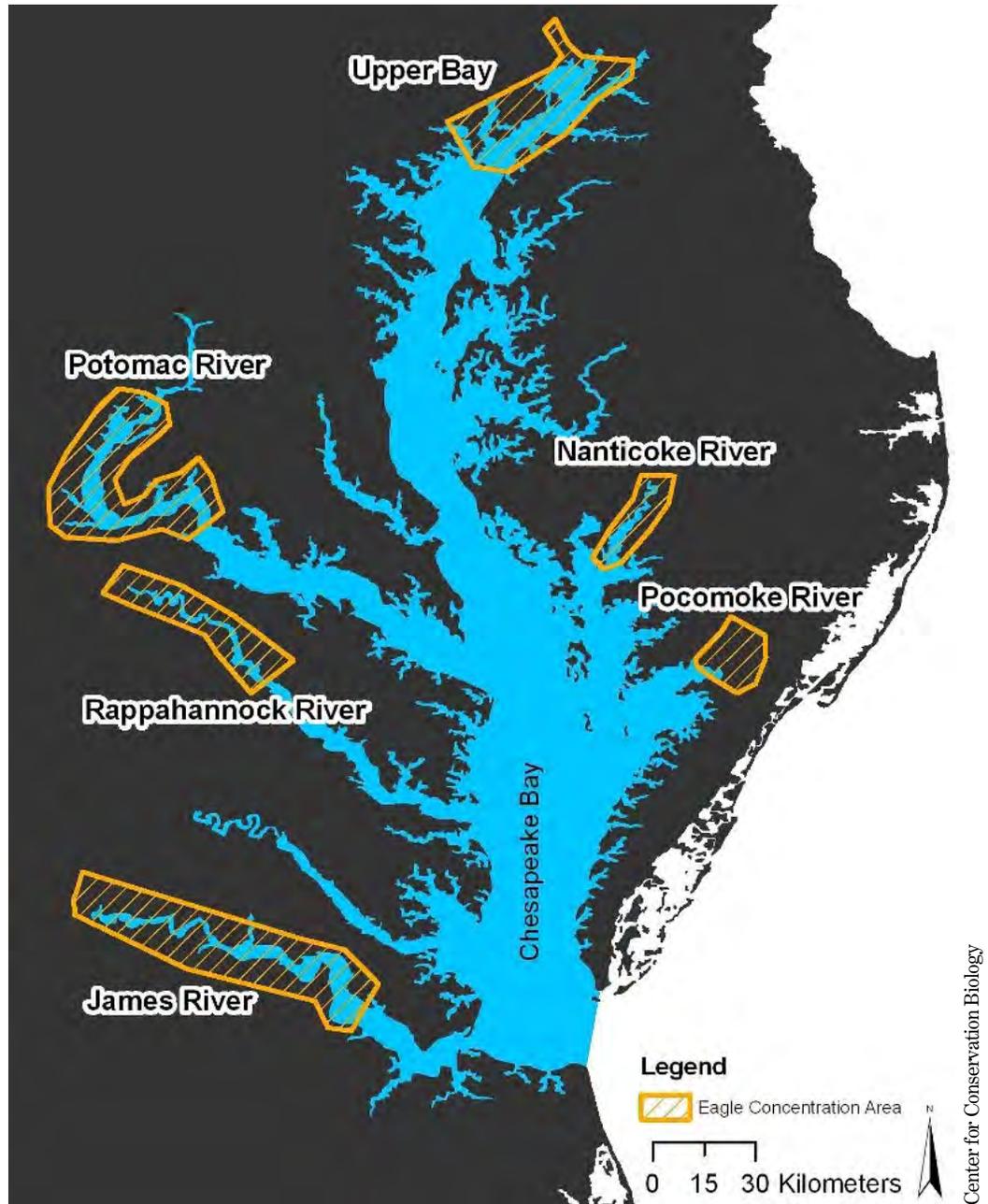
#### **Natural Heritage Conservation Sites**

The State defines Natural Heritage Conservation Sites as habitats of rare, threatened, or endangered plant and animal species; unique or exemplary natural communities; or significant geologic formations. Six natural heritage conservation sites occur within a 5-mile radius of the refuge; none of these sites occurs wholly or partly within the refuge (VDCR Natural Heritage 2014). Three of the six sites are stream conservation units because they include unique or exemplary natural communities, while the remaining three sites are areas that provide habitat for one or more rare terrestrial plants or animals.

#### **Bald Eagle Concentration Areas**

The refuge is within the VDGIF-designated James River Winter and Summer Bald Eagle Concentration Zone. Concentration zones are defined as "locations along waterways where eagles congregate in numbers much greater than can be accounted for by local breeding pairs and their offspring." These areas are used by juveniles, sub-adults, and non-breeding adults, as well as by breeding adults for foraging, perching, and roosting (VDGIF and CCB 2012). A report generated in February 2013 from the VDGIF Bald Eagle Concentration Areas and Roosts database listed 14 Bald Eagle Concentration [areas] and Roosts (BECAR) and 67 bald eagle nests within 3 miles of the refuge. Historically, as many as 100 birds were counted in a single BECAR (no date in database); however, the most recent BECAR data were recorded in 2009, and the numbers range from 0 to 13. From 2006

to 2007, eagle use in one BECAR was noted as “high” during the summer and others note winter BECAR use from “low” to “moderate.” Since 1993, bald eagles were observed at all of the 67 nests. Of these, 35 have been observed from February to May 2011. Currently, there are five active bald eagle nests on the refuge.



*Eagle Concentration Areas in Virginia*

#### **Anadromous Fish Use Area**

According to VDGIF, three waterways with frontage on the refuge are designated as anadromous fish use areas: James River, Powell Creek, and Flowerdew Hundred Creek. These areas are defined as waterways that are

known to provide migratory and spawning habitats for anadromous fish, those species that spend most of their life cycles in saltwater but return to freshwater to spawn. Seven anadromous fish species occur in this portion of the James River: alewife, American shad, striped bass, blueback herring, yellow perch, Atlantic sturgeon, and hickory shad. The primary threat to the conservation of these fish is hydrologic barriers (e.g., a dam preventing them from reaching spawning grounds), of which the refuge has none.

#### **Conservation Easements**

A conservation easement is a voluntary agreement that allows a landowner to permanently limit the type and amount of development on their property while retaining private ownership. Within a 5-mile radius of the refuge, there are nine conservation easements on a total of approximately 4,000 acres. Among the easement holders are Virginia Soil and Water Conservation District, Virginia Outdoors Foundation, and TNC (<https://vanhde.org/content/map>; accessed July 2013).

### **2.9.3 Other Special Status Areas**

#### **Lower James River Important Bird Area**

In 2007, the National Audubon Society designated 118,218 acres along 20 miles (32.2 kilometers) of the tidal James River and 1.9 miles (3 kilometers) landward on each side as an important bird area (IBA) (Audubon 2007). The Lower James River IBA earned this status largely due to the high concentrations of bald eagles using this area during the winter and summer months. Other species of concern in this IBA include prairie warbler, American woodcock, red-headed woodpecker, American black duck, eastern meadowlark, rusty blackbird, loggerhead shrike, prothonotary warbler, barn owl, grasshopper sparrow, and field sparrow. The largest threats to this IBA include: “(1) contaminants within the fishery used by piscivorous birds, (2) conversion of open land to residential, and (3) expansion of recreational boating access to sensitive portions of the river”

(<http://web4.audubon.org/bird/iba/virginia/Documents/Lower%20James%20River.pdf>, accessed August 2013). James River NWR is the largest contiguous tract of public land within the Lower James River IBA.

## **2.10 Refuge Administration**

### **2.10.1 Staffing**

Established in March 1991, James River NWR is part of the Eastern Virginia Rivers NWR Complex. The term “refuge complex” describes a situation where the Service combines two or more individual refuges, typically within the same state or adjoining states, under a single refuge manager’s responsibility. In 2000, the Service redirected staff and other resources, and management responsibility for James River and Presquile NWRs was transferred to the refuge manager stationed at the newly formed Rappahannock River Valley NWR. The Service named the three-refuge grouping the Eastern Virginia Rivers NWR Complex. In 2003, the Service added Plum Tree Island NWR, located in Poquoson, Virginia, to the refuge complex.

Current refuge complex staffing consists of eight positions, seven of which are stationed at the Eastern Virginia Rivers NWR Complex headquarters at Rappahannock River Valley NWR in Warsaw, Virginia: refuge manager, deputy refuge manager, natural resource planner, wildlife biologist, Federal

wildlife officer, administrative assistant, and maintenance worker. The remaining staff member, a wildlife refuge specialist, is stationed at the Harrison Lake NFH in Charles City, Virginia. Additional staff members may be hired on a temporary basis to assist with specific projects, biological surveys, and other required work.

All the positions within the refuge complex share in the responsibility for all four refuge units. The refuge complex manager is responsible for determining the priorities for the complex and how to distribute staff time and resources among the four refuges. Since 2003, one full-time employee has been administering activities and providing visitor services at James River NWR, as well as at Presquile NWR and Plum Tree Island NWR, with assistance from other refuge staff as needed.

### 2.10.2 Budget

Funding for James River NWR comes out of the budget for the entire refuge complex. Approximately 80 percent of the refuge complex budget is allocated to Rappahannock River Valley NWR, because it supports complex operations and is the largest refuge in the complex. Operational funding includes salaries, supplies, utilities, fuel, and all other operational activities (wildlife and habitat surveys and management) that are not funded by special projects. Base maintenance funds are used to repair vehicles, equipment, and facilities and have been generally stable over the past 5 years. Replacement of vehicles, larger pieces of equipment (tractor, backhoe), or larger facilities (buildings) are funded as projects. Annual funding fluctuates according to the number and size of projects funded in a given year (e.g., vehicle or equipment replacement, visitor service enhancements, and facility improvements) (see table 2.6).

**Table 2.6. Funding and Staff Allocations for the Eastern Virginia Rivers NWR Complex, 2005 to 2012**

Year	Operations	Maintenance	Projects	Cost Share	Total Funding	Staff
2005	\$650,748	\$23,520	\$368,229	\$8,133	\$1,050,630	8.34
2006	\$588,006	\$24,535	\$474,459	\$11,272	\$1,098,272	8.00
2007	\$782,083	\$59,117	\$116,917	\$10,606	\$968,723	8.30
2008	\$734,535	\$22,034	\$41,283	\$2,469	\$800,321	8.35
2009	\$788,886	\$24,000	\$469,021	\$7,999	\$1,289,906	7.40
2010	\$823,579	\$27,016	\$38,771	\$54,172	\$943,538	7.00
2011	\$963,324	\$27,410	\$290,260	\$0	\$1,280,994	7.40
2012	\$891,061	\$93,030	\$85,328	\$0	\$1,069,419	9.50

80 percent of the complex budget is allocated to Rappahannock River Valley NWR. 20 percent is divided among the other three refuges; it is not divided equally.

### 2.10.3 Lands

#### Refuge Establishment and Land Acquisition

In 1991, James River NWR was the fourth refuge established specifically for the protection of bald eagles. At that time, the bald eagle was federally listed as endangered. The primary objective for establishing the refuge was to protect essential nesting, feeding, and roosting habitat for bald eagles. Land acquisition significantly complimented recovery efforts for this species, in particular the Chesapeake Bay bald eagle population.

In March 1991, the first tract acquired was 3,516 acres. Previously owned by

Hopewell Hardwood Sales and later Continental Can, the property had been harvested extensively for timber, and several areas were clearcut. Historic logging operation at the sites left deep ruts and unburned slash. Some cutover areas naturally regenerated in with pine, while other areas were in need of restoration. In subsequent years, an additional 808 acres were acquired fee simple with funds from the Land and Water Conservation Fund (LWCF) under the authority of the ESA (table 2.7). In 2010, the Service acquired the 124-acre Blair's Wharf tract with LWCF funds and funds from the Virginia Aquatic Resources Trust Fund.

Three right-of-way easements associated with the refuge were already in existence at the time of the land transfer and refuge establishment. There are two easements for electricity transmission and distribution via pole line on the refuge, and there is one telephone easement for buried telephone cable along Route 639, Route 640, and the unimproved road through Blair's Wharf.

**Table 2.7. History of Refuge Land Acquisition**

<b>Date of Acquisition</b>	<b>Acreage</b>
1991	3,515.80
1992	630.70
1997	48.08
1999	5.00
2010	124.14
<b>TOTAL</b>	<b>4,323.72</b>

Within the refuge's approved acquisition boundary, one 223-acre parcel bordering Powell Creek remains in private ownership (map 1.3). Throughout this CCP, we refer to this property as the Hitch Sand and Gravel parcel. A number of methods are available to acquire property rights, including direct purchase, donation, or bequest from willing property owners.

