



Regional Economic Analysis of Current and Proposed Management Alternatives for Rappahannock River Valley National Wildlife Refuge

By Lynne Koontz, Natalie Sexton, and Ryan Donovan

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Introduction

The National Wildlife Refuge System Improvement Act of 1997 requires all units of the National Wildlife Refuge System to be managed under a Comprehensive Conservation Plan (CCP). The CCP must describe the desired future conditions of a refuge and provide long-range guidance and management direction to achieve refuge purposes. The Rappahannock River Valley National Wildlife Refuge (refuge) is in the process of developing a range of management goals, objectives, and strategies for the CCP. The CCP for the refuge must contain an analysis of expected effects associated with current and proposed refuge management strategies.

The purpose of this study was to assess the regional economic implications associated with draft CCP management strategies. Special interest groups and local residents often criticize a change in refuge management, especially if there is a perceived negative impact to the local economy. Having objective data on economic impacts may show that these fears are overstated. Quite often, the extent of economic benefits a refuge provides to a local community is not fully recognized, yet at the same time the effects of negative changes is overstated. Spending associated with refuge recreational activities, such as wildlife viewing and hunting, can generate considerable tourist activity for surrounding communities. Additionally, refuge personnel typically spend considerable amounts of money purchasing supplies in local stores, repairing equipment and purchasing fuel at the local service stations, and reside and spend their salaries in the local community.

For refuge CCP planning, a regional economic assessment provides a means of estimating how current management (no action alternative) and proposed management activities (alternatives) could affect the local economy. This type of analysis provides two critical pieces of information: (1) it illustrates a refuge's contribution to the local community; and (2) it can help in determining whether local economic effects are or are not a real concern in choosing among management alternatives.

It is important to note that the economic value of a refuge encompasses more than just the impacts of the regional economy. Refuges also provide substantial nonmarket values (values for items not exchanged in established markets), such as maintaining endangered species, preserving wetlands, educating future generations, and adding stability to the ecosystem (Caudill and Henderson, 2003). However, quantifying these types of nonmarket values was beyond the scope of this study because of time and budget constraints.

This report first presents a description of the local area and economic activities near the refuge. Next, the methods used to conduct an economic assessment are described. An analysis of current and proposed management strategies that could affect the local economy is then presented. The refuge management activities of economic concern in this analysis are:

- Refuge purchases of goods and services within the local community
- Refuge personnel salary spending
- Spending in the local area by refuge visitors
- Refuge land purchases and changes in local tax revenue

Regional Economic Setting

The refuge is located in east central Virginia along the banks of the Rappahannock River. It is the newest of four refuges that comprise the Eastern Virginia Rivers National Wildlife Refuge Complex (refuge complex). It is within a few hours drive from the urban areas of Washington, D.C., Baltimore, Maryland and Richmond and Norfolk, Virginia. The area between the Rappahannock and Potomac Rivers form the region known as the Northern Neck of Virginia. The Northern Neck region contains the counties of King George, Westmoreland, Lancaster and Richmond, all which border the refuge on the north and east (Northern Neck Tourism Council, 2003). Caroline, Essex and Middlesex Counties border the refuge to the south and west and are located in the region known as Virginia's Middle Peninsula, bound by the Rappahannock and York Rivers (Patterson, 2006).

The Northern Neck of Virginia offers abundant recreation opportunities including fishing, biking, canoeing and kayaking, as well as eco-tours that offer birding and chances for educational experiences. With more than 6,500 acres of natural areas and preserves and 1,100 miles of shoreline, the Northern Neck offers numerous habitats, including salt and freshwater marshes, agricultural croplands, woodlands and open fields, for boundless chances to view wildlife and birds (Northern Neck Tourism Council, 2003). The Middle Peninsula region also offers abundant wildlife and water related recreation opportunities, providing visitors with an assortment of activities: birding, swimming, fishing, boating, and sailing (Middle Peninsula Planning District Commission, 2003).

Local and Regional Demographics

Population

Table 1 shows the population estimates and trends for the counties and towns near the refuge. Combined, the seven county study area accounted for 1.4% of the state's total population in 2000. Virginia's population increased by 14.4% from 1990-2000 and five of the 7 counties in the study area exceeded that rate. King George County experienced the greatest population growth of the seven counties in the study area during that decade, increasing by 24.2%. Only Lancaster County and Westmoreland County grew at a slower rate than the state average, increasing their populations by 6.2% and 8.0%, respectively (U.S. Census Bureau, 2006).

The Northern Neck Counties

King George County, bordering the refuge on the northeast, is known as the Gateway to the Northern Neck (King George County, 2006). King George has the largest population of the Northern Neck counties in the study area. Established in 1720, King George County is rich in history and tradition.

Table 1. Local and regional population estimates and characteristics.

