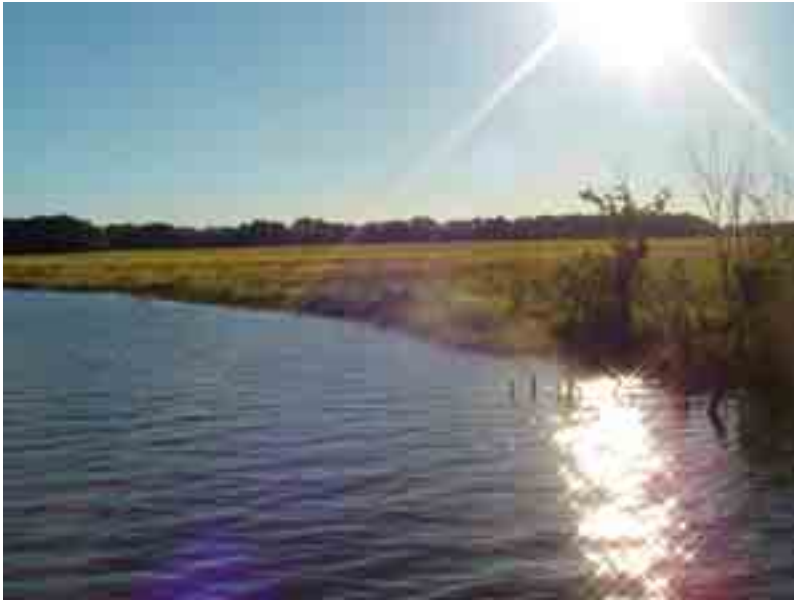


CHAPTER 4: ENVIRONMENTAL IMPACTS



Cat Point Creek: USFWS

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Introduction

This chapter describes the foreseeable consequences for the environment of our implementing each of the three alternatives we propose in chapter 3. When detailed information is available, we present scientific, analytic comparisons of the alternatives and their consequences, which we term “impacts” or “effects.” When detailed information is unavailable, we base those comparisons on our professional judgment and experience. Our discussion focuses on the direct, indirect, short-term, beneficial and adverse effects likely to occur during this 15-year plan. Beyond that period, we speculate more in describing those effects.

We organized this chapter by major resource headings. Under each heading, we discuss the context of the resource and the beneficial or adverse effects our management might produce. Then we discuss the beneficial or adverse effects that would result, regardless of the alternative we select for the final CCP. Finally, we discuss the beneficial and adverse effects of each of the alternatives. A summary comparing the effects of the three management alternatives is included at the end of the chapter in table 4.2.

As the CEQ and Service regulations on implementing NEPA require, we assess the importance of the effects of the alternatives based on their context and intensity. The scale of their context ranges from site-specific to local, landscape, or region. Although the area of the refuge is only a small percent of the context of its ecosystem or region, we developed all of our management alternatives to contribute to the many conservation goals in those larger contexts.

We based our evaluation of the intensity of the effects of the alternatives on these factors:

- the expected degree or percent of change in the resource from current conditions;
- the frequency and duration of the effect;
- the sensitivity of the resource to such an effect or its natural resiliency to recover from such an effect; and,
- the potential for implementing effective preventive or mitigating measures to lessen the effect.

The duration of those effects varies, from those occurring only once for a brief period in the 15-year period of this plan—for example, the effects of constructing a visitor contact station—to those occurring repeatedly or frequently during a given season of the year—for example, observing wildlife from refuge trails.

The following list of management activities are not analyzed in detail in this document because they would qualify for categorical exclusion under applicable regulations if independently proposed and are both trivial in effect and common to all alternatives.

- conducting environmental education and interpretation programs
- researching, inventorying resources, or otherwise collecting resource information
- operating and maintaining infrastructure and facilities
- recurring, routine management and improvements
- constructing small projects (e.g., fences, berms, small water control structures, interpretive kiosks) or developing access for routine management
- planting native vegetation
- changing minor amounts or types of public use
- issuing new or revised management plans when only minor changes are planned
- enforcing Federal laws or policies

We would like to point out other proposed actions, which are larger in scope or scale, and for which we make a concerted effort to analyze them in detail to comply with NEPA. Those include habitat restoration projects (e.g. including the use of fire, herbicides and mechanical treatments) and constructing a new headquarters and visitor center on the refuge's Hutchinson tract.

Two additional actions proposed under alternatives B and C, a new waterfowl hunt and a new turkey hunt, are not fully analyzed in this draft CCP/EA because we do not have detailed proposals developed. Within 5 years of CCP approval, we will initiate a separate NEPA analysis, and include public involvement and comment, as part of our consideration of those hunts. We may offer either or both new hunting seasons based on the results of that analysis and public comment, and if we have affirmative findings of appropriateness and compatibility.

Impacts on the Socioeconomic Environment

We enlisted the assistance of the U.S. Geological Survey (USGS), Policy and Science Analysis Team in Ft. Collins, Colorado to help us assess how the proposed management activities under each alternative could affect the regional and local economies. Their report, included as appendix I, provided us with two critical pieces of information for our analysis: 1) an illustration of the refuge's contribution to the local community; and, 2) a comparison of whether local economic effects are, or are not, a real concern in choosing among the proposed management alternatives. The refuge management activities of economic concern in the analysis are:

- purchasing of goods and services within the local community for refuge operations
- spending of salaries by refuge personnel
- spending in the local area by refuge visitors
- purchasing additional refuge land and resulting changes in local tax revenues

Appendix I, table I.7 and its associated narrative, provides a comparison summary of the alternatives and their economic contributions from visitor spending and refuge administration activities. We refer readers to appendix I for the detailed assessment. The summary narrative from appendix I states:

“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, an increase of \$158,950 compared to alternative A.

“Based on the increase in acreage, it is anticipated that the RRS payments could increase by nearly \$32,000 compared to alternative A for a total RRS payments of approximately \$73,000 to the local counties. However, without knowing the specific tracts or appraised values 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 (i.e. “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 compared to the overall seven county economy.”

Impacts on Air Quality

Chapter 2, “Affected Environment,” discusses the status of air quality in the landscape around the refuge. We evaluated the management actions each alternative proposes for their potential positive or negative effects on air quality.

The potential beneficial effects of the management alternatives we evaluated include:

- the potential of continuing and expanding our energy efficiency practices to reduce the refuge contribution to emissions: for example the use of fluorescent lighting, solar power, and hybrid vehicles
- the potential of refuge land conservation to limit the growth of development, thereby limiting sources of emissions and reducing losses of forest vegetation
- the potential of refuge forest management to enhance carbon sequestration and reduce greenhouse gases



National Wild Turkey Federation donating funds to protect turkey habitat: USFWS

The potential adverse effects of the management alternatives we evaluated included increases in

- particulates from burning prescribed fires as a management tool,
- emissions from vehicles or equipment, and
- emissions from new or upgraded buildings

Impacts on Air Quality that would not vary by Alternative

There are no major stationary or mobile sources of air pollution present on the refuge nor would any be created under any of the alternatives. In our opinion, refuge land management would help reduce any future direct and cumulative impacts by maintaining natural vegetative cover on up to 20,000 acres, requiring that all upgrades to existing facilities, or all new facilities, be energy efficient, and by limiting public uses to those that are appropriate, compatible, and wildlife-oriented activities. Collectively, these management actions would help reduce the potential for additional synthetic sources of emissions in the surrounding landscape.

One important activity in all of the alternatives is to continue to purchase up to 20,000 acres of land in full fee title or under conservation easement, to protect natural habitats that already benefit air quality. If we permanently protect that land, those benefits would persist, rather than diminish or vanish under development. The benefits on the land we purchase in full fee title may outweigh those on the land we protect by conservation easement. Farming and commercial logging might continue on some of the latter.

For our current facilities, we have implemented such actions as installing solar power, e-glass windows, cork flooring, fluorescent lighting, motion-activated night lighting, and on-demand water heaters. We have purchased two hybrid vehicles, and have equipped the refuge boats with 4-cycle engines to reduce oil and gas emissions into the air and water.

We do not expect visitors traveling in motor vehicles to add measurably to the current level of emissions. We will attempt to keep the use of vehicles on the refuge to a minimum, and will encourage the non-motorized use of trails for wildlife observation and other compatible recreation. We do not plan to provide access for motor boats, but will provide access for non-motorized boats such as canoes or kayaks.

The two management actions that may affect air quality the most are burning prescribed fires and planting trees. Although both of those will occur no matter which alternative is selected, the degree to which we practice them will vary, and thus, their impacts. For example, we would burn more prescribed fires under alternative B because of the amount of grassland we propose to manage. The major pollutants from prescribed burning are particulates (small particles of ash, partly consumed fuel, and liquid droplets), and gases (carbon monoxide, carbon dioxide, hydrocarbons, and small quantities of nitrogen oxides). Those will increase or decrease based on the alternative we select.

Prescribed burning releases inconsequential amounts of gases (USDA 1989). The pollutant of primary concern is particulate matter. Particulates can reduce visibility or cause negative effects on the health of people with respiratory illnesses. Appropriate smoke management can minimize or nearly eliminate both of those negative effects. The consideration of the wind speed, direction, and mixing heights is all-important in managing smoke. In planning our prescribed burns, we consider all those factors, and other environmental and geographical factors. Based on our experience, we expect prescribed burning to produce no major, long-term negative impacts.

Tree-planting, or letting old fields grow naturally into forest cover will improve air quality. Trees store carbon and release oxygen. Because air quality in the region is generally good, we do not expect our management to result in measurably improved air quality, but it will contribute to the existing good conditions.

The area of the refuge has no history of catastrophic wildfire. Humans caused most of the fires in the area. Nevertheless, we would seek to minimize the possibility of serious fires and their associated health and safety concerns. We would assess the hazards associated with the wildland-urban interface along the refuge boundaries with privately owned land to ensure that our management practices are not creating excessive fuel loading that would lead to severe fires.

In summary, our management activities would not adversely affect regional air quality; none of the alternatives would violate EPA standards, and all three would comply with the Clean Air Act.

Impacts on Air Quality in Alternative A

Beneficial

Our proposed refuge management activities would neither substantially benefit nor adversely affect the currently good local and regional air quality: no violations of Federal or state Clean Air Act standards, no impacts on Class I areas, and no cumulative effects on regional levels of ozone or particulate matter pollutants.

Air quality would benefit from the filtering effects of the 7,711 acres we now own, and the 12,289 acres of newly acquired upland, floodplain, riparian and wetlands vegetation, and from our adopting energy-efficient practices. The sequestering effects of presently owned or newly acquired forested acres would produce a negligible reduction in atmospheric carbon.

Adverse

Alternative A would include few ground-disturbing activities, and would introduce few additional emission sources. The construction of roads or other facilities would cause short-term, localized effects from the exhausts of vehicles or other equipment.

Visitation at the refuge is less than 1,300 annually; we do not expect it to increase to the point that its impacts on air quality became problematic.

Impacts on Air Quality in Alternative B

Beneficial

The effects of alternative B would resemble those in alternative A: no substantial change in air quality: no violation of air quality standards, no effects on Class I areas, and no cumulative effects on ozone or particulate matter.

Adverse

Given our emphasis on maintaining up to 1,200 acres of grasslands, annual prescribed burning may increase, resulting in local, temporary increases of particulate matter and various combustion gases. By adhering to the established standards of smoke management, we can minimize the potentially negative effect of particulates.

Under alternative B, we would seek to construct and operate a new visitor contact station and headquarters building, which would cause some local impacts on air quality. During construction, short-term, localized effects from construction vehicles and equipment exhausts would occur. Operations of the new facility would result in emissions from its heating and cooling systems, and visitor and employee travel would add sources of air pollution; however, these would be partially offset by the installation of energy-efficient heating and cooling systems and our replacement of our fleet with more energy efficient models. In addition, the building would be in a more central and accessible location to the greater population, thereby reducing travel time for many visitors.

Public use of the refuge would increase under this alternative, resulting in additional emissions from visitor vehicles and boats (e.g., in hunting waterfowl). We expect an increase over the next 15 years of fewer than 4,300 visitors. We do not expect that to affect substantially the air quality of the region. Our continued land acquisition program would also help mitigate impacts and reduce the overall cumulative adverse effects on local and regional air quality by dedicating land to conservation.

Impacts on Air Quality in Alternative C

Beneficial

In terms of air quality, the primary difference in alternative C is the amount of forest we would plant or allow to grow naturally. Although we cannot predict exactly how much forest we ultimately would manage, it would be close to the 20,000 acres we plan to protect and manage, except for those acres in wetlands and shrublands. Permanently protected forests contribute to air quality in two ways: by precluding development, and sequestering carbon. Under this alternative, we would convert at least 700 additional forested acres from managed grasslands, and convert more as we acquire more land.

We would manage our forests with longer rotation ages than commercial timber operations use, which would result in increased carbon sequestration. The predominance of more mature stands would improve forest health, diversity, and resilience to disturbance, thus maintaining an important carbon “sink.”

Adverse

We would still conduct prescribed burns, although fewer in alternative C than in alternatives A or B, to reduce fuels from thinning operations and clear the understory to improve bald eagle and other migratory bird habitat. As with all our alternatives, smoke management would remain our primary concern.

Other impacts related to visitor use and the construction and operation of a new headquarters and visitor contact facility would be the same as described for alternative B.

Impacts on Soils

Soils are the structural matrix and nutrient source for plant productivity that we must protect to sustain the variety of wetland, riparian, and upland habitats that would meet our goals for refuge habitat and species management. Overall, the soils of the refuge are productive and in good condition, with little or no compaction or contamination. Certain areas such as river and creek shorelines are experiencing erosion and are susceptible to disturbance. We would manage them to minimize human disturbance and to mitigate for the natural processes that result in the loss of valuable habitats, particularly at bald eagle sites.

We evaluated and compared the management actions proposed for each of the refuge CCP alternatives based on their potential to benefit or adversely affect refuge soils.

Potential beneficial effects from

- protecting soils from conversion to impervious surfaces through land acquisition
- enhancing soils formerly in agricultural production by re-establishing native vegetation
- reducing erosion along river and creek shorelines

Potential adverse effects from

- constructing buildings, parking facilities, access roads, and interpretive trails
- managing habitat
- increasing refuge visitation

Impacts on Soils that would not vary by Alternative

Regardless of which alternative is selected, we would continue to use best management practices in all management activities that might affect refuge soils to ensure that we maintain soil productivity and minimize erosion.

Managing Habitat

Forest management would equal or exceed the state-mandated standards to limit erosion. The initial thinning of overstocked forest stands would cause some disturbance of soil, particularly at loading areas. In preparing the Fire Management Plan for the James River refuge, we developed standard operating procedures (SOP) to minimize soil disturbance during logging operations to improve habitat. Those SOPs primarily protect potential and known archeological and historic sites, but also reduce soil disturbance and potential erosion. We will employ them in forest management operations at the Rappahannock River Valley refuge, as well.

Wildfires followed by rain can lead to substantial erosion and sedimentation. We would take steps to ensure that our forest management practices are not creating major fuel loads that would lead to soil-damaging fires. Should wildfires break out, the burned areas that are susceptible to erosion and the loss of productive soils would be stabilized with erosion control measures and re-vegetated to minimize the potential for damage.

Prescribed burning would occur under all the alternatives, and more so under alternatives A or B. If prescribed fires were set during dry conditions, especially during the growing season, they could remove organic matter and reduce soil productivity. However, the type of prescribed burning currently practiced, and proposed for the future, would not remove organic layers. In fact, the prescribed burning practices we propose release nutrients stored in plant material back into the soil.

Controlling Undesirable Plants and Other Pests

All of the alternatives propose an aggressive approach to invasive species control. We will use integrated pest management as a framework for implementation: an approach that combines mechanical, cultural, biological and chemical controls. The mechanical and chemical controls have the most potential for affecting soils. These treatment types are described in more detail below.

Potential effects to the biological and physical environment associated with the proposed site-, time-, and target-specific use of pesticides (Pesticide Use Proposals [PUPs]) on the refuge would be evaluated using scientific information and analyses documented in “Chemical Profiles” in the forthcoming IPM document. These profiles provide quantitative assessment/screening tools and threshold values to evaluate potential effects to species groups (birds, mammals, and fish) and environmental quality (water, soil, and air). PUPs (including appropriate BMPs) would be approved where the Chemical Profiles provide scientific evidence that effects to refuge biological resources and its physical environment are likely to be only minor, temporary, or localized in nature. Along with the selective use of pesticides, PUPs would also describe other appropriate IPM strategies (biological, physical, mechanical, and cultural methods) to eradicate, control, or contain pest species in order to achieve resource management objectives.

The effects of these non-pesticide integrated pest management (IPM) strategies (such as mowing, cutting or pulling, shading out by desired species) to address pest species on the refuge would be similar to those effects described elsewhere within this chapter, where they are discussed specifically as habitat management techniques to achieve resource management objectives on the refuge. For example, the effects of mowing invasive species in grasslands would be similar to those effects summarized for mowing to provide short-grass habitat for breeding grasshopper sparrows.

Based on scientific information and analyses of the chemical profiles upon which refuge pesticide use approvals are based, the pesticides which would be allowed for use on the refuge would typically be short-lived from environmental and microbial breakdown, and would result in less or non-hazardous degradation products. Thus, impacts to refuge resources and neighboring natural resources from pesticide applications are expected to be less than significant.

Combinations of two or more pesticides at labeled rates would not likely result in additive or synergistic adverse effects to non-target fish, wildlife, plants, and/or their habitats. The U.S. Forest Service (2005) found that mixtures of pesticides commonly used in land (forest) management likely would not cause either additive or synergistic effects to non-target species based upon a review of scientific literature regarding toxicological effects and interactions of agricultural chemicals (ATSDR 2004, US EPA-ORD 2000). Because pesticides allowed for use on the refuge would typically be short lived resulting from environmental and microbial breakdown to less or non-hazardous degradation products, cumulative effects also are unlikely associated with applications of pesticides to eradicate, control, or contain target pests conducted in accordance with pesticide labels. Moreover, pesticides with different modes of action may be used for repeated within and among year treatments that likely would minimize the potential for long-term cumulative effects.

Mechanical controls

Mowing and disking are the two mechanical techniques most often used in controlling invasive plants and, of the two, disking most affects soils. It temporarily disrupts soil structure and microbial communities. We typically use it to break up the root systems of unwanted vegetation before planting native vegetation. We do not disc frequently in the same areas; therefore, it should only temporarily affect soil structure and productivity. We do not typically disc on slopes; therefore, erosion is not a major concern.



Prescribed burn on the Wilna tract: USFWS

Chemical controls

We must request approval, through a Pesticide Use Proposal, for all uses of chemicals on any refuge. The refuge manager, regional pest management coordinator, and national pest management coordinator have the authority to approve chemicals and their application procedures, whether in a wetland or upland. We use herbicides primarily for controlling invasive species, although we continue to use some herbicides in our cooperative farming program, which we propose to phase out by 2012. The following list of herbicides and their potential effects on soils and water derives mainly from the products' labels and material safety data sheets (MSDS). They display the active ingredients, followed by the primary target plant or method of application, and their impacts.

Clethodium (Volunteer corn/boom sprayer): no soils impacts noted on label or MSDS; cannot be applied on open water or where runoff may occur; is slightly toxic to freshwater fish, and practically nontoxic to aquatic invertebrates.

Clopyralid Monoethanolamine Salt (Kudzu/broadcast spray with backpacks or skid sprayer): Its bioconcentration potential is low, but its potential for soil mobility is very high. It cannot be applied on open water or where runoff may occur; it has high potential to leach into groundwater under certain soil conditions. Its photolysis half-life in water is 261 days, in soil >12 years. Under aerobic soil conditions, the half-life is 71 days. It is practically nontoxic to aquatic organisms.

Glyphosate (*Phragmites*, Johnsongrass, Canada thistle, Texan panicum, ryegrass and more/sprayed aerially via helicopter or fixed wing aircraft, broadcast sprayed with backpacks or skid sprayer, boom spray): It can be applied to aquatic plants, but plant decomposition may result in oxygen depletion and fish suffocation. Its use is restricted within 0.5 miles of intakes for potable water. It is practically nontoxic to aquatic organisms on an acute basis. It is degraded by microbial action in both soil and water, and degrades in soil, with an estimated half-life of 30 days. It is highly soluble, but adsorbs rapidly and tightly to soil (USFS 2007).

Halosulfuron-methyl (Volunteer soybeans/boom sprayer): Its use where soils are permeable and the water table is high may result in groundwater contamination. It cannot be applied on open water or where runoff may occur. It is practically non-toxic to freshwater fish and aquatic invertebrates, but is very highly toxic to algae.

Imazapyr (*Phragmites*, tree-of-heaven, misc. grasses/aerially via helicopter, boom sprayer, and broadcast spray with backpacks or skid sprayer): It can be applied to aquatic plants, but plant decomposition may result in oxygen depletion and fish suffocation. Its use is restricted within 0.5 miles of intakes for potable water. With high probability, it is not acutely harmful to fish, aquatic invertebrates, or terrestrial organisms. It degrades in soil, with a half-life of 25 to 180 days. Under most field conditions imazapyr does not bind strongly to soils and can be highly available in the environment. Above pH 5, the herbicide will take on an ionized form, increasing the risk of herbicide runoff. McDowell et al. (1997) found that heavy rainfall caused significant movement of the herbicide (or more likely, moved the soil particles that the imazapyr was adsorbed to), and leaching up to 50 cm deep in soils have been reported (WSSA 1994).

Mesotrione (Volunteer soybeans/boom sprayer): It cannot be applied on open water or where runoff may occur. It has a high potential for runoff. It is unlikely to be hazardous to aquatic life. It is not persistent in the soil, but is stable in water. It has moderate mobility in soil, and sinks in water after 24 hours.

Metsulfuron methyl (Multiflora rose/backpacks or skid sprayer): It cannot be applied on open water or where runoff may occur. It percolates in sandy soils, and may run off on clay soils. Its effects on soil microorganisms appear to be transient. It degrades in soil, with a variable half-life of 120 days (USFS 2007).

Sethoxydim (Japanese stiltgrass/backpacks or skid sprayer): It cannot be applied on open water or where runoff may occur. It is slightly to moderately toxic to aquatic organisms, and has low soil persistence. Significant movement in soils has not been documented, possibly because it degrades rapidly. In water, it can be degraded by sunlight in less than one hour (TNC 2001). No adverse effects on soil organisms are expected (USFS 2007).

Triclopyr (Tree-of-heaven/basal spray or cut stump spray): It cannot be applied on open water or where runoff may occur. It is relatively non-toxic to terrestrial vertebrates and invertebrates, but can be extremely toxic to fish and aquatic invertebrates. For that reason, we use it only in upland areas as a basal or cut-stump application directly on the base of trees, or used in a foliar application in upland sites. In soils, it is degraded by photolysis, microbial metabolism, and hydrolysis to the parent compound, triclopyr acid. Triclopyr acid has an intermediate adsorption potential, limiting its movement in the environment. The acid degrades with an average half-life of 30 days. The ester formulation is not water-soluble, and can take significantly longer to degrade in water (TNC 2007).

Current plans are to eliminate cooperative farming on the refuge by 2012, unless it is determined that cooperative farming, on a limited basis, could contribute to refuge interpretation or habitat management objectives. If eliminated, an additional 210 acres will be taken out of production and allowed to revert naturally to native plants, or will be planted with native species. The fields now in production are being farmed with “no till” methods, which helps maintain soil structure and reduces erosion. Taking that land out of production and establishing native vegetation will improve soil conditions less than if the lands were traditionally farmed.

Developing Facilities

We would restore developed sites and remove buildings or other infrastructure that we have acquired but do not need for refuge purposes, to encourage the return of native vegetation as quickly as feasible. In general, the main access roads would remain open to provide motorized and non-motorized access for approved activities.

Protecting Land

Under all the alternatives, we would continue to pursue land protection as described in the refuge’s establishing documents, with additional criteria as noted in this CCP. This would result in the permanent protection of approximately 12,000 additional acres and the attendant protection of soils from potential conversion or degradation. The removal of old, unnecessary structures and the restoration of that land to natural habitats would likely offset the potential loss of soil productivity from the future development of facilities.

Regardless of the alternative, site conditions including soil condition, elevation, slope, aspect, and hydrology would be the ultimate determinant of the habitat management potential for any particular site on the refuge. We would not manage any site in a manner that was inconsistent with its recognized potential.

Public Use

Off-road and trail public use activities have the potential to impact soils from trampling, which can indirectly affect vegetation by loosening the soil surface layers and compressing its underlying layers. Coupled with a loss of plant cover, the result can be increased soil erosion (Hammit 1986). Trampling also decreases the abundance and diversity of soil organisms such as microbes, earthworms, arthropods, snails, and slugs, which often play a major role in nutrient cycling (Liddle 1997). However, the damage to soil and subsequent impacts on vegetation from public uses has been undetectable on the refuge. We regularly monitor alongside trails and roads and have not observed any major impact areas. We monitor parking and other concentration areas during the hunting season and have not observed excessive soil impacts there either. This is likely due to the high acreage-to-hunter ratio and

the fact that hunters, when going off-trail, tend to follow existing deer trails. In our observations, deer cause more disturbances of soils in the forests and fields of the refuge than hunters do, evidenced by the many deer paths on the refuge.

Impacts on Soils in Alternative A

Beneficial

Our current management has improved the soil characteristics of more than 1,300 acres. We have removed more than 15 dilapidated buildings not needed for refuge management and allowed those sites to re-vegetate naturally. The compacted and depleted soils under those buildings are now improving in structure and productivity. At two sites, we are placing new buildings within the footprint of former buildings, so as not to damage soils and habitat at new sites. We have taken more than 1,300 acres of former agricultural land out of production, and have restored or allowed them to revert to natural vegetation. Over time, the natural soil structure and associated microbial communities will reestablish themselves on that land.

In addition to the soils improved through refuge management, refuge land acquisition has permanently conserved more than 7,000 acres. That protects their soils from loss by conversion to impervious surfaces or the removal of topsoil or erosion, with the exception of the tidal areas, which are subject to the dynamic forces of nature.