Expansion of the refuge's acquisition boundary is a necessary future step to meet habitat needs for trust species such as federally listed threatened and endangered species, migratory birds, and migratory fish, as well as to contribute to the network of conservation lands and wildlife resources in the regional landscape. However, with input we received from the public during scoping coupled with reduced land acquisition funding, we are not planning any major refuge boundary expansion as part of this CCP and EA. Approval to explore refuge boundary expansion comes from the Service's Director, and then expansion requires development of a Land Protection Plan (LPP).

We will continue to consider minor acquisitions adjacent to the refuge from willing sellers if the lands are determined to be biologically important or provide connections with other protected lands. Land protection efforts that emerge outside of this planning process will include significant public involvement in decisionmaking, involve partners in the protection effort, and will use a full range of protection methods, including management agreements, conservation easements, and fee acquisition. Any new LPP developed in the future will incorporate these features and contributors.

#### **2.10.4 Refuge Operations and Sustainability Practices**

Refuge operations and sustainability practices are undertaken in accordance

with the Service's policy (565 FW 1). At James River NWR, we emphasize the following goals in refuge operations and employ sustainability practices. We lead by example and encourage others to adopt environmentally friendly practices by incorporating sustainability into the communications, environmental education, and interpretation programs offered by refuge staff and partner organizations, both on and off the refuge.

### **Non-hazardous Solid Waste Management and Recycling**

Refuge staff created the "James River Excess to Asset" program under which refuge volunteers and partners have worked with refuge staff to collect and recycle thousands of pounds of metal, tires, and other debris from refuge lands at James River NWR and Presquile NWR. Collected materials have been sold to local scrap yards for funding that is returned back into the refuge for promotion of the recycling program. As of 2011, more than 23,226 pounds of metal scrap had been taken for repurposing and more than \$1,300 has been recovered. We have purchased recycling containers using the funds obtained from previous recycling efforts.



*Scrap metal to be recycled*

Per policy requirements, 32 pieces of government equipment and vehicles have been excessed, including a 1951 Clark forklift, 1961 Cub tractor, and 1968 Dodge. Excess equipment has ranged in size from a small air compressor to a tilt bed trailer. All items were beyond the needs of their intended purpose and ready to be removed from the station's asset inventory. Some vehicles and equipment were replaced with newer, more fuel efficient vehicles/equipment, while other items were released with the only benefits being the return of proceeds to the government and increased space on the refuge. Items that were released would have demanded a prohibitively high expense to maintain or an exponential decline in value if unused. These items were sold through the U.S. General Services Administration (GSA) auction. The program has resulted in cleaner refuge lands, cleaner facilities, and monies returned to the refuge and the Department of the Interior. Several acres of property have been returned to natural habitat, and more than

\$30,000 has been generated in GSA sales.

This program has been implemented in accordance with the U.S. Department of the Interior's policy of promoting sound environmental practice by preventing pollution and recovering resources through recycling (515 DM 3) and various EOs (e.g., 12873, 13423, and 13514), where applicable. For example, we have diverted at least 50 percent of non-hazardous solid waste from landfills through recycling, meeting the goal specified in EO 13514, section 2(e)(ii).

In 2011, our wildlife refuge specialist, Mr. Cyrus Brame, was recognized by the U.S. Department of the Interior as a Sustainability Hero for developing, implementing, managing, and promoting this recycling program.

#### **Known and Potentially Hazardous Materials**

In 2005, Prion Compliance & Testing Services removed 1,600 square feet of asbestos from refuge lands. All known asbestos has been removed from the refuge.

Prior to refuge establishment, a 25-acre skeet range was used by five different hunt clubs. Upon refuge establishment, the skeet range was closed (USFWS 2012a). During the summer of 2014, personnel from the Ecological Services Virginia Field Office and refuge staff initiated a site characterization of the former skeet range located at the James River NWR (Brame 2014 personal communication). The purpose of this site characterization is to assess the extent and nature of the contamination associated with the former skeet range, which will focus on soil where shot was deposited within the footprint of the former skeet range. Soil outside the areas directly impacted by shot will also be assessed to determine whether lead or other chemical constituents have migrated as the result of runoff or windblown movement of soil particles. The primary constituent of concern associated with the former skeet range is from the lead shot.



Barry Brady/USFWS

*Skeet range in 1991*

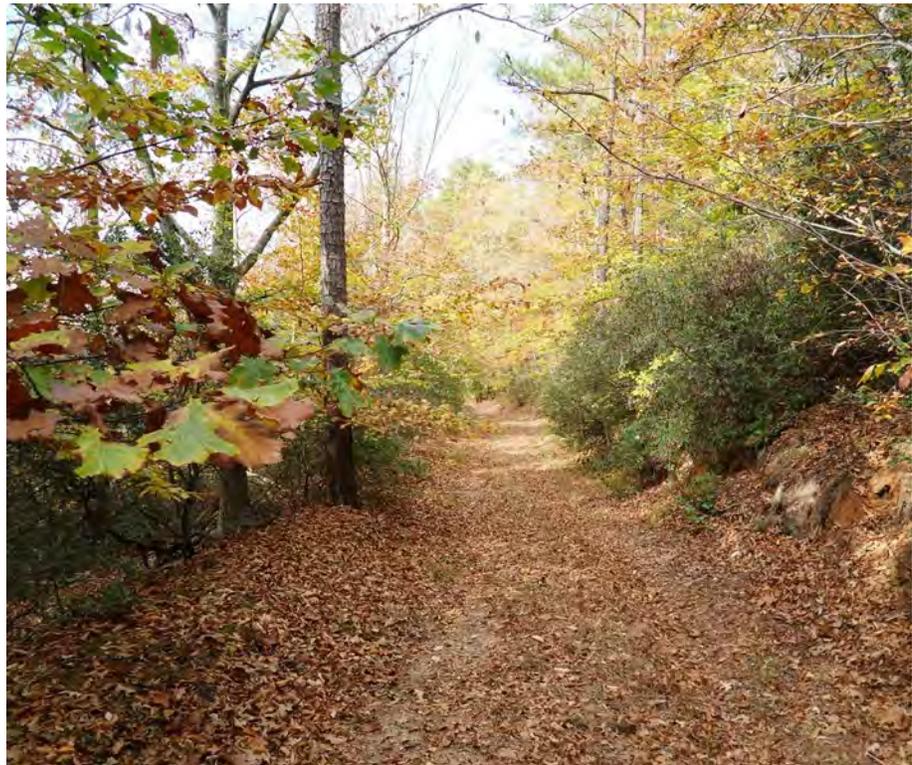
## 2.10.5 Facilities

### Access Routes and Features

Vehicular access to the refuge is via Route 10 to Flowerdew Hundred Road (State Route 639) (map 2.1). Within the refuge, there are 4 miles of State roadway (Routes 639 and 640). State and Prince George County maintenance staff is responsible for clearing and repairing culverts, mowing roadsides, and graveling and grading State roads. Approximately 13 miles of unimproved logging roads branch off State Routes 639 and 640 into the refuge forests. The unimproved roads serve as fire breaks. To limit unauthorized vehicular access, the refuge has installed 10 cable or swing gates that are lockable. Refuge staff also maintains refuge roads, associated gates, and drainage features. Two large culverts and an earthen levee straddle a feeder tributary to Flowerdew Hundred Creek on Hunter Circle Road.

There is an approximately 0.5-mile long designated nature trail within the refuge (maps 2.2 and 2.2). There are no designated biking trails along the State roads or refuge's unimproved roads.

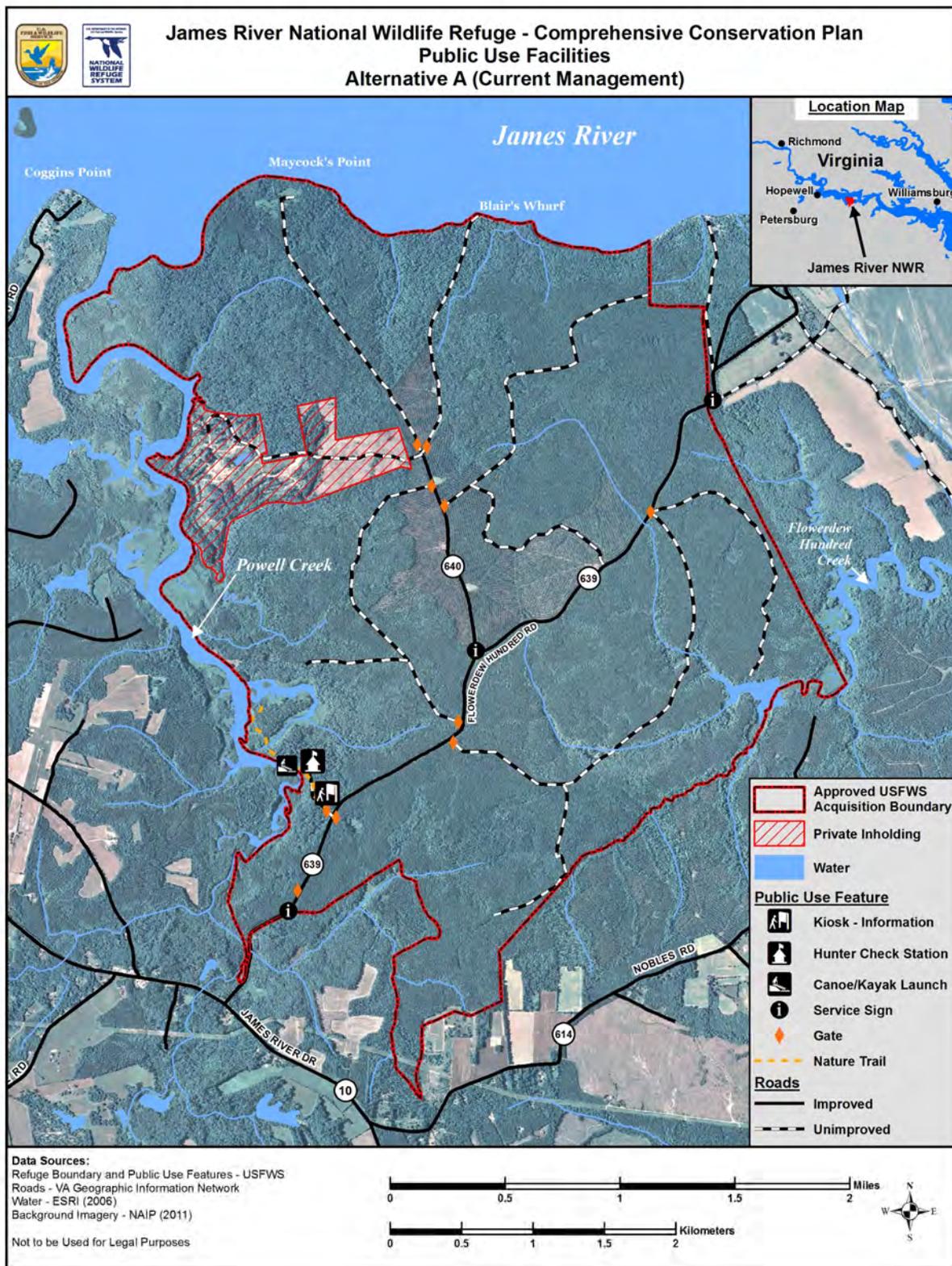
Boat access from the refuge is via an unimproved soft launch for canoes and kayaks along the shallow waters of Powell Creek, downhill from the refuge's maintenance complex. This unimproved soft launch is used by refuge staff and by the public when authorized. Pilings are the only remnants of a 215-foot long pier that once extended from the shoreline at Blair's Wharf perpendicular into the James River.