	Residents	Median Age	Persons per Square Mile	Land Area (Square Miles)	Population Percent Change 1990–2000
Virginia	7,078,515	35.7	178.8	39,594.07	14.4
Counties Near Refuge					
Northern Neck Counties					
King George	16,803	35.1	93.4	180.00	24.2
Lancaster	11,567	49.8	86.9	133.14	6.2
Richmond	8,809	40.3	46.0	191.46	21.1
Westmoreland	16,718	42.8	72.9	229.18	8.0
Middle Peninsula Counties					
Caroline	22,121	37.7	41.5	532.52	15.1
Essex	9,989	40.3	38.8	257.77	15.0
Middlesex	9,932	46.8	76.2	130.30	14.8
Principal Towns Near Refuge					
Port Royal (Caroline County)	170	37.0	1,467.9	0.12	–20.0
Tappahannock (Essex County)	2,068	38.7	793.6	2.61	33.4
Warsaw (Richmond County)	1,375	44.1	453.0	3.04	43.1

Source: U.S. Census Bureau, 2006

George Washington and James Madison resided in the county, and it is home to various historical buildings, including churches and courthouses (King George County, 2006).

Westmoreland County has the second largest population and largest land area of the Northern Neck Counties in the study area. The county boasts 5,450 acres of nature preserves and 6,300 acres of wetlands. In addition to its tradition of agriculture, it is also attracting new businesses that are compatible with the rural tidewater landscape and lifestyle (Westmoreland County, 2006).

Lancaster County is one of Virginia's leading resort, retirement and second home communities. The county's largest employers are resorts, medical facilities, retirement communities and financial service firms (Lancaster County Chamber of Commerce, 2006). Lancaster County is also home to the region's primary healthcare facility, Rappahannock General Hospital.

Richmond County is the least populated of the Northern Neck Communities in the study area. Founded in 1692, Richmond County is located in the heart of the Northern Neck of Virginia. Farming, fishing and forestry have formed the backbone of the county's economy (Richmond County, 2006). Warsaw, the county seat, is the headquarters for many regional government agencies, as well as a regional community college, vocational center, and jail (Richmond County, 2006).

The Middle Peninsula Counties

Caroline County has the largest population and land area of the seven counties in the study area. With low taxes and an excellent transportation system, including roadways to major east coast cities, railways and waterways, Caroline County is aggressively promoting new business. The county houses the Fort A.P. Hill military reservation (Caroline County, 2006). It is also home to the town of Port Royal; first settled in 1652 and chartered in 1744, it is a small town of 170 whose roots are centered around a ferry and tobacco warehouse. Port Royal is one of Virginia's oldest port towns, and its history is kept alive by the protection of the town's historical structures (Historic Port Royal, Inc., 2006).

Essex County, noted by its early settlers for its fertile land, is still a county with a healthy agriculture industry. Tappahannock, the only incorporated town in Essex County, is home to a growing residential base, a thriving business community, and an expanding industrial area which sits on the shores of the Rappahannock River. In less than three square miles, Tappahannock exhibits many features including a waterfront; historic downtown; residential subdivisions, homes, and neighborhoods along the beautiful river; a business corridor development; and an expanding industrial district located near the town's airport. It also includes extensive wetland areas (Essex County, 2006).

Middlesex County, located at the eastern end of Virginia's Middle Peninsula, is home to 9,932 residents. The county is bounded by the Rappahannock River to the north, Chesapeake Bay to the east, the Piankatank River and Dragon Run Swamp to the southwest, and by Essex County to the northwest (Middlesex County, 2006). The county's extensive miles of shoreline provide opportunities for water and wildlife-related recreation, from fishing to cruising and sailing.

Ethnicity, Ancestry, and Education

In 2000, Virginia's population consisted of 72.3% percent of white persons not of Hispanic or Latino origin (U.S. Census Bureau, 2006). The county percentages were similar to the state average. Percentages of the population consisting of white persons not of Hispanic or Latino origin across the study area ranged from 58.0% in Essex County to 78.5% in Middlesex County. Likewise, the county averages for percentage of the population consisting of black or African Americans was similar to the state average of 19.6%, ranging from 18.7% in King George County to 39.0% in Essex County. Virginia's total population consisted of 0.3% American Indian or Native Alaskan individuals, and all seven counties were similar to this estimate. In 2000, 3.7% of the state's population consisted of individuals who were of Asian descent. All seven counties in the study area consisted of smaller percentages of Asian residents, ranging from 0.1% in Middlesex County to 0.8% in Essex County. (U.S. Census Bureau, 2006). Ancestry patterns were also similar across the counties, with heavy English, German and Irish influences (U.S. Census Bureau, 2006).

Approximately 81.5% of Virginia residents 25 years and older were high schools graduates. The county averages were all lower than the state average, ranging from 60.0% in Richmond County to 80.4% in King George County. The percentage of state residents who held a bachelor's or advanced degree was 29.5%. Again, college graduation rates in each of the seven counties in the study area was less than the state average, ranging from 10.0% in Richmond County to 24.5% in Lancaster County (U.S. Census Bureau, 2006).