Adverse

Potential adverse impacts on soil could result from compaction by visitors using trails and other facilities as we noted above. As of May 2007, we had constructed less than 1 mile of new, fully accessible trails on previously undisturbed soils. Fully accessible trails typically are 5 feet wide and composed of gravel topped with stone dust or “screenings.” Although they are pervious to precipitation, they do cause the compaction of soils and the loss of vegetation. Other trails consist of paths mowed across fields, or paths cut through the woods. We minimally maintain approximately 2 miles of trails of that type. Soil compaction occurs on those trails as well, although not to the same extent as on the accessible trails. For each mile of trail, approximately 0.6 acres of soil is affected. We do not create trails on steep slopes, so erosion is minimal. The trails are for pedestrian or wheelchair use only. Therefore, under alternative A, the use of trails and adjoining information and interpretive signs would affect less than 2 acres.

We have not constructed any new roads for vehicle use, but have used existing gravel and dirt farm roads. Some of those, totaling just less than 10 miles, are open for public access, while the remainder is for use only by staff or special access permit. The 10 miles used by the public are undergoing rehabilitation, with an expected completion date in 2008. They are being resurfaced with gravel and graded for better drainage. Assuming an average width of 15 feet would result in approximately 18 acres of unavoidable long-term impacts on soils due to compaction and the removal of vegetation.

Impacts on Soils in Alternative B

The primary differences in alternative B that would affect soils are: the amount of prescribed burning needed to maintain additional grassland habitats, additional opportunities for public use, and construction of a new headquarters and visitor contact building.

Beneficial

Regular prescribed burning in grasslands should improve soils by releasing nutrients bound in plant biomass back into the soil. Because grassland fires are short, they should not remove or adversely affect organic soil material. Any additional grassland established would likely come from land now in agriculture. Therefore, improvements to soils would occur in two ways: by establishing native vegetation, and by regularly returning nutrients to the soil.

Soil damage from fires, or from erosion on fire-damaged sites, is unlikely to occur on the refuge. Nevertheless, we would suppress all wildland fires, with fire fighter and public safety as the highest priority. Although wildland fires occur rarely in the refuge area, we would protect against wildfire whenever it threatens human life, property, and natural or cultural resources. We would suppress wildfires in a prompt, safe, aggressive, and cost-effective manner to minimize adverse impacts on resources and acreage.

Adverse

Under alternative B, we would explore additional opportunities for the following public uses: deer, waterfowl, and turkey hunting, fishing, wildlife observation and photography, interpretation, and environmental education. We expect some adverse impacts due to increased foot travel but would likely result in only some minor adverse impacts. Construction of a new headquarters and visitor contact building would be planned for the Hutchinson tract in Essex County and would permanently affect soils; however, the site is in an area already disturbed from its use as a former farmhouse and associated outbuildings.

Hunting

We would evaluate opening the refuge for wild turkey hunting and waterfowl hunting under alternative B. Before we may offer these new hunt programs, however, both would require additional analysis, public involvement, and affirmative findings of appropriateness and compatibility. It would primarily be deer and/or turkey hunting that has the potential to affect soils as hunters would be walking off road and off trail, and primarily in uplands. To date, however, we have not observed any soil disturbance attributed to hunting and should any concerns arise, we would design our hunt program to ensure hunters are well dispersed.

Creating new hunter parking areas may cause some localized adverse impacts due to compaction and removal of vegetation. Most of the present hunter parking areas are not permanent and are simply mowed areas next to roads. We have noticed that the vegetation in these areas responds quickly after we stop mowing outside of the hunt season. As such, we have not observed that the soils in these areas are permanently or significantly impacted. We would construct any new hunter parking areas similarly, and would expect them to have the same negligible impact to soils.

We would require waterfowl hunters to use public boat launches and parking areas, and access the refuge by boat. We would work with the VDGIF to develop a waterfowl-hunting plan that does not require the construction of permanent, stationary blinds, which could affect wetland soils and accelerate erosion at localized sites. Under those conditions, waterfowl hunting would have minor adverse impact on refuge soils.

Fishing

We propose to expand opportunities for fishing two locations: the Hutchinson and Laurel Grove tracts. At the Hutchinson tract, we propose to construct one new parking area of gravel to accommodate fishing and canoe launching. That construction would result in the compaction and loss of vegetation on approximately 0.25 acres. Anglers would fish from a pier that replaced an existing structure, so no additional impacts on soil would occur in the area designated for fishing and canoe launching.

At the Laurel Grove tract, we would create a small parking area to accommodate fishing, wildlife observation, and photography. We would locate that parking area on a site where farming operations previously have affected soils. Two grain silos, which we would remove, now occupy the site. We would construct the parking area (0.1 acres) on or next to their foundations.

Anglers would fish from the dam, which could result in the erosion of soil into the pond. We would monitor the site and, if erosion becomes a problem, would take steps to eliminate it, which could include constructing a boardwalk or fishing pier. Based on our experience at Wilna Pond, where we have permitted bank fishing for four years without an erosion problem, we would not expect the erosion at the Laurel Grove tract to become a major problem.

Wildlife observation and photography

We would construct one new trail at the Hutchinson tract and at least two additional photo blinds, one at the Wilna tract and one potentially at the Port Royal unit. The new trail would be fully accessible and constructed as described above. It would be approximately 2.5 miles long and would adversely affect approximately 1.5 acres of soil and vegetation. The photo blinds would be less than 100 square feet, located next to trails. We would probably build them on pilings, and the impacts on soils would be minor. We would also complete a trail under construction at the Laurel Grove tract. We would build it on natural topography without the use of imported material such as gravel or stone dust, and build a short bridge over a swale to avoid impacts on wet soils and maintain a level grade.

Environmental education

The environmental education program would use existing facilities; therefore, no additive impacts on soils would occur.

On-site interpretation

Alternative B proposes modest improvements to existing interpretive facilities such as signs and brochure dispensers along existing and proposed trails, which would result in minor additional impacts on those described under wildlife observation and photography. The soil impacts from the canoe launch site at the Hutchinson tract are the same as those described under the fishing impacts.

Constructing new Headquarters and visitor contact facility

The headquarters and visitor contact building would be constructed using the Service's standard design for a small facility. Approximately 3 acres or less of land would be temporarily disturbed during construction, or permanently impacted by the building footprint and parking area. The proposed site lies less than 150 yards from U.S Route 17, which is traveled by over 7,000 cars per day on the average. The building site is not pristine, and while no soils testing has been done to date, we predict that soils are already impacted or otherwise compromised by its former use as a farmhouse, or by its proximity to a well-traveled highway. The farmhouse stood on that site for over 100 years. It was removed approximately 4 years ago and non-native fescue established there. The topography is flat on this site, so no major soil removal or importing would be necessary. All imported soil would be clean. The new building would be located to avoid impacting the habitat restoration project that has been underway on the rest of the Hutchinson tract.

Impacts on Soils in Alternative C

Beneficial

The benefits for soils would be similar to, though somewhat less than, those described in alternative B. There would be no grassland management, and therefore less frequent prescribed burning would be necessary. Nutrients would not be released from plants as often, but burning would still occur to reduce fuel and improve understory habitat in forested habitats. A forest canopy over a greater area would reduce the potential for erosion.

Adverse

Impacts due to visitor improvements and the new administrative and visitor building would be the same as those described under alternative B.

Impacts on Hydrology and Water Quality

We evaluated and compared our alternatives for their potential to help maintain or improve the hydrology and water quality of the lower Rappahannock River watershed.

We evaluated the benefits of the following actions to protect or restore hydrology or maintain or improve water quality.

- protecting land from conversion to other uses that would potentially be detrimental to water quality, such as residential development
- creating and maintaining riparian buffers along the river and tidal streams and wetlands
- requiring vegetative buffers on easement lands between farm fields and wetlands and streams
- creating and maintaining vegetative buffers around all known vernal pools
- restoring hydrologic functions on previously drained wetlands
- controlling invasive species
- implementing measures to control erosion
- encouraging other landowners in the watershed to take action to improve and maintain hydrology and water quality



Volunteers on the refuge: USFWS

We evaluated the effects of the following actions with the potential to cause adverse effects on hydrology and water quality.

- applying herbicides to control invasive species
- constructing administrative and visitor service facilities
- implementing new or existing recreational uses, particularly those that occur in wetlands or on open water
- using prescribed fire

Impacts on Hydrology and Water Quality that would not vary by Alternative

Because the primary differences among the alternatives involve the amount of grassland or forest habitat that we protect and manage and the degree and kind of recreational use we may permit, most of the management actions that could affect water quality and hydrology will vary more as a matter of degree among the alternatives.

Beneficial

Basing decisions on available scientific data and professional experience

Regardless of which alternative we select, we would ensure that we have sufficient scientific data, or have consulted with sufficient subject matter experts, to support our management decisions affecting refuge hydrology and water quality. For example, in cooperation with the Corps of Engineers, we may employ a regional sediment management process to evaluate scenarios of erosion control. We would continue to consult scientific literature regarding the appropriate widths of riparian buffers to benefit the largest number of indigenous and migratory wildlife species. We would continue to work with state agencies and other conservation partners to improve our understanding and knowledge about the impacts on water quality and their possible remedies in the Rappahannock River watershed.

Protecting land by purchasing full fee title or easements

Under all of the alternatives, we would continue to work with partners to complete our goal of protecting 20,000 acres within the refuge boundary. In doing so, we would prevent their conversion to uses that may negatively affect water quality and hydrology. A study in southeast Virginia between 1994 and 2000 (Tiner, et. al. 2005) reported a loss of more than 3,300 acres of forested wetland during that 6-year period. Residential development was the primary cause (71 percent) for the conversion of more than 2,100 acres to upland. Because of timber harvesting, over 1,000 acres of forested wetland were converted to emergent wetland. Those changes are temporary, but will last until the forest cover reestablishes. By protecting land from conversion to residential development, and by not conducting timber management in wetlands, we would help maintain water quality and hydrology by keeping those wetlands intact, particularly forested wetlands.

Restoring wetland

When we acquire a property for the refuge, we evaluate its potential to restore the hydrology of lands that previously were drained for agriculture or other purposes. Once the hydrology is restored, wetland plants typically emerge without any planting necessary. Those wetlands then act as sponges, soaking up storm water and allowing it to percolate slowly into the ground rather than quickly running off into the nearest stream. That function can replenish ground water supplies and reduce the amount of sediments and nutrients that would have ended up in adjacent waters. As we acquire new properties, we will assess their potential for wetland restoration. We will also encourage landowners who sell easements to the refuge to consider wetland restoration on their lands.

Controlling invasive species

As the EPA notes, “Invasive species effects on water resources can be direct, as in the case of many aquatic nuisance species, or indirect, as in terrestrial species that change water tables, runoff dynamics, fire frequency, and other watershed attributes that in turn can alter water body condition” (<http://www.epa.gov/owow/watershed/wacademy/acad2000/invasive.html>).

One invasive species that affects hydrology is the common reed (*Phragmites australis*). Able, et al. (2003) found that as *Phragmites* invasions proceed, the marsh surface where they grow becomes more altered (flatter, more elevated, and with reduced standing water and water-filled depressions. That, in turn, can affect marsh functions negatively as nursery, feeding, and reproduction areas for fish. The refuge has taken an aggressive stand on controlling *Phragmites*, on both refuge land and private land in the lower Rappahannock River watershed. By keeping populations of *Phragmites* in check, we would continue to have a beneficial impact on marsh hydrology and ecological functions.

Adverse

In managing the refuge, we monitor closely and mitigate all of our routine activities that have some potential to result in the chemical contamination of water directly through leaks or spills, or indirectly through soil runoff. Those include the use of motorized watercraft, the control of weeds and insects around structures, the use of chemicals for de-icing roads and walkways, the concentrations of herbicides at locations where we clean spraying equipment, and the use of soaps and detergents for cleaning vehicles and equipment. Our personnel take precautions to minimize the potential for the chemicals and petroleum products from becoming a water quality problem.

Controlling invasive plants with herbicides

Regardless of the alternative selected, we would continue to aggressively identify and control invasive plant species before they cause large changes on the landscape. That “early detection—rapid response” approach can succeed in preventing much larger problems later on. We will use integrated pest management, which employs a variety of cultural, mechanical, biological, and chemical means of controlling unwanted plants, but our experience to date suggests that the use of herbicides will continue to be part of our invasive species control program.

Please refer to the section “Effects on Soils” to review the herbicides we use on the refuge. The review of their effects on soils also incorporates their effects on water resources. The level of review that Service policy requires before we can apply any chemical on a refuge ensures that the environmental risk is minimized, and that all facets of the proposed use have been examined and justified. Few of the herbicides we use on the refuge are labeled for use in aquatic areas, the exception being some formulations of glyphosate and imazapyr to control *Phragmites*. We follow all of the precautions listed on the labels to minimize impacts on ground and surface waters. When used appropriately, those products should not have direct or indirect negative impacts on water quality or hydrology.

Potentially, concentrations of herbicides in low areas could build up to chronic levels over time. That potential depends on the balance of pesticide input and removal from the aquatic system. Herbicide inputs may occur through direct application, water inflow, or re-suspension and diffusion from the sediment layer. Herbicide removal from the system may occur through outflow, degradation, volatilization, and settling or diffusion into the underlying sediment (Neitsch, et al. 2001). Although we do not expect that effect on the refuge because of the low volumes we are applying and the other precautions we are taking, our monitoring of sensitive species such as amphibians should give us early warning if problems were to arise. We would pursue an adaptive management strategy in dealing with invasive plan management to ensure we could respond quickly to our monitoring results and other new information.

Constructing facilities

Under all of the alternatives, we would continue to renovate or construct approved refuge facilities. In planning those activities, we always consider their potential effects on water quality and hydrology. Without precautions, the runoff of sediments could increase as we disturb soils and temporarily or permanently remove ground cover. The examples that follow illustrate the potential problems with water quality and methods of alleviating them.

During the rehabilitation of the Wilna Pond dam, considerable earth moving went on next to the pond and the wetlands of Wilna Creek. It moved hundreds of cubic yards of earth to build up the dam and reshape its slope and exposed bare ground for several months. That could have resulted in large amounts of sediment washing off into the pond and adjoining wetlands. To prevent that, we installed and maintained silt fences next to all disturbed areas. We created a parking lot where the fill was removed, and installed permanent sediment traps to catch any runoff in the future. We used gravel for the parking lot rather than asphalt, allowing more precipitation to percolate through rather than run off immediately into the pond or wetlands.

We have recently completed the rehabilitation of refuge roads on three tracts. During the design phase, we decided to maintain most of them as gravel roads, to avoid adding to the impervious surfaces on the refuge. We redesigned a paved portion of road as a gravel road, to further reduce the impervious surfaces on the refuge.

Burning prescribed fires

We would continue to conduct prescribed burning under all of the alternatives, although more so under alternative B because of the increased habitat management. Without sufficient planning, prescribed burning has the potential for adverse effects on water quality. For example, the bare ground caused by burning could result in sediments washing into streams, especially on steep slopes. The considerable research and many publications on the impacts of fire on water quality describe in detail the techniques for avoiding negative impacts during and after prescribed burns. Elliott and Vose (2005) find that low-intensity, low-severity fires, like those on the refuge, result in no detectable differences with control sites for concentrations of nitrogen, phosphorous, sodium, calcium, magnesium, potassium, or pH, nor were there any differences in total suspended solids. According to the National Management Measures to Control Nonpoint Source Pollution from Forestry (EPA), "Periodic, low-intensity prescribed fires usually have little effect on water quality, and revegetation of burned areas reduces sediment yield from prescribed burning and wildfires."

We will continue to follow best management practices, such as those published by the Virginia Department of Forestry and, in many cases, expand those practices to ensure that our prescribed burn program does not affect water quality.

Impacts on Hydrology and Water Quality in Alternative A

Beneficial

Water-quality buffers

A great deal of information is available about the positive effects of vegetative buffers on water quality. A search engine request on the Internet for the term "water quality buffers" produced more than 2 million "hits." Vegetated buffers have been shown to reduce drastically the sediments, nutrients, and other pollutants entering waterways adjacent to agricultural fields and developed areas. Vegetated filter strips only 15 feet wide have been shown to reduce sediments by up to 70 percent (Klapproth and Johnson 2000). The effectiveness of buffers depends on several factors, including the slope, type of vegetation in the buffer, and the type and intensity of the uses on adjoining land. As an extreme

example, as much as 12,000 feet may be needed to buffer the impacts of high-density residential or commercial uses (Houlahan and Findlay 2004).

However, as we note in chapter 3, we seek to create and maintain buffers strips not only to improve water quality, but also to provide riparian habitat for bald eagles, other migratory birds, and resident wildlife. Under alternative A, we would create and maintain buffers of at least 330 feet. That would be sufficient to filter most sediments and nutrients before they entered adjacent wetlands and watercourses. In addition, if we phase out cooperative farming as planned, few land-disturbing activities will result in sediment flows after heavy rains.

In terms of resident wildlife, one of the species groups upon which we would focus attention is herpetofauna (reptiles and amphibians). For those species, vernal pools are of special importance. By creating at least a 300-foot buffer around all known vernal pools, and 1,000 feet where possible, we would not only protect the necessary water quality for breeding and nursery areas, but also would retain shade and protect food sources for those species.

On easement lands, we would continue to require a minimum vegetated buffer of at least 100 feet next to all wetlands, streams, and major drainage ditches. Although buffers of that width will not provide the degree of riparian habitat found on fee title lands, they should be adequate to filter a large percentage of sediments and nutrients. A study along Maryland's western shore of the Chesapeake Bay found that a riparian buffer removed 89 percent of nitrogen from field runoff, mostly within the first 62 feet (Peterjohn and Correll 1984). Therefore, buffers installed next to watercourses, wetlands, and vernal pools on both fee title and easement lands would have a positive impact on water quality.

Erosion control measures

Under current management (alternative A), we have started investigating how to stem erosion along the river shore, particularly near the bald eagle roost on the Wilna tract. We hope to receive funds to create a breakwater that will reduce the wave and tidal action that is causing the loss of beach habitat, and causing eagle roost trees that grow along the shoreline to fall into the water. In addition to protecting those trees, stemming erosion will reduce the influx of suspended solids, which chapter 2 lists as one of the influences that negatively affect water quality in the river.

We also hope to use this project to demonstrate to other riverfront landowners the techniques they can use to stem erosion on their properties. We plan to collaborate with the landowner who owns land adjacent to the Wilna tract to affect a greater segment of that shoreline and use it as a demonstration area.

Adverse

Recreational uses

Recreational uses, especially those in wetlands and open water, have the potential to affect water quality negatively by increasing erosion, stirring up bottom sediments, or introducing pollutants into waterways. The refuge offers all six priority uses: hunting, fishing, environmental education and interpretation, and wildlife observation and photography.

Environmental education activities that involve the sampling of wetlands and ponds could cause temporary, localized, minor impacts on water quality as the students disturb the bottom of the pond or walk on the marsh to gather specimens.

Fishing has a somewhat greater potential to affect water quality if vegetation became trampled and erosion occurred, especially along banks of Wilna Pond or the Wilna Pond dam. That has not occurred to date, and we do not expect it to become a problem.

We do not permit use of gasoline motors on Wilna Pond, thereby eliminating the primary potential source of direct water pollution that could result from our fishing program. Anglers in boats with paddles or electric motors could disturb the bottom of the pond, but we do not expect that to detract from its water quality. We do not expect the other recreational uses to have negative effects on water quality or hydrology.

Impacts on Hydrology and Water Quality in Alternative B

Beneficial

Water-quality buffers

We discuss the benefits of water quality buffers in the impacts of alternative A, above. In alternative B, we would seek opportunities to expand our riparian buffers beyond the 330-foot minimum up to 1,600 feet. That would not only provide excellent benefits for water quality, but also would be wide enough to provide an adequate amount of habitat for the full range of birds, reptiles, amphibians, and mammals that rely on the riparian zone.

Erosion control measures

Under alternative B, we would identify other areas where shoreline stabilization should occur, and seek funds to implement evaluations and erosion control measures. The impacts on water quality would resemble those in alternative A, somewhat expanded.

Technical advice to private landowners

Our refuge staff assists landowners who seek to improve water quality on or near their properties. Under alternative B, we would seek to improve our capacity to assist landowners by adding a private lands biologist to our staff. There is a critical need within the Rappahannock watershed to improve land use practices to achieve water quality improvements in the river and tidal tributaries. As described in chapter 2, the Rappahannock River has the second highest total area and percentage of agricultural land at 31.4 percent, and the lowest percentage of wetlands and percentage of shoreline with a riparian buffer, of all the Virginia river tributaries of the Chesapeake Bay (Dauer et al. 2005).

By working with partners, conducting outreach, and helping landowners seek funds, the refuge could help increase the existing amount of water quality projects and have a positive impact within the watershed.

Adverse

Prescribed burning

The potential negative impacts of prescribed burning on up to 500 acres/year in alternative A would be greater under alternative B, where up to 700 acres/year may be burned as we bring more grasslands under refuge management. Grasslands require frequent burning to maintain their health and vigor. Under alternative B, we would continue the best management practices that we now employ to reduce the potential for negative impacts on water quality.



Cat Point Creek: USFWS

Proposed recreational uses

Under alternative B, we propose increases in all of the six priority refuge uses (environmental education, fishing, hunting, interpretation, photography, and wildlife observation) that now occur on the refuge. Proposals for waterfowl and turkey hunting would be further explored and evaluated under this alternative. Fishing would be expanded at the Laurel Grove and Hutchinson tracts. White-tailed deer hunting would continue, and possibly expanded as new properties are acquired. Canoe and kayak access points would be developed and new wildlife observation trails constructed. We would continue, and hope to expand, opportunities for environmental education.

The proposed activities with the most potential to affect water quality adversely are constructing facilities (see ‘Impacts Common to All Alternatives,’ above), fishing and waterfowl hunting. This is because these activities would occur on or adjacent to wetlands and waterways. We do not expect other new or expanded recreational uses to affect water quality or hydrology.

Fishing

We would expand public recreational fishing opportunities, beginning at the Laurel Grove and Hutchinson tracts. At Laurel Grove, we would likely permit bank fishing only along the existing dam and, possibly, from a newly constructed fishing pier. Bank fishing could result in erosion and increased sedimentation along the banks of the 10-acre pond. To minimize this impact, we would maintain permanent herbaceous cover on the slopes of the dam and remove existing trees that, if left in place, could serve to concentrate anglers at more open areas, and thus increase the potential for erosion. Trees themselves also weaken the structure of the dam, and may cause erosion or dam failure if not removed. We also would permit canoes, kayaks, and other small boats to access the pond via an unimproved shoreline access point. This too could cause erosion problems if the area is used too frequently. We would monitor the erosion issue and take steps to correct it if necessary. Our experience to date at Wilna Pond has demonstrated that erosion is not likely to become a serious issue at Laurel Grove if managed and monitored similarly. No gasoline motors will be permitted, which will alleviate concerns about water pollution from boats.

Waterfowl hunting

As with fishing, erosion causing sedimentation is the most likely negative impact on water quality that could result from waterfowl hunting. If trampling of vegetation resulted in complete loss of cover, the banks could erode. We would have the flexibility to relocate potential hunting blind locations if loss of vegetation were to become evident. Compared to erosion from wave action and existing boat use of the river and tidal creeks, the potential impact from waterfowl hunting is expected to be minimal. In addition, lead shot is prohibited for all waterfowl hunting, so lead is not introduced into the water from this activity. The potential for waterfowl hunting to impact water quality will be further assessed in a subsequent NEPA analysis.

Constructing new Headquarters and visitor contact facility

Constructing a new headquarters and visitor facility on the Hutchinson tract has the potential to increase stormwater runoff by creating impervious surfaces and may degrade water quality if not done properly. We would reduce those negative impacts by following best management practices and low-impact development processes. In siting the new headquarters and visitor contact facility we would minimize adverse impacts on surface and groundwater flow. We would also implement appropriate stormwater practices including installing rain barrels and creating rain gardens to mitigate for the impervious surfaces created by the facility. The building we constructed in 2007 on the Wilna tract is an example of our use of rain barrels to water the native flower garden next to the building, thus reducing runoff and saving water.

Impacts on Hydrology and Water Quality in Alternative C

Beneficial

Same as alternative B.

Adverse

Same as in alternative B, although potential impacts from frequent prescribed burning impacts would be less under alternative C.

Impacts on Vegetation

The types of activities proposed in the alternatives that would affect vegetation and other biological resources include burning prescribed fires, brush-hogging and mowing, disking, treating invasive or unwanted vegetation with herbicides; controlling erosion; thinning forest; constructing new trails; constructing new buildings or public use facilities such as piers, docks, trails, photo blinds, docks; increasing or offering new opportunities for public use, such as opening new tracts to visitors or offering new opportunities for hunting waterfowl or wild turkeys; and ceasing habitat management to allow natural succession.

Impacts on Vegetation that would not vary by Alternative

Managing invasive species in wetlands and hardwood bottomlands

For some habitat types, there would be little habitat management activity other than passive protection, such as land acquisition or conservation easement, closing to public access, allowing natural succession or processes, or establishing protective buffers. Passive protection would apply to habitats that are inaccessible primarily because of hydrology and the difficulty of terrain such as hardwood bottomlands and wetlands. Vegetation in these habitat types would remain similar in structure and species composition to what they are today, except for those changes wrought by beaver activity, storms, wildfire, loss of pollinators or seed dispersers, climate changes, plant diseases, or invasive species. With respect to invasive species and, to a limited degree, beavers, the refuge would move from a passive approach to low-intensity intervention, where resources are available. Without intervention and depending on the size of the natural resource unit, the effect on vegetation from such invasives as *Phragmites* or Japanese knotweed could vary in degree from slow, incremental spread from the edges to complete stand replacement. Across all alternatives, we would engage in intervention at the early-detection, early-response stage and this could potentially have the effect of preserving 100 percent of the native cover from a particular threat.