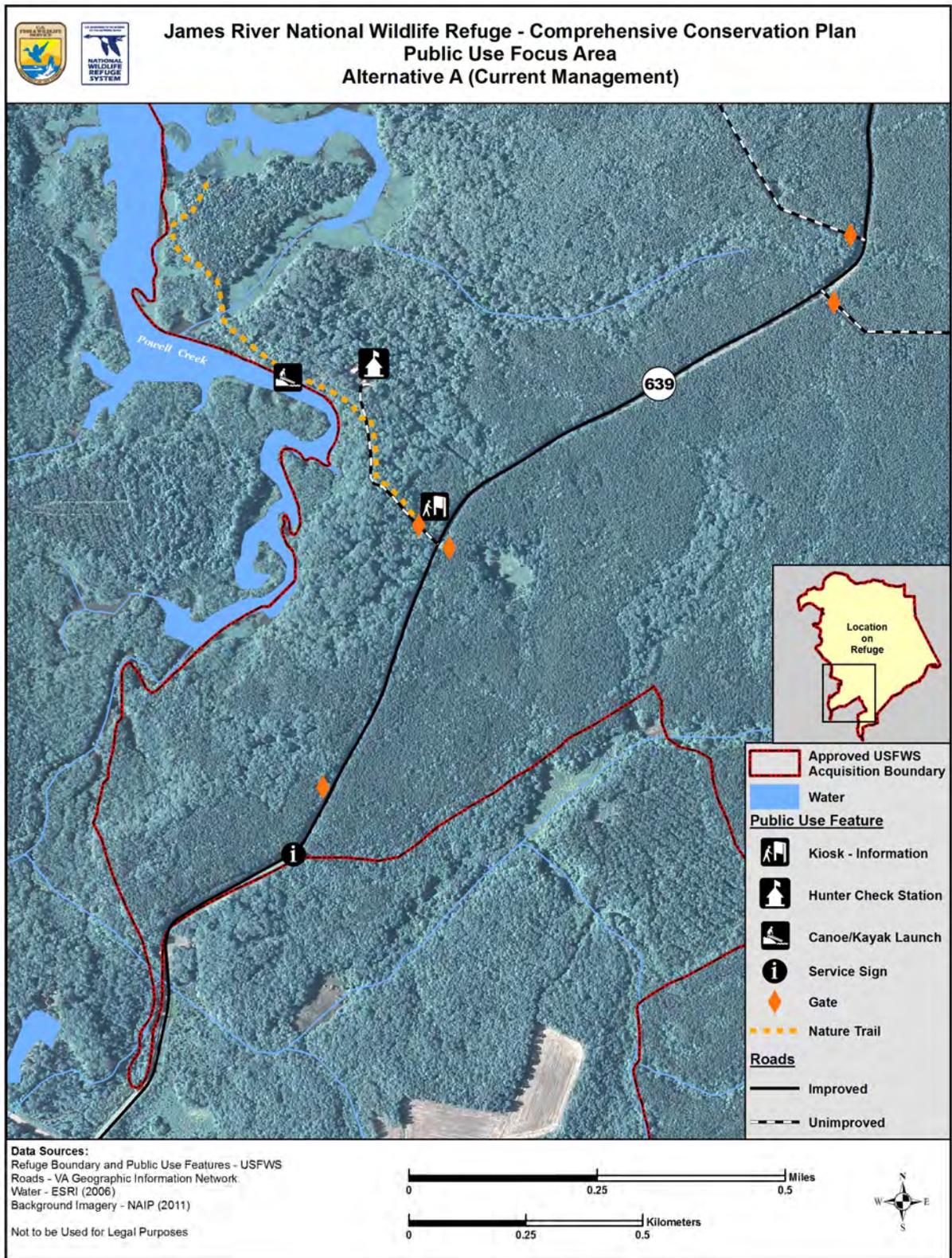
Meghan Powell/USFWS

*Fall foliage on the Powell Creek nature trail*

Map 2.1 Current Public Use Facilities at James River NWR



Map 2.2 Current Public Use Focus Area at James River NWR



### **Buildings and Support Facilities**

The refuge's maintenance complex is located approximately 1 mile from the refuge entrance, to the west of State Route 639, and is accessible via a gated, unimproved road. A 0.88-acre maintenance complex located on the refuge consists of these structures and support facilities:

- An equipment shed (400 square foot tin-sided enclosure with an 800 square foot roofed, open-walled shed area).
- A one-story cinderblock building (800 square feet) used as an Americans with Disability Act (ADA)-accessible hunter check station.
- A repeater radio tower (100 feet tall) used to aid with refuge communications.
- Electricity transmission poles.



Cyrus Brame/USFWS

*Maintenance complex*

A remote automatic weather station (RAWS) used to support prescribed burns on the refuge is located east of State Route 639 and south of the maintenance complex, in a 0.3-acre fenced area. Vegetation surrounding the RAWS is maintained by annual mowing and invasive plant management on an as-needed basis. The RAWS at James River NWR is one of the nearly 2,200 interagency RAWS strategically located throughout the United States (<http://raws.fam.nwccg.gov>; accessed April 2013). Weather data collected by these stations provides valuable information used for monitoring air quality, rating fire danger, and research applications. The data are transmitted from the station to a satellite, then to the NOAA.

Additional facilities not currently in use and in disrepair include:

- A wooden house off Bradby Road.
- Two structures previously used as part of a 25-acre skeet range.
- A cinderblock house at Blair's Wharf.
- Remnants of a 213-foot long pier and associated construction debris on the shoreline at Blair's Wharf.

While the refuge owns these facilities, they were acquired with land purchases and are not currently identified as critical to accomplishment of the refuge purposes and Service's mission. The refuge is considering demolition of the structures, but a decision to demolish them has not been finalized. Until sites and structures have been evaluated for National Register eligibility, they are treated as if eligible. Cultural resource professionals will help us determine our course of action through an existing project in the Service's Refuge Operation Needs System (RONS) (appendix D).

### **Signage**

Refuge entrance signs are located along Flowerdew Hundred Road (State Route 639) at the southern and eastern termini. A directional sign points refuge visitors from Flowerdew Hundred Road toward the information kiosk. One informational sign and two interpretive signs are located at the kiosk. One additional informational sign is located at the intersection of Routes 639 and 640.

The refuge boundary and gated access roads are also identified with standard-issue NWR boundary signs.

## **2.10.6 Refuge Access Permit Requirement**

Since the establishment of James River NWR, refuge managers have managed public access, use, and recreation activities at the refuge by issuing special regulations, individual permits, or public notices in accordance with Service regulations (50 CFR 25 et seq.) and policies (603 FW 1, 603 FW 2, and 605 FW 1).

Because no portion of the refuge is open to general public access, refuge visitors must participate in a refuge- or partner-sponsored program, acquire an individual general special use permit, or acquire a hunting permit to be able to access the refuge. Persons interested in visiting the refuge are required to contact refuge staff to learn more about scheduled events open to the public or learn more about acquiring a permit to access the refuge. Visitors are required to contact the refuge at least 3 business days in advance to allow for request processing and permit issuance. Instructions regarding refuge access requirements are provided on the refuge website ([http://www.fws.gov/refuge/james\\_river](http://www.fws.gov/refuge/james_river); accessed November 2013).

Section 2.13 provides additional information regarding public uses at the refuge.

## **2.11 Refuge Natural Resources**

### **2.11.1 Soils**

Most of the refuge lies on upland soils, with the seven most dominant soils comprising 82 percent of the refuge (USDA 2010). The moderately well drained Peawick silt loam, on slopes of 0 to 2 percent and 2 to 6 percent, occurs on stream terraces and represents 31 percent of the refuge. The somewhat poorly drained Newflat silt loam also occurs on stream terraces and accounts for another 12.3 percent, while well-drained Emporia soils on slopes of 15 to 45 percent occur on marine terraces and account for 11.8

percent of refuge acreage. A summary of the characteristics of major soil types follows in table 2.8. Additional information can be obtained from the refuge headquarters.

**Table 2.8. Summary of the Seven Most Prevalent Soils Types on James River NWR**

<b>Soil Type</b>	<b>Local Landform</b>	<b>Hydric Traits</b>	<b>Suitability</b>	<b>Classified as Prime and Other Important Farmland</b>	<b>Acres<sup>1</sup> (percentage of total refuge)</b>
Chickahominy Silt Loam	Stream Terraces	Poorly drained/hydric	Agriculture: Poor Silviculture: Poor	Not prime farmland	345 (8.1 percent)
Emporia and Slagle Soils, 6 to 15 percent slopes	Marine terraces	Well drained	Agriculture: Good Silviculture: Good	Farmland of Statewide importance	303 (7.1 percent)
Emporia Soils, 15 to 45 percent slopes	Marine terraces	Well drained	Agriculture: Poor (Slopes) Silviculture: Fair	Not prime farmland	483 (11.4 percent)
Newflat Silt Loam	Stream terraces	Somewhat poorly drained	Agriculture: Poor Silviculture: Poor	Farmland of Statewide importance	545 (12.8 percent)
Peawick Silt Loam, 0 to 2 percent slopes	Stream terraces	Moderately well drained	Agriculture: Good Silviculture: Good	Farmland of Statewide importance	743 (17.5 percent)
Peawick Silt Loam, 2 to 6 percent slopes	Stream terraces	Moderately well drained	Agriculture: Good Silviculture: Good	Farmland of Statewide importance	574 (13.5 percent)
Wickham Fine Sandy Loam, 2 to 6 percent slopes	Stream terraces	Well drained	Agriculture: Good Silviculture: Good	Prime farmland	492 (11.6 percent)

<sup>1</sup> Approximate. Source: (USDA 2010).

### 2.11.2 Vegetation Communities and Associated Special Status Plant Species

Vegetation communities within James River NWR were identified using the NatureServe ecological systems classification system and further defined by the Northeastern Terrestrial Wildlife Habitat Classification Project (Gawler 2008). An ecological system is a “group of plant community types (associations) that tend to co-occur within landscapes with similar ecological processes, substrates, or environmental gradients. A given ecological system will typically manifest itself in a landscape at intermediate geographic scales of tens to thousands of acres and will persist for 50 or more years” (Comer et al. 2003). These units form a cohesive, distinguishable unit on the ground (USFWS 2007b) that are readily mappable and identifiable by conservation and resource managers in the field (Gawler 2008).

Pine-dominated forest occupies approximately 61 percent of the refuge’s total land area (table 2.9 and map 2.3). Within this single largest general habitat category on the refuge, the most dominant ecological community is Southern Piedmont Dry Oak-(Pine) Forest, which dominates the eastern half of the refuge.

To determine the habitat types described this CCP, we grouped similar ecological systems into broader habitat categories to define management objectives and strategies proposed in this CCP. Subsequent planning for the refuge's habitat management plan may make use of the more detailed mapping of habitat associations. Table 2.9 represents how refuge habitat types were categorized, listing them in the order they are described throughout this CCP and EA.

**Table 2.9. Refuge Habitat Types at James River NWR**

<b>Habitat Type</b>	<b>Management Units<sup>1</sup></b>
Pine-dominated Forest	2,653 acres
Moist Hardwood Forest	775 acres
Floodplain Forest	633 acres
Freshwater Marsh and Shrub Swamp	82 acres
Aquatic Habitats	17 acres
Erosional Bluff	3 shoreline miles
Non-forested Upland	13 acres
<b>Habitat Total</b>	<b>4,173 acres</b>
<b>Refuge Total</b>	<b>4,324 acres</b>

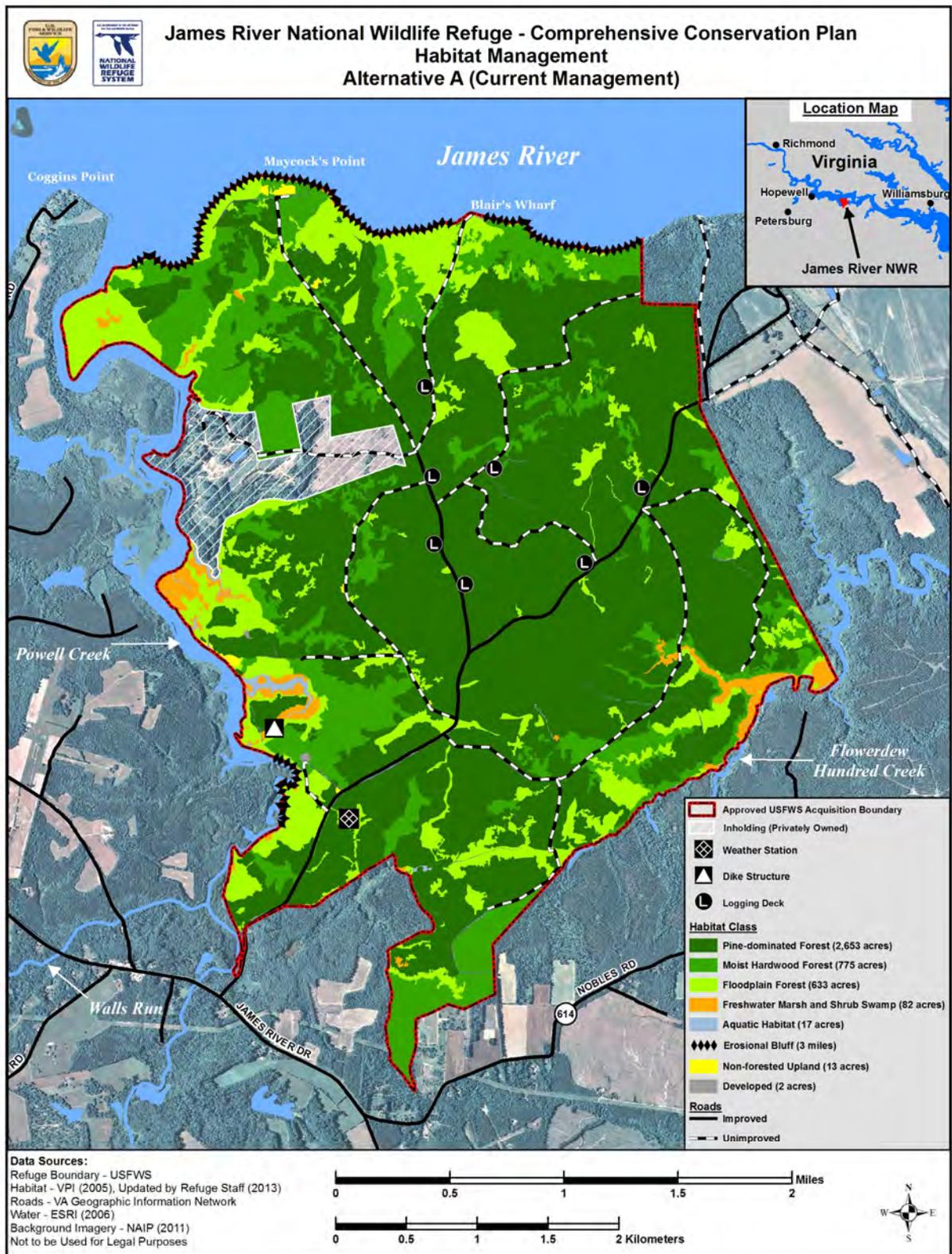
<sup>1</sup> Management units estimated from Geographic Information System (GIS) and rounded up to nearest whole number. The difference in habitat acres and total refuge acres occurs because boundaries that were used for habitat mapping project are not identical with the data held in our reality files. Total habitat acreages do not include 2 acres of developed lands (e.g., roads, buildings) because they are not considered habitat.