Employment and Income

Employment estimates for the seven county study area are shown in table 2. Construction, retail trade and government are all major employers over the seven county study area (U.S. Department of Commerce Bureau of Economic Analysis, 2002). Construction employment ranged from 5.7% of total employment in King George County to 17.4% in Caroline County. Retail trade, as a percentage of total county employment, ranged from 6.8% in King George County to 19.1% in Essex County. Government employment (local, state and federal) comprised 8.5% of total county employment in Lancaster County and nearly 40% of total employment in King George County. The finance, insurance and real estate sectors were also well represented across the study area. (U.S. Department of Commerce Bureau of Economic Analysis, 2002)

Major employers in the town of Tappahannock include Riverside Tappahannock Hospital, the region's major healthcare provider, which employs over 500 individuals (Essex County, 2006). Other major employers in the town include Wal-Mart (400 employees), Essex County Schools (255 employees), and Quality Automotive Group (160 employees) manufacturers of brake shoes (Essex County, 2006).

Table 2. 2002 full time and part time employment for counties near the refuge.

Total non-farm employment (jobs)	Northern Neck Counties				Middle Peninsula Counties		
	King George	Lancaster	Richmond	Westmoreland	Caroline	Essex	Middlesex
	13,906	6,740	3,604	5,020	8,915	4,983	4,680
Percent of Employment by Industry							
Ag, forestry, fish & hunting	0.9%	2.6%	2.3%	(D)	(D)	0.7%	2.5%
Mining & Utilities	(D)	(D)	(D)	0.3%	(D)	(D)	(D)
Construction	5.7%	8.6%	7.4%	8.6%	17.4%	5.8%	9.1%
Manufacturing	1.1%	3.8%	4.5%	11.7%	5.3%	12.8%	5.5%
Wholesale trade	(D)	1.5%	4.8%	1.2%	(D)	3.3%	2.8%
Transportation & warehousing	1.7%	(D)	(D)	2.8%	3.8%	(D)	(D)
Retail trade	6.8%	12.8%	13.5%	12.5%	13.4%	19.1%	11.1%
Finance, insurance, real estate, & information Services	7.9%	12.5%	9.6%	7.6%	9.1%	6.0%	8.8%
Professional, management, admin., & waste	24.7%	10.0%	3.9%	8.3%	5.1%	4.2%	4.0%
Health care, social assistance, & educational	3.8%	(D)	(D)	(D)	4.9%	(D)	5.8%
Arts, entertainment, & recreation	1.4%	1.6%	(D)	3.6%	(D)	2.2%	4.0%
Accommodation & food	2.4%	8.5%	(D)	6.7%	(D)	9.4%	6.2%
Other services	3.8%	10.0%	7.7%	9.2%	8.9%	7.0%	8.4%
Government (federal, state, & local)	38.3%	8.5%	26.3%	17.8%	16.9%	10.1%	20.3%

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, 2002. Self-employment is not included.

(D): Not shown to avoid disclosure of confidential information, but the estimates for these items are included in the totals. A disclosure of data occurs when published statistical information would identify a specific individual or business that has provided information under a pledge of confidentiality.

Rappahannock Community College, the county corrections facility, and services sector jobs are the prominent employers in the town of Warsaw (Warsaw and Richmond County Chamber of Commerce, 2006). Other major employers within Caroline County include the Fort A.P. Hill Military Facility and the Union Bank and Trust, and sportswear manufacturer Robert Bryan Limited, located in Port Royal (Caroline County, 2006).

U.S. Census Bureau (2006) data for median household income, unemployment and percentage of persons below poverty are shown in table 3. The median household income for six of the seven counties in the study area falls below the state and national averages. King George, with a median household income of \$49,882, is greater than the state and national average. All seven counties have unemployment rates lower than the 2000 national average of 3.7%. However, the percent of unemployed is lower than the state average (2.7%) for only four of the seven counties. As shown in table 3, Caroline (2.8%) and Lancaster (3.1%) counties are slightly higher than the state average and King George County matches the state average.

Table 3. Income, unemployment and poverty estimates.

	Median Household Income (1999)	Percent Unemployed (2000)	Percent of Persons below Poverty (1999)
United States Average	\$41,994	3.7%	12.4%
Virginia	\$46,677	2.7%	9.6%
Counties Near Refuge			
<i>Northern Neck Counties</i>			
King George	\$49,882	2.7%	5.6%
Lancaster	\$33,239	3.1%	12.5%
Richmond	\$33,026	2.3%	15.4%
Westmoreland	\$35,797	2.3%	14.7%
<i>Middle Peninsula Counties</i>			
Caroline	\$39,845	2.8%	9.4%
Essex	\$37,395	2.0%	11.2%
Middlesex	\$36,875	2.1%	13.0%
Principal Towns Near Refuge			
Port Royal (Caroline County)	\$31,429	3.0%	7.2%
Tappahannock (Essex County)	\$33,688	2.4%	14.5%
Warsaw (Richmond County)	\$28,971	2.2%	16.8%

Source: U.S. Census Bureau, 2006

The percent of population below the federal poverty line is an indicator of the economic distress within a community. Caroline (9.4%) and King George (5.6%) counties fall below both the state and national average for the number of people living below poverty level. Essex County (11.2%) is greater than the state average, but less than the national average. All four remaining counties are greater than both the state and national averages (U.S. Census Bureau, 2006).