Managing invasive species in upland grasslands, shrub and upland forest habitats

Upland habitats, by virtue of their accessibility, have had a long history of disturbance and alteration from such land uses as logging, agriculture, and grazing. Depending on the time scale, the size, existing vegetation cover, and location of the unit in question, stand-replacing invasions are of concern because of the many varieties of terrestrial invasive plant species on the landscape and the extent of disturbance. These factors have created countless opportunities for the transport and establishment of reproductive plant parts (seeds, rhizomes). A passive approach toward upland protection from invasive plants could potentially have highly negative impacts on vegetation, even to the degree of complete stand replacement, depending on patch size, location, and the reproductive mechanisms of the invasive species. For example, Japanese stiltgrass in disturbed forests prevents recruitment and regeneration of native tree species. The impact of this process may not be apparent for a couple of decades. Another example is the presence of mature, seed producing black locust or tree of heaven at the upwind edge of an early successional habitat. Without annual, growing season disturbance, stand-replacing monoculture patches could become established within two to three years throughout the

early successional field, particularly if it does not receive annual disturbance (as in the case of sites designated for shrub or forest succession). Across all alternatives, intervention at the early-detection, early-response stage would potentially have the effect of 100-percent preservation of the native cover from these threats in both examples.

Regardless of alternative, upland habitats and wetlands continue to require substantial inputs of permanent staff time and funding resources to control, prevent and defend vulnerable areas from invasive species, particularly in the early years of the planning horizon. It is hoped that, over the long term, the input levels will taper, as native communities become restored, dominant, and stabilized. It is difficult to predict the extent to which invasive plant species will affect currently farmed land when we remove it from the cooperative farming program.

Establishing and maintaining riparian buffers

Another habitat management activity that would not vary with alternative is the establishment of vegetated buffers along riparian and wetland borders, either through plantings or natural succession. As described in the objectives, we would seek to maximize the width of forested buffers, if such action did not conflict with another high priority use. This action could potentially have an indirect negative effect on managed grasslands if, during the process, high seed producing and invasive trees were permitted to remain on the border of a grassland. This action would have a direct positive effect on the quality of the riparian zone by increasing the source and recruitment of desirable native tree species, suppressing competition of undesirable species that degrade forest quality, and ensuring the long-term persistence of local populations of slow-maturing native tree species.

Managing forest

Regardless of the alternative, the refuge will continue management and maintenance of healthy and diverse forests as funding and resources permit. This may include mechanical thinning and prescribed fire to thin out overstocked, monocultural stands resulting from previous clear cutting (although that would receive more emphasis in alternative B). Strategic building of large forest blocks through land acquisition, easements, and progression of natural succession and expansion of forested riparian buffers would also take place under any alternative and would form an integral part of refuge management.

Administering the refuge

We plan some administrative activities, such as constructing new or rehabilitating existing buildings and improving roads. Most of the impacts on vegetation resulting from those actions would be minor, temporary, and confined to the sites.

Offering public use

The present level of public use on refuge lands is modest, mostly in the form of white-tailed deer hunting, fishing on a manufactured pond, and watching wildlife. The latter two have no perceptible direct or indirect impacts, as visitors generally are confined to farm roads, trails, or specially provided access points and piers. Irrespective of alternative, however, public visitation and use will increase on its own as the public becomes more familiar with and aware of the opportunities provided by the refuge, and will increase as we open other tracts and provision them with new facilities such as trails, kiosks, signs, and parking.

With respect to the public deer hunts, both direct benefits and adverse impacts may be realized. On the benefits side, keeping the deer population in check has shown a positive response by vegetation in experimental exclosures (Augustine and Frelich 1998, McCullough 1982). Deer browse lines are visible along some forest edges on certain tracts of the refuge. Deer sign such as browse, rubbings,

trails, droppings, rooting through the leaf litter, and foot prints are visible everywhere and very few locations contain the woodland wildflowers that one would expect in this area including columbine, trillium, bloodroot, and spring beauty. In this situation, no hunting or no-culling of deer would have lasting effect on sensitive vegetation and may set back resiliency for many years depending on the 'shelf life' of seeds in the seed bank, and in the long run would have potential negative impacts on the songbird community (Allombert et al 2005).



Wood duck ducklings: USFWS

Hunter trampling of vegetation is undetectable due to the high acreage to hunter ratio, limited number of hunt days, sparseness of understory vegetation, and time of year (dormant season). Plant species vary in their resistance to trampling, leading to changes in plant communities. In general, plant diversity has been shown to increase with slight use and to decrease as use intensifies (Liddle 1997). Plant recovery in the mid-Atlantic Coastal Plain is relatively rapid compared to wilderness areas located in alpine, arctic, and desert ecosystems where abiotic factors limit plant growth. Plant recovery from trampling damage in these areas can take many years and may never occur (Newsome 2002). Because deer are everywhere all the time and hunters are present on a limited number of days and only during the dormant season, deer impacts on vegetation far outweigh trampling of vegetation by deer hunters.

The impacts on soils from trampling indirectly affect vegetation by loosening the soil surface layers and compressing its underlying layers. Coupled with a loss of plant cover, that leads to increased soil erosion (Hammitt 1986). Trampling also decreases the abundance and diversity of soil organisms such as microbes, earthworms, arthropods, snails, and slugs, which often play a major role in nutrient cycling (Liddle 1997). However, the damage to soil and subsequent impacts on vegetation has been undetectable on the refuge. That is likely due to the high acreage-to-hunter ratio and the fact that hunters, when going off-trail, tend to follow existing deer trails. Deer cause more disturbances of soils in the forests and fields of the refuge than hunters do, evidenced by the many deer paths on the refuge.

Impacts on Vegetation in Alternative A

Beneficial

Protecting and Managing Habitat

The discussion here pertains to grassland management, as we are conducting no intensive or significant management of other habitat types.

Direct benefits of a grassland management program under alternative A include the reintroduction or reappearance of native herbaceous and grass species in the fields being maintained in early succession, and the long-term persistence of high quality early successional habitats, which are relatively rare in the east. This effect is of high intensity and long duration, but requires frequent management actions to maintain. Other direct benefits to vegetation result from prescribed fire: the return of nutrients to the soil by combustion of dead plant biomass, reduction of litter, and creation of openings where grasses and fire-adapted herbaceous vegetation can establish.

An indirect benefit of grassland management is the increase in population of native plants to a level where they become self-sustaining population sources, as opposed to population sinks. Another benefit is the provision of overwintering habitat for pollinators, upon which many plants depend for reproduction. The duration of these benefits is difficult to predict due to many uncontrollable variables.

Administering the Refuge and Public Use

The impacts on vegetation under this alternative would be the same as those discussed in the section “Impacts Common to All Alternatives.”

Adverse

Protecting and Managing Habitat

The direct impacts would be the temporary removal of vegetation because of brush-hogging, burning prescribed fires, or applying herbicides. We would conduct those primarily to maintain fields in early succession, set back woody encroachment, or control invasives. The regimes are intense and relatively frequent, ranging from semi-annual, annual or biannual depending on the response. Their direct effects are of short duration, in that vegetation regrows quickly during the growing season. Brush-hogging generally is non-selective; hence, some desired species, such as milkweed may have to be expended in order to control woody invasive species at the most effective times of the year. Broad-spectrum herbicides, such as glyphosate products, when applied aerially or by boom applicator, also kill non-target species of plants. We reserve those methods for units that are infested so heavily with an invasive that selective application would be impossible. Likewise, fire destroys some desired vegetation, for example, winter cover for grassland-dependent species. However, we always leave unburned some fields nearby to provide winter cover. When planting grasses or trees, direct adverse effects could range from short duration to permanent. The process of preparing a field for native grass or tree-planting has the effect of wiping the current slate clean, and thus a loss of some native species is expected, however, these plantings nearly always occur in former agricultural fields or pastures that are already in non-native cover.

Although we have made every effort to consider the range of adverse effects on vegetation, and how to avoid them, some indirect adverse effects may result. One is the potential loss of some non-fire-adapted vegetation when enrolling a unit in a prescribed fire regime. That would apply more to high seed-producing annuals that do not develop robust root systems or regenerative structures below ground, as perennials do. Their mortality would be more of a function of the depth of organic and mineral soil and the severity and duration of the fire at a given spot (Miller 2000). Repeated use of prescribed fire shifts the balance from less fire tolerant communities or species to fire-tolerant communities. However, fire seldom completely consumes all the biomass in a burn unit; instead, the result is usually a patchy distribution of completely or partially burned and unburned vegetation.

Depending on how a tree-planting project is laid out, the maintenance between rows can be challenging, and make it difficult to keep out undesirable competitors, thus giving them a foothold in overtaking an area or inhibiting the establishment of the planted species.

Administering the Refuge and Public Use

The impacts on vegetation under this alternative would be the same as those discussed in the section “Impacts Common to All Alternatives.”

Impacts on Vegetation in Alternative B

Beneficial

Protecting and Managing Habitat

In this alternative, vegetation management would focus on increasing the acreage of grassland from the current level of about 700 acres to about 1,200 acres, thinning overstocked forest stands to promote forest health and diversity, and controlling invasive plants wherever possible.

With respect to increasing and maintaining grassland and early successional habitat, direct and indirect benefits would be identical to those described in alternative A, except that those benefits would increase by about 500 acres (or 70 percent above the current condition) in grassland/early successional habitat.

With respect to upland forest habitat, direct benefits would apply to the residual trees released from competition and surrounding forest because of the proposed thinning of overstocked stands of loblolly and tulip poplar. Those trees would experience increased vitality and vigor and be a source for future trees. An indirect benefit would be increased structural and species diversity, and reduced vulnerability to disease. Another indirect benefit would accrue from application of prescribed fire in selected areas. This would shift the dominance in the overstocked areas from the current beech-tulip-maple in the hardwood stands and loblolly in the pine stands, to an oak-dominated forest, along with the associated complement species, which is more natural for this region.

About 400–500 acres of forest are distributed among the 17 tracts in fee-simple ownership that hold the potential for enrollment in such a program. However, since an inventory of the forests is an objective under this alternative, to date the information on the exact number of stands and their sizes is unavailable for quantitative analysis.

Administering the Refuge and Public Use

This alternative proposes the expansion of the trail system. The indirect benefits for vegetation include staff and visitors' increased, enhanced awareness, appreciation, and protection of native plant communities, particularly those that contain high value for habitat, cover or food resources, and increased accessibility for scouting and treating any invasive plants that may threaten those desired plant communities.

An indirect benefit to vegetation from the refuge hunt programs is the increased potential to partner with hunting organizations who would assist in wildlife habitat enhancements projects (e.g. seeking grants or donations for planting native trees, assisting in herbicide applications for controlling invasive plants, etc.).

Adverse

Protecting and Managing Habitat

Direct and indirect adverse impacts on vegetation would be the same as that described in alternative A, except that those adverse effects would increase by about 500 acres (or 70 percent of the current condition). The frequency and duration of effects, sensitivity and natural resiliency of the resource would be the same as in alternative A.

Administering the Refuge and Public Use

The direct impact of new trails has the potential for increasing edge effects on adjacent vegetation communities, which provides inroads for invasive species to colonize. However, that depends upon the type of habitat, the type and placement of trail, and the resulting amount of canopy closure. A narrow earthen or woodchip path through a closed-canopy forest is not likely to fragment or produce edge effects in such a forest, but a wide path mowed straight through managed grassland would fragment that habitat. Examples of other impacts include the removal of foundation species, increased light on the forest floor if canopy trees are removed, and increased climbing vines on interior trees. Placing trails with care can avoid most adverse effects. Quantifying the impacts on vegetation from trails depends exactly on their location, length, width, and type (gravel, dirt, wood chip, and boardwalk).

Expanding opportunities for hunting (wild turkey and waterfowl)

We mentioned previously that our plans on whether or not to expand hunting on the refuge to include new waterfowl and wild turkey hunts are not fully developed yet. We have committed to working on this within 5 years of CCP approval. We will conduct additional NEPA analysis and public involvement prior to making a final decision on those hunts. As such, we do not have a full assessment of potential adverse consequences described here.

Wild turkey hunts are more likely to affect native vegetation directly, depending on the time of year, length of season, number of hunters, and extent of hunt locations. Spring gobbler season is when spring ephemerals are in bloom, and are most are vulnerable to trampling. That is difficult to quantify without knowing its exact locations. Staff would need to consider carefully the allocation of sites and the timing to avoid or minimize adverse impacts on vegetation. A fall turkey-hunting program would have minor adverse impacts similar to those discussed under the impacts of deer hunting.

Waterfowl hunts may pose direct impacts on vegetation with increased presence of boats and boating traffic physically traversing through wetlands vegetation. Portions of, or whole plants, can be torn, sometimes by the roots, and boat wakes contribute to erosion. Accidental introduction of invasive plants, pathogens, or exotic invertebrates attached to boats is another source of direct adverse impact. However, many of these impacts could be even greater in the absence of a refuge waterfowl hunting program. Currently, private stationary waterfowl hunting blinds are being licensed below low tide immediately adjacent to refuge lands. This is permitted by state and Federal laws. In the absence of new state or Federal regulations, the refuge has no control over the location or use of these blinds. State law does require that stationary blinds must be at least 500 yards apart, but there are no regulations as to the distance from public lands. At present, there are at least 15 blinds located within 20 feet of the refuge. If the refuge had a waterfowl hunting program, we could exercise our riparian rights. This would allow the refuge to annually establish and license stationary blinds along its shoreline before non-riparian hunters are permitted to purchase stationary blind licenses. This would keep non-riparian blinds at least 500 yards from any refuge blind.

If we had the ability to manage waterfowl hunting in proximity to refuge lands, we would regulate the amount of hunting, boat access, and the location, design, and construction material of blinds. We would protect sensitive areas and rare plant communities. Therefore, the impacts on vegetation from establishing a waterfowl hunting program on the refuge would be less than what occurs at present.

Constructing new Headquarters and visitor contact facility

As described under the “Soils” discussion, less than 3 acres would be impacted by the construction of the proposed new headquarters and visitor contact facility. The proposed location is on the Hutchinson tract, within 150 yards of U.S. Route 17, a major highway. The former land use of this site for over 100 years was a farmhouse and outbuildings. The old farmhouse was taken down in recent years, but some of the structure remains, such as the old chimney. The site primarily consists of non-native fescue. We would try to keep the one American beech that stands in the yard. Hackberry bushes on the site would likely be taken out. The site is not considered quality native habitat for any wildlife. No unusual plants or plant communities occur here. We would site the building and parking so as not to compromise the habitat restoration that is underway on the majority and interior of the Hutchinson tract.

Impacts on Vegetation in Alternative C

Beneficial

Protecting and Managing Habitat

In addition to the benefits noted under alternative B, direct benefits in the form of increased acreage (by 700 acres) would accrue to shrub and forest habitat types over the long term because of discontinuing grassland management. An indirect benefit would be increased opportunities over several portions of the refuge for the recruitment of forest species and sustaining populations of forest species.

Administering the Refuge and Public Use

Same as in alternative B.

Adverse

Protecting and Managing Habitat

For grassland species, direct adverse vegetation impacts would be the mirror opposite of benefits to forest species. About 700 acres of grassland species of vegetation would eventually disappear except in scattered openings and edges. Indirectly, and for the long term, these scattered fringe remnants will no longer serve as source populations for grassland species in the larger landscape.

Administering the Refuge and Public Use

Same as in alternative B.

Constructing new Headquarters and visitor contact facility

Same as in alternative B.

Impacts on Federal-listed and Recently Delisted Species

One of our highest priorities is the conservation and management of Federal or state-listed species, a cornerstone of the purposes for establishing the refuge. We evaluated each of the alternatives for their potential to affect beneficially or adversely the riparian habitat or other habitats where breeding, wintering, or migrating bald eagles concentrate, and where populations of sensitive joint-vetch grow. Although we removed the bald eagle from the Federal-list of Endangered and Threatened Species List on August 12, 2007, the state continues to list it as a threatened species. It remains a priority for conservation on the refuge. We will continue to adhere to the management guidelines for bald eagles in Virginia.

We evaluated the benefits of our actions that would conserve, restore, improve, or increase riparian or other habitats of listed focal species (e.g., the sensitive joint-vetch) and the recently de-listed bald eagle:

- expanding riparian forests and improving interior forests
- controlling invasive species
- phasing out agriculture
- acquiring and protecting strategic land
- controlling erosion and protecting shoreline
- increasing public awareness through environmental education

Listed Species on the Refuge

Sensitive joint-vetch

We evaluated the potential for the actions proposed to cause adverse effects on riparian and other habitats of listed species:

- the disturbance of listed species from public use
- the impacts on habitat quality from the placement of facilities
- the potential impacts from the aerial spraying of invasive species, grassland management and maintenance, forest improvement, or shoreline protection

Impacts on Bald Eagles or Sensitive Joint-vetch that would not vary by Alternative

Protecting or Managing Habitat

In all of the alternatives, we would manage riparian habitat the same way. The Federal-listed sensitive joint-vetch and bald eagle live in riparian habitats within the refuge boundary. Although varying numbers of bald eagles use the refuge, its populations of sensitive joint-vetch are small, sparsely distributed, and less predictable in their occurrence and duration. The objectives and strategies in chapter 3 for protecting land, monitoring and abating diseases of wildlife and plants, controlling invasive or pest species, and phasing out cooperative farming would all contribute direct and indirect benefits to the refuge habitat for bald eagles and, except for cooperative farming, the conservation of sensitive joint-vetch.

Phasing out cooperative farming at the Tayloe tract would result in a minor increase of riparian habitat by expanding the widths of native vegetation cover and allowing it to reforest. That increase, of about 50 acres, would directly benefit bald eagles nesting, roosting, or foraging at Cat Point Creek by widening the amount of forest along the shoreline. It would not have any bearing on the existence or persistence of sensitive joint-vetch.



Eastern pondhawk: ©John Fox

We evaluated the potential impacts on sensitive joint-vetch from the aerial spraying of chemical herbicides against *Phragmites* in a “Section 7 Interagency Endangered Species Consultation” available at refuge headquarters. Those protocols call for the investigation of potential spray sites to assess the presence of sensitive joint-vetch and, if it is present, allow treatment only by hand equipment. The sensitive joint-vetch grows in the intertidal zone where plants are flooded twice daily. The species seems to prefer the marsh edge at an elevation near the upper limit of tidal fluctuation. It usually grows in areas where plant diversity is high (50 species per acre) and annual species predominate. Bare to sparsely vegetated substrates appear to be a habitat feature of critical importance for this plant (USFWS 1995). These conditions, plus the fact that aerial spraying is applied only to patches of obvious monocultures, provide a means for avoiding non-target species when spraying *Phragmites*.

Our goals for acquiring land or easements target riparian habitats, marshes, or the uplands around marshes. That would directly benefit bald eagles by providing protected habitat and minimizing disturbance.

Administering the Refuge and Public Use

Public access to any waterfront or marsh managed by the refuge holds the possibility of affecting bald eagles or sensitive joint-vetch. Those impacts may be either displacement or temporary disturbance, depending on the extent of use of a given site by visitors and eagles. We plan to provide a public canoe launch at Mount Landing Creek and a public fishing pier at Laurel Grove. None of those plans will affect sensitive joint-vetch. However, bald eagles use the trees along Mount Landing Creek and Laurel Grove Pond, but not in high concentrations. Neither of those sites is a known concentration or roost site. However, as the trees mature and the forest riparian buffers at Hutchinson improve, they may attract more eagles. The public canoe launch at Hutchinson may one day be in direct conflict with this use, but at this stage, that is purely speculation, without knowing the extent to which the public or the eagles will use the site. Should the use by eagles increase, it likely would have done so in the presence of some level of public use, and therefore, at a tolerable level of disturbance (Spencer, personal observation).

Impacts on Bald Eagles and Sensitive Joint-Vetch in Alternative A

Beneficial and Adverse

The impacts on these species would be the same as described above in “Impacts on bald eagles or sensitive joint-vetch that would not vary by alternative.”

Impacts on Bald Eagles and Sensitive Joint-Vetch in Alternative B

Beneficial

Protecting and Managing Habitat

The impacts on sensitive joint-vetch would be the same as those discussed under “Impacts on bald eagles or sensitive joint-vetch that would not vary by alternative.” The impacts on bald eagles follow.

The primary difference between this alternative and the other two are the plans for expanding grasslands from their present 700 acres to about 1,200 acres as we acquire suitable sites. Grassland maintenance activities such as prescribed fire, discing, and brush-hogging are types of disturbances that occur during farming, except that their frequency and duration is less. Within the refuge boundary, eagles appear to tolerate farming activities. In 2004, for example, a pair successfully fledged three young in a nest adjacent to a field subjected to all of the preparation and other work involved in a prescribed burn. Another preferred foraging habitat for bald eagles, particularly in the winter, is broad, open habitats within 2 miles of the river or major tributaries and next to mature forest with large canopy trees on its edge. Therefore, grassland management adjacent to mature trees and within 2 miles of rivers would have direct, long-term benefits for wintering bald eagles.

The intensive forest management activities (mechanical thinning of overstocked loblolly and tulip stands) and prescribed fire this alternative proposes will have long-term, direct benefits for bald eagles wherever such stands border broad, marshy ravines (such as at the Wright tract) by releasing current and potential nest trees from competition.

Administering the Refuge and Public Use

The impacts would be the same as those discussed under “Impacts on bald eagles or sensitive joint-vetch that would not vary by alternative.”

Adverse

Protecting and Managing Habitat

The impacts on sensitive joint-vetch would be the same as those discussed under “Impacts on bald eagles or sensitive joint-vetch that would not vary by alternative.” The impacts on bald eagles follow.

Erosion is threatening the long-term persistence of the roost area at Wilna. Strategies for stabilization, if implemented, may include construction of breakwaters just offshore from the roost, beach replenishment, and planting. Breakwater construction is likely the most disturbing activity involving heavy equipment (loaders, cranes, lifts, dump trucks). Time of year restrictions will need to be observed as much as possible. There are no nests at the roost area.

Grassland management may have minor, temporary disturbance not lasting more than a few hours to a day at most.

Intensive forest management activities may have short-term adverse impacts on bald eagles if conducted during nesting season and within the primary or secondary zones of a nest. There are currently three nest sites on the Wright tract, and one may be abandoned. At present, no nest is within 1,325 feet of any of the areas most likely to undergo intensive forest management.

Administering the Refuge and Public Use

Prior to permitting any public recreational use on the refuge or constructing any visitor facility, we assess the potential for that use to negatively affect threatened or endangered species. Sensitive joint-vetch only occurs in freshwater tidal marshes, and typically along edges of marshes subject to frequent disturbance. The only recreational activity likely to have any impact on sensitive joint-vetch is waterfowl hunting. When we evaluate the potential for a waterfowl hunting program, we will fully assess possible impacts to sensitive joint-vetch, and under any alternative, we would locate waterfowl blinds away from known locations of this plant.

Although they are no longer on the Federal threatened species list, bald eagles remain a focus of refuge management objectives. As with sensitive joint-vetch, we would fully assess the potential for any future recreational program to negatively impact bald eagles. We will locate any new facilities away from known bald eagle nests or concentration areas, maintaining recommended distances as shown in Federal guidelines for bald eagle management. We may permit public use near bald eagle nests outside the courtship and nesting period, when pairs or young are not using the nest. We would also observe time-of-year restrictions during construction activities, consistent with Federal guidelines.

Impacts on Bald Eagles and Sensitive Joint-Vetch in Alternative C

Beneficial

Protecting and Managing Habitat

The primary feature of alternative C is the cessation of grassland management. Although no direct benefit is apparent for the bald eagle or sensitive joint-vetch, an indirect, long-term benefit would accrue in the form of increased forest riparian habitat, particularly at the Tayloe tract, where agriculture and grass buffers lie close to sites where eagles forage, roost, and nest. No specific benefits for the sensitive joint-vetch would apply under this alternative.

Adverse

Protecting and Managing Habitat

Whatever benefits would have accrued to bald eagles from maintaining grasslands within the 1.9-mile (3-kilometer) buffer of the river and its tributaries would not exist under this alternative. As natural succession progressed over the next 15 years, the trees the eagles use to forage for rabbits and other small mammals or turtles in the grasslands would no longer be advantageous. The perimeters of the fields at the Tayloe, Wilna, and Hutchinson tracts contain several favored perch trees, particularly those close to a water body. However, given the agricultural context in which those grasslands are situated, that is likely to be a minor loss.

Administering the Refuge and Public Use

The impacts would be the same as in alternative B.

Impacts on Landbirds



A volunteer helping to restore habitat: USFWS

The conservation and management of upland habitats in the Rappahannock River Valley is a priority of the refuge, one consistent with its establishment purpose, and one of our CCP goals. We evaluated the management actions each of the alternatives proposes for their potential to benefit or adversely affect open, forested, and shrub habitats and their associated focal species.

We evaluated the benefits of our actions that would conserve or restore the upland habitats or conserve and enhance breeding or migrating focal species, including:

- expanding riparian forests and improving interior forests;
- managing or expanding grassland habitat, or allowing its reversion to forest;
- controlling invasive species;
- phasing out agriculture;

- acquiring and protecting strategic land; and,
- increasing public awareness through environmental education.

We also evaluated the potential of the proposed actions to cause adverse effects on upland habitats or species, such as:

- public use disturbing wildlife;
- placement of facilities affecting habitat quality; and,
- treatments to control invasive species or maintain grasslands that might adversely affect wildlife.

Impacts on Landbirds that would not vary by Alternative

Beneficial

Protecting and Managing Habitat

The objectives and strategies in chapter 3 for protecting land, monitoring and abating diseases of wildlife and plants, controlling invasive or pest species, and phasing out cooperative farming would all contribute direct and indirect benefits to the habitat needs of various species of landbirds of conservation concern. A primary goal in any alternative is providing quality breeding, migrating, and wintering habitat for migratory birds. For landbirds, that translates into acquiring and managing large patch sizes free of stand-replacing invasive species, and striving to produce in those stands the patchwork of plant diversity most beneficial for the breeding needs of the most area-sensitive species in each major habitat type.

Improvements to forest stands affected by prior logging activity would also be part of the habitat management program under any alternative. Alternatives B and C describe them with greater emphasis or intensity. Interior forest birds would benefit from the proposed thinning of overstocked, monoculture stands of loblolly and tulip poplar, which often dominate and become stagnant for many years without intervention. However, without a preliminary forest inventory, we can only estimate them at 500 acres on current tracts.