### **Pine-dominated Forest**

Pine-dominated forests are the largest single habitat type on the refuge. They consist primarily of abandoned loblolly pine plantations or early successional loblolly pine forests that became established after agriculture ended. The soil and topography in these areas results in more moist conditions than upland pine stands in sandy conditions. The canopy is dominated by loblolly pine, with varying amounts of white, red, black, and post oaks in both upper and mid-canopy. Sweetgum may be present, but it is not generally present in quantity. The shrub layer has variable closure and is often characterized by American holly, wax myrtle, or swamp bay. Vines (such as common greenbrier, muscadine, and poison ivy) can contribute considerable midstory cover. The herbaceous layer is sparse to non-existent. If it is present, it is often composed of exotic invasive species, such as Japanese stiltgrass.

Prior to refuge establishment in 1991, a commercial timber operation owned and managed the land that is now part of the refuge. Over time, the pine forests have become too thick to benefit migratory birds, with more than 1,000 trees per acre. This thickness presents a wildfire hazard and makes trees susceptible to disease infestation from pine bark beetles.

Map 2.3 Current Habitats at James River NWR



We work closely with our Regional Office, State partners, non-governmental organization partners, and contractors to conduct pine thinning and prescribed burns on the refuge in accordance with the refuge's Forest Management Plan (USFWS 2003), Fire Management Plan (USFWS 2006) and regularly updated Prescribed Fire Plan (USFWS 2013b). We strive to improve forest stand conditions, protecting it from losses due to catastrophic wildfire, disease, and habitat management activities. Our top priority has been to treat dense stands that have the greatest potential for catastrophic wildfire. Thinning and burning these overstocked stands improves stand health of the remaining trees and increases their value to wildlife.

In accordance with the National bald eagle management guidelines (USFWS 2007c), thinning operations have not been conducted within 660 feet of active nests and have not been conducted between December 15 and July 15 to protect nesting bald eagles. Since these trees have commercial value as pulp, bio-fuel, and some saw timber, using a commercial contractor to achieve the refuge's habitat management goals is the most efficient and cost-effective approach. The contractor is authorized to conduct work on the refuge in accordance with specific conditions detailed in a special use permit. Among the permit conditions is a requirement to employ the standard operating procedures previously approved by the Historic Preservation Officers of the USFWS and Commonwealth of Virginia for the protection of historic and archaeological resources.

We work with VDOF to assess the forest before operations, provide recommendations for thinning and burning patterns and regimes, and coordinate assessments after thinning activities are completed.

The Service has established a unique partnership with TNC and VDCR Natural Heritage for conducting prescribed burns in southeastern Virginia. This partnership enables annual fire management of the thinned sections of pine-dominated forest. Prescribed burning occurs in the late winter to early spring season when plant growth is dormant. To minimize adverse impacts to ground nesting birds, the last date that a prescribed burn can occur on the refuge is April 15 (USFWS 2013b).



*Prescribed burn in progress*

Cyrus Brame/USFWS

### **Moist Hardwood Forest**

This habitat is characterized by moist upland forested areas typically located on lower slopes, bluffs along streams and rivers in dissected terrain, mesic flats between drier pine-dominated uplands and floodplains, and local raised areas within bottomland terraces or wet flats. These forest stands are naturally sheltered from frequent fire. Soils vary in both texture and pH. Vegetation is tree-dominated and includes a significant component of mesophytic deciduous hardwood species, such as beech or southern sugar maple. Upland and bottomland oaks found in areas with a mid-range of moisture tolerance are usually also present, particularly white oak but sometimes also southern red oak. Virginia pine and loblolly pine, which are dominant in the pine-dominated forest, are also present. The lower shrub and herbaceous layers, if present, may be sparse or moderately dense.

### **Floodplain Forest**

Floodplain forests occur on floodplains of smaller streams and the James River, where fine-textured silt and clay sediment are dominant. Depositional landforms, such as a natural levee, are often distinctly present but fairly small. They help create variation in the duration of flooding and nutrient input. Soils are generally fertile and not strongly acidic. Flooding is generally seasonal but may range to nearly semi-permanent. Vegetation consists almost entirely of forests of wetland trees. Bald cypress and tupelo dominate in wetter sites. Forested stands with oaks and other bottomland hardwoods are possible. The understory, shrub, and herbaceous layers are generally well developed.

### **Freshwater Marsh and Shrub Swamp**

The refuge's tidal freshwater marshes are characterized by fresh to slightly saltwater (oligohaline) waters driven by irregular tides. They are predominantly found in the drowned creeks and inland estuary shores of the embayed region. The marshes typically occur as complexes dominated by large grasses (graminoids), such as salt hay, bulrushes, cattails, and rushes, sometimes with species-rich associations of shorter grasses, forbs, and floating or submerged aquatics.

### **Aquatic Habitats**

Open water on the refuge is primarily present as the waters of the James River and Powell Creek. To a lesser extent, open water exists in small streams that flow into Flowerdew Hundred Creek. Three small seasonal inland ponds are also mapped on the refuge. This habitat supports a variety of aquatic species and other terrestrial species that rely on water for parts of their lifecycles.

SAV can be found in the open waters of Powell Creek and just beyond the refuge boundary in Flowerdew Hundred Creek. SAV is characterized by the presence of horned, sago, and claspingleaf pondweed. A host of macroalgae is also an important system component. Although the refuge does not actively manage SAV habitats, the Chesapeake Bay Foundation (CBF) has organized volunteer events for SAV plantings at the refuge.

### **Erosional Bluff**

This habitat consists of steep, linear cliffs where erosion in alluvial deposits has left nearly vertical banks more than nine feet high (three meters) high of sand, silt, clay, or a mixture. They typically develop in landscapes that are

otherwise of rather low relief. The substrate is unconsolidated and provides habitat for animals that burrow into steep banks, such as bank swallows and certain invertebrates. Vegetation here is sparse, mostly herbaceous, and variable in composition.

### **Non-forested Upland**

Non-forested upland occurs on the refuge as small, localized patches of grass among the other habitats. These areas include remnants of former farm fields and homesteads, and they are maintained for administrative purposes. Where ongoing maintenance is not performed to retain these lands in grasses, tree and shrub species are beginning to develop and dominate the habitat. Mowing is generally needed on at least an annual basis to prevent tree and shrub species from becoming dominant in the non-forested upland.

### **Federal and State-listed Plants**

In Virginia, the VDCR Natural Heritage maintains the database and rankings of plant and animal species. Determining which plants and animals are thriving and which are rare or declining is crucial for targeting conservation towards those species and habitats in greatest need. For individual plant and animals, the ranking provides an estimate of extinction risk, and for ecological communities they provide an estimate of the risk of elimination. Conservation status ranks are based on a one to five scale, ranging from critically imperiled (G1) to demonstrably secure (G5). Status is assessed and documented at three distinct geographic scales: global (G), national (N), and state/province (S). These status assessments are based on the best available information, and consider a variety of factors such as abundance, distribution, population trends, and threats (<http://www.natureserve.org/explorer/ranking.htm#interpret>; accessed May 2013).

In 2001, the VDCR Natural Heritage conducted targeted botanical surveys to look for rare plant species at James River NWR (Belden et al. 2002).

Surveyors targeted the following species:

- Blue hearts
- Cuthbert turtlehead
- Little-leaf sensitive-briars
- Long stalked crowfoot
- New Jersey rush
- Parker's pipewort
- Red milkweed
- Sensitive joint-vetch
- Small whorled pogonia
- Sun-facing coneflower
- Swamp pink
- Virginia least trillium

Of these 12 species, none were found to occur at James River (Belden et al. 2002). Surveyors noted that the refuge does have suitable habitat for the sensitive joint-vetch (federally threatened) and small whorled pogonia (federally threatened) (Belden et al. 2002). The refuge lies within the documented distribution of sensitive joint-vetch on the James River which currently spans approximately 41 river miles (USFWS 2012d). The nearest known occurrence of small whorled pogonia is from uplands between the York and Chickahominy Rivers

(<http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?scode=Q1XL>; accessed November 2013).

### 2.11.3 Invasive Plants

EO 13112, "Invasive Species," signed on February 3, 1999, guides Federal management of nonnative, invasive plant species. This EO requires that a Council of Departments dealing with invasive species be created and develop a National Invasive Species Management Plan every 2 years. The first plan was released in January 2001, providing the basis for Federal management of invasive species. The EO defines an invasive species as "...an alien (or non-native) species whose introduction does, or is likely to cause economic or environmental harm or harm to human health."

The presence of invasive plants can have an adverse impact on the biological integrity, diversity, and environmental health of refuges and other natural areas. Several invasive plants are known to occur in refuge habitats:

- Pine-dominated Forest
  - ❖ Shrubby lespedeza
- Moist Hardwood Forest
  - ❖ Princess tree
  - ❖ Periwinkle
- Aquatic Habitats
  - ❖ Hydrilla
- Moist Hardwood Forest and Non-forested Upland
  - ❖ Japanese privet
  - ❖ Japanese stiltgrass
  - ❖ Japanese wisteria
  - ❖ Tree-of-heaven

Refuge staff actively control invasive species by using a combination of mechanical removal (brush hogging and pulling), prescribed fire and herbicide applications (typically glyphosate and triclopyr products). On average, refuge staff control invasive species on between 1 and 5 acres per year on the refuge.



Cyrus Brame/USFWS

*Japanese wisteria*

## 2.11.4 Wildlife

Since James River NWR was established to conserve fish, wildlife, and plants that are listed as endangered or threatened species, we highlight species of conservation concern under each of the following groups. A comprehensive list of potential wildlife species of conservation concern for the refuge is included in appendix A.

### Birds

James River NWR occurs within BCR 30, New England/Mid-Atlantic Coast; however, it is located near BCR 30's southern edge. The refuge is also located just north of BCR 27, the Southeastern Coastal Plain. Although James River NWR is not physically located in BCR 27, we consider it relevant to include BCR 27 in our planning considerations. BCR planning boundaries are based on ecologically distinct regions with similar bird communities, habitats, and management issues. When initially developed in 1999, the U.S. North American Bird Conservation Initiative (NABCI) believed that boundaries may change over time as more information becomes available (<http://www.nabci-us.org/bcrs.htm>; accessed May 2013). Factors like climate change, which may result in a shift in species ranges due to warmer temperatures or change in habitat, may increase the importance of the refuge to bird conservation in both BCR 27 and BCR 30.

Of the 219 bird species confirmed or highly likely to be present on the refuge, 118 are priority species common to BCR 27, BCR 30, or the Virginia WAP, including 66 landbirds, 16 waterbirds, 12 shorebirds, and 24 waterfowl (ACJV 2007, Watson 2008, VDGIF 2005).

Discussion about bird abundance on the refuge is based on data collected from the National Audubon Society's annual CBC and the VDGIF Mid-Winter Waterfowl Survey. The annual CBC is an early winter bird census, where volunteers follow specified routes through a designated 15-mile (24-kilometer) diameter circle, counting every bird they see or hear all day. The Hopewell (site code VAHO) CBC has occurred annually since 1929. James River NWR is located approximately 1 mile east of the 15-mile diameter count circle; while this count may not be truly representative of refuge habitats, for our purposes, it is considered as being representative of regional bird species.

### *Bald Eagle*

James River NWR is located within the summer and winter concentration area for bald eagles along the James River watershed (VDGIF 2014). Bald eagles nest, roost, and winter on refuge lands.