Recreation and Tourism

The travel and tourism industry continues to be a significant and growing contributor to the local economies of Virginia. In 2004, the tourism industry had a \$15.3 billion impact on Virginia's economy, generating more than 280,000 jobs and over \$2 billion in state and local taxes representing a 8.6% increase from 2003 (Virginia Tourism Corporation, 2005). According to the Draft Virginia Outdoors Plan (2007), the number of out of state visitors has increased by 52% over the past 40 years, from 6 million in 1965 to 54.8 million in 2005 (Virginia Department of Conservation and Recreation, 2007). As shown in table 1, Virginia's overall population increased by 14% from 1990 to 2000 while population increases in counties near the refuge ranged from 6% to 24%. The amount of recreation land available is not keeping pace with current tourism and population growth (Virginia Department of Conservation and Recreation, 2007).

Excellent wildlife observation, photography, environmental education, interpretation, hunting, and fishing opportunities can be enjoyed on several tracts of the refuge. Details about the economic contributions associated with wildlife viewing, hunting, and fishing in Virginia are provided below.

Wildlife Viewing

Abundant opportunities are available throughout Virginia for wildlife viewing. Wildlife viewing can include the activities of observing, identifying, and photographing wildlife. In 2001, the number of people that reported participating in wildlife viewing as a primary form of recreation totaled 2.5 million in

Virginia (U.S. Department of the Interior and U.S. Department of Commerce, 2003). Spending associated with wildlife viewing in Virginia totaled \$789 million in 2001; of which 22% (\$172 million) were trip related expenditures, 47% (\$371 million) were spent on equipment related expenses, and 31% (\$246 million) were other expenses such as magazines, membership dues, and land leasing (U.S. Department of the Interior, 2003a). According to a U.S. Fish and Wildlife Service (USFWS) report on the national and state economic impacts of wildlife watching (U.S. Fish and Wildlife Service, 2003) accounting for the multiplier effect, spending by resident and nonresident wildlife watchers in Virginia in 2001 generated; \$1,548 million in output, \$489 million in wages, 25,135 jobs, and \$28 million in state sales tax revenue.

According to the 2006 Virginia Outdoors Survey, the three biggest needs for outdoor recreation in the next five years are for walking/hiking trails, increased public access to recreational waters, and access to natural areas (Virginia Department of Conservation and Recreation, 2007). The growing trend for visiting natural areas could be related to the interest in walking for pleasure as well as the growth in Virginia's senior population. Over the past 10 years, the participation rate for visiting natural areas has increased from 24% of households to 44% of households, making it the fifth most popular outdoor recreational activity in the 2006 Virginia Outdoors Survey (Virginia Department of Conservation and Recreation, 2007).

Hunting

In 2001, there were a total of 355,000 resident and non resident hunters in Virginia; 91% participated in big game hunting, 36% participated in small game hunting, and 12% participated in migratory bird hunting (totals exceed 100% because most hunters participated in both big and small game hunting). Residents of Virginia accounted for 79% of total hunters and 92% of the total days of hunting in Virginia (U.S. Department of the Interior, 2003a). According to the USFWS (2003), hunting related expenditures by state residents and nonresidents in Virginia totaled \$321 million in 2001; of which 30% (\$96 million) were trip related expenditures, 44% (\$141 million) were spent on equipment related expenses, and 26% (\$84 million) were other hunting-related expenses (for example, membership dues, licenses, permits, and land leasing). According to a report by the International Association of Fish and Wildlife Agencies (2002) accounting for the multiplier effect, spending by resident and nonresident hunters in Virginia in 2001 generated \$725 million in output, \$158 million in income, 6,641 jobs, and \$17 million in state and local sales taxes.

A significant trend indicated in the 2006 Virginia Outdoors Survey is the decline in hunters in Virginia (Virginia Department of Conservation and Recreation, 2007). In the past 10 years, hunting has decreased from an activity engaged in by 17% of households in 1994, to 7% of households in 2006 (Virginia Department of Conservation and Recreation, 2007). This decline has been driven by the continued change in land use patterns from rural to urban. Where lands remain rural, hunting participation rates are much higher than in urban and suburban areas (Virginia Department of Conservation and Recreation, 2007).

Fishing

In 2001, more than 1 million state residents and nonresidents fished in Virginia. Virginia residents accounted for 75% of total anglers and 93% of total days of fishing in Virginia (U.S. Department of the Interior, 2003a). Direct spending in Virginia by state resident and nonresident anglers totaled \$518 million in 2001; of which 54% (\$277 million) were trip related expenditures; 54% (\$277 million) were spent on equipment related expenses, and 4% (\$18 million) were other fishing-related expenses (for example, membership dues, licenses, permits and land leasing). According to the 2006 Virginia Outdoors Survey, the second biggest need for outdoor recreation in the next five years is increased public access to recreational waters (Virginia Department of Conservation and Recreation, 2007).

Agriculture Industry in Virginia

The state of Virginia has a longstanding tradition with agriculture. Today, agriculture practices in Virginia include not only traditional field crops, vegetables, livestock, and seafood, but also aquaculture, landscape and nursery products and wineries. The agricultural industry also has significant links to the forestry, tourism and transportation sectors as well (Lamie, 1997). In 2003–2004, there were 47,600 farms in Virginia, with an average size of 181 acres and assets worth about \$490,000. According to Virginia Department of Agriculture and Consumer Services (2006), 90% of Virginia's farms are owned by individuals or families.