Forest birds will also benefit by the expansion of the widths of forested riparian zones that will create more habitat for roosting, foraging, or seeking cover and, depending on the width, breeding. The acreage depends on the alternative selected, as grassland management may occupy some acreage that otherwise would be forested. The range of increase along the gradient of the varying alternatives would not be dramatic, as most of the riparian habitat available under current management is already in its desired condition. Additional acreage would come largely from phasing out cropland on the Tayloe tract, where expanding the forested buffers from their present 30 feet to 1,000 feet or more would be possible, if those acres do not continue in grassland management.

Focal Bird Species

American woodcock

Northern bobwhite

Wood thrush

Scarlet tanager

Eastern meadowlark

Grasshopper sparrow

Savannah sparrow

Administering the Refuge and Public Use

An indirect benefit to upland habitats and associated species would derive from careful, strategic placement of trails and interpretive signs. Public awareness and appreciation of the refuge, its habitats, and resources would inspire some to volunteer or in other ways support the refuge needs, and conservation of resources on the landscape in general.

Adverse

Protecting and Managing Habitat

The spot treatment of invasive species that grow in field habitats is one area of concern for its potential to harm breeding birds: not the treatment itself, but accessing those areas. In some cases, that is done on foot with back-pack sprayers, but where the invasion is widespread or composed of many individuals, far from the road, and dense growth impedes walking, then we gain access and transport equipment in an all-terrain or other vehicle. Most spot treatments take place in July, after the nesting season. However, some plants require an earlier attack to prevent their seeding or developing rhizomes.

Administering the Refuge and Public Use

All of the alternatives predict some increase in annual visitation. However, the impact varies with the types of habitat management and visitor use each alternative proposes. We can expect direct, adverse impacts on wildlife by disturbance wherever humans have access, and the degree of that disturbance may vary depending on the type of habitat. In general, the presence of humans disturbs most wildlife, which typically results in a temporary displacement without long-term effects on individuals or populations. Some species, such as the wood thrush, will avoid areas people frequent, such as developed trails and buildings, while other species, particularly highly social species such as the eastern tufted titmouse, Carolina chickadee, or Carolina wren, seem unaffected or even drawn to a human presence.

When visitors approach nests too closely, they may cause the adult bird to flush exposing the eggs to weather conditions or predators (Banks et al. 2007; Hammitt 1986; Liddle 1997; and Miller et al. 2001). Limiting the presence of humans to trails will limit any disturbance during the breeding season to the trail area. The extent of that disturbance on either side of the trail also depends on visibility and the density of vegetation through which the trail runs. Overall, the direct effects from non-consumptive uses should decrease greatly if trails and other high-use facilities avoid area-sensitive habitats (the interiors of grasslands and forests), and are confined to a 300-foot edge zone.

Impacts on Landbirds in Alternative A

Beneficial

Protecting and Managing Habitat

This discussion primarily pertains to grassland management, the most intensive type of activity under current management.

The direct, long-term benefits for grassland birds under current management would result from the continued availability of 500–700 acres of suitable habitat for grassland birds that nest, migrate, or winter there, and for birds such as the barn owl, northern harrier, and short-eared owl that feed on

grassland prey. The indirect benefits for grassland birds would be the contribution to their population increase over the long term (excluding the causes of decline off-refuge).

Administering the Refuge and Public Use

Same as those in “Impacts on Landbirds that would not vary by alternative.”

Adverse

Protecting and Managing Habitat

Temporary, direct, adverse impacts, particularly on wintering or migrating species, would result from our setting back and maintaining grasslands, when we burn prescribed fires to remove biomass or brush-hog woody growth. However, other fields of similar vegetation structure are always available nearby the larger tracts and, in the case of maintenance in the late winter or early spring, the vegetation quickly rebounds in time for breeding birds in the spring.

Another indirect, adverse impact over the long term would be the approximately 700 acres of grassland available for grassland birds that would be unavailable for shrubland-dependent species or forest-interior-dwelling species of landbirds. It would affect shrubland-dependent species less, because inherent in grassland management is the temporary availability of shrub cover along the edges, pockets and corners, or in fields that are nearing their time for treatment in the rotation cycle. At any one time, the acreage of shifting or temporary shrub habitat associated with grassland management typically is no more than 30 acres.

Administering the Refuge and Public Use

Same as those in “Impacts on Landbirds that would not vary by alternative.”

Impacts on Landbirds in Alternative B

Beneficial

Protecting and Managing Habitat

The direct benefits for grassland birds would resemble those in alternative A, except that they would increase by 500 acres, or nearly 70 percent. An indirect benefit of that increase would be the potential boost to the separated and isolated subpopulations of these birds in the area, collectively called a “metapopulation”, by having large tracts of grasslands available at disparate locations. That would contribute to the enhanced survival of generations of breeding and wintering grassland species.

Administering the Refuge and Public Use

Same as those in “Impacts on Landbirds that would not vary by alternative.”

Adverse

Protecting and Managing Habitat

These would be the same as in alternative A, except they would expand to 1,200 acres, or by 70 percent.

Administering the Refuge and Public Use

The off-trail visitor use is more likely to disturb breeding birds attempting to establish and settle into nest territories, nest-building and incubating, as would occur during the spring turkey hunting season,

particularly for low-elevation or ground-nesting birds, and particularly if the same spots experience repeated disturbance from gunshots, vehicles, lights, and communications. Overall, the direct effects of consumptive use during the spring should decline greatly if it is fairly dispersed, if it is confined to limited areas on tracts open to public use, if large areas remain undisturbed, and if sensitivity to the breeding season is observed. Observing time-of-year restrictions and limiting the frequency, duration, and number of locations of consumptive activity also may mitigate those direct effects. There would obviously be adverse impacts on individual turkeys during the hunting season. We would assess the potential effects on the local and regional wild turkey populations in a future NEPA document evaluating hunting opportunities.

Constructing a new Headquarters and visitor contact facility

We have described previously an impact area of less than 3 acres on the Hutchinson tract for locating a new Headquarters and visitor contact facility. The location is on an old farmhouse site that has been disturbed for more than 100 years. The vegetation consists of primarily non-native fescue and is not considered quality habitat for any landbird group. Its location within 150 yards of U.S Route 17, a major highway, further compromises its ability to provide quality habitat for landbirds over the long-term. Siting this facility here would not adversely impact the habitat restoration work currently underway on the majority of the Hutchinson tract.



Wilna Pond fishing pier: USFWS

Impacts on Landbirds in Alternative C

Beneficial

Protecting and Managing Habitat

This discussion pertains primarily to the reversion of grasslands to forest, as that is the most significant management feature of this alternative.

Species that prefer dense understory and early successional forest vegetation would experience direct benefits in the short term as grassland and agricultural fields undergo their shrubby stages of succession. Breeding species such as the prairie warbler, yellow-breasted chat, worm-eating warbler, and eastern towhee, and migrating species such as the blue-winged warbler, magnolia warbler, and yellow warbler, would gain an additional 700 acres over the next 15 years. That group of birds would receive maximum benefits if diverse flowering and fruiting shrub and tree species develop during succession, as that would provide a greater abundance of food during the migrating and breeding seasons.

However, those benefits would be limited if these stands become monocultures of black locust, sweet gum or tulip poplar, as each of those species, particularly black locust, with its windborne seeds, is well adapted to colonize open fields, and are common colonizers in this part of Virginia. Removing parent trees along the perimeters of fields undergoing succession is the best way to prevent that, but the extent to which we can succeed depends on the resources available at the time of need. Indirectly, the long-term benefits for canopy forest birds would come into play beyond the 15-year planning horizon of this document, as the early successional forest reaches maturity.

Adverse

Protecting and Managing Habitat

Under this alternative, grassland birds will experience the loss of the 700 acres or so of habitat within 3 years of the cessation of grassland maintenance. In addition, the 30 acres or so of shifting or temporary shrub habitat associated with grassland management will be eliminated as taller tree species shade out the undergrowth. Within 3 years we would expect to see dramatic declines in grassland bird populations on the refuge.

Administering the Refuge and Public Use

Same as in alternative B.

Constructing a new Headquarters and visitor contact facility

Same as in alternative B.

Impacts on Open Water and Wetland Bird Species

Wetlands management and conservation is a priority of the refuge, consistent with the original refuge establishment purpose, and one of our CCP goals. It is a priority in large part because wetlands support Service trust species such as waterfowl, shorebirds, wading birds, and waterbirds. These are focal management species for this refuge. We evaluated the management actions proposed for each of the refuge CCP alternatives for their potential to benefit or adversely affect open water and wetland habitats—tidal freshwater emergent marsh, tidal freshwater swamp, tidal brackish emergent marsh, non-tidal riparian forested wetlands, wet meadows, beaver meadows and ponds, vernal pools, and associated focal species.

We evaluated the benefits of the following actions that would conserve or restore the open water and wetlands habitats or conserve and enhance breeding or migrating focal species.

- acquiring and conserving additional wetlands
- conducting public outreach and education on wetland protection methods
- managing and preventing the growth of invasive species
- establishing or increasing width of vegetated buffers around wetlands
- exerting refuge riparian rights and regulating hunting pressure on waterfowl
- maintaining quality habitat in wetlands

We evaluated the following proposed actions for their potential to cause adverse effects on open water and wetlands habitats or species.

- activities of visitors and users that might directly impact wetlands habitats or disturb nesting or migratory species
- invasive species treatments that might adversely affect nesting or migratory species

Some Focal Bird Species Using Refuge Wetlands and Open Water Habitats

Tundra swan

Mallard

Least bittern

Virginia and king rail

American woodcock

Red-headed woodpecker

Rusty blackbird

Marsh wren

Prothonotary warbler

Seaside sparrow

Impacts on Open Water and Wetland Bird Species that would not vary by Alternative

Other than very gradual losses of acreage, due to erosion or sea level rise, we anticipate other impacts may result from changes in water quality of the river, floods or droughts, direct human disturbances, or influxes of invasive species. Regardless of which CCP alternative we select, we would develop a HMP for wetland habitats, and would account for major unplanned changes in vegetation by continuously monitoring our vegetation types and updating our GIS database at least every 5 years.

Beneficial

Protecting and Managing Habitat

Across all of the alternatives, controlling invasive plant species, particularly *Phragmites*, is the single most intensive and most frequent management activity in wetlands owned by the refuge. The *Phragmites* control program, which involves applying herbicides from helicopter, boat, and on foot, goes on both on- and off-refuge in late summer. Diving and dabbling species would experience direct benefits of controlling invasive plants in wetlands from the restoration or maintenance of the diversity of food plants on which waterfowl and fish depend. Other wetland birds would also experience direct benefits from the protection of preferred nesting substrate and associated insects for forage during breeding season.

Also across all alternatives, refuge land acquisition and protection or public outreach to private landowners would provide maximum protection for wetlands. The primary method is to establish vegetated buffers between wetlands, open water, and uplands where certain land use activities (e.g. agricultural runoff, soil erosion from logging or construction) pose a threat to the vegetation or food web. It provides an indirect benefit, by preventing wetlands from receiving high levels of nutrients, pesticides, or solids, which affect the quality and health of aquatic plant and animal life. Increased nutrients tend to benefit invasive plants, cause eutrophia, and the erosion of soil into wetlands and bodies of open water suffocates fish eggs and blocks sunlight from submerged aquatic vegetation (SAV) beds.

Adverse

Protecting and Managing Habitat

Because we spray from August through September, wintering waterfowl would avoid most negative impacts, as they do not arrive until late October or early November. By that time, most marshbirds have completed their breeding cycle. Some migratory wetland birds, such as rails and bitterns, sedge wrens, seaside sparrows, coastal plain swamp sparrows, and wintering marsh wrens, may be present during the spraying period, and may experience direct contact with the herbicide if they do not flush ahead of the helicopter or power sprayer in time, or if the spray misses the targeted patch. The herbicides and surfactants approved for use in marshes are not toxic to birds, and would wet them only temporarily, if at all. We do not expect that as a frequent occurrence, as those species show no strong affiliation with monocultural stands of *Phragmites*.

Administering the Refuge and Public Use

The direct disturbance of marshbirds and waterfowl occurs during white-tailed deer hunting season, as hunters flush the deer through marshes, creeks and open water habitats. The deer and dogs running through the marshes would flush wintering waterfowl resting and feeding there, or the snipe, woodcock, killdeer using the higher wetlands. We offer only a still-hunting program for a limited number of days during the season. However, pursuit dogs released off-refuge flush deer nearly every day and night during the hunting season. Consequently, the impact of the refuge hunt program is not distinguishable from that of the traditional hunting elsewhere.

An increase in visitors to the refuge for fishing would likely occur under any alternative at the present fishing site (Wilna Pond). The potential direct negative impacts on non-target wildlife, such as eagles, osprey, herons, waterfowl or other fish-eating wildlife (e.g. turtles, otters) from lost fishing gear; specifically, hooks, lures, and litter, or from becoming entangled in fishing line or hooks. The ingestion of lead sinkers is another source of concern, but we prohibit their use at the refuge. We do not know the extent to which fishing tackle at the pond affects species of wetland or open water birds, and cannot summarize the direct or cumulative impacts at this time. We will continue to work with the state in implementing a public education and outreach program and planning law enforcement on those issues under all of the alternatives.

Impacts on Open Water and Wetland Bird Species in Alternative A

Beneficial and Adverse

Same as those in “Impacts on Open water and Wetland Bird Species that would not vary by alternative”

Impacts on Open Water and Wetland Bird Species in Alternative B

Beneficial

Protecting and Managing Habitat

Same as those in “Impacts on Open Water and Wetland Bird Species that would not vary by alternative”

Administering the Refuge and Public Use

Hunting is a priority, wildlife-dependent, consumptive activity with additional direct effects on open water wildlife and habitats. On this part of the Rappahannock, hunting waterfowl has been a tradition for generations in or around various marshes on the refuge, before the Service acquired them. The waterfowl hunt program that we propose would follow Federal and state regulations for annual harvest and seasons by species. Each state sets its regulations based on what levels of harvest a species can sustain without adversely affecting its Atlantic Coast flyway population. Hunting results in the loss of individual fowl, but the projected cumulative harvest would not jeopardize the population viability of any harvested species. Some disturbance of non-target wildlife species may occur; however, those impacts should be minimal, because hunting pressure is moderate and occurs outside the breeding season.

We expect the presence of boats and the discharge of firearms in and around marshes to flush some waterfowl. However, that already occurs in the refuge marshes close to privately owned marshes. In addition, where the refuge does not exert its riparian rights, the public, according to Virginia law, may establish duck hunting blinds along the boundaries of the refuge marshes, as long as they set them beyond mean low tide. That means that the refuge then has no control over the extent or frequency of the disturbance of waterfowl resulting from unregulated public use around or in tidal guts⁹ in refuge marshes.

However, a waterfowl hunt program managed by the refuge could provide waterfowl with longer periods of protection from disturbance. The refuge would be exerting its riparian rights, determining the quantity of hunting pressure, and employing adaptive management where necessary. In that sense, waterfowl foraging or loafing within the refuge marshes would experience direct benefits through minimized or controlled disturbance and increased opportunities to forage and loaf undisturbed.



Viceroy butterfly: USFWS

Adverse**Protecting and Managing Habitat**

Same as those in “Impacts on Open Water and Wetland Bird Species that would not vary by alternative

Administering the Refuge and Public Use

One potential indirect adverse impact is increased rates of predation by raptors if building permanent, fully covered duck blinds creates too many perch areas throughout a marsh. That would affect not only wintering waterfowl, but also other wetland birds during the breeding and migration seasons. Designing an open blind on low pilings accessible only by boat, or allowing hunting only from floating blinds, should help avoid that type of impact.

We plan to offer public fishing at the Laurel Grove tract, and a canoe launch, fishing pier and a new trail system at the Hutchinson tract. The increased presence of visitors at each of those locations in the daytime (public use sites would be open only from sunrise to sunset) will surely result, although it is difficult to predict a frequency or rate. Visitors at those sites may flush rafting waterfowl or eagles hunting the marshes within view of a trail, launch, or pier; although we expect that, in the winter, the public use at either site would be moderate, at least in the years that follow their opening. We expect higher rates of public use during the warm months, when most waterfowl are on northern breeding grounds. The wetland species likely to be disturbed or flushed during the warmer months include the bald eagle (fewer than in winter), belted kingfisher, mallard, great blue heron, and basking turtles. The sites are not particularly sensitive, rare, or close to areas of nesting, and disturbed individuals can repair to secluded, protected areas nearby. We expect the disturbances to be minor, temporary, and infrequent.

In summary, our observations and knowledge of the area provide no evidence that, cumulatively, the visitor activities we propose to continue will have an unacceptable effect on wildlife resources or their habitats. Prior landowners have allowed the public to engage in those activities for many years without discernible negative effects. We do not expect a substantial increase in the cumulative effects of visitor use over the 15-year period of this plan. The refuge staff, in collaboration with state agencies and partners, will monitor and evaluate the effects of visitor use to discern and respond to unacceptable impacts on wildlife or habitats.

Impacts on Open Water and Wetland Bird Species in Alternative C**Beneficial and Adverse**

Same as those in described under alternative B

Impacts on Fisheries

Wetlands management to protect the river’s fisheries and nurseries for native anadromous and catadromous fish is another priority at the refuge, one that is consistent with its original establishing purpose, and one of our CCP goals. We evaluated the management actions and public uses each of the alternatives proposes for their potential to benefit or adversely affect wetlands and riparian habitats used for nurseries or foraging.

Fishing, one of the six wildlife-dependent public uses, is a consumptive activity with additional direct effects on open water wildlife and habitats. Because the Virginia code for riparian ownership extends only to low mean water on tidal rivers and tributaries, the refuge has no jurisdiction on the Rappahannock River and its tidal creeks. The relevant CCP actions that would most likely have any affect on the fisheries of the river system involve wetlands and riparian zone management that borders the river and its tributaries. However, we also discuss the impacts on fish populations in relatively closed systems (ponds) in Service ownership.

We evaluated the benefits of our actions that would conserve or improve wetland and riparian habitats or conserve and enhance breeding or migrating focal species.

- acquiring and conserving additional wetland
- conducting public outreach and education on methods of protecting wetland
- managing and preventing the growth of invasive species
- establishing or increasing the width of vegetated buffers around wetlands
- exerting refuge riparian rights
- maintaining quality habitat in wetlands
- installing fish ladders for Wilna Pond

We evaluated the potential for the proposed actions to cause adverse effects on fisheries.

- accidental introductions of non-native fish by anglers
- accidental introductions of invasive plants, pathogens, or exotic invertebrates attached to fishing boats
- invasive species treatments that might adversely affect fisheries

Impacts on Fisheries that would not vary by Alternative

Beneficial and Adverse

Protecting and Managing Habitat

Many of the same management actions for protecting wetlands, such as controlling non-native invasive plants and providing or improving vegetated buffers around wetland-upland interfaces and riparian edges, are actions that would take place regardless of which alternative we select, and would not only benefit wetlands but the fish nurseries that depend on good water quality and a well-functioning wetland ecosystem. Controlling *Phragmites* in marsh habitats has an indirect benefit for fish because the build-up of peat from the litter raises the marsh floor, which in turn affects the hydrological forces that create the little shaded guts and pools that fish need for nurseries and foraging. Over time, those would disappear if *Phragmites* is not controlled.

Where forested buffers lie next to open water, the debris from trees falling into the water provides cover and food. Vegetated buffers, whether grass or forest types, serve to filter nutrients and other contaminants that otherwise may leach into wetlands or water bodies and affect fish directly or indirectly through their prey.

Impacts described under the section on hydrology and water quality, and regarding open water and wetlands relate to fisheries as well.



Having fun on youth fishing day: USFWS

Impacts on Fisheries in Alternative A

Beneficial and Adverse

Protecting and Managing Habitat

Same as those described under “Impacts on Fisheries that would not vary by Alternative.”

Administering the Refuge and Public Use

The refuge currently has one public fishing site on a freshwater pond at the Wilna Unit. This pond was created decades earlier by damming a creek that flowed directly to the Rappahannock, and had been stocked prior to Refuge ownership, likely with bass species. Fishing-related activities may have effects downstream or below the outflow. Major concerns of any refuge fishing program are accidental or deliberate introductions of non-native fish (used for bait), accidental introduction of invasive plants, pathogens, or exotic invertebrates attached to fishing boats, and over-harvesting. The refuge does not permit use of live minnows in order to prevent the likelihood of introductions of non-native fish. We do not permit the use of lead sinkers to prevent accidental ingestion by water birds. Another common concern is the reduction or alteration of prey base important to fish-eating wildlife. Bass is the dominant predator species at Wilna Pond and is catch and release only. With the exception of bass, the current fishing program of the refuge follows the Virginia state harvest regulations. These limits are set to ensure that harvest levels do not cumulatively impact native fish resources to the point they are no longer self-sustainable.

We also follow recommendations of Service fisheries biologists who conduct periodic sampling of refuge ponds. With the assistance of State Conservation Police, we will continue to enforce our special regulations, and will continue to educate refuge anglers on the rationale behind them. While there will obviously be direct impacts (mortality) to individual fish, the public fishing program is not expected to have negative impacts on the fish populations at Wilna Pond. We will verify this assumption by conducting periodic surveys. Other potential impacts on fisheries and their habitats are detailed in the compatibility determination for public fishing (appendix C).

Fisheries Impacts of Alternative B

Protecting and Managing Habitat

Same as those described under “Impacts on Fisheries that would not vary by Alternative.”

Administering the Refuge and Public Use

The Refuge plans to open another freshwater pond at Laurel Grove and a site on Mount Landing Creek for public fishing. The Laurel Grove pond was created by damming a network of drainages that flowed into Farnham Creek, a tidal tributary of the Rappahannock. This pond had also been stocked prior to refuge ownership, likely with bass species. The Service’s Virginia Fisheries Assistance Office helped conduct a fish survey at Laurel Grove Pond, and prepared a report, to make recommendations on opening the pond to public fishing. They determined that the pond could be opened, while protecting self-sustaining reproductive levels of bass and bluegill. We plan to enact refuge regulations identical to those at Wilna Pond, including prohibitions on the use of live minnows for bait and the use of lead sinkers.

The site on Mount Landing Creek (Hutchinson Unit) is less than 0.5 mile from the Rappahannock River. Since this body of water is tidal, as opposed to the closed pond systems at Wilna Pond and Laurel Grove Pond, we intend to follow state regulations regarding fishing tackle, bait, and harvest. As described above in alternative A, direct mortality of individual fish will occur under alternative B,

but our program is not expected to have long-term impacts of fish populations in any of the bodies of water opened for fishing.

Fisheries Impacts of Alternative C

Same as those described under Alternative B.

Impacts on Mammals

Mammals in Virginia occupy a diverse array of habitat types, ecological niches, and food webs, and play an important role in the ecosystems in the refuge boundary. As a taxonomic group, mammals will also benefit from the refuge land protection and management of Mammals on the Refuge

riparian habitats, forests, grasslands, shrub, and wetlands proposed for listed species, waterfowl, and migratory birds. Likewise, refuge habitats will benefit from careful attention to the impacts on mammals resulting from any of its activities. We evaluated the management actions and public uses each of the alternatives proposes for their potential to beneficially or adversely affect large and small aerial, terrestrial, or wetland mammals, including:

- acquiring and conserving additional wetland and upland habitats;
- improving habitat quality in wetland and upland habitats, as in controlling invasive plant species or planting native species;
- controlling deer populations; and,
- providing grassland habitat.
- We evaluated the potential for these proposed actions to cause adverse effects on mammals:
 - managing and maintaining grassland, such as burning prescribed fires or brush-hogging;
 - managing deer hunts; and,
 - controlling beavers.

Impacts on Mammals that would not vary by Alternative

Beneficial

Protecting and Managing Habitat

The programs that hold potential for impacts on mammals, and that would continue regardless of the alternative we select, are our strategies for protecting land (acquisition, easements, or habitat improvement measures) and controlling invasive or nuisance species. Each of those indirectly benefits mammalian fauna over the long term by ensuring the continuation of quality natural habitats on the refuge.

Strategic land acquisition (especially large tracts), conservation agreements, and outreach programs to the public on good stewardship practices are the best strategies for ensuring the increased or continued availability of quality forest, riparian, early successional, or wetland habitats. The carrying capacity of each of those habitat types varies with respect to different mammals, and depends on the size of each tract, vegetation composition, corridors, surrounding land uses, weather patterns, availability of food resources, and various other factors.

For example, a large mammalian herbivore species such as the white-tailed deer, the maximum population density above which signs of habitat degradation begin to appear, is one deer per 25 acres (Virginia Deer Management Plan 1999, 2006). Assuming that the refuge program of land acquisition ultimately protects 15,000 acres of upland habitat, a crude estimate of the biological carrying capacity of refuge lands for white-tailed deer is 600. Yet the true capacity is likely much higher, as shown by state population estimates from harvest demographics, for this region holds abundant food resources for deer year-round (including row crops) and has mild winters. Likewise, wetland mammals such as beaver and river otter benefit simply by preserving forested wetlands and bottomlands, and forested riparian habitats. We assume also that small mammals, such as woodland mice and squirrels, aside from normal fluctuations due to weather and predator abundance, will thrive where the composition of refuge forests contains a diversity of mast-bearing species.

Because we cannot predict the exact proportions of habitat types the refuge ultimately will acquire or protect in fee-title acquisition or easement, it is difficult to project quantitatively the benefits to mammals in terms of acres of habitat provided. Although no focal species of mammals appear in our CCP objectives or goals, we believe that the indirect measures of overall health of the refuge habitats, such as the presence of browse lines (too many deer) or barn owls (a healthy population of voles), will enable us to recognize the balance of the refuge ecosystems in which mammals play an integral part.

Controlling invasive species benefits mammals by maintaining the balance of food sources and vegetation structural types with which they evolved or adapted to for cover or nesting. Although thousands of non-native plant species have become naturalized throughout North America, those that pose the biggest threat to mammals are those that quickly form dense, monocultural stands. For herbivores that depend on a variety of food sources throughout the year, this would be detrimental. For smaller, highly productive, insectivorous mammals, such degradation of the vegetation community could also affect the diversity of invertebrate food resources associated with the native floral assemblages.