In July 2007, the bald eagle was removed from the Federal list of threatened and endangered species; in January 2013, it was removed from Virginia's list of endangered and threatened species. However, the bald eagle is still afforded special protection as a Federal species of concern through BGEPA and the MBTA. The bald eagle currently is globally secure, is imperiled to uncommon as a breeding species, and is rare to uncommon as a non-breeder in Virginia. The Virginia WAP lists the bald eagle as being of very high conservation need (tier II) because it occurs within a very limited distribution (VDGIF 2005).

Since 1977, the CCB at the College of William and Mary has conducted

Statewide annual surveys of breeding bald eagles in partnership with a variety of partners. During the 2011 breeding season, the annual survey documented 726 occupied bald eagle territories in Virginia, a 6.2 percent increase over 2010. More than 130 new nests were mapped within 45 counties and 10 independent cities. Within Prince George County, there were 25 occupied territories, 23 active nests, and 42 chicks produced (Watts and Byrd 2011).

Most known territories continue to be concentrated within the coastal plain, with less than 5 percent of pairs occurring in the piedmont and mountain regions. The Virginia population continues to have tremendous reproductive momentum. Of 11,030 chicks documented in the past 35 years, 8.5 percent were produced in 2010 and 73.2 percent were produced since 2000. In general, this momentum is the combined result of an overall increase in the breeding population, the breeding success rate and the average brood size (Watts and Byrd 2011).

The Chesapeake Bay-Virginia bald eagle population favors habitat with mature, super-canopy trees that overlook broad expanses of marsh, river, or fields with relatively clear understory below and in close proximity to water bodies where fish are abundant. Bald eagles in Virginia more frequently use pines as nest trees, but nests are also found in beeches and bald cypress. Pines, hardwoods, or snags with extended branches free of obstructing vegetation are favored for perches. The forested riparian habitats along the tidal portion of the James River and the abundant fish provide ideal bald eagle nesting conditions (USFWS 2007b).

There are five known nests on the refuge; four are located along the northern boundary near the James River, and one is on the western edge near Powell Creek (<http://www.cbbirds.org/what-we-do/research/species-of-concern/virginia-eagles/nest-locator/>; accessed May 2013). From April 1998 through August 2007, refuge staff conducted shoreline surveys for the bald eagle over multiple iterations each year. Over the 10-year study, 75 separate surveys of adult and juvenile birds were conducted. The results of these surveys documented an average of 27 individuals using the refuge each summer (USFWS unpubl. data 2007c).



Steve Jurvetson

*Bald eagle and its nest*

The refuge staff follows measures developed by the Service and VDGIF to limit disturbance to nests during the nesting season, as well as roosts and important forage areas throughout the year (VDGIF and USFWS 2000). During the nesting season (December 15 to July 15), human activity is restricted within a 330-foot buffer zone around nests. This requires that refuge staff and visitors be restricted from certain areas surrounding known nest sites during the breeding season, as well as sensitive areas during the wintering season. Without such restrictions, eagles may abandon their nests and young when nesting and may experience additional stress and mortality during the wintering months. Prescribed burns are also implemented when they will have the least impact on eagles (USFWS 2007e).

#### *Landbirds*

Since 2001, approximately 93 landbird species have been identified on or near the refuge based on data collected by refuge staff or through volunteer activities such as the Hopewell CBC (Richmond Audubon Society n.d.). From 2000 to 2008, the most abundant landbird species were red-eyed vireo, Acadian flycatcher, pine warbler, ovenbird, hooded warbler, tufted titmouse, blue-gray gnatcatcher, Carolina wren, northern cardinal, and American crow (Spencer 2009 personal communication). Records during the Hopewell CBC from 2001 to 2011 document the following dominant species of landbirds during early winter: European starling, red-winged blackbird, American robin, cedar waxwing, white-throated sparrow, common grackle, mourning dove, dark-eyed junco, song sparrow, and northern cardinal.

A total of 66 landbirds found on the refuge are a priority in one or more of the conservation plans or lists reviewed. Twenty of these 66 landbird species are BCR 27 priority species, BCR 30 priority species, Virginia WAP tier category species, and have been observed or are likely to occur during the breeding season at the refuge (table 2.10).

Pine-dominated forests support at least eight bird species with high concern scores distributed among the forest successional stages, from early successional, shrub stage, and forest stages (Watts 1999). Of these eight species, five have been recorded at the refuge: Chuck-will's-widow, brown-headed nuthatch, eastern wood-pewee, prairie warbler, and red-headed woodpecker. Cavity-nesting species (such as the brown-headed nuthatch, red-headed woodpecker, and prothonotary warbler) prefer older pine stands that contain snags for roosting (Smith et al. 2000, Wilson and Watts 1999) and high insect populations for foraging (McCarty 1996, O'Halloran and Conner 1987, Straight and Cooper 2012). Open understories created from prescribed burning increases foraging and breeding opportunities for Chuck-will's-widow. The eastern wood-pewee uses the high canopy of this habitat for nesting (Straight and Cooper 2012, McCarty 1996).

Other high priority species recorded within the refuge during breeding season include bald eagle, prothonotary warbler, Louisiana waterthrush, worm-eating warbler, scarlet tanager, wood thrush, and yellow-throated vireo. Bald eagles and other raptor species use larger trees within the pine-dominated, moist hardwood and floodplain forests for nesting and roosting (USFWS 1996). Breeding Louisiana waterthrush and prothonotary warbler use the late-successional moist hardwood and floodplain forests (Mattsson et al. 2009, Wilson and Watts 1999). Mature moist hardwood forest provides shrub understory nesting and foraging cover for the wood thrush and warbler

species while mature trees are used by nesting scarlet tanagers (Evans et al. 2011, Vitz et al. 2013, Mowbray 1999).

In addition to landbirds supported by our forested habitats, the erosional bluff habitat along the James River provides breeding habitat for bank swallows. Males of the colony excavate burrows or cavities into the banks of the bluffs to build nests in early spring. Sites are often selected because of the alluvial soils and the open vertical space around nest burrows (Garrison 1999). Erosional bluff habitat has been declining locally due to the closure of sand and gravel pits in Virginia that provided steep, unvegetated banks (Blem and Blem 1990).

The limited freshwater marsh and swamp habitat at the refuge supports the marsh wren, a priority species. This songbird uses coastal plain marshes year-round and prefers cattail marshes with scattered patches of bulrush. Over time, marshes have been destroyed and created throughout their range, and marsh wren populations have matched these fluctuations. Little is known about how habitat fragmentation effects populations (Kroodsma and Verner 1997).

**Table 2.10. BCR 27, BCR 30, and Virginia Wildlife Action Plan Landbird Priority Species on the Refuge or Project Area**

Species	BCR 27 Priority Status <sup>1</sup>	BCR 30 Priority Status <sup>1</sup>	Virginia WAP Tier <sup>2</sup>	Season of Occurrence <sup>3</sup>
Brown thrasher	H	H	IV	B
Brown-headed nuthatch	H	M	IV	B,W
Cerulean warbler	HH	M	II	B
Chimney swift	H	H	IV	B
Eastern kingbird	H	H	IV	B
Eastern towhee	H	H	IV	B,W,M
Field sparrow	H	H	IV	B,M
Grasshopper sparrow	H	M	IV	B
Kentucky warbler	H	H	IV	B
Louisiana waterthrush	M	H	IV	B
Marsh wren	M	H	IV	B, W
Northern bobwhite	H	H	IV	B,W
Prairie warbler	H	HH	IV	B
Prothonotary warbler	H	H	IV	B
Rusty blackbird	H	H	IV	B
Sedge wren	M	M	III	B,W,M
Swainson's warbler	H	M	II	B
Wood thrush	H	HH	IV	B
Worm-eating warbler	H	H	IV	B
Yellow-throated vireo	M	H	IV	B

<sup>1</sup> BCR priority status levels: HH = highest; H = high; M = Moderate (Watson 2008 [BCR 27], USFWS 2008b [BCR 30])

<sup>2</sup> Virginia WAP Tiers: I= Critical Conservation Need; II= Very High Conservation Need; III= High Conservation Need; and IV= Moderate Conservation Need

<sup>3</sup> Conservation Habitat Need based on Table 1 in Watson 2008 and Table 5 in USFWS 2008b; B=Breeding; W=Wintering, M=Migration.

### *Waterbirds*

Because interior wetland and marsh habitat is limited on the refuge, relatively few waterbird species have been observed in these habitats. The linear wetland corridors along the river and creeks that border the refuge offer suitable habitat. The least bittern is one of the priority species that this habitat supports. This small heron forages along marsh and swamp habitats and builds platform nests within the emergent vegetation (Poole et al. 2009).

During the 2001 to 2011 Hopewell CBC, 13 waterbird species were observed, including priority species such as American bittern and Forster's tern. In 2001, as many as 243 great blue herons were counted; the Lower James River IBA is known for several great blue heron rookeries along this portion of the river. More information about the Lower James River IBA is provided in section 2.9.3.

Eight waterbird species are BCR 27 priority species, BCR 30 priority species, Virginia WAP tier category species, and have been observed or are likely to occur during the breeding season at the refuge (table 2.11).

**Table 2.11. BCR 27, BCR 30, and Virginia WAP Waterbird Priority Species on the Refuge or Project Area**

<b>Species</b>	<b>BCR 27 Priority Status<sup>1</sup></b>	<b>BCR 30 Priority Status<sup>1</sup></b>	<b>Virginia WAP Tier<sup>2</sup></b>	<b>Season of Occurrence<sup>3</sup></b>
Black-crowned night-heron	H	M	III	B,W
Common tern	HH	M	III	B,M
Forster's tern	M	H	IV	B,M
Glossy ibis	H	H	III	B
Least bittern	H	M	III	B
Little blue heron	H	M	II	B,W
Tricolored heron	H	M	III	B
Yellow-crowned night-heron	H	M	III	B,M

<sup>1</sup>BCR priority status levels: HH = highest; H = high; M = Moderate (Watson 2008 [BCR 27], USFWS 2008b [BCR 30])

<sup>2</sup>Virginia WAP Tiers: I= Critical Conservation Need; II= Very High Conservation Need; III= High Conservation Need; and IV= Moderate Conservation Need

<sup>3</sup>Conservation Habitat Need based on Table 1 in Watson 2008 and Table 5 in USFWS 2008b; B=Breeding; W=Wintering, M=Migration.

### *Shorebirds*

Few shorebird species use the inland and drier habitats of the refuge. Suitable habitat for these species is limited to areas along the narrow gravel beaches and mudflats below the refuge's erosional bluffs, the early successional forest stands in moist hardwoods and floodplain forest, and freshwater marshes along the James River, Powell Creek, and Flowerdew Hundred Creek.

At various times of the year, 12 shorebird species of conservation concern on the BCR 27 or BCR 30 lists may occur on the refuge. Five shorebird species are BCR 27 priority species, BCR 30 priority species, Virginia WAP tier category species, and have been observed or are likely to occur during the breeding season at the refuge (table 2.12).

The most familiar shorebirds in the refuge area are killdeer, American woodcock, and spotted sandpiper. During the 2001 to 2011 Hopewell CBC, nine species of shorebirds were observed. Killdeer, Wilson's snipe, and American woodcock are the most commonly observed. American woodcock and red knot are on the highest priority shorebird species in both BCR 27 and BCR 30 and are listed in the Virginia WAP as tier IV moderate conservation need species; James River NWR provides little habitat for red knot. Dunlin and short-billed dowitcher are listed as high in both BCR 27 and BCR 30 plans and are of moderate conservation need in the Virginia WAP.

**Table 2.12. BCR 27, BCR 30, and Virginia WAP Shorebird Priority Species on the Refuge or Project Area**

Species	BCR 27 Priority Status <sup>1</sup>	BCR 30 Priority Status <sup>1</sup>	Virginia WAP Tier <sup>2</sup>	Season of Occurrence <sup>3</sup>
American woodcock	HH	HH	IV	B,W,M
Dunlin	H	H	IV	W,M
Red knot	HH	HH	IV	M
Short-billed dowitcher	H	H	IV	M
Upland sandpiper	H	M	I	B,M

<sup>1</sup>BCR priority status levels: HH = highest; H = high; M = Moderate (Watson 2008 [BCR 27], USFWS 2008b [BCR 30])

<sup>2</sup>Virginia WAP Tiers: I= Critical Conservation Need; II= Very High Conservation Need; III= High Conservation Need; and IV= Moderate Conservation Need

<sup>3</sup>Conservation Habitat Need based on Table 1 in Watson 2008 and Table 5 in USFWS 2008b; B=Breeding; W=Wintering, M=Migration.