A report investigating the economic impacts of agriculture on the overall state economy found that, on average, from 1991–1996, the agriculture production sector and its related sectors, including processing, distribution and inputs, accounted for \$12.8 billion or 7.4% of Virginia's Gross State Product (GSP) (Lamie, 1997). The report also showed that 235,800 jobs were supported by these primary agriculture activities, representing 6% of Virginia's GSP. Accounting for multiplier effects, the total economic impact of the agriculture industry represented 11.2% of the state GSP and supported 10% of the state's employment (Lamie, 1997).

The eastern counties of Virginia, including the counties in Northern Neck and middle peninsula areas near the refuge, account for 7% of the state's employment in the poultry production sector and 4% of the state's hog and sheep production employment (Lamie, 1997). The region also accounts for a quarter of the state's total meat processing employment, as well as 8.5% of the state's dairy processing employment. Major crops of the state include corn, soybeans, wheat, barley, hay and peanuts (Lamie, 1997 and Virginia Department of Agriculture and Consumer Services, 2003). The eastern counties of Virginia represent 20.6% of the state's total employment in production of these crops (Lamie, 1997).

Economic Analysis of Current and Proposed Management Activities

Refuge management can have an impact on local communities in terms of stimulating or suppressing output and revenue, as well as employment. Spending associated with refuge recreational activities such as wildlife viewing and hunting can generate considerable tourism activity for surrounding communities. Additionally, refuge personnel typically spend considerable amounts of money purchasing supplies in local stores, repairing equipment and purchasing fuel at the local service stations. Refuge personnel also, reside and spend their salaries in the local community. Economists typically use input-output models (i.e., IMPLAN) to determine how money generated by current and proposed refuge management activities will and will not affect businesses (output, income, and employment) in the local economy. For the purposes of an economic-impact analysis, a region (and its economy) is typically defined as all counties within a 30–60 mile radius of the impact area. Only spending that takes place within this local region is included as stimulating the changes in economic activity. The size of the region influences both the amount of spending captured and the indirect effects (that is, the multiplier effect as initial spending is recycled through the economy).

Current refuge lands are spread out on several tracts across a large seven-county area. Total economic impacts associated with refuge operations under all management alternatives would not register much of an impact in the overall seven-county economy. Therefore, a regional economic-impact assessment of management activities was not conducted. Money generated in the local seven-county area from the Refuge Revenue Sharing program, refuge visitation, and refuge administration was estimated, but the direct and indirect (multiplier) effects on output, income, and employment effects were not analyzed.

There are three alternatives evaluated in the draft CCP. Alternative A would continue the type and scale of current management activities and programs. Alternative B would focus on enhanced habitat diversity by an expansion of current management over the next 15 years that assumes the Service would

complete the acquisition of up to 20,000 acres, as funding and staffing levels allow. Alternative C would emphasize forest management rather than current habitat-management programs for areas now in grasslands and old field, croplands, and planted, overstocked pine stands. The refuge administration and visitor services are the same for alternatives B and C.

The CCP provides long-range guidance and management direction to achieve refuge purposes over a 15 year timeframe. Money generated by refuge management activities are reported on an annual basis in 2006 dollars. Large management changes such as land acquisition often take several years to achieve. The estimates reported for Alternatives B and C represent the final effects after all changes in management have been implemented. It is important to note that the economic value of a refuge encompasses more than just money generated by management activities. Refuges also provide substantial nonmarket values (values for items not exchanged in established markets) such as maintaining endangered species, preserving wetlands, educating future generations, and adding stability to the ecosystem (Caudill and Henderson, 2003). Quantifying these types of nonmarket values is beyond the scope of this study.

Economic Contribution from Alternative A

Proposed Land Acquisition and Protection Measures

Under provisions of the Refuge Revenue Sharing (RRS) Act, local counties receive an annual payment for lands that have been purchased by full fee simple acquisition by the Service. Payments are based on the greater of 75 cents per acre or 0.75% of the fair market value of lands acquired by the Service. 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. In fiscal year (FY) 2007, actual RRS payments were 43.1% of authorized levels. Payments to local counties in FY 2007 were \$2,736 to Caroline County, \$7,758 to Essex County, \$4,827 to King George County, \$23,826 to Richmond County, and \$1,906 to Westmoreland County for a total payment of \$41,053. This RRS payment amount will continue to generate additional money in the local area as the initial county allocations are recycled through the economy (the multiplier effect).

Public Use and Access Management

Spending associated with recreational visits to national wildlife refuges generates significant economic activity. A visitor usually buys a wide range of goods and services while visiting an area. Major expenditure categories include lodging, restaurants, supplies, groceries, and recreational equipment rental. The recent FWS report *Banking on Nature: The Economic Benefits of National Wildlife Refuges Visitation to Local Communities* estimated the impact of national wildlife refuges on their local economies (Caudill and Henderson, 2003). According to the report, more than 35.5 million visits were made to national wildlife refuges in FY 2002 which generated \$809 million of sales in regional economies. Accounting for both the direct and secondary effects, spending by national wildlife visitors generated nearly 19,000 jobs, and over \$315 million in employment income (Caudill and Henderson, 2003). In FY 2002, hunters and anglers typically spent longer amounts of time on national wildlife refuges than non-consumptive users, but non-consumptive users generated approximately 30% more economic activity because the numbers of non-consumptive users of wildlife at many refuges far exceeded the number of hunters and anglers (Caudill and Henderson, 2003).