Controlling beavers may be an occasional activity where their overabundance presents a clear threat to mature forests nearby. That would take place on an occasional basis and in scattered, disjunctive sites. We believe that the indirect, long-term benefits for the remaining beaver, and other mammalian species that depend on hardwood forests for food and cover, outweigh the direct negative impacts on the few individuals subject to removal.

Administering the Refuge and Public Use

White-tailed deer hunting is the single most important public use that would affect mammals, and it is limited only to deer. It serves both a wildlife-dependent recreational use and a method of population control.

Mammals on the Refuge
Bat (little brown, other spp.)
Beaver
Bobcat
Coyote
Deer, white-tailed
Fox (gray and red)
Groundhog
Mouse (deer, harvest, house, meadow jumping, white-footed)
Mink
Mole (eastern and star-nosed)
Muskrat
Opossum, Virginia
Rabbit, eastern cottontail
Raccoon
Otter, river
Shrew (least, northern and southern short-tailed)
Skunk
Squirrel (eastern gray and flying)
Vole, eastern meadow

Although managed hunts for white-tailed deer is a consumptive action that directly affects individual deer, as a control method at the herd or population level it indirectly benefits deer by stabilizing them below carrying capacity of an area. This ensures continued recruitment and maturation of a diversity of palatable herbaceous plants, and soft and hard mast-producing species on which deer and other herbivores depend throughout the year.

Adverse

Protecting and Managing Habitat

The temporary loss of habitat on a very small scale may occur where invasive species control or diversity objectives warrant clearing an entire monoculture stand of a given species. The timing of herbicidal applications to be most effective is usually from late spring to late summer. Occasionally, eliminating an entire field of a monocultural stand is necessary, but in most cases, the treatments are patchy. The treated sites soon regrow, and small mammals still have margins of habitat or other fields nearby for alternate use. Therefore, we believe the negative impacts on some individuals to be slight.

Controlling beavers would have a direct, fatal impact on some individuals. Removing beavers and releasing them elsewhere is neither practical nor feasible. It simply transfers the problem. To date, the refuge has yet to engage in any beaver control other than defensive actions, such as opening water control structures or wrapping vulnerable trees. We would contract their removal to skilled trappers, which likely would result in the take of only a few individuals from a given creek system.

Administering the Refuge and Public Use

The inaccessibility of most of the refuge tracts limits hunter success. No season to date has produced harvests of more than 200 deer on the refuge. Although we encourage hunters to abide by a “doe-first” priority, the state data on hunter harvests suggests a balance between bucks and antlerless deer harvested. Besides the direct take of deer, hunters wound but never find some deer, resulting in their mortality or reduced fitness. Some still-nursing fawns may die of starvation, thus yielding a slightly higher rate of take than reported. We believe the cumulative impacts on the deer population to be far less than are those that result from the degradation of habitat due to an overabundance of deer. Please refer to the refuge environmental assessment on public deer hunting (2007; on file in the refuge office) for additional discussion of environmental impacts.



Cat Point Creek: USFWS

Impacts on Mammals in Alternative A

Beneficial

Protecting and Managing Habitat

Grassland management is the chief activity that would affect mammals, as it involves periodic use of heavy equipment and prescribed fire.

The direct benefits for grassland mammals, such as voles, moles, shrews, mice, rabbits, groundhogs, and deer, derive under the current management alternative simply because it provides up to 700 acres of grassland and open habitats. Those habitats contain diverse grasses and forbs the deer use for food and cover throughout the year in multiple locations within the refuge boundary. Bats also need open habitats for their nighttime aerial foraging. Grasslands have high abundances of insects beneficial to bats. Grasslands, wet meadows, and marshes that lie close to deep forests where the bats roost are essential, as they cannot forage in the forest.

An indirect benefit would derive from the long-term persistence of large patches of grasslands in multiple locations, as that pattern contributes to the enhanced survival and population growth of small mammals with limited home ranges. A continuous supply of palatable herbaceous plants also contributes to the overall health of the deer herd. The carnivores or omnivores such as the fox, skunk, mink, bobcat, coyote, opossum, raccoon that feed on small mammals thrive at the interface between field and forest, serving to maintain the balance of mammal populations.

Adverse

Protecting and Managing Habitat

Maintenance activities such as brush-hogging and burning prescribed fires naturally carry a direct risk to some individuals among small mammals. However, the risk is low or the impact slight at the population level, and always of short duration. We usually carry out those activities no more than once per year on a given tract, and rarely in the breeding season. Most mammals can scurry out of the way or go underground. Fire flashes across fields quickly, often burning only the top few centimeters of duff and leaving unburned the layer closest to the ground. Small mammals such as mice, shrews, or voles generally burrow underneath the duff and thus escape injury. In addition, the back-burning and stripping techniques employed in prescribed burns to manage their heat and rate of spread provide opportunities for most non-burrowing mammals to flee, thus minimizing fatalities or injuries.

The direct mortality of some mammals, such as rabbits and raccoons, will occur occasionally during prescribed burns. Another direct effect is derived after a prescribed fire has removed their protective cover. That exposes small rodents and rabbits to predation and, if it is winter, to cold. The extent to which they are exposed depends on the proximity of available cover and the density of raptors, foxes, and feral cats in the area. We believe the cumulative benefits for the population of small mammals that fire-improved habitat would provide outweigh the negative effects of exposure.

Impacts on Mammals in Alternative B

Beneficial and Adverse

With the exception of the new Headquarters and visitor facility, and the fact that grassland management and all its benefits and adverse impacts would increase on up to an additional 500 acres, the impacts on mammals are the same as those described under alternative A.

Constructing a new Headquarters and visitor contact facility

We have described previously an impact area of less than 3 acres on the Hutchinson tract for locating a new Headquarters and visitor contact facility. The location is on an old farmhouse site that has been disturbed for more than 100 years. The vegetation consists of primarily non-native fescue and is not considered quality habitat for any mammal. Its location within 150 yards of U.S Route 17, a major highway, further compromises its ability to provide quality habitat for mammals over the long-term. However, individual mammals would be impacted during construction. Those that are mobile, such as deer and raccoons or other small mammals, would be displaced. Individual mammals that are less mobile may not survive; however, we would not expect to impact local or regional species populations as a result of this project. Siting this facility here would not adversely impact the habitat restoration work currently underway on the majority of the Hutchinson tract.

Impacts on Mammals in Alternative C

Beneficial

Protecting and Managing Habitat

In this alternative, grassland management would cease, and the current 700 acres would transition to early successional forest and eventually mature forest, except for scattered occurrences of shrub habitat.

In the uplands, woodland-dependent mammals, such as the eastern gray squirrel, flying squirrel, raccoon, and opossum would benefit over the long term from increasing forest cover in the uplands, particularly when the stands have reached maturity. Bats also would gain increased roosting habitat when the trees are mature enough to form cavities and crevices in their bark. Along riparian habitats, increased forest cover would benefit the otter, mink, and beaver, but that would apply only to easements or new tracts where grassland habitat exists directly on the edge. Deer would also derive short-term benefits from the increased cover and some palatable saplings during the interim period as the fields undergo natural succession.

Adverse

Protecting and Managing Habitat

Grassland or open-habitat-dependent mammals that favor herbaceous and grass cover types found in fields, such as voles, shrews, moles, some species of mice, and groundhog would be negatively impacted through loss of habitat in direct proportion to the benefits to the population gained in alternatives A and B. Bats would be directly impacted by loss of open habitat forage areas.

Constructing a new Headquarters and visitor contact facility

Same as described under alternative B.

Impacts on Amphibians and Reptiles

The protection and good stewardship of the area's herpetofauna is another priority of the refuge, and fits into nearly all the goals for wetlands, uplands, riparian habitats. We evaluated the management actions and public uses each of the alternatives proposes for their potential to benefit or adversely affect amphibians and reptiles or the habitats they use for mating, reproducing, overwintering, and foraging.

Although most species that live on the refuge are very common and widespread, we are concerned about two species of turtle: the eastern box turtle and the spotted turtle. Amphibians everywhere are considered to be experiencing a general decline. Some areas are experiencing the loss of mixed

mature forest due to their development or high rates of conversion to timber farms. That affects the vernal pools amphibians need to overwinter and reproduce.

We evaluated the benefits of these actions to conserve or improve vernal pools and all habitat types, to enhance the survival and breeding of amphibians and reptiles.

- building upon existing habitat types to augment patch size and connectivity
- expanding wetland buffers
- conducting public outreach and education on protection and stewardship practices
- controlling invasive species

We evaluated the potential for these proposed actions to cause adverse effects on amphibians and reptiles.

- managing habitat by mowing, brush-hogging, or burning prescribed fires
- treating invasive species and controlling weeds
- creating trails and access routes
- disturbing wildlife by recreation activities

Impacts on Amphibians and Reptiles that would not vary by Alternative

Building upon existing habitat types to augment their patch size and connectivity, ensuring adequate grass or forest buffers around wetlands, controlling invasive species in all habitat types, and enhancing access and opportunities for public use will occur regardless of the alternative selected.

Beneficial

Protecting and Managing Habitat

Just as building upon existing habitats to augment their effective interior benefits area-sensitive bird species, likewise the strategy to augment upland and bottomland forests and wetlands benefits the herpetofauna that use them. Upland forests are valuable for the eastern box turtle, while bottomland forests and forested stream courses are important for the spotted turtle: VA WAP lists both. Large tracts of mature forest are more likely to contain vernal pools, and large tracts of wetlands are more likely to hold fare as of still water for breeding amphibians. Frogs, toads, salamanders and wetland turtles need to have access to protected uplands next to their wetland habitats. Turtles must go onto dry land to lay their eggs, and the hatchlings need to be able to return quickly to the water. Salamanders, frogs and toads, which must lay their eggs in water, need grasslands and forests nearby for foraging.

Heptofauna Species of Conservation Concern

All amphibians: Salamander, Newt, Frog and Toad species common to this area

Eastern box turtle and spotted turtle

The strategic juxtaposition of forest, grassland and wetland habitats, with a view toward their unbroken continuity and easy communication between them, will also serve to ensure amphibians and reptiles access to different habitats for during different stages of their annual life cycles. In the future, the refuge may conduct forest thinning for stand improvements. For their protection, vernal pools will remain buffered by at least 300 feet and where feasible up to 1,000 feet, to protect them from drying out. We will avoid intensive forest management in the spring.

Amphibians must have clean water for proper embryo development. Shallow, still-water wetlands and vernal pools shaded by canopy trees are crucial for breeding from February to late summer, and for overwintering. Buffering is essential to protect those areas from drying out too quickly (in the case of vernal pools), and to absorb the runoff of nutrients, pesticides, and soil before they reach the wetland or vernal pool. The same objectives and strategies for providing buffers around wetlands described for enhancing fish nurseries and wetland birds will also greatly benefit amphibians, turtles, and water snakes.

When other landowners embrace our public outreach and education to emphasize buffering wetlands, connectivity, and easy access between forests, grasslands and wetlands, protecting vernal pools, and augmenting patch size, amphibians and reptiles will benefit on an even larger scale.

Controlling invasive species will benefit amphibians and reptiles by contributing to the propagation of native food species of plants and their associated insects. Studies have shown that gray tree frogs declined in body mass and weight where habitats were degraded by invasive species and that *Phragmites*, over time, can change the hydrology in high marshes (Blossey 1999; Blossey and Maerz 2002 unpublished). Controlling invasive species in uplands is important for box turtles, which thrive in mixed deciduous forests and feed on the some of the host-specific caterpillars associated with native tree species.



Forest habitat on the Wilna tract: USFWS

Adverse

Protecting and Managing Habitat

Sometimes, maintenance actions for public use may involve preparations or outcomes that have direct negative effects on amphibians and reptiles. Mowing grassy access roads and public use trails also occasionally destroys turtles, snakes or frogs, if conducted during times of movement (the warm months). The best way to minimize that type of direct, negative impact is to keep public use and access roads mowed short so that they do not become habitat, and mow in the heat of the day when turtles have retreated to the cool forest.

However, in many cases, it will be impossible to find a perfect time to carry out maintenance that will completely avoid conflict with wildlife. Another potential threat is accessing interior portions of fields to treat invasive species. For big jobs needing many backpacks or tanks of herbicide, transporting those and personnel requires the use of vehicles, typically an ATV. That usually is a one-time trip, somewhat reduced if the perimeters of the fields are kept open and drivable so that access on foot is possible from the nearest parking point.

Applying herbicides to control invasive species and weeds on the refuge trails, roadsides, kiosks and signs, and buildings holds the potential for negative impacts on amphibians if we do not take certain

precautions. In all cases, we use only herbicidal products and surfactants approved by the Service, based on extensive testing of their impacts on wildlife by the EPA. We maintain a list of those products at the Region 5 headquarters. If we follow properly the instructions of the label about the strength, weather condition, and other conditions of the applications, they should not harm any sensitive-skinned amphibians. Should herbicides (or surfactants and wetting agents) intended for terrestrial use be applied to vegetation along roadside ditches and get into the water or vernal pools, that potentially could be lethal for developing amphibian eggs, larval stages, and tadpoles (Montague 1998; Relyea, et al. 2005; Relyea 2005a/b).

Disposing wastewater after rinsing the tanks and backpacks is another source of negative impacts, particularly on frogs and toads, which are attracted to the wastewater. Rinsing should be done in an area devoid of vegetation, away from streams or ditches, where it can quickly drain without pooling.

Impacts on Amphibians and Reptiles in Alternative A

Beneficial

Protecting and Managing Habitat

The distinguishing feature of the current management alternative is the focus on 700 acres of grassland habitat. Maintenance activities for grasslands, besides invasives control, involve use of heavy equipment and fire.

The maintenance of grasslands provides an enormous direct benefit for reptiles and some amphibians due to the abundant food resources, particularly in older fields with a rich diversity of plant and invertebrate life, and complex soils. A number of snake species use grasslands for foraging, particularly if they are near woodlands with ample cover. Grasslands near forested vernal pools and wetlands also enhance the survival and weight gain of post-breeding amphibians (Blossey unpublished). Carnivorous reptiles such as snakes benefit from the abundance of small mammals, such as mice and voles, in grasslands.

Adverse

Protecting and Managing Habitat

Prescribed fire and mowing firebreaks sometimes overtake an occasional turtle or snake if conducted in early spring and temperatures have been warm enough to mobilize reptiles. Usually we apply brush-hogging, mowing and burning during the dormant season, but occasionally, we must use prescribed fires during the growing season, early spring or late summer to control woody encroachment. Spring and fall is when more reptiles and amphibians are on the move, migrating toward their breeding or wintering sites or finding mates.

Impacts on Amphibians and Reptiles in Alternative B

Beneficial

Protecting and Managing Habitat

The most distinguishing features of this alternative are the increase of grassland habitat and expansion of visitor services. The benefits would resemble those in alternative A, except that grasslands would increase by 500 acres.

Administering the Refuge and Public Use

Opening a limited amount of habitat for the public to experience and appreciate through a network of interpretive trail systems, outdoor classrooms, and an education center, should heighten an awareness of the habitat needs and plight of declining reptiles and amphibians in the minds of children and adults. The refuge offers a limited opportunity for visitors to encounter the more reticent, uncommon, or interior-dwelling species of reptiles and amphibians in their natural habitats. Adults are homeowners, landowners, land managers, and land-use decision makers, and have considerable influence on the value systems of children. Opportunities to learn and marvel about the habits, appearance, and needs of reptiles and amphibians and their role in the ecosystem will indirectly benefit that group of animals if those learning experiences translate into beneficial changes in landscaping, yard maintenance, farming practices, pesticide use, and management of towns and communities.

Adverse

Protecting and Managing Habitat

The negative impacts would resemble those in alternative A, except that grasslands would increase by 500 acres.

Administering the Refuge and Public Use

Enhancing and expanding the trail systems for public use poses the potential threat of blocking access among different habitat types, depending on the placement, length, width, and substrate material of the trails. Some salamander species will not cross openings that are too wide or dry (Vinson 1998). Bare ground, such as earthen trails, if exposed to sunlight could become dry enough to form a barrier. Gravel roads or trails, even though permeable, may also act as a barrier to salamander movement (Marsh, et al. 2005). The graveled trails we plan are for wheelchair access, and need to remain on the most level terrain, avoiding ravines. At most, those trails will be 5 miles in length on four tracts, and their widths no more than 6 feet. Other walking trails will be simple cleared paths, perhaps mulched in some locations, but may wander down through moist ravines close to amphibian habitat.

The disturbance of basking or nesting turtles may occur where public use concentrates at points where the land and water meet. Basking turtles usually can find another log or resting surface. Nesting turtles, once engaged in digging, usually cannot be distracted and, at such times, are vulnerable to predators. However, the presence of humans at a site may deter a turtle trying to come ashore to lay eggs. Because the wetland-forest-grassland interface will be ample elsewhere, we expect that, overall, the cumulative impact of roads and trails on amphibians and reptiles will be insignificant at the landscape scale.

Expanding refuge facilities, such as the visitor center, new quarters, and a new multi-purpose building, may cause adverse impacts on nocturnal amphibians where we install security lamps, which burn all night, or motion-detecting flood lamps. That artificial illumination may have both positive and negative impacts on the nocturnal behavior and ecology of frogs (Buchanan 2002) and salamanders (Wise and Buchanan 2002). Although it may enhance their detection of prey, it also may hinder their avoidance of predators, may cause aggression between individuals of the same species, may cause temporary blindness in frogs (sudden bright light), and may disrupt or confuse migration to or from ponds for salamanders (Wise and Buchanan 2002) or inhibit reproduction by frogs adapted to low illumination (Buchanan 2002).

Constructing a new Headquarters and visitor contact facility

We have described previously an impact area of less than 3 acres on the Hutchinson tract for locating a new Headquarters and visitor contact facility. The location is on an old farmhouse site that has been disturbed for more than 100 years. The vegetation consists of primarily non-native fescue and is not considered quality habitat for any reptile or amphibian. Its location within 150 yards of U.S Route 17, a major highway, further compromises its ability to provide quality habitat for these animals over the long-term. However, individual reptiles or amphibians would be impacted during construction. Those that are mobile would be displaced. Individual reptiles or amphibians that are less mobile may not survive; however, we would not expect to impact local or regional species populations as a result of this project. Siting this facility here would not adversely impact the habitat restoration work currently underway on the majority of the Hutchinson tract.

Impacts on Amphibians and Reptiles in Alternative C

Beneficial and Adverse

Protecting and Managing Habitat

The distinguishing feature of this alternative is the phasing out of 700 acres of existing grasslands. Eventually, as the canopy closes over, and vernal pools form where there are depressions, breeding or wintering amphibians and woodland species of snakes and turtles will gain an additional 700 acres of habitat. However, without grasslands juxtaposed with forest and wetlands, the quality of the foraging habitat will decrease. Whether that will become a limiting factor in amphibian population increase is unclear, as numerous openings and breaks in the habitat are likely at the microsite level. A potential concern about amphibians and reptiles exists where refuge roads that now bisect grasslands later bisect forests. Those roads will become wildlife crossings for amphibians during spring rains, as is already the case on the refuge entrance road at the Wilna tract.

Administering the Refuge and Public Use

Same as in alternative B.

Constructing a new Headquarters and visitor contact facility

Same as in alternative B.



Green tree frog: USFWS

Impacts on Invertebrates

This broad group of animals is the least understood within the ecosystems around the refuge, and consequently, is not a well-defined component of the refuge goals. Yet, they are likely the most important contributor and modifier in the functioning of those ecosystems and related food webs. Invertebrates play key roles in those ecosystems including:

- as detritivores, returning nutrients and basic elements back to the soil and the system;
- as pollinators, without which many sexually reproducing plants would not be able to propagate;
- as prey for other species in the food web, such as the millions of mosquitoes upon which frogs, birds and bats feed; and,
- as predators, such as spiders, that help keep rapidly producing insects in check.

One formal survey for insects on the refuge took place in the summer of 2000, in fields that had been taken out of production only recently, and were dominated by vegetation typical of that stage. Those fields are quite different now, as is their invertebrate community. Where once there were only thrips and grasshoppers, now there are many species of butterflies, moths, dragonflies and damselflies, praying mantis, specialty beetles, bees, wasps, ants, earthworms, snails, millipedes and centipedes. We have not surveyed the refuge forests for invertebrates.

Judging from the diverse bird community during breeding season, particularly foliage gleaners, forest litter gleaners, and woodpeckers, and by the seed and mast production of the trees, apparently there are enough pollinator and prey base resources to sustain forest life, at least for the forest species now present. Therefore, we must operate on the assumptions that our management will affect invertebrates the least if we conduct it during the dormant season (overwintering pupae and larvae excepted) and, that a diversity of plant life begets a healthy diversity of insect life, and vice versa.

We evaluate the alternatives and the actions they propose with respect to their beneficial impacts on the invertebrate community in general, as we understand well the specific impacts on only a few species without a thorough inventory. We considered the value of the following actions for the diversity, long-term persistence, and overwintering survival of invertebrates in habitats where we are most certain to conduct management activities:

- providing grassland habitat;
- controlling invasive species;
- planting native species; and,
- hunting deer.

We evaluate those same actions with respect to their adverse impacts on the invertebrate community, such as:

- maintaining grassland by burning prescribed fires, mowing and brush-hogging;
- maintaining roads; and,
- installing artificial lighting around facilities.

Impacts on Invertebrates that would not vary by Alternative

Acquiring or protecting land, controlling invasive species and maintaining grounds, security lighting and forest health are actions common to all the alternatives that may affect refuge invertebrates. Controlling invasive species and maintaining grounds are recurring activities throughout the growing season, from April to October or later.

Beneficial

Strategic land acquisition and protection provides a wide array of general habitat types and microhabitats that serve as foraging, breeding, overwintering, and roosting and stopover habitat for many groups of invertebrates.

Removing invasive species permits native flora to reestablish and expand. That especially benefits the insects that coevolved with the native flora, particularly those that are host-specific, such as the monarch butterfly, which mostly uses milkweed as the host plant for their eggs. Although the Service approves the herbicides we use in controlling invasive species because of their neutrality on animal life, should soft-bodied insects, eggs, pupae, or organisms with permeable skin come in direct contact with an herbicide or its surfactant, mortality, reduced fitness, or abnormal development may result. Many species of invasive, non-native plants are not optimal hosts for native insects, and do not contribute to the health or diversity of the pollinator community. We presume that any dependence on those plants is minimal and, therefore, removing them would not result in unacceptable losses in the insect populations.

Planting native trees, shrubs, vines and herbaceous species is another tactic that, over time, would bestow benefits on invertebrates by providing the food sources for which host-specific insects have evolved, as is the case for numerous species of moths and butterflies, and for more generalist species, such as native bees. As opportunities to acquire land arise, we may reforest some areas by replanting them.

The populations of Lyme-disease-bearing ticks, *Ixodes scapularis* (the blacklegged or “deer” tick), are believed to be related to increased densities of the white-tailed deer population and changing habitats on a landscape scale (Stafford 2004). That leads to increased chances of contact with humans. At least from a human disease perspective, preventing an overabundance of deer would suppress the tick population, and that would benefit the human population, although not the ticks. To what extent Lyme disease affects other mammals is unknown. The ticks do parasitize other taxa—reptile, amphibian, and bird.

Adverse

Maintaining grounds on the refuge now involves mowing the roadsides, parking areas, walking paths, and yards, and spraying glyphosate-based herbicide on the parking lots, trails, around buildings, walkways, signs and kiosks. Generally, we keep those areas mowed short. Thus, they provide very limited sources of nectar, usually white clover. Where grasses and forbs have grown tall, such as along seldom-used roads or paths where they begin to flower and set seed, pollinators and herbivorous insects will be found. Mowing in the warm months, when insects are breeding, may destroy the eggs or pupae attached to leaves, consume adults, remove food sources, or unfavorably alter microhabitat. However, the area we maintain is a very small fraction of the amount of land serving as habitat.

Although we have yet to conduct a formal forest health inspection for disease and pests, traverses through the forests by staff while conducting bird or other surveys have not suggested an infestation to the level that would warrant intervention, yet. However, we foresee that the time may come when spraying for forest pests, such as the gypsy moth, could be necessary. We would consult with forestry experts and the Service authority on pesticide use for recommendations on the least harmful products and methods of averting impacts on non-target species. For example, a species-specific, albeit expensive, pesticide for gypsy moth, Gypcheck, is a biological pesticide derived from a virus that commonly exists in the soil (USDA Forest Service 2007).

Artificial lighting for the security of existing and proposed new facilities and administrative buildings such as a visitor center, multi-purpose building, quarters, and motion-detecting floodlights, is another potential source of adverse impacts on invertebrates, particularly nocturnal moths. Decreases in populations of moths have been attributed to artificial lighting. However, extinctions due exclusively to lighting have not been recorded, and some species of moths thrive in well-lit communities or cities. When compounded with other disturbances, such as habitat fragmentation, unnatural lighting may weaken or eliminate local populations (Frank 2002).

A century ago, collectors used to find hundreds of species in large quantities attracted to the early electric lights in big cities. Today, lamps in big cities such as Washington, D.C., Philadelphia, and Boston rank among the worst places to collect moths (or meet entomologists) and reductions have been noted in other locations. Several explanations have been posited: declines in moth populations, dilution of moths among thousands of city light sources, and diffuse background light suppressing flight to light behavior, even genetic shifts in behavior. The direct impacts of lighting on moths and other arthropods are increased rates of predation, entrapment, desiccation and burning of moths and other insects that fly into lamp housings, disruption in migration, and interference with mating, vision, dispersal, migration, feeding, depositing eggs, and possibly circadian rhythm. An indirect impact may result in densely illuminated urban environments where the lighting may have favored species that either fly during the day, do not fly to lamps, or do not fly at all (Frank 1988).