#### *Waterfowl*

The tidal tributaries of the lower Chesapeake Bay are important wintering grounds for waterfowl. VDGIF annually conducts aerial Mid-Winter Waterfowl Surveys throughout the Chesapeake Bay and its tributaries. The following information is based on 2006 to 2011 data obtained from those surveys for a section of the river within 5 miles of the refuge. Mallards, American black duck, gadwall, and green-winged teal were the most numerous of the dabbling ducks. Among the divers, ring-necked ducks and bufflehead were the most numerous. Among the geese and swan species, Canada goose, snow goose, and tundra swan dominate the survey totals. The counts for Canada geese over this period averaged more than 7,500 individuals, while snow geese averaged more than 2,500 individuals. Between 2006 and 2011, more than 2,500 tundra swans were observed within a 5-mile radius of the refuge on an annual basis during the VDGIF Mid-Winter Waterfowl Surveys.

In addition to the VDGIF Mid-Winter Waterfowl Surveys, the Hopewell CBC also has provided some on-the-ground visual observations of waterfowl within the count circle (a much smaller observation area compared to the aerial surveys). Of the 30 species on the compiled 2001 and 2011 list, the most dominant included Canada goose, snow goose, double-crested cormorants, mallard, ring-necked duck, gadwall, American black duck, bufflehead, hooded merganser, and ruddy duck.

Through the various surveys, 28 different waterfowl species have been observed to use the refuge. American black duck is the only waterfowl species that is a BCR 27 priority species, BCR 30 priority species, and Virginia WAP tier category species that has been observed on the refuge (table 2.13).

**Table 2.13. BCR 27, BCR 30, or Virginia WAP Waterfowl Priority Species on the Refuge or Project Area**

Species	BCR 27 Priority Status <sup>1</sup>	BCR 30 Priority Status <sup>1</sup>	Virginia WAP Tier <sup>2</sup>	Season of Occurrence <sup>3</sup>
American black duck	HH	HH	II	B,W,M
American wigeon	H	M		W,M
Blue-winged teal	H			W, M
Brant	HH	HH	III	W, M
Bufflehead		H		B,W,M
Canada goose	HH	HH		W,M
Canvasback	HH	H		W,M
Common goldeneye	H	M		B,W,M
Gadwall		M		B,W,M
Greater scaup		H	IV	W,M
Green-winged teal		M		B,W,M
Hooded merganser		M		B,W,M
Lesser scaup	HH	H		W,M
Long-tailed duck		H		W,M
Mallard		H		B,W,M
Northern pintail	HH	M		W,M
Red-breasted merganser		M		W,M
Redhead	HH		III	W
Ruddy duck		M		W,M
Snow goose	HH			W
Tundra swan		H		W,M
Wood duck		M		B,W,M

<sup>1</sup> BCR priority status levels: HH = highest; H = high; M = Moderate (Watson 2008 [BCR 27], USFWS 2008b [BCR 30])

<sup>2</sup> Virginia WAP Tiers: I= Critical Conservation Need; II= Very High Conservation Need; III= High Conservation Need; and IV= Moderate Conservation Need

<sup>3</sup> Conservation Habitat Need based on Table 1 in Watson 2008 and Table 5 in USFWS 2008b; B=Breeding; W=Wintering, M=Migration.

### Mammals

VDGIF lists 45 species of mammals that are present in Virginia. Of these, 17 species are designated as game or furbearer species, and 6 species are designated as pest or nuisance species (<http://vafwis.org/fwis>; accessed May 2013). However, Linzey (1998) describes 49 native species of mammals that are possible based on distribution ranges, but does not include non-native species such as domestic cat, nutria, escaped pigs, goats, dogs, Norway rat, or black rat.

Many mammal species are known to be present within James River NWR. Mice are the most abundant and are found in all habitat types, followed by white-tailed deer. Other known species includes eastern cottontail rabbit, gray squirrel, muskrat, opossum, American beaver, raccoon, and at least one bat species (Brame 2013 personal communication). All these species are common for this part of Virginia. Less frequently observed is the North American river otter.

The white-tailed deer population within James River NWR is relatively stable when evaluated using doe to fawn ratios. The buck to doe harvest ratio is considered sufficient enough to provide a stabilized herd (Proctor 2013

personal communication). Little evidence of browse lines can be found throughout refuge forests. Harvest data from the early 1990s to present show little evidence of hemorrhagic or other diseases and rare reports of piebald deer (VDGIF 2012a).

Four mammal species of concern potentially occur within James River NWR. The State endangered Rafinesque's big-eared bat, also a Virginia WAP tier 1 species of critical conservation need, could potentially use the large tracts of forest on the refuge for roosting habitat. The cotton mouse is listed as a Virginia WAP tier IV species of moderate conservation need and has a range that may include the refuge. The marsh rabbit, which is also a Virginia WAP tier IV species of moderate conservation need, has been found in Surry County, though its potential habitat on the refuge is limited. The southeastern fox squirrel, a Virginia WAP tier III species of high conservation need, may possibly be extending its range northward; suitable habitat for this species is readily abundant on the refuge.

#### *Rafinesque's Big-eared Bat*

Rafinesque's big-eared bat is a State-endangered species and a Virginia WAP tier I species of critical conservation need for the coastal plain. It is considered globally vulnerable to secure and State rare, as it has never been an abundant species ([www.natureserve.org](http://www.natureserve.org); accessed May 2013). It is documented in nearby counties (Sussex and James City) with the core of the Virginia population occurring closer to the North Carolina border. It prefers forested wetlands, and its main foods are moths. Essential habitat for roosting is hollow trees in wooded areas and mature hardwood floodplain forests, which the refuge does supply in modest quantity. More information is needed on the bat community of the James River NWR to confirm its presence or absence within the refuge. The moist hardwood and floodplain forest of the refuge may provide roosting and foraging habitat for this species (VDGIF 2005).

#### **Reptiles and Amphibians**

Within a 3-mile radius of the refuge, 82 species of reptiles and amphibians are either potentially or likely to occur (VDGIF 2005). Of these, 17 species have State status or are tiered species in the Virginia WAP. These include species such as oak toad (tier II), eastern box turtle (tier III), spotted turtle (tier III), eastern spadefoot (tier IV), and eastern hog-nosed snake (tier IV). The riparian forests and wetlands along the James River, Powell Creek, and Flowerdew Hundred Creek, as well as the isolated vernal pools, swamps, and marshes on the interior of the refuge provide breeding and foraging habitat for many species of reptiles and amphibians.

Few baseline surveys have been conducted at James River NWR. In 2001, the Virginia Natural Heritage Program (VDNH) conducted surveys for rare species and communities and documented eight amphibian species and four reptile species (Belden et al. 2002). All of the species observed were common to Virginia, and none were Virginia WAP conservation species. In 2006, the Virginia Herpetological Society and VCU conducted a spring survey at the refuge and found similar results. While the refuge was found to contain numerous reptiles and amphibians, none of the species were of significant conservation concern. Refuge staff and visitors have observed two tier III species, eastern box turtle and spotted turtle (Spencer 2009 personal communication), indicating that species of concern are using the refuge and

that additional surveys may provide a better picture into the reptiles and amphibians of the refuge.

#### *Eastern Box Turtle*

The eastern box turtle is listed in the Virginia WAP as a tier III high conservation need species and as a vulnerable species on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species with the most severe threats to the species listed as pesticide effects, habitat destruction and fragmentation, and vehicle strikes (VDGIF 2005, van Dijk 2011). Data sets from multiple studies point to an estimated 30 percent decline in populations over the last three generations (van Dijk 2011). Eastern box turtles are considered habitat generalists (Erb 2011); however, microhabitat conditions of temperature and moisture are driving factors for habitat selection more than vegetation structure (Reagan 1974). Diet of the eastern box turtle includes mushrooms, plant stems, leaves, flowers, slugs, and snails (van Dijk 2011). Home ranges can vary from 0.005 acres to 47.4 acres depending on habitat quality and fragmentation (Kapfer et al. 2013, Iglay et al. 2007).



Doug Letterman

*Eastern box turtle*

#### *Spotted Turtle*

Spotted turtle is a Virginia WAP tier III high conservation need species. This species is common throughout Virginia's coastal plain and has been documented on the refuge (Brame 2013 personal communication). Mating occurs in shallow water and nests are constructed in well-drained soils of marshy pastures, tussocks and hammocks, or in open areas at the edges of thick vegetation. Industrial pollution, increases in water depths, and the loss of wetland habitats are significant factors in the decline of populations.

#### *Spotted Salamander*

Spotted salamanders occur throughout most of Virginia in well-shaded deciduous forest stands close to swamps and vernal pools (Hammerson 2004, Faccio 2003, <http://www.dgif.virginia.gov/wildlife/information/?s=020049>;

accessed November 2013). Recent studies of breeding pools shows that microclimate variables of deeper water, abundant submerged vegetation, and cooler temperatures are used in selection (Kern et al 2013). During fall through early spring, small mammal burrows are used almost exclusively as terrestrial refuges (Madison 1997). Maintaining connectivity of forest habitat around pools should be considered a management priority due to avoidance of open areas and edges by amphibians (Regosin et al. 2005). Maintaining corridors along riparian areas especially can also aid in dispersal and gene flow between populations (Purrehage 2009).

While conducting a reptile and amphibian survey in 2006, the Virginia Herpetological Society examined individual animals for evidence of parasites, infection, or malformations. Of particular note, many of the eastern fence lizards caught were found to be heavily infested with ticks. Also at that time, a snake lesion and blood sampling study was initiated for non-threatened and non-endangered snakes. Snakes that were captured were analyzed for lesions and biopsied; if appropriate, blood samples were taken, and snakes were tagged prior to release. This study was prompted by an earlier study conducted in June 2005 at the Rappahannock River Valley NWR, where an unusually high incidence of skin lesions and eye infections were noted among several species of snakes. Researchers sought to expand their investigations to the nearby James River and Presquile NWRs to determine the extent and find clues for potential cause(s). No major concerns have been noted to date with populations on James River NWR since the 2006 study (Ware 2012 personal communication).

### Fish

VDGIF lists 50 fish species to be present within 3 miles of the refuge (VDGIF 2010). During general surveys that VDNH conducted in 2001, three fish species were identified at the refuge: spottail shiner, banded killifish, and bluegill (Belden et al. 2002).

Within the portion of the James River watershed that includes the refuge and its waterways, the following fish species may find suitable spawning and nursing sites: bridle shiner, alewife, American shad, blueback herring, gizzard shad, hickory shad, and striped bass ([http://www.fws.gov/refuge/james\\_river.html](http://www.fws.gov/refuge/james_river.html); accessed June 2013). Atlantic sturgeon uses the waters adjacent to refuge and has been observed breaching the water during eagle surveys (Brame 2013 personal communication).

Species of fish listed in the Virginia WAP and in the Virginia Fish and Wildlife Information Services Biota of Virginia Database that have been identified within a 3-mile radius from the refuge are listed in table 2.14. Federal and State statuses are also included, where applicable.

**Table 2.14. Virginia WAP Fish Species**

Common Name	State and Federal Status <sup>1</sup>	Virginia State WAP Tier <sup>2</sup>
Alewife		IV
American brook lamprey		IV
American eel		IV
American shad		IV
Atlantic sturgeon	FE/SE	II

Common Name	State and Federal Status <sup>1</sup>	Virginia State WAP Tier <sup>2</sup>
Banded sunfish		IV
Black-banded sunfish	SE	I
Bridle shiner		I
Ironcolor shiner		IV
Lake chubsucker		IV
Least brook lamprey		IV
Mud sunfish		IV
Roanoke bass		II

<sup>1</sup> FE = Federally Endangered; SE = State Endangered

<sup>2</sup> Virginia WAP Tiers: I= Critical Conservation Need; II= Very High Conservation Need; III= High Conservation Need; and IV= Moderate Conservation Need

### *Atlantic Sturgeon*

In February 2012, the NOAA's National Marine Fisheries Service listed the Chesapeake Bay population of Atlantic sturgeon as federally endangered (NOAA 2010, NOAA 2012a). In addition to being a globally vulnerable species, Atlantic sturgeon is also a State-endangered species.

According to State fishery biologists, a small but viable sturgeon population occurs in the lower James River, and the James River remains one of the best places in the Chesapeake Bay watershed to find sturgeon. Service staff have been working with VCU by supporting tagging and recapture efforts, establishing the Atlantic Sturgeon Research Station nearby at Presquile NWR, and assisting with preliminary studies to investigate potential effects of river channel dredging on the population. In 2013, 162 sturgeon were captured and tagged within the lower James River (Belazik 2013 personal communication).

In 2010, the JRA partnered with State and private entities to construct an artificial spawning reef adjacent to Presquile NWR. Partner agencies and organizations are conducting ongoing monitoring to evaluate whether or not the artificial reef site is promoting spawning by sturgeon. Other fish species have been noted to use the area for spawning. However, use by sturgeon has not been confirmed to date (Frederickson 2011 personal communication).