Excellent wildlife observation, photography, environmental education, interpretation, hunting, and fishing opportunities can be enjoyed on several tracts of the refuge. Information on state and regional trends and associated economic impacts of some of these recreational activities was presented in the previous section. This section focuses on expenditures in the local economy associated with refuge visitation. Annual refuge visitation estimates are based on several refuge statistic sources including:

visitors entering the refuge headquarters, hunting permits, and general observation by refuge personnel. Annual refuge visitation estimates are on a per visit basis. Table 4 summarizes estimated refuge visitation by type of visitor activity for Alternative A. The visitation estimates for Alternative A assume a 10% increase over the current refuge-visitation estimate of 1,180 annual visits to reflect the increasing trend in regional visitation.

To determine the local impacts of visitor spending, only spending by persons living outside the local seven-county area is included in the analysis. The rationale for excluding spending by local visitors is two-fold. First, money flowing into the local seven-county area from visitors living outside the local area (hereafter referred to as non-local visitors) is considered new money injected into the local economy. Second, if residents of the seven-county area visit the refuge more or less due to the management changes, they will correspondingly change their spending of money elsewhere in the seven county area, resulting in no net change to the local economy. Refuge visitation statistics, the FWS National Survey of Fishing, Hunting, and Wildlife Associated Recreation (NSHFWR) statistics (U.S. Department of the Interior, 2003a and 2003b), and the Virginia Outdoor Plan (Virginia Department of Conservation and Recreation, 2007) were used to determine the percentage of non-local refuge visitors. Table 4 shows the estimated percent of non-local refuge visits for Alternative A.

For this analysis we use the average daily visitor spending profiles from the Banking on Nature report (Caudill and Henderson, 2003) that were derived from the 2001 NSHFWR. The NSHFWR reports trip related spending of state residents and non residents for several different wildlife-associated recreational activities. For each recreation activity, spending is reported in the categories of lodging, food and drink, transportation, and other expenses. Caudill and Henderson (2003) calculated the average per-person per-day expenditures by recreation activity for each FWS region. Residents were defined as living within 30 miles of the refuge and nonresidents as living outside the 30 mile radius (Caudill and Henderson, 2003). For our analysis, non-local visitors match the nonresident spending profile definition. Therefore, we used the spending profiles for nonresidents for FWS Region 5 (the region the refuge is located in). Nonresident spending profiles for big game hunting, and fresh water fishing were used to estimate non-local visitor spending for refuge hunting and fishing related activities. The nonresident spending profile for non-consumptive wildlife recreation (observing, feeding, or photographing fish and wildlife) was used for wildlife viewing activities.

The visitor spending profiles are estimated on an average per day (8 hours) basis. Because some visitors only spend short amounts of time on the refuge, counting each refuge visit as a full visitor day

Table 4. Estimated annual refuge visitation and visitor spending by activity for Alternative A.

Visitor Activity	Total # of visits	Percentage (%) of non-local visits	Total # of non-local visits	Number of hours spent at refuge	Number of non-local visitor days ¹	\$ spent per visitor day	Total visitor spending (\$1,000)
Consumptive Use							
Fishing	176	70%	123	6	92	\$35.67	\$3.3
Big Game hunting	373	68%	254	8	254	\$46.19	\$11.7
Waterfowl hunting	0						
Non-Consumptive Use							
Wildlife viewing	749	75%	562	4	281	\$45.77	\$12.9
Total	1,298		939		627		\$27.9

¹One visitor day = 8 hours.

would overestimate the spending impact of refuge visitors. In order to properly account for the amount of spending, the annual number of non-local refuge visits was converted to visitor days. Refuge personnel estimate that non-local visitors participating in hunting spend a full visitor day (8 hours) on the refuge, anglers spend 6 hours (3/4 of a visitor day), and non consumptive visitors spend 4 hours (1/2 of a visitor day) on the refuge. Table 4 shows the number of non-local visitor days by recreation activity for Alternative A.

Total spending by refuge visitors was determined by multiplying the average non-local daily spending for each visitor activity by the number of non-local visitor days. Based on visitor spending profiles from the Banking on Nature report (Caudill and Henderson, 2003), the average non-local refuge angler spends \$35.67 per-day, the average non-local big game hunter spends \$46.19 per-day, the average non-local waterfowl hunter spends \$67.96 per-day, and the average non-local visitor participating in wildlife viewing activities spends \$45.77 per-day. As shown in Table 4, annual non-local visitors account for 92 angler, 254 hunter, and 281 non consumptive visitor days. For Alternative A, non-local refuge visitors spend approximately \$27,900 in the local seven-county area annually. This amount of visitor spending would continue to generate additional money in the local area as initial spending is recycled through the economy (the multiplier effect).