Recommendations for reducing the impact of artificial lighting include restricting its use where the protection of biodiversity is a high priority, turning light sources off when not essential, sealing the lamp housings and locating lamps away from structures where insects may become entrapped, and finally, using low-pressure sodium lamps. (Frank 2002). On some structures, where constant night lighting is not required for security, the refuge has installed motion-activated lighting to conserve energy and reduce light pollution.

Impacts on Invertebrates in Alternative A

Beneficial

Protecting and Managing Habitat

The most important, direct benefit is the provision of large tracts of diverse grasslands in multiple locations for pollinating, herbivorous, or predatory insects. Well-established grasslands possess a diverse array of nectaries and plant structures that would provide food and cover year-round for the annual life cycles of many species. That also benefits small mammals, reptiles, amphibians, and grassland-dependent birds. Prescribed fire increases the production of seed in legumes, grasses, and spurge in frequently burned areas. Grassland fires cause the early green-up of warm-season grasses, improved seed-germination, and greater production of grasses and forbs. It also increases the production of berries, drupes, and pomes for 2 to 4 years after fire (Lyon et al. 2000). In that sense, an indirect benefit derives from increased habitat quality.

Arthropod density and biomass increased following fire, especially grasshoppers, in the sand hills of the Florida panhandle. Fire opened up and diversified the vegetation in the understory which attracted a wider array and abundance of invertebrates. Also understory burns in loblolly-shortleaf pine forests in Mississippi increased invertebrates for up to 3 years (Lyon et al. 2000). Fire modifies the invertebrate communities, which may continue to change a few years after a burn. Different orders of invertebrates respond differently to fire depending on the season and year, but prairies where fires burn in different years and seasons tend to have greater species diversity (Lyon et al. 2000.) Thus, indirect benefits for invertebrates may derive from variable applications of the refuge fire regime.

In our forest habitats, our control of invasive plants, namely tree of heaven, Japanese stiltgrass, multiflora rose, and privet would benefit native invertebrate populations by improving their habitat quality and reducing the threat of competition from invasive pests associated with those undesirable plants.

Adverse

Protecting and Managing Habitat

Under current management, the activity with the greatest impact on invertebrates is grassland management, as it involves the intensive manipulation and rapid alteration of vegetative cover through prescribed burns and brush-hogging.

The maintenance of grasslands requires dramatic, periodic disturbance. That is impossible without cost to some species, particularly insects above ground using plant structures for roosting, egg-laying, or development. Monarch butterflies are completely migratory, are among the many species of pollinating Lepidoptera (butterflies, moths, and skippers) that use refuge habitats. Monarchs lay their eggs primarily on milkweed. In some instances, it is necessary to conduct burns late in the growing season to set back more effectively woody encroachment. That poses a direct conflict for the latest generation of monarch, should burning or mowing destroy patches of milkweed. That generation, which may still be eggs by late September to mid-October in Virginia (Monarch Larvae Monitoring Project) will be the generation to migrate to the monarch wintering grounds in the oyamel forests of Mexico (Prsyby, pers com 2007; Solensky 2004). However, we do not burn or mow all the fields at once; we leave some in reserve, and thus, some patches of milkweed would remain. Milkweed is also stimulated or returns more vigorously after burning and mowing. We expect that these two factors bestow benefits at the population and habitat level and offset the negative impacts sustained at the individual level.

Most of our prescribed burning to date has occurred during the dormant season. Although the timing of burns during the winter would not affect species like the Monarch butterfly, it could adversely affect those species that overwinter as eggs or larvae in the stems of plants.

Adverse impacts to forest invertebrates under alternative A is predicted to be minimal since we currently do very little active management in our forests. Our management is primarily passive, except for the treatment of invasive plants noted above. We do not anticipate any major changes to forest invertebrate populations or diversity as a result of alternative A.

Impacts on Invertebrates in Alternative B

Beneficial

As the refuge grasslands mature and become more complex under alternative B, the diversity of Insecta would also increased. We cannot underestimate the important contribution that native insect pollinators, who thrive in these grasslands, make to the health of the ecosystem in general and the refuge habitats in particular. Not only are they essential for pollination, but also the protein biomass they provide for higher organisms. Up to 90 percent of all leaf-eating insects are specialists that coevolved with only a few plant lineages. The remaining 10 percent are generalists, but these few species have relatively larger populations and thus provide the bulk of the pollination and biomass (Tallamy 2007). Our provision of acres of native forbs and grasses throughout the year and throughout the acquisition area will provide nectaries and nesting habitat many species of bees, wasps, flies, moths, beetles, and butterflies. Native bees in particular are of great concern as many species are declining (National Research Council 2006), yet these are our most important pollinators. Native bees coevolved with native plants and developed morphological adaptations to facilitate efficient foraging in flowers (Tallamy 2007). This fact is even more important in a region such as this

one where intensive farming and pesticide use is prevalent. These activities contribute to the decline of native pollinators by reducing the occurrence of native plant species to by direct mortality when non-target species are affected by spraying for crop pests. Also, 70 percent of bee species are solitary bees that nest in the ground, and bees do not tend to forage very far from their nesting/roosting sites (Shepherd et al. 2003). By maintaining open habitats consisting of native plant species, juxtaposing forage and nesting sites, and keeping forests from becoming dominated by alien species, the refuge will not only directly promote the interests of its focal species, but will also contribute to a healthier, sustainable population of insect pollinators for the benefit of local agriculture.

Adverse

The majority of impacts would be the same as those described in alternative A, except that the acreage of grassland and the related impacts would increase by 500 acres.

Active forest management would increase under alternative B compared to alternative A. Based on our professional judgment, we feel that the different types of forest management we would have limited impact on invertebrates. Mechanical thinning and prescribed fire may disturb the soil and cause a minor impaction of soil, humus and litter. This would affect the invertebrate composition of those treated areas. However, following best management forest practices will minimize soil impacts and reduce the adverse effects on existing invertebrate populations. We do not predict any loss of populations or any major changes to species diversity.

Constructing a new Headquarters and visitor contact facility

We have described previously an impact area of less than 3 acres on the Hutchinson tract for locating a new Headquarters and visitor contact facility. The location is on an old farmhouse site that has been disturbed for more than 100 years. The vegetation consists of primarily non-native fescue and is not considered quality habitat for any invertebrate. Its location within 150 yards of U.S Route 17, a major highway, further compromises its ability to provide quality habitat for these wildlife over the long-term. However, individual invertebrates would be impacted during construction. Those that are mobile would be displaced. Individual invertebrates that are less mobile may not survive; however, we would not expect to impact local or regional species populations as a result of this project. Siting this facility here would not adversely impact the habitat restoration work currently underway on the majority of the Hutchinson tract.

Impacts on Invertebrates in Alternative C

Beneficial

Protecting and Managing Habitat

In alternative C, we would phase out the provision of grassland habitat in favor of natural succession into forest. For species that depend on the bark, cambium, leaves, flowers, sap, or decomposing litter of woody vegetation (beetles, slugs, earthworms, certain wasps and bees, ants, termites, caterpillars, and forest butterflies and moths), that would be a direct benefit and delayed gain of about 700 additional acres. Forest butterflies and moths would not be able to use the trees for nectaries until they had matured enough to produce flowers, and for some tree species, that takes many years. Predators such as spiders also would benefit from the increase of arboreal attachment points by which to capture flying insects.

Adverse

Protecting and Managing Habitat

For species that depend on forb and grass nectaries, the loss of grassland habitat could result in the gradual, localized extinction of their populations. That change would affect many species of bees, beetles, butterflies, dragonflies, damselflies, flies, gnats, moths, and spiders. Indirectly, their loss could set in motion a reduction in the pollination of grassland vegetation, which may have broader consequences on the landscape scale.

Forest invertebrates would be impacted similar to alternative B.

Constructing a new Headquarters and visitor contact facility

Same as alternative B.

Impacts on Invasive Species

The establishment and spread of invasive species, particularly invasive plants, is a significant problem that reaches across all habitat types. For the purposes of this discussion, we use the definition of invasive species contained in the Service Manual (620 FW 1.4E): “Invasive species are alien species whose introduction does or is likely to cause economic or environmental harm, or harm to human health. Alien species, or non-indigenous species, are species that are not native to a particular ecosystem. We are prohibited by Executive Order, law, and policy from authorizing, funding, or carrying out actions that are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere.”

The unchecked spread of invasive plants threatens the biological diversity, integrity and environmental health of all refuge habitats. In many cases, they have a competitive advantage over native plants and form dominant cover types, reducing the availability of native plants as food and cover for wildlife. In chapter 3, under “Actions Common to All of the Alternatives” we describe our current program priorities in managing invasive species.

Impacts on Invasive Species that would not vary by Alternative

Protecting and Managing Habitat

We would continue to monitor and treat the highest priority threats to goal-related habitats for invasive species. Removing even one invasive species sometimes can lead to invasion by another. That outcome is not always predictable without knowing what lies in the seed bank or off-refuge sources nearby.

Administering the Refuge and Public Use

Just as certain disturbances from managing habitat provide enhanced opportunities for the establishment of invasive species, so can activities to improve or maintain administration, facilities, grounds, or public use create the same opportunities. Those could include widening roads, maintaining ditches, removing trees, installing or repairing septic lines, creating new trails and parking areas, archaeological test pits, and removing old structures. Anywhere that the ground cover is disturbed is a potential target. The extent to which that would occur under all of the alternatives is difficult to quantify, but in any case, the actual amount of disturbance would be a very small fraction of the developed portion of the entire refuge acreage. We would remain vigilant for the potential to spread invasive plants as we prepare for construction or other disturbance activities and would plan for their control accordingly. We would also continue to map and monitor the locations of recent disturbance activities to enable our staff to monitor and treat new incursions as warranted. We would also plant native species in any areas around our facilities developed for landscaping.

Impacts on Invasive Species in Alternative A

Beneficial and Adverse

Same as those described under “Impacts on invasive species that would not vary by alternative.”

Impacts on Invasive Species in Alternative B

Beneficial and Adverse

Same as those described under “Impacts on invasive species that would not vary by alternative.”

Impacts on Invasive Species in Alternative C

Beneficial

Protecting and Managing Habitat

The distinguishing feature of this alternative is the cessation of grassland management. We would allow the 700 acres now in grassland or early succession habitat to undergo natural succession to forest cover.

Fewer or infrequent management and setback actions may indirectly result in delayed benefits regarding the occurrence and extent of invasive plant species in former grasslands. Over time, a closed canopy of native tree species should form, and shade out the under-story. Eventually, the near constant concern about threats from invasive species common in more open or early succession habitats will be greatly reduced. Of course this will heavily depend on the ability of refuge staff to adequately deal with invasive species along the perimeters and interiors of a management unit during the initial phase of succession.

Adverse

Protecting and Managing Habitat

Because of allowing the 700 acres of grasslands undergo natural succession, less or infrequent management and setback actions may directly and relatively immediately result in an increase in occurrences of invasive species. Species expected to invade include tree of heaven, Johnson grass, autumn olive, multiflora rose, Chinese privet, Japanese honeysuckle, kudzu, and pawlonia, based on existing occurrences in or next to current grasslands. The extent to which those invasions occur (in acres) depends on our management capability and staff resources at the time for eradication and prevention measures. Although mowing and burning help keep the rate of spread somewhat in check in the grasslands, keeping pace with the spread of invasive plants is already difficult.

Impacts on Public Use and Access

As described previously, the Northern Neck area is a major attraction for outdoor enthusiasts. Although the refuge is not typically the principal destination, it does enhance the experience by offering public access to premiere sites with outstanding opportunities for wildlife-dependent recreational activities. Since refuge lands are held in the public trust by the Service, we seek to permit access for compatible, priority wildlife-dependent public uses unless, 1) Federal trust resources would be impacted; 2) the activity would detract from achieving refuge purposes or the Refuge System mission; or 3) administrative resources are not available to ensure a safe, quality experience. As discussed in chapter 2 – affected environment, the Wilna tract is currently open to all six priority public uses (hunting, fishing, wildlife observation and photography, environmental education and interpretation) on while other tracts offer some or none of them, depending on their suitability and evaluation of the aforementioned factors.

We estimated the total annual visitation on the refuge in 2006 at 1,180 visitors. In 2008, we updated our estimates and reported 2,203 visitors on the refuge (see chapter 3, Affected Environment, Refuge Visitor Services Program). However, because preparation of this CCP was well underway in 2008, our analysis in this chapter and in appendix I uses the 2006 visitation levels as the base year. We lack vehicle counters or other means to count the actual number of visitors. As such, we based these estimates on personal observations and extrapolations of frequency from visitor log entries, and hunter permits. Table 4.1, below, shows a summary of the projected annual visitation by the major activities in each alternative. Alternative A assumes a 10 percent increase in visitation on current e refuge lands, using 2006 as the base year, over the next 15 years. This projected increase under current management is based on state recreational trend information (USGS 2005). The increase in Alternatives B and C also assume additional land is acquired.

Table 4.1. Annual visitation projected for each alternative using 2006 as the base year

Activity	Projected number of annual visits by activity for each CCP alternative	
	Alternative A (assumes a 10% increase over 2006 levels)	Alternatives B and C
Consumptive Uses		
Freshwater Recreational Fishing	176	500
Hunting: Big Game (white-tailed deer and wild turkey)	373	1,330*
Hunting: Migratory Birds	0	750*
Non-Consumptive Uses		
Nature trails/other wildlife observation/office visits	749	1,700
Total	1,298	4,280

* Note: Under alternatives B and C we propose to evaluate expanding our refuge hunt program to include a quality waterfowl hunt and/or wild turkey hunt within 5 years of CCP approval. These programs are, therefore, not definite and our estimate of hunter numbers is a rough estimate is based on our observations of hunter distribution and capacity on other ownerships within the watershed. These alternatives assume the refuge continues its land acquisition program.



A boardwalk on the Wilna tract trail: USFWS

Chapter 4: Environmental Impacts

We evaluated the following management actions for their potential beneficial or adverse impacts on public use and access that would result from implementing each alternative:

- acquiring land in fee simple, providing permanent access for approved public activities;
- opening existing refuge tracts for approved public access and appropriate, wildlife-dependent activities;
- improving or constructing visitor infrastructure;
- collaborating in partnerships with local, regional, and state recreation interests; and,
- improving outreach and Service visibility.

We considered the following potential short- and long-term direct, indirect, and cumulative impacts on public use and access that could result from the actions above:

- conflicts among users—both actual (e.g., consumptive vs. non-consumptive) and perceived (e.g., outreach for one activity may deter the interest of other users);
- conflicts among uses (e.g., conflicts about safety and access);
- changes in use (e.g., existing non-wildlife-dependent uses may cease);
- confusion over changes in land ownership and management;
- more informed public (e.g., about species, their habitats, and their conservation);
- more supportive public (e.g., of the refuge, the Refuge System, and the service); and,
- increases in visitation and its associated effects on the quality of the experiences and our ability to meet the demand.

Impacts on Public Use and Access that would not vary by Alternative

Of the management activities that would not vary by alternative, the following would benefit or adversely affect public use and access on the refuge: protecting land, maintaining facilities, and implementing existing priority public use opportunities. We discuss the general impacts below. We discuss the details of the impacts specific to each alternative in the next section.

Operating Hours

In all of the alternatives, we will continue to open the Wilna tract of the refuge for public use from sunrise to sunset, seven days a week. At a minimum, we would open the other refuge tracts (the Hutchinson, Tayloe, Port Royal, and Laurel Grove tracts) by reservation, from sunrise to sunset, seven days a week. However, emergency situations may arise on the refuge resulting in closures that are not anticipated at this time.

Protecting Land

As we acquire land for the refuge, we plan to evaluate its suitability to offer opportunities for wildlife-dependent public use. At this time, we do not know whether the owners of future acquisitions allow public access, or what types of activities they permit. Our observations, and interactions with the public, indicate that the following activities occur in the surrounding areas: hunting deer and fox with dogs, allowing dogs to roam off-leash, using off-road vehicles, hiking off-trail, camping, picnicking,

collecting plants or artifacts, making campfires, and swimming. Those activities have been determined inappropriate uses of the refuge, or have been prohibited by the general access regulations in Title 50 of the Code of Federal Regulations. In addition, all of the priority public uses the Refuge System promotes most likely occur on surrounding private lands. Although those activities prevail in the area as private uses, it is likely that most of the land we plan to acquire in fee title or in conservation easement is effectively closed to public access.

Contingent upon the results of our site evaluations, we could open tracts to opportunities for additional public use or close them to existing activities. That would affect the levels of current use at some sites, as those users may choose a new refuge location for their activity. Without knowing what public access current owners allow, we are unable to quantify that impact on refuge visitors.

Beneficial

Demand and Access

If we opened newly acquired tracts to any of the six priority uses, having additional locations to enjoy these pastimes would benefit those who engage in them. We would be helping to meet the demands documented in the Virginia Outdoors Plan and in our Community Survey. We would plan the locations of facilities and activities to minimize conflicts among users and treat different users fairly when conflicts are unavoidable (e.g., hunting and photographing wildlife in the same area).

Maintaining Visitor Facilities

Having well-maintained visitor facilities is important for encouraging and welcoming visitors to public lands. It reflects on the Service's responsibility to spend taxpayer dollars effectively and efficiently. It is also important to protect public safety and refuge resources, both of which can be directly impacted or compromised when facilities deteriorate. Under all alternatives, we would continue to take this responsibility seriously and insure all facilities are up to Service standards and safe conditions.

Existing Priority Public Use Opportunities

According to the USGS *Regional Economic Setting* report, Virginia's overall population is outpacing the amount of recreation land available (USGS 2007). To reflect the regional trend, we assume a 10 percent increase over the current annual visitation of 1,180, resulting in an increase to 1,298 annual visitors.

The beneficial impacts of providing the existing level of wildlife-dependent activities, with some modest increases, include helping meet existing and future demands for outdoor recreation and education, as documented in the Virginia Outdoors Plan and our Community Survey. Hunters, anglers, birders, and photographers would find high quality opportunities to engage in their favored pastimes. Visitor use is increasing over time as local residents and visitors become more aware of refuge opportunities, and as we progress in creating new facilities and programs. The economic benefits of increased tourism likely would also benefit local communities.

Hunting White-tailed Deer

Annual refuge deer hunts would continue on the Wilna, Wright, Tayloe, Hutchinson, Thomas, Port Royal, Toby's Point, Mothershead, and Laurel Grove tracts, on a minimum of 4,000 acres (assuming no closures to protect wildlife or habitat). Those tracts would be open for hunting from the opening of the state season (usually the first week in October) until the end of November or early December.

Hunters would continue to have access to public lands at a minimal cost. Prior to refuge acquisition, lands now open to public hunting were available only to those who had landowner permission. We now provide

public opportunities that were previously restricted to private use. We also make special accommodations for mobility-impaired hunters. As there is minimal to no change in the regulations or methods and practices of hunting in any alternative, little disruption of hunter expectations or routines would occur.

Fishing

We would continue to provide fishing from shoreline, pier, and hand-launch boat at the Wilna Pond, a 35-acre freshwater pond, with associated facilities (pier, access). This opportunity would be available seven days a week, sunrise to sunset. We would also continue to offer the Annual Kids' Fishing Day, an educational event held on the first or second Saturday in June, for ages 5-15. Both fishing opportunities are heavily used by the community, and have resulted in very positive verbal feedback.

Pursuant to the Commonwealth of Virginia's compilation of comments from the multi-agency review of the "Environmental Assessment, Public Fishing on the Rappahannock River Valley National Wildlife Refuge," the Department of Conservation and Recreation indicated that the proposed action would not affect any of the following:

- existing streams on the National Park Service Nationwide Inventory, Final List of Rivers;
- existing or potential State Scenic Rivers;
- existing or potential State Scenic Byways; or,
- existing or planned state recreational facilities.

The Northern Neck Planning District Commission stated, "Opening the refuge for fishing, a wildlife-dependent activity, will allow citizens to appreciate the natural environment and abundant wildlife of the Rappahannock River Valley." in addition, Richmond County indicated that the Wilna Pond fishing program is "in keeping with the County's desires to provide a wide range of recreational opportunities to its citizens."

Observing and Photographing Wildlife

Current opportunities to observe and photograph wildlife exist daily at the Wilna tract, and by reservation at the Hutchinson, Tayloe, Port Royal, and Laurel Grove tracts.

Some organizations in the area provide regular nature-based outings and lecture series (e.g., the Northern Neck Audubon Society). Others, such as the Chesapeake Bay Foundation, Boy Scouts, or Master Naturalists Program, offer events that focus on the region's wild resources. The refuge also offers occasional wildlife-related events, which would continue under any of the alternatives. All of those organizations have offered events at the refuge, to the benefit of their members and the public. Some of these events take advantage of the three stops the refuge offers along the Virginia Birding and Wildlife Trail-Coastal Area.

Environmental Education

The outdoor classroom site on the Wilna tract is the focal environmental education facility on the refuge. We expect that its current use would continue, regardless of the alternative.

As regional tourism and coastal populations increase, the demand for local outreach and environmental education programs is also increasing (USGS 2007). In all of the alternatives, we would continue to provide at least limited environmental education and outreach. That includes providing supplies and outdoor classroom sites for visiting school groups, taking part in local fairs, speaking to local organizations, releasing newspaper articles, and providing refuge brochures to chambers of commerce and information centers upon request.

The Rappahannock Wildlife Refuge Friends would continue to assist in providing outreach and future programs. Students, especially local students, would benefit from having a site on which to conduct field experiments, learn about wildlife and habitats, and supplement their classroom lessons with outdoor experiences. For local students, the time they save in travel will allow them more time on the refuge.

Interpretation

We would continue the activities we describe in chapter 2: information signs and interpretive talks or tours on the Wilna, Hutchinson, Tayloe, Port Royal, and Laurel Grove tracts. In all of the alternatives, we would continue to provide at least the current level of interpretation. Interpretive activities that coincide with other public use activities would not disrupt them on those tracts. Other beneficial impacts of the current level of on-site interpretive activities are incorporated in providing general access and opportunities above.

Adverse Demand and Access

Because the protection of riparian habitats is a priority, we expect to acquire some of those waterfront properties. Because riparian habitats support roosting and nesting bald eagles, we typically would close those sensitive areas to public access during critical periods. Alternatively, Service acquisition would allow legal, approved access to the sections of those properties that are away from the sites of bald eagle use, where the presence of visitors would not cause adverse impacts.

We could surmise that people will either discontinue certain activities, or continue them elsewhere, if we disallow them on the lands we acquire. Those include the unleashed “running” of dogs: we prohibit domestic animal trespass and deer hunting with dogs on the refuge. We would encourage local dog owners to obtain an annual special use permit for access to retrieve dogs trespassing during the deer-hunting season. Local dog owners would likely need to adjust their use of dogs on or near new refuge tracts to prevent trespass and its associated legal ramifications.

If we were to allow public use on new tracts, neighboring landowners would benefit from close access to them; however, they could experience a change in the level of disturbance and an increase in the potential for trespass by refuge visitors. We should note that, to offset those issues, we would post boundary signs along the property line and deploy a law enforcement presence to regulate the activities of visitors.

Over time, it is reasonable to believe that public awareness of the refuge would increase, and, in turn, visitation would increase on the tracts open for public use. The refuge may or may not be capable of meeting the demand as it increases: providing programs, maintaining facilities, and providing adequate facilities for increased numbers of visitors (e.g., parking areas). Whether the refuge would be capable of meeting that increasing demand depends on our coinciding levels of staffing, the proximity of the tract to staff (for ease of management capability) or the availability of partners and volunteers to assist.



A young bald eagle in its nest: USFWS

Existing Priority Public Use Opportunities

Eventually, the level and means of use resulting from this increase in visitation could change the nature of the experience for many visitors. Some may choose either to forgo certain recreation due to issues of crowding or behavior, or to go elsewhere. Because the refuge provides opportunities now for only a small portion of the area's visitors, if that shift occurs, it is not imminent and likely would occur outside the 15-year period of this plan. If it does occur, it could put additional strains on other public lands, or diminish the refuge contribution to the mission of the Refuge System. We would work to avoid that by continuing to distribute our programs and facilities to minimize conflicts among users.

Hunting White-tailed Deer

We may close the refuge to other public uses on those tracts during hunt days, unless we can safely sequester the locations of those uses from the locations of hunting activity. Currently, we restrict other wildlife-dependent recreation on days when we allow hunting on the refuge. However, that chiefly concerns only one out of the current 19 tracts: the Wilna tract, as it is the only tract open full-time to the public.

In this situation, it is open only to hunt permit-holders on the nine days of hunting in the month of November. It is not open for archery hunting, to limit the impact on other refuge users. Therefore, hunters enjoy the exclusive use of the Wilna tract for a maximum of 2.74 percent of the year, while other recreational users enjoy the use of the tract for 97.26 percent of the year. Other options exist outside the periods for hunting. For example, we may permit research personnel or organized group's access at different times than hunter access (e.g., nighttime meetings, or educational or interpretive programs at Wilna Lodge).

Fishing

We would re-evaluate the fish population in the Wilna Pond every 5 years or as necessary to ensure the continued health of the fish population. Declining or unhealthy populations of fish should not adversely affect the quality of the experience for anglers. Should those populations demonstrate unhealthy conditions, we could close or otherwise restrict the program until we studied the problem further or corrected it. That would disrupt regular use; however, we would make every effort to prevent confusion by explaining the situation to the public through the refuge website, signs, and news releases.

Because the pier on Wilna Pond serves both environmental education and fishing, conflicts among users could arise. We have made environmental education the higher priority, when field trips by students are scheduled in advance. We posted that regulation from the Code of Federal Regulations at the site and on our website.

Observing and Photographing Wildlife

The area of user conflicts offers the primary potential for adverse impacts, which we discuss in the impacts of hunting.

Environmental Education

As noted above, educational use of this site holds precedence over other recreational uses (i.e. fishing from the pier) and may result in closure of the site during scheduled activities. Advanced notification of this closure via the refuge website and posting of the closure at the tract entrance would minimize this impact on other public uses.

As public awareness and subsequent demands on the refuge increase, our current staff would not be able to meet the demand for these programs. The outdoor recreation planner for the refuge complex,

stationed in Charles City, Virginia, can provide only modest assistance in the programs at the refuge. The staff members stationed in Warsaw all contribute to visitor services needs, and with the continued involvement of Friends and partners, we could minimally meet the current demand.