### *Alewife and Blueback Herring*

Alewife (tier IV) and blueback herring were recently proposed for Federal listing as threatened in the *Federal Register* (76 FR 67652), primarily due to concerns with habitat loss, habitat alteration, impaired water quality, and overutilization. According to the *Federal Register* Notice, the substrate preferred for spawning varies greatly and can include gravel, detritus, and SAV. Blueback herring prefer swifter moving waters than alewife. According to the VDGIF Fish and Wildlife Information Service (FWIS), alewife has been documented to be within a 3-mile radius of the refuge (<http://vafwis.org>; accessed March 2013).

### **Invertebrates**

During general surveys conducted in 2001 by the VDNH, 11 species of dragonflies and damselflies, 18 species of butterflies and skippers, and 110

species of moths were identified at the refuge. Representative dragonflies included common green darner, eastern pond hawk, great blue skimmer, and eastern amberwing. Only two damselflies were noted, big bluet and fragile forktail (Belden et al. 2002). The extensive list is on file at the refuge office; see Belden 2002.

VDGIF lists 59 species of invertebrates within 3 miles of the refuge. Two species of invertebrates of conservation concern may also occur on or near the refuge: the alewife floater mussel (tier IV) and the Diana fritillary (Federal species of concern; tier IV). VDGIF also lists six species of crayfish known in Prince George County, but none is either State or federally listed nor do any have Virginia WAP rankings. There are no known rare crayfish, isopods, or amphipods within the refuge.

In 2001, the VDNH conducted a zoological inventory at the refuge for targeted rare species. Targeted species for the zoological inventory included yellow lampmussel, Ohio shrimp, rare skipper, tidewater interstitial amphipod, and insects of varying conservation ranks (See Belden et al. 2002 for complete lists). During surveys, two rare dragonflies and damselfies formerly listed on the VDNH Heritage Watch list were collected. The blue dragonlet was collected in a ponded section of a small tributary to Flowerdew Hundred Creek, near the James River NWR. The big bluet damselfly was found to be common and was collected along the vegetated banks of Powell Creek at the refuge.

#### *Insect Pests*

The southern pine beetle poses a far more significant threat than other insect pests known to occur on the refuge. Highest risk areas include dense pine stands (greater than 1,000 stems per acre), over mature trees (greater than 60 years old), and generally unhealthy stands (for example, just after crown closure). Typical outbreaks of this beetle occur every 10 to 15 years, and it has been about 11 or 12 years since the last outbreak in Prince George County (Lacey 2007 personal communication). Although a full assessment of the refuge's pine stands has not been conducted, refuge staff has documented suspected pine beetle infestations at four sites and confirmed pine beetle presence at two sites (Brame 2013 personal communication). Each of these six sites is approximately 0.25 acres or less and contains three to nine dead trees in a cluster. Increasing the distance between individual pine trees limits the spread of the southern pine beetle through the entire stand.



U.S. Department of Agriculture

*S-shaped egg galleries of the southern pine beetle under pine bark*

The gypsy moth, which can defoliate numerous species of trees, is known to occur in Prince George County and may occur at the refuge. However, gypsy moth was not among the 110 species of moths collected during a natural history survey conducted at the refuge by the VDNH in 2001 (Belden et al. 2002). Furthermore, according to the VDOF (Lacey 2007 personal communication), complete stand defoliation occurs only in western Virginia. Evidence of gypsy moth has not been detected on the refuge, but we have also not yet conducted a refugewide survey.

Of much less concern, the pales weevil feeds on all pine species within its range and symptoms, which include dead seedlings or shoot tips on larger trees; pitch or resin bleeding, occur from June through August (<http://pubs.ext.vt.edu/2902/2902-1102/2902-1102.html>; accessed May 2013).

#### **Nonnative Invasive Wildlife**

Nonnative invasive wildlife species of potential management concern include feral hogs, nutria, and mute swans. However, none of these species has been detected on the refuge to date.

## **2.12 Cultural Resources**

A variety of Federal laws require that the Service identify and preserve its important historic structures, archaeological sites, and artifacts. NEPA mandates consideration of cultural resources in planning Federal actions. The Improvement Act calls for identification of the archaeological and cultural values of each refuge in the comprehensive conservation plans.

Federal agencies are also required by the NHPA to locate and protect historic resources (archaeological sites and historic structures eligible for or listed in the National Register of Historic Places [National Register], and museum property) on their land or on land affected by their activities. In addition, agencies are required to establish a program for these activities and carry out their preservation activities in consultation with SHPO. The Service's Regional Historic Preservation Officer (RHPO) in Hadley, Massachusetts, oversees compliance with these laws and consults with the SHPOs in 14 states. In Virginia, the SHPO is the VDHR.

The NHPA makes site preservation depend on the National Register eligibility, a measure of the site or structure's quality or importance. Federal agencies are also charged with locating, evaluating and nominating sites on their land to the National Register. The Service maintains an inventory of so far discovered archaeological sites and historic structures in the Service's Regional Office, with copies of the site files at each refuge.

Section 110 of NHPA requires the each Federal agency to identify and nominate to the National Register all resources under its jurisdiction that appear eligible, including cultural landscapes. Research and preliminary field surveys are conducted to determine the existence of cultural landscapes. Identifying the significant characteristics and features of a landscape involves understanding its physical modifications and use, along with any ethnographic values and affiliations.

In addition, the Service complies with the ARPA, which requires that we protect our archaeological sites from vandalism and looting, and we require permits for site excavation. The RHPO manages these activities for Region 5.

The Service also owns and cares for museum property. Archaeological collections, art, zoological and botanical collections, historical photographs, and historic objects are our most common types of museum property. Each refuge maintains an inventory of museum property. Museum property care on refuges is guided by the Museum Property Coordinator in the Region 5 Regional Office, and helps the Service comply with the NAGPRA, as well as Federal regulations guiding curation of Federal archaeological collections. The program ensures that Service collections will continue to be available to people for learning and research.

#### **Applicability to James River NWR**

James River NWR contains significant cultural resources that have contributed to and have the potential to advance our understanding of Virginia prehistory and history. The heritage surviving at the refuge includes a material culture chronicling Native American culture, initial settlement of the James River by Europeans, Native American response to European settlement, Plantation society, military history, and post-Civil War rural agriculture.

An archaeological overview has been compiled for this refuge (Goode et al. 2009). Within the refuge 7 known archeological sites, 53 potential historic locations, and a large area of prehistoric high probability have been inventoried. Additionally, the 2011 update to the 1993 Civil War Sites Advisory Commission Report identified portions of the potentially eligible Petersburg II Battlefield on refuge lands (VDHR ID#123-5025; Eaton 2014 personal communication). As summarized in section 2.3, the refuge also has the potential to contain Paleo-Indian sites, known prehistoric archeological sites include Early Archaic through Late Woodland sites, and historic sites include occupations dating from the 17th to the 20th century. Until National Register eligibility has been evaluated, each of these sites and areas is treated as if eligible.

The following sections provide more specific details about the known National Register eligible properties, cultural landscapes, and archaeological resources known to occur on the refuge.

#### **2.12.1 National Register Eligible Properties**

The National Register is composed of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture. The National Register defines an archaeological site as “the place or places where the remnants of a past culture survive in a physical context that allows for the interpretation of these remains” (Little et al. 2000). Such properties may meet criteria for inclusion in the National Register for a variety of reasons, not the least of which may be because “they have yielded, or may be likely to yield, information important to prehistory or history” (National Register Criteria for Evaluation, 36 CFR 60.4). It is possible that additional unrecorded archaeological sites exist at James River NWR, awaiting identification. When an action is proposed in an area of archaeological sensitivity, it may be necessary to perform an archaeological investigation to locate any archaeological sites that may be present, and to

evaluate their eligibility for the National Register.

The Hatch Site at James River NWR is the only site within the refuge listed on the National Register (44PG0051). The Hatch Site is also listed in the on the Virginia Landmarks Register. Analysis and reporting for this site are incomplete, but remains include Early Archaic (8000 to 6500 B.C.) through Late Woodland Period (A.D. 900 to European Contact) artifacts. The area has been capped with clean fill. An excavation was conducted in 2004 in an attempt to analyze ethno-botanical samples, but the sample size was inadequate to conduct the analysis. There are no current plans to conduct further archaeological work at this site (Small 2013 personal communication).

Goode et al. (2009) examined historic maps of the refuge vicinity and determined that 53 different buildings or structures (e.g., ruins, cemeteries) appeared on maps throughout the 19th and 20th centuries. Until sites and structures have been evaluated for National Register eligibility, they are treated as if eligible. VDHR recently suggested that we prepare the determination of eligibility documentation for Maycock's Point Site (44PG0040; Eaton 2014 personal communication). The Maycock's Point Site was part of a plantation from 1620 to 1690. Prior to this, Native Americans used the location. Deposits seem to begin as early as the Early Archaic Period and continue into the Contact Period, but the heaviest use was during the Middle Woodland Period. Based on carbon dates, the Middle Woodland Period site was occupied between A.D. 300 and A.D. 800. The site may take up 20 to 30 acres, but a systematic modern archaeological survey to define site boundaries has not been completed. Additional survey work at this site was conducted in 2004 and 2005 (Small 2013 personal communication).

### **2.12.2 Cultural Landscapes**

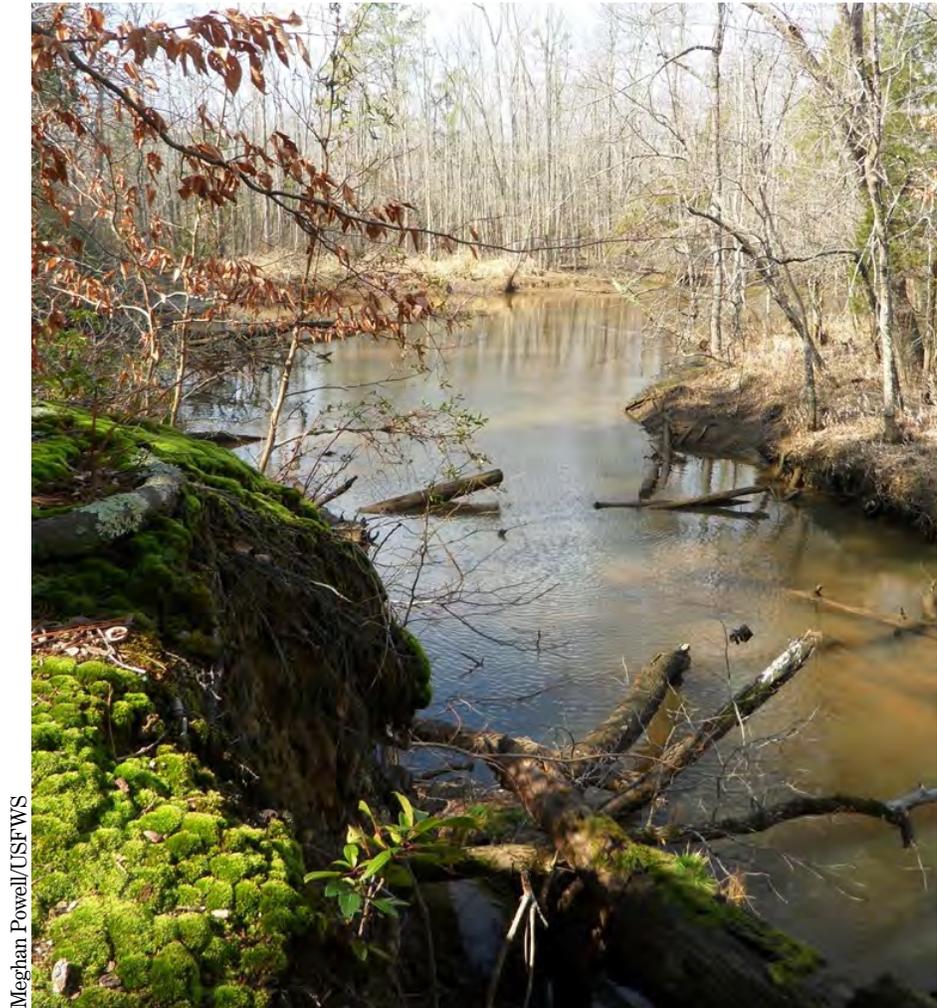
Refuge lands have been used by a variety of peoples through time, and understanding the changes in land use helps us better understand the relationship between people and events. We aim to promote a deeper understanding of America's diverse peoples and to inspire refuge stewardship by telling a more complete story of the area's significance in the past, present, and future.

In this section, we characterize the various cultural landscapes associated with refuge lands. The NPS defines a cultural landscape as "a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein), associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values" (NPS 2006). We conducted a preliminary survey for cultural landscapes at the refuge. Formal documentation, evaluation, and registration of these cultural landscapes has not been completed.