Refuge Administration

Staff — personal purchases

Refuge employees reside and spend their salaries on daily living expenses in communities near the refuge, thereby generating impacts within the local economy. The current approved refuge staff consists of six employees for Alternative A (table 5). Household consumption expenditures consist of payments by individuals/households to industries for goods and services used for personal consumption. Economic input-output modeling systems contain household consumption spending profiles that account for average household spending patterns by income level. These profiles also capture average annual savings and allow for leakage of household spending to outside the region which can range from 20% -50% of the total salary estimate. Based on FY 2006 salary charts, it was estimated that annual salaries for Alternative A would total over \$454,000. Using a conservative estimate of 50% for salary savings and out of region leakages, an average of \$227,000 would be spent in the local seven-county area annually by refuge employees. This amount of salary spending would continue to generate additional money in the local area as initial spending is recycled through the economy (the multiplier effect).

Table 5. Current approved staff (Alternative A).

Refuge Manager
Deputy Refuge Manager
Administrative Assistant
Wildlife Biologist
Law Enforcement (Park Ranger)
Maintenance Worker

Work-related purchases

A wide variety of supplies and services are purchased for refuge operations and maintenance activities. Major local expenditures include: supplies and services related to building maintenance and construction; auto repairs, parts, and fuel; and utilities. The refuge receives a base for nonsalary funds and then receives additional funds for specific projects throughout the year. In FY 2006, the refuge nonsalary

budget was approximately \$565,500, of which nearly \$448,000 was additional funds. The additional funds that the refuge will receive annually are difficult to predict and therefore, the FY 2006 funding level was used as a base estimate for all alternatives. Refuge purchases made in seven-county area, contribute to the local economic impacts associated with the refuge. According to refuge records, approximately 50%, or \$282,750 of the annual nonsalary budget expenditures are spent on goods and services purchased in the local area. This amount of refuge work related spending would continue to generate additional money in the local area as initial spending is recycled through the economy (i.e., multiplier effect).

Summary of Money Generated by Refuge Activities for Alternative A

For Alternative A, non-local refuge visitors spend approximately \$27,900 in the local seven-county area annually. Money contributed to the local economy related to refuge administration includes an average of \$227,000 from salary spending by refuge employees. Approximately \$282,750 would also be spent on refuge-related goods and services purchased in the local area. Refuge operations from visitor spending and refuge administration would contribute approximately \$537,650 to the local seven-county economy annually. Total RRS payments to local counties totaled \$41,053 in FY 2007 and are expected to gradually increase as annual authorized levels from Congress increase. All refuge operations would continue to generate additional money in the local area as initial spending is recycled through the economy (the multiplier effect).

Economic Contribution from Alternatives B and C

Proposed Land Acquisition and Protection Measures

The proposed acquisition of lands to be acquired as a fee simple acquisition will have an impact on the amount of local property taxes collected as land is transferred from private taxable ownership to public nontaxable ownership. Although lands acquired by means of fee simple acquisition by the Service are removed from the tax rolls, the local taxing entities will receive an annual payment, under provisions of the Refuge Revenue Sharing Act. Payments to local towns are based on the greater of 75 cents per acre or 0.75% of the fair market value of lands acquired by the Service. The exact amount of the annual RRS 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. In FY 2007, actual RRS payments were 43.1% of authorized levels. RRS payments to local counties in FY 2007 for the current 6,352 acres in fee ownership were \$2,736 to Caroline County, \$7,758 to Essex County, \$4,827 to King George County, \$23,826 to Richmond County, and \$1,906 to Westmoreland County for a total payment of \$41,053. For Alternatives B and C, it is anticipated an additional 5,000 acres in fees lands will be acquired over the next 15 years including land in Lancaster and Middlesex counties; however, the specific tracts and appraised value of land to be acquired are unknown. RRS payments are based on appraised land values which vary among the counties in the acquisition area, and will vary considerably as to whether it is wetland or upland. Based on the increase in acreage compared to Alternative A, it is anticipated that RRS payments could increase by approximately \$32,000 for Alternatives B and C. Without knowing the specific tracts or appraised value of land to be acquired, the associated loss in local property-tax revenue for each of the potentially affected counties can not be determined or compared to the increase in RRS payments. Lands acquired by conservation easements would remain in private ownership subject to appropriate property taxes, and RRS payments would not apply.

Public Use and Access Management

Changes in refuge-management activities can affect recreational opportunities offered and visitation levels. Table 6 shows the estimated visitation levels associated with certain visitor activities for Alternatives B and C. Under Alternatives B and C, visitation is anticipated to increase for all activities as compared to Alternative A (table 4). Visitation levels are anticipated to increase based on regional visitation trends, as well as from the opening of two new public use areas for fishing, the addition of waterfowl and wild turkey hunting opportunities, and the continued rise in demand for deer hunting and wildlife observation opportunities on the refuge.