Interpretation

We would continue to provide at least the current level of interpretation, although local communities and area visitors have made numerous requests for additional signs and interpretive information. Our efforts to maintain current signage and install identifying signage would continue, but those would not meet the current or future demands.

Impacts on Public Use and Access in Alternative A

Beneficial and Adverse

Demand and Access

Alternative A would maintain the current level of programs and types of public use opportunities on the refuge. We would not expand permitted uses, programs, or facilities. We would continue to allow public access for the current public use programs on the Wilna tract from sunrise to sunset, seven days a week, and on the Tayloe, Hutchinson, Laurel Grove, and Port Royal tracts by reservation. Refuge staff would continue to maintain the trails, fishing pier, boardwalk, rest room, and informational signs. Refuge law enforcement would continue to enforce current refuge regulations, in cooperation with VDGIF Conservation Police, to provide a safe environment for refuge visitors.

As seen above in table 4.1, we assume a 10 percent increase over the current refuge visitation estimate in alternative A, for a projected total annual visitation of 1,298. That can be attributed to the increasing trend in regional visitation (USGS 2007). Eventually, the level of use could change the nature of the experience for many visitors. Should that occur, some visitors would choose either to give up certain recreation due to issues of crowding or behavior, or to visit alternate locations. We do not anticipate that this increase would adversely affect resources or their use or enjoyment by visitors, because the increases we project for the refuge would be well distributed.

Hunting White-tailed Deer

This alternative would have little effect on current hunting opportunities on the refuge. The current annual refuge deer hunts would continue on the Wilna, Wright, Tayloe, Hutchinson, Thomas, Port Royal, Toby's Point, Mothershead, and Laurel Grove tracts, with a minimum hunting area of 4,000 acres.

Based on recent trends toward filling our firearms hunting opportunities and averaging 10 days of archery use per season, we estimate 373 annual visits would result from deer hunting under alternative A. Associated beneficial and adverse impacts would be the same as stated above.

Fishing

Public opportunities for fishing by boat abound in the Rappahannock River area. For those without access to boats, opportunities to fish are more limited. We are currently able to meet the demand for fishing according to staff observation of the level of use at the Wilna Pond fishing area. The use is steady, but not crowded.

However, the demand for public fishing is growing quickly in the immediate area and in Virginia. According to the 2006 Virginia Outdoor Survey, the second biggest need for outdoor recreation in the next five years is increased public access to recreational waters (VDCR 2007). The USGS Community Survey supports that. When asked which additional recreational opportunities community members

desired on the refuge, the second-highest mean desirability was for fishing. In addition, according to the 2002 Virginia Outdoors Plan, the lack of opportunity for lake fishing in the region continues. When compared to the demand, that projects a deficit by 2010 in both the Northern Neck and Middle Peninsula. The Virginia Outdoors Plan specifically addresses the need for a freshwater fishing pond in Essex County to meet the current demand (USFWS 2003).

The existing refuge fishing program at the Wilna tract would continue, with the management and associated beneficial and adverse impacts discussed above. Since this alternative involves little or no change in the regulations that affect fishing, anglers would encounter little or no disruption of their expectations or routines.

Based on the increasing trends in regional visitation, a 10-percent increase over current refuge visitation under alternative A would result in 176 annual visits by anglers. Our present facilities would meet that demand, but the frequency of visitor interaction may adversely affect quality of the experience for some visitors. Current facilities would not meet the demand for Essex County.

Wildlife Observation, Photography, Environmental Education, and Interpretation

According to the 2006 Virginia Outdoors Survey, the three biggest needs for outdoor recreation in the next 5 years are for walking/hiking trails, increased public access to recreational waters, and access to natural areas (VDCR 2007). The USGS Community Survey Report (2007) further reveals that community members have a greater desire to see an increase in opportunities for wildlife observation than in opportunities for consumptive use (e.g., hunting). Our present facilities meet the existing demand; however, that will not be the case as populations and subsequent demands increase.

In alternative A, opportunities for wildlife-dependent activities would continue as with current management, with a predicted 10-percent increase in annual visitation for a total of 749 visitors. The previous section discusses the associated impacts.

Impacts on Public Use and Access in Alternative B

Beneficial

Demand and Access

Alternative B would increase opportunities for wildlife-dependent public use and access by enhancing those programs and facilities at the refuge. Based on trends in regional visitation, the USGS Regional Economic Setting report anticipates that visitation would increase for all activities (detailed below) under this alternative, raising visitation levels to 4,280 visits, an estimated 329 percent higher than current estimates (USGS 2007).

Providing new public recreation opportunities would enable people to participate in outdoor activities where they otherwise could not. As a byproduct of this new interaction, increased public awareness, improved community relations and enhanced support of the refuge mission would result. We would help meet demands from the communities where we are located, and from tourists, for outdoor recreation and education, as documented in the Virginia Outdoors Plan and our Community Survey. By attracting visitors from outside the area, local communities should experience economic benefits from sales of food, lodging, and supplies.

Constructing Facilities

As we state in chapter 3, we propose to construct a new Headquarters/visitor contact facility and make incremental progress in constructing new interpretation and information signs and small pavilions on this and other tracts.

Of these, the proposed construction of a new headquarters/visitor contact facility is a high priority. Our proposed siting on the Hutchinson tract would be readily accessible and visible from U.S. Route 17, which is a major travelway with over 7,000 cars a day on average. This contrasts with our current location on the Wilna tract. We often get complaints from new visitors who have difficulty locating the current building. We predict that constructing a new headquarters/visitor facility in this location would increase public awareness of, and visitation to, the refuge, and would enable staff to provide better customer service.

Constructing new interpretive and informational signs and small pavilions on new and existing tracts would provide opportunities for providing a conservation message to visitors, thus increasing their awareness, and possibly, their support of the refuge. Depending on the site, that exposure, visitation, and message will vary, but overall should result in beneficial effects on visitors.

Hunting

Alternative B proposes to evaluate and potentially add newly acquired or presently owned refuge lands that offer quality opportunities for hunting to the program. Although the land acquisition program is unpredictable, we estimate in table 4.1 that initiating new opportunities for hunting would result in a 316-percent increase in consumptive use visitation assuming refuge acquisition continues and new lands are acquired.

We should note that, according to the USGS Community Survey, the overall mean desirability of additional hunting opportunities was not as high as that of other public use activities. However, upon further breakdown between hunters and non-hunters, the additional hunting opportunities listed were very desirable by the hunting community. Thus, the majority of visitors would be uninterested in our efforts to increase the opportunities for hunting, while the hunting community would support them. We detail below the impacts that may result from the different types of hunting: white-tailed deer, waterfowl, and wild turkey.

White-tailed deer hunting: In alternative B, in addition to continuing the current refuge annual deer hunts on the Wilna, Wright, Tayloe, Hutchinson, Thomas, Port Royal, Toby's Point, Mothershead, and Laurel Grove tracts (4,000 huntable acres), we would evaluate other refuge tracts and newly acquired tracts for inclusion in the program. We would open them for archery, muzzle-loader, or shotgun hunting starting from the opening of the state season (usually the first week in October) until the end of November or early December, as in the current program. Based on recent trends toward filling our firearms hunting opportunities and an average of 10 days of archery use per season, we estimate 1,180 annual visits would result from deer hunting in alternative B. That estimate is conservative, because it does not include the unpredictable newly acquired acreage.

Newly acquired lands and the improvement of habitat quality from ongoing habitat management projects would likely result in an increase in some game populations and positively affect the hunting experience for many. Since this alternative involves little or no change in the regulations or methods and practices of hunting, hunters would encounter minimal disruption of their expectations and routines.

Waterfowl hunting: In alternative B, we would evaluate opening approximately 1,000 acres of wetland/marsh for waterfowl hunting on refuge tracts such as the Tayloe, Island Farm, and Toby's Point.

Because we offer no opportunities for public waterfowl hunting in the refuge boundary, the local demand goes unmet. Based on an assumption of 10 blinds, each with 3 hunters, for 25 days, approximately 750 waterfowl hunters annually would use this waterfowl-hunting program. Because licensed blinds along or within refuge marshes are now used, we believe that the cumulative adverse impacts on the local populations of waterfowl wintering in those marshes would not increase and, potentially, could decrease. Designating the location of the blind sites, managing the timing, season,

and numbers of hunters would positively affect waterfowl populations, which in turn would improve opportunities for hunting waterfowl.

Our selection of dates would focus on minimizing conflicts among hunting, managing habitat, and other recreational uses and users of those tracts. In addition, waterfowl hunting in sensitive areas would cease no later than December 15 to minimize the disturbance of bald eagles, pursuant to the “Bald Eagle Protection Guidelines for Virginia” (VDGIF/FWS), and thus shorten the period of potential conflict. In addition, we would coordinate this program with the VDGIF, and reinforce our strong partnership.

Wild turkey hunting: In alternative B, we would provide opportunities for hunting wild turkey, including a “Youth Turkey Hunt,” in partnership with the VDGIF, pending additional NEPA review and approval of opening a new hunt. The sites we propose include the Toby’s Point and Tayloe tracts, as well as our future acquisitions of land where we determine this use compatible.

We predict that 150 turkey hunters (15 hunters for 10 days annually) would use this program. We have received requests from members of the National Wild Turkey Federation for a wild turkey hunting program with a youth hunt. Few public lands in our area are open for turkey hunting. We also predict that our current staff will be able to meet the current and future demand for this form of hunting. Our overall communications with partners, including the VDGIF, would increase in response to the need for meetings to plan and develop the program.



Fishing

Restoring a field to native grasslands on the Wilna tract: USFWS

Alternative B proposes that we open two new sites, the Hutchinson and Laurel Grove tracts, for public fishing. In addition to the opportunities we mentioned previously for fishing at Wilna Pond, we would provide hand-launch boat and pier access to the Mount Landing Creek on the Hutchinson tract (Essex County); at the Laurel Grove tract, we would provide hand-launch boat and shoreline access on the 10-acre Laurel Grove Pond (Richmond County). The fishing program at the Laurel Grove Pond would follow regulations similar to those enforced at the Wilna Pond (see chapter 2). Those refuge-specific regulations would affect the type of experience for some anglers.

We conservatively predict that 500 anglers each year would use those fishing opportunities, which would also serve the demand for freshwater fishing opportunities in Essex County. The improving habitat quality resulting from ongoing habitat restorations on both tracts would likely result in improving water quality and increasing some fish populations. That could positively affect the fishing experience and fishing success.

We have received many inquiries about opening the Laurel Grove Pond for fishing. We recently conducted a biological evaluation of the pond, and find that opening it to fishing is biologically feasible without negatively affecting the fish populations. Our goal in opening the pond is to satisfy the demand for freshwater fishing in the area, while maintaining a self-sustaining fishery for the many ecological functions that it provides (e.g., it benefits the food web).

Fishing on Mount Landing Creek is also a popular activity among local anglers. Opening the Hutchinson tract for fishing would help meet the present and future demands for this activity. Because the creek is open to the Rappahannock River, there is no need to conduct a separate fishery evaluation. We will rely on existing state and Federal fishing regulations to ensure that biological impacts are negligible. We do not expect conflicts among users to arise outside the hunting seasons at either of the locations we propose for fishing.

Observing and Photographing Wildlife

Alternative B proposes that we work toward meeting the increasing demand for opportunities to observe wildlife by constructing trails, boardwalks, overlooks, and photo blinds, as well as facilitating access to recreational waters at the Hutchinson and Laurel Grove tracts.

We would expand the existing self-guiding opportunities under this alternative as well. We would open four additional tracts for daily access: the Hutchinson, Tayloe, Laurel Grove and Port Royal tracts. Based on trends in non-consumptive use in the area, we estimate over a 200-percent increase in annual visitation to result in 1,700 visitors using these facilities each year.

Nature photographers and other visitors would benefit directly from those additional facilities and the new opportunities that they would provide. The facilities constructed on the Hutchinson and Wilna tracts would be fully accessible, expand existing accessible opportunities and benefit additional audiences. Further, developing the Hutchinson facilities would provide access to and parking for the Mount Landing Creek, providing additional opportunities to observe and photograph wildlife by kayak/canoe access.

Environmental Education

Alternative B proposes that we increase educator-led programs from three visits to at least five visits per year. This attempts to meet demand that is ever increasing. In effect, we would increase use of the Wilna Outdoor Classroom site by adding approximately 40 additional visitors (two classes of 20 students each). Other direct and indirect impacts would those in “Impacts on public use and access that would not vary by alternative.”

Interpretation

This alternative also proposes that we increase on-site interpretive programs to at least six per year, and off-site programs to 10 per year, reaching out to civic groups, conservation organizations, and community events. In addition, we propose using a variety of public use materials, including signage, brochures (including Spanish translations), and kiosks with interpretive panels.

Our Friends group is assisting the refuge in establishing an interpretive water trail on Mount Landing Creek. That project will create a new partnership with the National Park Service “Chesapeake Gateways Network,” and become part of the John Smith Trail. That will provide new opportunities for a priority public use, and help meet the demand for additional information on historic sites recorded in our Community Survey.

According to the Community Survey, only about half of the residents sampled were aware of the refuge. Clearly, more opportunities exist to provide public education and information for those who are unaware of the refuge (USGS 2007). Those opportunities would foster more public understanding and appreciation of resource issues and needs, which could lead to increased political support and funding and affect fish and wildlife resources positively on the refuge. Increased outreach could also affect land use decisions positively by local governments and private landowners outside the refuge, and thus, lead to increased populations of fish and wildlife over a broader area.

As we noted above, our survey further revealed that educational information on historic sites had the highest mean desirability for future services on the refuge. One of the interpretive panels that this alternative proposes, to be located at the Tayloe tract, explains the traditional role of farming in wildlife conservation over the past century. The survey findings suggest that information of this nature would be well accepted by the community.

Adverse

Demand and Access

As above, the level and means of use resulting from this increase in visitation would change the overall experience for some visitors. That could result in their changing their patterns of activity or site preferences due to issues of crowding or behavior. Again, given that the refuge provides opportunities for a small portion of the area's visitors, if that shift occurs, it would not be imminent, and could occur outside the 15-year period of this plan. If it does occur, it could put additional strains on other public lands.

Alternative B would have adverse impacts on a certain segment of the public that does not desire change in current public use programs and regulations, or that may hold differing views on the course of action. In addition, while new visitors become familiar with those changes, violations could increase. One new rule we plan to implement that we expect may cause a negative reaction by some visitors is one of "no pets," including no dogs on leash. Refuge officers would enforce this and other current refuge regulations, and would seek the assistance and cooperation of VDGIF Conservation Police in enforcing common regulations, to provide a safe environment for refuge visitors and promote activities that are compatible with protecting the resources.

Constructing and Maintaining Facilities

We would expect a certain level of inconvenience during the actual demolition or construction of refuge facilities. Our use of practices that alert and safeguard refuge visitors should mitigate those effects somewhat. The adverse effects generally are short-term, and more than offset by the long-term gains in public education and appreciation.

Hunting

White-tailed deer hunting: We may close the refuge to other public uses on tracts open for hunting on scheduled hunt days, unless we can safely sequester those uses from the locations for hunting. As before, the options are to restrict other wildlife-dependent recreation on days on which we allow hunting at that tract, or to allow hunting only during the firearms season on tracts with multiple forms of public use. That would minimize the duration of impacts on other uses (as is done now on the Wilna tract).

In addition, we would enforce 50 CFR 26.21b on these new lands, prohibiting domestic animal trespass, and refuge regulations prohibiting deer hunting with dogs. We would encourage local dog owners to obtain an annual special use permit allowing them access to retrieve dogs trespassing during the deer-hunting season. They likely would need to adjust their use of their dogs on or near new refuge tracts to prevent trespass and its associated legal ramifications. An increase in violations seems likely, until hunters in the surrounding area become familiar with the refuge boundaries and regulations.

Waterfowl hunting: If waterfowl hunting were approved on the refuge, it would eliminate the use of private hunt blinds within 500 yards of refuge blinds. That would eliminate as many as 10 private hunting blinds adjacent to refuge properties. The refuge would install and maintain numbered stakes to designate temporary blinds, or would erect permanent blinds. We would distribute them in a way that would ensure some areas where the disturbance of waterfowl is minimal, thus reducing the potential for negative effects on the life cycles of migratory birds by better regulating the disturbance on refuge lands and providing safe resting and feeding areas through the winter. The direct mortality of individual waterfowl would occur, but we would have more control over the number of hunters, their locations, and the days they hunt during the season than we do now, due to our inability to exercise our riparian rights.

Wild turkey hunting: The refuge may close those tracts to other public uses on hunt days, unless these uses we can safely sequester them from the locations of hunting activity. That could result in fewer opportunities for bird watchers, photographers, and other users. We discuss other potential adverse impacts above under “Impacts on Landbirds.”

Fishing

Because we allow deer hunting on the Hutchinson tract, the potential for inter-use conflicts would exist during the deer-hunting season. We would manage those in one of the ways we describe above in “Public use and access impacts that would not vary by alternative.” This fishing program would not adversely affect people enjoying other, non-consumptive uses of the Hutchinson tract.

Although some anglers would welcome refuge regulations from the standpoint of noise, disturbance, and pollution abatement, others may resent the change from long-standing modes of use. For example, we do not permit the use of minnows for bait or the use of lead sinkers at the Wilna Pond, and the same would hold for the Laurel Grove Pond. The fact that we are opening that pond to the public, after its having been closed since we acquired it in 2003, may offset those negative inclinations.

Observing and Photographing Wildlife

The expanded use of those tracts will affect, and be affected by, visitors participating in the refuge annual hunt program. We may enact seasonal closures to ensure the safety of non-consumptive users, as well as the quality of both programs. There may be unavoidable adverse effects on the site and its existing visitation as well, especially during the actual construction of the facilities. Our practices and precautions to safeguard visitors, such as prior notification of construction activities, would mitigate those effects somewhat. Adverse effects generally would be short-term and more than offset by the long-term gains in public awareness and support of refuge resource programs.

Environmental Education

Alternative B proposes that we increase educator-led programs from three visits to at least five visits per year. That increase would cause only two additional days of the potential interruption of other users of the Wilna Outdoor Classroom site. Other direct and indirect impacts would those in “Impacts on public use and access that would not vary by alternative.”

Interpretation

As stated in “Impacts on public use and access that would not vary by alternative - Existing Priority Public Use Opportunities” section, interpretive activities would be performed in conjunction with other existing public use activities and therefore would not cause user-conflicts on these tracts.



Community outreach: USFWS

Impacts on Public Use and Access in Alternative C

Beneficial and Adverse

Alternative C proposes the same enhancements in our public use program as alternative B, and therefore, would cause the same beneficial or adverse impacts.

Impacts on Cultural and Historic Resources

Chapter 2, “Description of the Affected Environment,” describes our consultation with the Virginia State Historic Preservation Officer (VA SHPO) about the 36 archeological sites recorded on the refuge. The likelihood is high that we may locate additional prehistoric or historic sites.

We will send this draft CCP/EA to the VA SHPO for review in compliance with section 106 of the NHPA. In all of the alternatives, we would conduct any further compliance requirements on individual projects after consulting with our regional archeologist and the VA SHPO as needed. That further compliance may require a survey of state historic preservation records, literature survey, or field survey.

Impacts on Cultural and Historic Resources that would not vary by Alternative

Beneficial

Regardless of which alternative we select, we would protect known cultural and historic resources. We would continue our outreach and education and use law enforcement, if necessary, to protect against the loss of or damage to those resources.

In all of the alternatives, we would also conduct evaluations before implementing any activity with the potential to affect those resources. Those evaluations would provide additional information to share in outreach and education programs. We would also continue to maintain, to the standards Federal historic preservation, the two structures eligible for inclusion on the National Register of Historic Places: the Wilna house and the detached kitchen building on the same grounds.

Adverse

Refuge lands are vulnerable to looting, despite our best efforts at outreach, education and law enforcement. In addition, refuge visitors may inadvertently or even intentionally damage or disturb known or undiscovered cultural artifacts or historic properties. We would continue our vigilance in looking for this problem, and use law enforcement where necessary. However, we also recognize we may not discover every incident.

Impacts on Cultural and Historic Resources in Alternative A

Beneficial

Refuge lands are protected from development or destructive land uses that may result in substantial impacts on cultural and historic resources. As we acquire up to 20,000 acres on this refuge, opportunities to protect these resources would increase.

Adverse

Although we plan to achieve whatever level of compliance is recommended for ground-disturbing projects, our cooperative farming, grasslands management, invasive plant control, and forest restoration projects might disturb unknown sites. In any year, those projects may affect up to 750 acres, thus increasing the risk of exposure or damage to potential sites. However, as those projects are underway, we would remain watchful for potential sites or artifacts, and take all necessary precautions should we locate them.

Impacts on Cultural and Historic Resources in Alternative B

Beneficial

In addition to the benefits in alternative A, the benefits for cultural and historic resources would increase in alternative B, because it would foster a greater public appreciation of their value. We would include that information in the appropriate environmental education and interpretative programs and materials, and include a message about the Archeological Resources Protection Act on signs, literature, and materials where suitable.

Adverse

The risk of impacts in alternative A would increase slightly in alternative B, because of the increased acreage proposed for grassland management (up to an additional 500 acres). Our habitat management programs may affect up to 950 acres in any year, resulting in a commensurate increase in the risk of the exposure or damage of potential archeological, cultural, or historic sites. In addition, our proposal to construct a new Headquarters and visitor contact facility on the Hutchinson tract has some potential risk to these resources. However, the former farmhouse and immediate surroundings were evaluated for their historic importance by our Regional Archeologist and determined not to be significant or eligible for the historic register.

As in alternative A, we would conduct site assessments and surveys as recommended by our Regional Archeologist prior to any ground disturbing activity. In addition, we would be watchful for potential sites or artifacts as construction projects are underway. Should any potential resources be observed, we would contact our Regional Archeologist or state SHPO and take all necessary precautions.

Impacts on Cultural and Historic Resources in Alternative C

Beneficial

The benefits would resemble those in alternative B.

Adverse

Adverse impacts to cultural and historic resources under alternative C have the potential to be greater than under alternatives B and C, especially during mechanical thinning of young forests. However, we have standard operating procedures in place that should prevent significant ground disturbance. These procedures were originally developed for forest management at James River refuge, and have been approved by VA SHPO. Once a forest is established, forest cover also affords additional protection because the sites would be less visible. Potential impacts from a new Headquarters and visitor contact facility would be the same as those described under alternative B.

Cumulative Impacts

According to the CEQ regulations on implementing NEPA (40 CFR 1508.7), a cumulative impact is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes the other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time.

This cumulative impacts assessment includes the actions of other agencies or organizations, if they are interrelated and influence the same environment. Thus, this analysis considers the interaction of activities at the refuge with other actions occurring over a larger spatial and temporal frame of reference.

Cumulative Impacts on the Physical Environment

Air Quality

Air quality is good in the seven-county area of the refuge acquisition boundary. We would expect short-term, negligible, localized effects on air quality from the emissions of motor vehicles used by staff and refuge visitors, from equipment such as mowers or heavy equipment used by refuge staff, and from prescribed burning. However, we expect none of the activities on the refuge to contribute to any measurable incremental increase in ozone levels or other negative air quality parameters. We expect none of the alternatives to cause any greater than negligible cumulative adverse impacts on air quality locally or regionally.

We predict no cumulative impacts on Class I airsheds. None of the alternatives would adversely affect visibility at the nearest Class I airshed, the Shenandoah National Park, approximately 70 miles west of the refuge. Because the prevailing weather patterns are from the west, emissions from the refuge are even less likely to affect that Class I area.

With our partners, we will continue to contribute to improving air quality through management of native upland and wetland vegetation, which ensures that those areas will continue to filter out many air pollutants harmful to humans and the environment. We also strive to reduce energy consumption with “green” infrastructure and products.

Water Quality

None of the alternatives would produce significant adverse cumulative impacts on water quality. We would continue to use best management practices and measures to control erosion and sediments in all ground-disturbing operations to their ensure impacts are minimal.

Alternatives B and C and, to a lesser extent, alternative A, call for increased attention to habitat restoration or enhancement projects, floodplain and adjacent land acquisition, and improvements in water quality in terms of both chemistry and reduced sediment. Collectively, and over time, those actions would improve the ability of the wetland system to process nutrients and store carbon and, along with other basin-wide regulations and initiatives, contribute to improvements in hypoxia in the Chesapeake Bay and overall climate change. Restoring and managing riparian habitat will help restore tributaries and improve water quality, resulting in a more diverse and dynamic system.

Although the rates and amounts of sediment leaving the refuge and eventually reaching the Rappahannock River may reduce over time, none of the alternatives will adequately address sedimentation problems in the river and the Chesapeake Bay. Thus, the actions in the alternatives will not cumulatively improve the continued deficit in the water quality of the river or bay.

In slightly varying degrees, all of the alternatives emphasize maintaining the integrity of the refuge boundary and conserving the scenic landscape. Actions taken to ensure the long-term health of forest habitat, acquire and manage a variety of habitats, and preserve and enhance rare prairies, will serve as a model for planning land use and zoning near the refuge. In addition, when the actions on the refuge are combined with the actions of the state, non-profit organizations, and private landowners, there can be measurable progress in stemming the rate or type of changes in land use that detract from the scenic beauty of the Rappahannock River Valley.



Wilna Pond in the Fall: USFWS

Soils

The greatest past and present adverse impacts on refuge soils occurred from agriculture and development. We will continue to use best management practices to minimize the impacts of the cooperative farming program. Under all of the alternatives, we expect to restore native plant communities on lands that otherwise would have been threatened by conversion or, in some cases dominated by invasive species, if the refuge had not been created.

Cumulative Impacts on the Biological Environment

All of the alternatives would maintain or improve native biological resources on the refuge, in the Lower Rappahannock River Basin, and in the Mid-Atlantic region ecosystem. The combination of our management actions with those of other conservation organizations and landowners could result in beneficial cumulative effects by

- increasing the protection and management of Federal trust species, state-listed threatened or endangered species, and other native flora and fauna;
- protecting or improving upland and wetland habitats that are regionally declining or affected by development; and,
- controlling invasive plants and nuisance animals.