#### **Indigenous Cultural Landscapes**

James River NWR is a good example of a new concept of place known as an "indigenous cultural landscape" (Beacham 2011 personal communication). Developed during planning for the Captain John Smith Chesapeake NHT, the concept is intended to represent large landscapes from the perspective of American Indian nations at the time of their first contact with Europeans. The indigenous cultural landscapes identified in the Chesapeake Bay area still have many of the cultural and natural resources that would have supported the historic lifestyles and settlement patterns of American Indian

peoples in their totality. The concept also attempts to demonstrate that



Meghan Powell/USFWS

*Indigenous cultural landscape along Powell Creek*

American Indian places were not confined to the sites of houses, towns, or settlements. It emphasizes that the American Indian view of one's homeland is holistic rather than compartmentalized into the discrete site elements typically described by European-descended peoples as "hunting grounds," "villages," or "sacred sites." More on this concept is described at <http://www.nps.gov/chba/parknews/upload/ICL-Paper.pdf> (accessed June 2014).

The conclusion that indigenous cultural landscapes occur at James River NWR is supported by the presence of several archaeological sites with artifacts from the Early Archaic period (8000 to 6500 B.C.) through European contact in May 1607 (Goode et al. 2009), documentation from early European exploration of the James River (<http://www.smithtrail.net/captain-john-smith/smiths-journals>; accessed November 2013), and persistence of many landscape elements that supported American Indian communities and peoples (Beacham 2011 personal communication). The transportation routes on and adjacent to the James River and its tributaries, accessible landing

places, marshes, brushy areas, mixed deciduous forest, high bluffs, and uplands that could support hunting were all central elements that supported American Indian communities for centuries prior to and following European settlement. The combination of these natural landscape elements gives refuge visitors the feeling that they are walking through the past and encourages them to imagine living off the land and waters as a Virginia Indian or early European settler despite the presence of paved roads, few modern facilities on refuge land, and motorized boat traffic on the James River.

Interpretation that the refuge has indigenous cultural landscapes on and adjacent to the James River and its tributaries is wholly consistent with the Service mission “to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people,” which includes Native Indian peoples independent of Federal or State recognition.

### **European Settlement and Plantation Landscapes**

Lands near present-day James River NWR were among the earliest of the 50-acre land patents granted to private individuals in an effort to encourage and expand European settlement in Virginia (Goode et al. 2009). Early settlements clustered along the rivers and major streams, including Powell Creek and Flowerdew Hundred Creek. Much of the 1,700 acres granted to Captain Samuel Maycock in 1618 is located within the present-day refuge. The 600-acre Powell-Brooke farm was settled on the west side of present-day Powell Creek, and the 1,000-acre Flowerdew Hundred farm was settled to the east of the present-day refuge. European settlement remained sparse until the late 19th century.

Evidence of early European settlement on the refuge persists. Historic documentation, structural ruins, cemeteries, and artifacts offer additional information about the early European settlement landscape (Goode et al. 2009). The property divisions in place by the 19th century remained largely intact until the early 20th century, and settlement remained concentrated in the western part of the present-day refuge and along the James River. Today, refuge staff maintains a portion of the Maycock farm in open grassland as representation of the former tenant farm. Adjacent to the refuge, the Flowerdew Hundred Plantation retains some characteristics of the former tenant farm, such as the expansive and unobstructed views of the grasslands bounded by fence lines, hedgerows, and densely vegetated swamp or upland forests in the distance. Partners, such as the VDHR and Prince George County, have assisted in assessing cultural resource sites and coordinating efforts to preserve these areas.

### **Strategic Military Positions**

Many of the same landscape features that served to protect and support American Indian and early European settlement were key features that factored into military actions during the Revolutionary War, War of 1812, and the Civil War. Popular river crossing locations and defensible bluffs within and adjacent to the present-day refuge were frequented during each of these wars (Goode et al. 2009).

### **African-African Settlement**

In the early 20th century, and possibly the late 19th century, a somewhat dispersed African-American community was located in nearly the center of the present-day refuge. No evidence of this cultural landscape remains

obvious today because the buildings of this community were largely demolished by the mid-20th century (Goode et al. 2009).

### **2.12.3 Archaeological Resources and Collections**

All of the archaeological sites and artifacts within the refuge are protected under the provisions of NHPA, ARPA, and other laws.

Within the refuge, the past archeological investigations have only focused on the largest and densest archeological sites. It is highly likely that additional archeological sites remain to be found. The known archeological sites are not isolated within the landscape. Additional ancillary and support sites related to the known sites of occupation should be present within the refuge.

Seven previously identified archaeological sites are located within James River NWR. Previous archeological investigations have included large scale and extensive excavations. However, these investigations have not resulted in site reports. Consequently, the state of current information about the past contains a significant gap. Significant information, which would advance the current understanding of the past, is in danger of being lost forever.

Erosion is threatening intact archeological deposits. This may not only result in the loss of valuable information, but the presence of artifacts at a location where the public has access may result in unlawful artifact collection. Of the potential effects of climate change, sea level rise would potentially affect sites in the refuge's tidal marshes by 2025. We anticipate that the sites within the refuge's dry lands, inland-fresh marshes, and non-tidal swamps would be relatively resilient to sea level rise (Clough and Larson 2010).

Formal Phase I field investigations involving surface collections, shovel testing, and metal detection to identify and define the boundaries of archeological resources within the refuge have not been conducted by the Service.

## **2.13 Public Uses**

This section describes the public access, education, and recreation opportunities at James River NWR. Information about the refuge's recreation features and access are available from the refuge website ([http://www.fws.gov/refuge/james\\_river](http://www.fws.gov/refuge/james_river); accessed November 2013) and refuge staff. In 1993, the Service prepared a public use management plan for James River NWR.

Currently the refuge's wildlife refuge specialist spends between 6 and 9 percent of his time annually administering activities and facilitating visits to James River NWR. According to the most current Refuge Annual Performance Planning Workbook, 485 people visited the refuge in 2012, primarily for hunting.

The Refuge Administration Act identified six priority public uses: hunting, wildlife observation, photography, environmental education, interpretation, and fishing. In accordance with this act and Service policy, these uses receive enhanced consideration over general public uses in the Refuge System. Compatibility determinations are included in appendix B of this draft CCP.

### 2.13.1 Hunting

The refuge opened to big game hunting in 1992, specifically hunting of white-tailed deer (57 FR 58108; codified at 50 CFR 32.66); the refuge remains closed to small game hunting, waterfowl, and turkey (USFWS 1993).

Proposed changes to the refuge-specific big game hunt regulation revisions have been published in the *Federal Register* and Title 50 in the CFRs annually since that time. We prepared a compatibility determination and categorical exclusion for our big game hunt program in 1994 (USFWS 1994).

The refuge is currently open to the hunting of white-tailed deer on specific days during the State's archery, muzzleloader, and shotgun seasons. Participation in each hunt on the refuge requires a refuge-issued permit. The refuge allows hunting in designated areas; the refuge does not allow hunting on the refuge in safety zones, administrative areas, and on public roads. The use of pursuit dogs during deer hunting on the refuge is prohibited.

Hunters wishing to participate in the refuge's archery hunt apply through the State's quota hunt lottery system. Hunters may apply by mail, telephone, or through the VDGIF's website (<http://vaquotahunts.com>; accessed April 2014), and the application fee is \$7.50. Up to 25 archery hunters are selected by lottery. Each selected hunter may be accompanied by one guest hunter, who must acquire a refuge permit to participate in the hunt. Up to 50 hunters may participate on any or all of a 19-day still archery season in October, excluding Sundays (950 hunt use days annually). A refuge archery hunt permit fee of \$50 is charged to each hunter participating in the 19-day archery deer season. For the past 5 years, the refuge has issued 50 archery hunt permits annually, but no single hunter has actively hunted on every one of the 19 days of the season. On average, seven hunters participate in the archery hunt per available day (15 percent participation annually) (Brame 2013 personal communication).



*Designated hunt location #8*

Meghan Powell/USFWS

Hunters wishing to participate in the refuge's muzzleloader or shotgun hunts are selected on a first-come, first served basis; hunters report to the refuge's hunter check station (maps 2.1 and 2.2) on the hunt day to acquire a refuge-issued permit for the day.

The refuge accommodates up to 70 hunters per day on each of two muzzleloader hunting days, on the first two Saturdays of the season (140 hunter use days annually). On average, 38 hunters participate in the muzzleloader hunt per available day (54 percent participation annually). Muzzleloader hunters are required to use portable tree stands to hunt.

The refuge accommodates up to 70 hunters per day on each of four shotgun hunting days, typically in late November and early December (280 hunter use days annually). On average, 33 hunters participate in the shotgun hunt per available day (46 percent participation annually). Use of portable tree stands by shotgun hunters is optional.

Currently, the bag limit for the refuge's archery, muzzleloader, and shotgun hunts is two deer of either sex per hunt day. The refuge harvest totals support that objective of having a stable deer population, with a female harvest rate of approximately 40 percent of the total deer kill (VDGIF 2012a).

The refuge hunt program is part of the State's Deer Management Assistance Program (DMAP). The primary goal of DMAP is to allow landowners and hunt clubs to work together on a local level to manage their deer herds. Secondary objectives are to increase the Department's biological deer database and to improve communication between deer hunters, landowners, and the Department. Participation in the DMAP contributes information about the refuge's deer population and helps us to ensure a harvestable surplus of deer exists within the refuge. We coordinate closely with our VDGIF District Biologist throughout the year to evaluate herd size, disease issues, and current regulations. Current hunting information is available at the refuge website ([http://www.fws.gov/refuge/james\\_river](http://www.fws.gov/refuge/james_river); accessed May 2013).

### **2.13.2 Wildlife Observation, Photography, Environmental Education, and Interpretation**

The refuge is open to and allows access to organized groups and individuals to engage in environmental education. We prepared a compatibility determination and categorical exclusion for use of the refuge as an outdoor classroom in 1994 (USFWS 1994). Refuge visitors may be unchaperoned or may request an orientation from staff or a partner organization. In all instances, visitors are required to notify the refuge three business days in advance of each visit to make reservations, and after each trip report back to the refuge the total number of people involved in the visit. Partner organizations, such as VCU, CCB, CBF, and JRA, have assisted in offering environmental education opportunities at the refuge. VCU and CCB have provided environmental education regarding their research efforts on the refuge. CBF offers unique environmental education opportunities to local teachers, informing them about the refuge and the potential to use the refuge and similar types of places as outdoor classrooms. The JRA has led canoe trips for students and members of the public that highlight the importance of clean waters and healthy watersheds.

Refuge staff provide a limited number of public opportunities for wildlife

observation, photography, and interpretation annually. We also collaborate with Richmond Audubon to conduct bird walks and similar interpretation opportunities. CBF incorporates interpretive messaging about the refuge into SAV plantings and other associated group visits to the refuge. The Appalachian Trail Club has been an integral partner in providing volunteers to perform trail maintenance activities and assist in maintaining other public use facilities for visitors participating in wildlife observation, photography, and interpretation.

In December 2007, the Service and JRA entered into a MOU to formalize a partnership to encourage the public to develop an appreciation for, and stewardship ethic toward, the protection and conservation of natural and cultural resources at James River and Presquile NWRs. Our partnership with JRA exemplifies the Service's commitment to fulfilling the goals of President Obama's AGO Initiative, EO 13508: Chesapeake Bay Protection and Restoration, and the Refuge System's renewed vision, detailed in *Conserving the Future: Wildlife Refuges and the Next Generation* (USFWS 2011a). The MOU outlines the terms under which JRA may use the properties for the purposes of environmental education, nature study, wildlife observation, and other uses as specified and detailed in a special use permit, and includes the creation of the James River Ecology School (Ecology School) program. The current focus of this environmental education program is to offer single- and multi-day environmental education programs on Presquile NWR. The Ecology School opened on Presquile NWR in early 2013. Currently, no environmental education programs through the Ecology School are being offered at James River NWR.



Cyrus Brame/USFWS

*Boy Scout troop observing refuge wildlife*

### **2.13.3 Fishing**

The James River is Virginia's premier trophy blue cat fishery, due to having large quantities of fish 50 pounds and larger (VDGIF 2011). However, James River NWR has not been opened to fishing from refuge property and does not allow herring dipping (USFWS 1993). The intent of this status is to protect sensitive shoreline habitat and minimize disturbance to wildlife. Ample fishing opportunities exist on nearby waters where allowed by State regulation and on adjacent lands where permitted by the landowner.

### **2.13.4 Findings of Appropriateness and Compatibility Determinations for Public Uses**

Appendix B includes our updated evaluations, which are included in this document for public review and comment. Final decisions on these uses will be made with the final CCP.

The following activities are found to be appropriate and compatible public uses on the refuge:

- Commercial forest management for habitat management.
- Hunting.
- Research by non-Service personnel.
- Wildlife observation, photography, environmental education, and interpretation.

The following activities were determined to be not appropriate uses of the refuge. We provide updated findings of appropriateness in accordance with Service policy (603 FW 1) for the following uses in appendix B:

- Camping.
- Collecting natural products.
- Firing range.
- Horseback riding.
- Pets on the refuge.
- Swimming and sunbathing.
- Use of pursuit dogs for hunting.