As shown in table 6, the annual number of refuge visitors under Alternatives B and C would account for 263 non-local angler visitor days, 904 non-local big game hunter visitor days, 305 non-local waterfowl hunter visitor days, and 638 non-local wildlife viewing visitor days. For Alternatives B and C, annual non-local refuge visitors would spend approximately \$72,600 in the local seven-county area. This amount of visitor spending would continue to generate additional money in the local area as initial spending is recycled through the economy (the multiplier effect). Due to the increased visitation levels for Alternatives B and C, visitor spending would generate an additional \$44,700 annually in the local economy as compared to Alternative A.

Table 6. Estimated annual refuge visitation by visitor activity for Alternatives B and C.

Visitor Activity	Total # of visits	Percentage (%) of non-local visits	Total # of non-local visits	Number of hours spent at refuge	Number of non-local visitor days ¹	\$ spent per visitor day	Total visitor spending (\$1,000)
Consumptive Use							
Fishing	500	70%	350	6	263	\$35.67	\$7.0
Big Game hunting	1,330	68%	904	8	904	\$46.19	\$41.8
Waterfowl hunting	750	65%	488	5	305	\$67.96	\$12.9
Non-Consumptive Use							
Wildlife viewing	1,700	75%	1,275	4	638	\$45.77	\$10.9
Total	4,280		3,017		2,109		\$72.6

Refuge Administration

Staff — personal purchases

Proposed staff for Alternative B and C includes all current staff positions (Alternative A, table 5) plus an additional four permanent positions over the next 15 years. The new positions are for a Private Lands Biologist, Visitor Services Specialist, Maintenance Worker, and a Biological Technician. Based on FY 2006 salary charts and forecasted accretions and promotions, it was estimated that annual salaries for Alternatives B and C would total over \$674,000. Using a conservative estimate of 50 percent salary savings and out of region leakages, an average of \$337,500 would be spent in the local seven-county area annually by refuge employees. This amount of salary spending would continue to generate additional money in the local area as initial spending is recycled through the economy (the multiplier effect). Due to the increased staffing levels for Alternative B and C, salary spending by refuge employees would generate \$110,500 more annually in the local economy than Alternative A.

Work-related purchases

The refuge receives base funding for salaries, other fixed costs (utilities), and operations and then receives additional funds for specific projects to be completed within one or two years. The additional funds that the refuge will receive annually are difficult to predict and therefore, the FY 2006 additional funding level of \$448,000 was used as the average additional-funds estimate for all alternatives. Including slight increases to base and incidental funding, total nonsalary expenditures for Alternatives B and C are projected at \$573,000 annually. Assuming the refuge would continue to spend the same percentage locally as for Alternative A, approximately 50% or \$286,500 of the annual nonsalary budget expenditures would be spent on goods and services purchased in the local area. This amount of refuge work related spending would continue to generate additional money in the local area as initial spending is recycled through the economy (i.e., multiplier effect). Because of the high level of uncertainty in the amount of additional projects funds that will be received annually, the nonsalary expenditures in the local economy under alternatives B and C are difficult to predict. Base and incidental funding are anticipated to increase generating an additional \$3,750 more in the local economy than Alternative A.

Summary of Money Generated by Refuge Activities for Alternatives B and C

For Alternatives B and C, annual non-local refuge visitors spend over \$72,600 in the local seven-county area. Money contributed to the local economy related to refuge administration would include an average of \$337,500 from salary spending by refuge employees and approximately \$286,500 would be spent on refuge-related goods and services purchased in the local area. Refuge operations from visitor spending and refuge administration would contribute an average of \$696,600 to the local seven-county economy annually. Based on the increase in acreage, it is anticipated that RRS payments could increase by \$32,000 for total of approximately \$73,000 to the local counties annually. However, without knowing the specific tracts or appraised value of land to be acquired, the associated loss in local property-tax revenue for each of the potentially affected counties can not be determined or compared to the increase in RRS payments. All refuge operations would continue to generate additional money in the local area as initial spending is recycled through the economy (the multiplier effect).

Summary and Conclusions

Table 7 summarizes the economic contributions from visitor spending and refuge administration activities for all alternatives and the change between alternatives. Under Alternative A, refuge operations associated with visitor spending and refuge administration would contribute approximately \$537,650 to the local seven-county economy annually. Alternatives B and C would contribute an average of \$696,600, a 30% increase (\$158,950) compared to Alternative A.

Table 7. Summary of visitor spending and refuge administration activities.

	Alternative A	Alternatives B and C	Difference
Visitor Spending	\$27,900	\$72,600	+ \$44,700
Refuge Administration			
Staff salary spending	\$227,000	\$337,500	+ \$110,500
Work-related purchases	\$282,750	\$286,500	+ \$3,750
Total	\$537,650	\$696,600	+ \$158,950

Based on the increase in acreage, it is anticipated that RRS payments could increase by nearly \$32,000 compared to Alternative A for total RRS payments of approximately \$73,000 to the local counties. However, without knowing the specific tracts or appraised value of land to be acquired, the associated loss in local property-tax revenue for each of the potentially affected counties can not be determined or compared to the increase in RRS payments.

All refuge operations would continue to generate additional money in the local area as initial spending is recycled through the economy (the multiplier effect). Total economic effects of refuge operations will play a much larger role in the smaller communities near the refuge such as Tappahannock and Warsaw where most of the refuge-related economic activity occurs as compared to the overall seven-county economy.

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