The biological resources that we would manage to control, prevent, or eliminate, such as invasive plants or mute swans, are not natural components of those areas; we would not consider the loss of those biotic components an adverse effect.

Habitat improvements under the alternatives should benefit rare or declining species and species listed as threatened or endangered. Appendix A lists species of conservation concern in the area that will benefit from management. In particular, we target bald eagles, migratory waterfowl, and migratory landbirds. For some species, such as bald eagles, the refuge may provide a source for populations expanding onto adjacent lands or, conversely, may provide habitat for expanding populations searching for new habitats to exploit.

The land around the refuge is principally agricultural land. Prior to extensive settlement, it was primarily forested. Now, residential development is encroaching. Within 50 years, it is likely that the refuge will have some of the largest expanses of native habitat accessible to the public in the area. Alternative B, with its larger grasslands program, would protect more of the current agricultural context. Alternatives B and C also would increase restoration of degraded native habitat on refuge lands. Under all alternatives, our future acquisitions will protect native habitats and ensure enjoyment and use by refuge visitors for generations.

Although all of the alternatives either maintain or increase monitoring and controlling invasive plants and animals, we expect infestations to continue to increase and expand to new areas. Alternatives B and C also have a strong biological monitoring component, with increases in surveying the species and habitats, and research and coordination with others. That additional information not only would aid decision-making that benefits fish and wildlife on the refuge, but also would add to the body of knowledge collected by other agencies, which can affect resource decision-making over a broader landscape.

Two of the public use programs we offer, hunting and fishing, result in the direct loss of individual wildlife. We describe the site-specific impacts of our hunting and fishing programs earlier in this chapter and in appendix B, "Compatibility Determinations." In 2007, we also completed an EA for our deer hunt program, including an evaluation of cumulative effects. Below, we explain why, in our professional judgment and experience, we do not think those programs cause a significant cumulative effect on the respective populations of the wildlife species harvested.

Alternatives B and C propose to evaluate two new hunting programs: for migratory waterfowl and for turkey. We will develop them in detail over the next 5 years, and conduct additional analysis and public review once those details are available. We lack enough detailed information to include them in this cumulative effects analysis. Deer hunting is the only program we will analyze in detail below.

The VDGIF published a deer management plan (2006), which you may view at <http://www.dgif.virginia.gov/wildlife/deer/management-plan/virginia-deer-management-plan.pdf>. It describes the history of deer populations in the state, and identifies statewide management goals and techniques for managing deer populations and resolving deer-related issues, while also providing recreational opportunities. That strategic plan establishes direction through 2015. The 2004 data it contains indicates that the counties near the refuge have a moderate deer density in comparison to the rest of the state, with counties to the north having extremely high densities. That suggests that deer populations in the county near the refuge are at or within its carrying capacity.

A deer harvest is essential in helping to maintain the herd at or below the carrying capacity of its habitat. When deer overpopulate, they over-browse their habitat, and can completely change the species composition of a forest, in addition to reducing its overall biodiversity. For example, the refuge has reforested several fields with species of bottomland hardwood trees to improve habitat diversity and minimize the establishment of invasive plants. Tree seedlings of this age (1–9 years old) are attractive to deer, and can be killed readily by over-browsing. The failure to establish that bottomland hardwood forest will have negative impacts on future resident and migratory populations of native wildlife. Deer overpopulation can also lead to outbreaks of devastating diseases such as hemorrhagic disease, bluetongue, and chronic wasting disease. Furthermore, overpopulation leads to starvation, more numerous car-deer collisions, and poorer herd health overall.

The management of white-tailed deer in Virginia is because herd density and health are controlled best by regulating the levels of antlerless deer kills. The numbers of female deer kills have been at record levels for the past four years. The state sets the objectives and regulations of deer management by county, and evaluates and amends them every other year on odd years. Over most of Virginia, the current deer management objectives call for the stabilization of the deer herd(s) at their early to mid-1990s levels for deer kills. Those objectives appear to be working fairly well over most of the state (see www.dgif.virginia.gov/wildlife/deer/harvestsummary.asp).

Deer hunting does not affect deer populations at the regional scale due to their restricted home ranges; deer harvesting affects only the local population. During the 2006–07 season, hunters reported killing 223,198 deer in Virginia. That total included 106,595 antlered bucks, 19,652 button bucks, and 96,951 does (43.4 percent). That represents a 4-percent increase from the 215,082 deer reported killed in the previous season. It is also 7 percent higher than the last 10-year average of 208,300. As we stated earlier, the direct impacts on deer in alternative B or C would include an estimated take of 38 deer by 44 hunters in 15 days, or 660 hunter-days (only during daylight hours).

Those harvest and survey data confirm that decades of deer hunting on surrounding private lands has not had a local cumulative adverse effect on the deer population. Therefore, expanding hunting on 1,394 acres of the refuge for a very limited deer hunt (a maximum of 660 hunter-days) should not have negative cumulative impacts on the deer herd; but instead, should support better overall herd health and maintain or increase habitat biodiversity.

Non-target wildlife affected by deer hunting

Deer hunting could affect non-target wildlife, including small mammals such as voles, moles, mice, shrews, and bats; reptiles and amphibians such as snakes, skinks, turtles, lizards, salamanders, frogs and toads; and invertebrates such as butterflies, moths, insects and spiders. Those species have very limited home ranges, and hunting could not possibly affect their populations regionally; therefore, we will discuss only local effects.

The disturbance of hunting on non-target resident wildlife, particularly the less mobile mammals, reptiles and amphibians, is likely during the fall hunt, before the onset of weather cold enough to bring on their winter hibernation or torpor¹⁰. However, the nocturnal habits of resident wildlife should minimize the level of disturbance. Hunting regulations will further protect non-target species (particularly reptiles) from harm or disturbance by banning the injuring or shooting of any non-target species. As hunting seasons extend into the winter, the level of disturbance will decline further. As noted previously, the direct, indirect, and cumulative impacts of any new hunting programs will be detailed in separate environmental assessments when they are proposed.

Cumulative Impacts on the Socioeconomic Environment

We expect none of the three proposed alternatives to have a significant adverse cumulative impact on the economy of the towns or counties in which refuge lies. We would expect none of the alternatives to alter the demographic or economic characteristics of the local community. The actions we propose would neither disproportionately affect any communities nor damage or undermine any businesses or community organizations. The land acquisition we propose would involve only willing sellers, and would spread among 7 counties and over 65 miles of the Rappahannock River. All of the alternatives would maintain the rural landscape. Consequently, no adverse impacts would be associated with changes in the community character or demographic composition.

Implementing any of the alternatives would result in several minor beneficial impacts on the social communities near the refuge and in the region as a whole. We would expect public use of the refuge to increase, thereby increasing the number of days visitors spend in the area and, correspondingly, the level of visitor spending in the local community. Fully funding the additional staffing in alternatives B and C would also make a small, incremental contribution to the employment and income in the local community.

Various objectives in alternatives B and C will have varying degrees of impact on the recreational use of the refuge. Earlier sections detailed specific impacts on individual uses, such as hunting, fishing, and observing or photographing wildlife. Cumulatively, each alternative has a different economic impact since it affects the level of public use. The table at the end of this chapter summarizes that cumulative impact by alternative. Each alternative takes a different approach to managing the variety of recreational uses on the refuge, ranging from the status quo (alternative A) to an integrated approach (alternative C) that seeks to conserve wildlife and habitat while providing diverse recreational opportunities for visitors.

These varying alternatives will have cumulative impacts, because we expect the demand for nearly all recreation to grow while the amount of refuge space and natural resources stays relatively constant. In alternative A, current uses would continue without much change. Alternatives B and C attempt to strike a reasonable balance to ensure that the refuge remains a destination of choice for both wildlife and people. If successful, that integrated approach may prove more sustainable, with more positive, long-term impacts on natural resources on the refuge, and social, and economic impacts on the communities beyond. Alternatives B and C also involve an approximate 250-percent increase in the refuge base operating and maintenance budget over the next 15 years, plus additional maintenance and construction funding for new facilities. Although budgets are impossible to predict, if that increase came from existing allocations, it could affect operating funding at other refuges and wetland management districts in the region. That would delay or forego habitat and facility improvements and other work in the region, although the change would be small at any particular station.

Our working relationships with the State of Virginia, area colleges and universities, private landowners and others should improve in terms of the responsiveness to inquiries and speed of joint projects under alternatives B and C. That improvement mainly would result from the increased staffing in key areas such as biology, public use, and maintenance. The overall coordination and communication with the public should improve under alternatives B and C, because a new staff position would deal with public use and public information. Although some may oppose changes in one or more of the alternatives, or support them, the cumulative impact on the public perception of the refuge and the service could be negative or positive.

More emphasis on public education and information in alternatives B and C should foster more understanding and appreciation of resource issues and needs, and could lead to increased political support and funding, which could positively affect fish and wildlife resources in the refuge and the Rappahannock River. The increased outreach of these alternatives could also positively affect land use

decisions outside the refuge by local governments and private landowners, and thus, lead to increased fish and wildlife populations over a broader area.

Cumulative Impacts on Cultural and Historical Resources

The activities in each alternative have the potential to impact cultural resources, either by direct disturbance during the construction of habitat projects and facilities related to public use or administration and operations, or indirectly, by exposing artifacts during actions such as managing grassland and prescribed burning. Although the presence of cultural resources, including historic properties, cannot stop a Federal undertaking, the undertakings are subject to section 106 of the National Historic Preservation Act and, at times, other laws.

Thus, the refuge staff will, during the early planning of actions, provide the regional historic preservation officer a description and location of projects, activities, routine maintenance and



Child fishing at Wilna Pond: USFWS

operations that affect ground and structures, details on requests for allowable uses, and the range of alternatives being considered. That officer will analyze those undertakings for their potential to affect historic properties, and consult with the State Historic Preservation Officer and other parties as appropriate. We will notify the public and local government officials to identify concerns about the impacts of those undertakings. That notification will be at least equal to, but preferably, with the public notification required for NEPA compliance and compatibility determinations.

We expect none of the alternatives to have significant adverse cumulative impact on cultural resources on the refuge. Depending on the alternative, beneficial effects would vary, because of the changes proposed in habitat management (e.g., allowing some or all of the intensively managed grasslands to transition to shrub and forest habitat), increasing environmental education and interpretation programs, training in cultural resource identification and protection by refuge staff, and increasing field surveys to identify and protect any undiscovered sites.

Cumulative Impacts Related to Climate Change

Department of the Interior Secretarial Order 3226 states that “there is a consensus in the international community that global climate change is occurring and that it should be addressed in governmental decision making. This Order ensures that climate change impacts are taken into account in connection with Departmental planning and decision making”. Additionally, it calls for the incorporation of climate change considerations into long-term planning documents, such as a CCP.

The Wildlife Society published an informative technical review report in 2004 titled “Global Climate Change and Wildlife in North America” (Inkley et al 2004). It interprets results and details from such publications as the Intergovernmental Panel on Climate Change (IPCC) reports (1996-2002) and describes the potential impacts and implications on wildlife and habitats. It mentions that projecting the impacts of climate change is hugely complex because not only is it important to predict changing precipitation and temperature patterns, but more importantly their rate of change, as well as the exacerbated effects of other stressors on the ecosystems. Those stressors include loss of wildlife

habitat to urban sprawl and other developed land uses, pollution, ozone depletion, exotic species, disease, and other factors. Projections over the next 100 years indicate major impacts such as extensive warming in most areas, changing patterns of precipitation, and significant acceleration of sea level rise. According to the TWS report, "...other likely components of on-going climate change include changes in season lengths, decreasing range of nighttime versus daytime temperatures, declining snowpack, and increasing frequency and intensity of severe weather events" (Inkley et al. 2004). The TWS report details known and possible influences on habitat and wildlife, including: changes in primary productivity, changes in plant chemical and nutrient composition, changes in seasonality, sea level rise, snow, permafrost, and sea ice decline, increased invasive species, pests and pathogens, and impacts on major vertebrate groups.

The effects of climate change on populations and range distributions of wildlife are expected to be species specific and highly variable, with some effects considered negative and others considered positive. Generally, the prediction in North America is that the ranges of habitats and wildlife will generally move upwards in elevation and northward as temperature rises. Species with small and/or isolated populations and low genetic variability will be least likely to withstand impacts of climate change. Species with broader habitat ranges, wider niches, and greater genetic diversity should fare better or may even benefit. This will vary depending on specific local conditions, changing precipitation patterns, and the particular response of individual species to the different components of climate change (Inkley et al 2004). The report notes that developing precise predictions for local areas is not possible due to the scale and accuracy of current climate models, which is further confounded by the lack of information concerning species-level responses and to ecosystem changes, their interactions with other species, and the impacts from other stressors in the environment. In other words, only imprecise generalizations can be made about the implications of our refuge management on regional climate change.

Our evaluation of the proposed actions concludes that only two activities may contribute negligibly, but incrementally, to stressors regionally affecting climate change: our prescribed burning program and our use of vehicles and equipment to administer the refuge. We discuss the direct and indirect impacts of those activities elsewhere in chapter 4. We also discuss measures to minimize the impacts of both. For example, with regards to prescribed burning, we follow detailed burn plans operating only under conditions that minimize air quality concerns. In addition, many climate change experts advocate prescribed burning to manage the risk of catastrophic fires (Inkley et al. 2004). With regards to our equipment and facilities, we are trying to reduce our carbon footprint wherever possible by using alternative energy sources and energy saving appliances, and using recycled or recyclable materials, along with reduced travel and other conservation measures.

In our professional judgment, the vast majority of management actions we propose would not exacerbate climate change in the region or project area, and in fact, some might incrementally prevent or slow down local impacts. We discuss our actions relative to the 18 recommendations the TWS report gives to assist land and resource managers in meeting the challenges of climate change when working to conserve wildlife resources (Inkley et al. 2004).

- Recommendation #1: Recognize global climate change as a factor in wildlife conservation: This recommendation relates to land managers and planners becoming better informed about the consequences of climate change and the variability in the resources they work with.

The Service is taking a major role among Federal agencies in distributing and interpreting information on climate change. There is a dedicated webpage to this issue at <http://www.fws.gov/home/climatechange/>. The Service's Northeast Region co-hosted a workshop in June 2008 titled "Climate Change in the Northeast: Preparing for the Future." The goal of the workshop was "to develop a common understanding of natural and cultural resource issues and to explore

management approaches related to climate change in the Northeast.” Its primary target audience was land managers. Experts in climate change gave presentations and facilitated discussion. The stated outcomes were to have participants more fully understand the present and anticipated impacts from climate change on forested, ocean and coastal ecosystems, and be able to identify effective management approaches that include collaboration with other local, state and Federal agencies. All of the Northeast Region Refuge Supervisors and planners attended, as did over 20 refuge field staff. A second workshop is planned for 2009 for the Mid-Atlantic states.

- **Recommendation #2: Manage for diverse conditions:** This recommendation relates to developing sound wildlife management strategies under current conditions, anticipating unusual and variable weather conditions, such as warming, droughts and flooding.

Our proposed habitat management actions described in chapter 3 promote healthy, functioning native forests, shrublands, and grasslands. Protecting the integrity of wetlands and managing for fully functioning riparian areas is also a priority. We have identified monitoring elements, which will be fully developed in the IMP step-down plan, to evaluate whether we are meeting our objectives and/or to assess changing conditions. We will implement an adaptive management approach as new information becomes available.

- **Recommendation #3: Do not rely solely on historical weather and species data for future projections without taking into account climate change:** This recommendation relates to the point that historical climate, habitat and wildlife conditions are less reliable predictors as climate changes. For example, there may be a need to adjust breeding bird survey dates if migratory birds are returning earlier to breed than occurred historically. A 3-week difference in timing has already been documented by some bird researchers.

We are aware of these implications and plan to build these considerations into our IMP so that we can make adjustments accordingly. Our results and reports, and those of other researchers on the refuge, will be shared within the conservation community.

- **Recommendation #4: Expect surprises, including extreme events:** This recommendation relates to remaining flexible in management capability and administrative processes to deal with ecological “surprises” such as floods or pest outbreaks.

Refuge managers have flexibility within their operations funds to deal with emergencies. Other Regional operations funds would also be re-directed as needed to deal with an emergency.

- **Recommendation #5: Reduce nonclimate stressors on the ecosystem:** This recommendation relates to reducing human factors that adversely affect resiliency of habitats and species.

Similar to our response to #2 above, the objectives of our habitat management program are to protect the biological integrity, diversity and health of refuge lands. Objectives to enhance riparian habitat for watershed protection, and establish healthy, diverse native forests in large tracts will help offset the local impacts of climate change.

- **Recommendation #6: Maintain healthy, connected, genetically diverse populations:** This recommendation relates to the fact that small isolated populations are more prone to extirpations than larger, healthy, more widespread populations. Large tracts of protected land facilitate more robust species populations and can offer better habitat quality in core areas.

Our goal to acquire in fee or easement up to 20,000 acres for the refuge from willing sellers will help establish protected core areas or conservation corridors between other protected lands. We strive to acquire large contiguous tracts because their conservation value is greater. We will also continue to work with our many conservation partners at the state and regional level to support and complement restoration and protection efforts.

- **Recommendation #7: Translocate individuals:** This recommendation suggests that it may sometimes be necessary to physically move wildlife from one area to another to maintain species viability. However, it is cautioned that this tool has potential consequences and should only be used in severely limited circumstances as a conservation strategy.

We have no plans to translocate animals within the 15 year time frame of this CCP.

- **Recommendation #8: Protect coastal wetlands and accommodate sea level rise:** This recommendation relates to actions that could ameliorate wetland loss and sea level rise, such as purchasing wetlands easements, establishing riparian and coastal buffers, restoring natural hydrology, and refraining from developments or impacts in sensitive wetlands and coastal areas.

Our responses to recommendation #2 and #6 above identifies our objectives to establish fully functioning riparian areas, protect wetlands, maintain healthy native habitats, and acquire additional land in fee or easement that has high wildlife and habitat values. In purchasing wetland habitats, our practice will be to continue to seek protection of adjoining uplands to act as a buffer for pollutants entering the wetlands, and also to serve as areas where wetlands can migrate in response to rising sea levels. The heart of this refuge is Rappahannock River, and all of our conservation actions ultimately contribute to its protection.

- **Recommendation #9: Reduce the risk of catastrophic fire:** This recommendation acknowledges that fire can be a natural part of the ecosystem, but that climate change could lead to more frequent fires and/or a greater likelihood of a catastrophic fire.

Our plans to conduct prescribed burns to maintain grasslands, control invasive plants, and possibly to reduce fuel loading in overstocked forest stands would reduce the overall risk of a catastrophic event.

- **Recommendation #10: Reduce likelihood of catastrophic events affecting populations:** This recommendation states that increased intensity of severe weather can put wildlife at risk. While the severe weather cannot be controlled, it may be possible to minimize the effects by supporting multiple, widely spaced populations to offset losses.

Our response to recommendations #2 and #6 above describes the actions we are taking to minimize this risk.

- **Recommendation #11: Prevent and control invasive species:** This recommendation emphasizes the increased opportunities for invasive species to spread because of their adaptability to disturbance. Invasive species control will be essential, including extensive monitoring and control to preclude larger impacts.

Invasive species control is a major initiative within the Service. The Northeast Region, in particular, has taken a very active stand. In chapter 3, we provide detailed descriptions of our current and future plans on the refuge to control existing invasive plant infestations. We also describe monitoring and inventorying strategies to protect against any new infestations. Our control program also has a huge private lands outreach component. We are working with many landowners in the refuge area to control *Phragmites* and other invasive plants. This effort expands the long-term effectiveness of our on-refuge program.

- Recommendation #12: Adjust yield and harvest models: This recommendation suggests that managers may have to adapt yield and harvest regulations in response to climate variability and change to reduce the impact on species and habitats.

We do not have plans for any significant harvest activities. We plan to phase out our cooperative farming program, and will only harvest trees in our overstocked pine plantations to improve forest diversity and composition. Our monitoring program will include detecting population trends in focal species to alert us to any significant changes.

Regarding animal harvest through hunting programs, the refuge does not set harvest regulations. For resident wildlife, regulations are established at the state level. For migratory game birds, the harvest framework is established at the Flyway level, and further refined at the state level.

- Recommendation #13: Account for known climatic conditions: This recommendation states we should monitor key resources through predictable short-term periodic weather phenomenon, such as El Nino, to aid us in future management efforts.

We plan to develop a monitoring program that will help us evaluate our assumptions and success in achieving objectives, as well as help us make future management decisions. Any restoration activities or management actions will be carefully planned and its effectiveness monitored and documented so we can use this information in future management decisions.

- Recommendation #14: Conduct medium- and long-range planning: This recommendation states that plans longer than 10 years should take into account potential climate change and variability as part of the planning process.

This 15-year CCP addresses climate change with its emphasis on restoring and maintaining healthy, contiguous, native habitat areas, reducing human stressors on refuge lands, working with private landowners to improve the health and integrity of their lands, and pursuing larger conservation connections and corridors with partners to enhance protected core areas. Our monitoring program and adaptive management strategies will also facilitate our ability to respond to climate change.

- Recommendation #15: Select and manage conservation areas appropriately: This recommendation states that establishing refuges, parks and reserves is used as a conservation strategy to try to minimize the decline of wildlife and habitats in North America. Decisions on locating future conservation areas should take into account potential climate change and variability. For example, it is suggested that decisions on new acquisition consider the anticipated northward migrations of many species, or the northern portion of species ranges. Managers of existing conservation lands should consider climate change in future planning.

Refuge land protection of up to 20,000 acres along the Rappahannock River will provide important corridor connections for many land and aquatic species. Our efforts, coupled with those of many other land protection partners, will enhance that benefit. Our response to recommendation #14 also should be noted here.

- Recommendation #16: Ensure ecosystem processes: This recommendation suggests that managers may need to enhance or replace diminished or lost ecosystem processes. Manually dispersing seed, reintroducing pollinators, treating invasive plants and pests, are examples used.

While we plan to take an aggressive approach to treating invasive plants, we do not believe at this time there is any need to enhance or replace ecosystem processes. Further, none of our proposed management actions will diminish natural ecosystems processes underway. Should our monitoring results reveal that we should take a more active role in enhancing or replacing those processes, we will reevaluate and/or refine our management objectives and strategies.

- Recommendation #17: Look for new opportunities: This recommendation states that managers must be continually alert to anticipate and take advantage of new opportunities that arise. Creating wildlife conservation areas out of abandoned or unusable agricultural land, and taking advantage of industry interest in investing in carbon sequestration or restoration programs, are two examples cited.

Refuge staff have many conservation partners in the area which, in turn, are networked throughout the larger region. We hear about many opportunities for land protection or habitat restoration through that broad-based network. Our Northeast Region has field offices and a regional office that integrates the other Service program areas, including those that work with private entities. We have developed outreach materials, and make ourselves available to interested organizations and groups, to provide more detailed information on the Service and Refuge System missions, refuge goals and objectives, and partnership opportunities.

- Recommendation #18: Employ monitoring and adaptive management: This recommendation states that we should monitor climate and its effects on wildlife and their habitats and use this information to adjust management techniques and strategies. Given the uncertainty with climate change and its impacts on the environment, relying on traditional methods of management may become less effective.

We agree that an effective and well-planned monitoring program, coupled with an adaptive management approach, will be essential to dealing with the future uncertainty of climate change. We have built both aspects into our CCP. We will develop a detailed step-down IMP designed to test our assumptions and management effectiveness in light of on-going changes. With that information in hand, we will either adapt our management techniques, or re-evaluate or refine our objectives as needed.



Environmental educators workshop: USFWS

Relationship between Short-term Uses of the Human Environment and the Enhancement of Long-term Productivity

In this section, we consider the relationship between local, short-term uses of the human environment and maintaining the long-term productivity of the environment. By long-term, we mean that the impact would extend beyond the 15-year period of this draft CCP/EA.

Under all of the alternatives, our primary aim is to maintain or enhance the long-term productivity and sustainability of natural resources on the refuge, in the Lower Rappahannock River Basin, and migratory birds and inter-jurisdictional fish and other far-ranging species, across the whole range of each of the species.

Habitat protection and restoration actions across all alternatives often entail short-term negative impacts to ensure the long-term productivity of the refuge. Many of the cyclic management actions in the alternatives, namely, prescribed burning, controlling invasive plants and animals, and managing forest, can have dramatic short-term impacts. Those include the direct mortality of some plants and animals, the displacement of species, and the temporary displacement or cessation of certain types of public use. However, the near-term and long-term benefits of those actions generally offset their short-term impacts, practices that often mimic the natural and thus sustainable processes necessary for long-term habitat health. We describe many of them in more detail earlier in this chapter, under their applicable issues or concerns.

As we discussed in “Impacts on Public Use,” the short-term disruption that habitat management causes in the current means, locations, and timing of public uses, should, in the long term, help sustain the greatest diversity of opportunity for the greatest number of people. In addition, diverse opportunities for public use should provide the best long-term positive economic impact on local communities. That mirrors the widely accepted premise that maintaining diversity in natural systems helps ensure their long-term resiliency. We would design our proposed programs in outreach and environmental education to explain our actions and what some may perceive as inconveniences to visitors may encourage visitors to be better stewards of our environment.

The dedication of refuge lands for new visitor facilities and parking areas, trail and fishing access facilities represents a loss of long-term productivity in a few localized areas, but we do not consider it significant, given the comparative size of the refuge.

In summary, we predict that the alternatives would contribute positively in maintaining or enhancing the long-term productivity of the environment with minimal inconvenience or loss of opportunity for the American public.

Unavoidable Adverse Effects

Unavoidable adverse effects are the effects of those actions that could cause harm to the human environment and that cannot be avoided, even with mitigation measures. All of the alternatives would result in some minor, localized, unavoidable adverse effects. For example, constructing a new headquarters and burning prescribed fires to maintain grassland and control invasive plants would produce minor, short term, localized adverse effects. The loss of property tax by local taxing authorities and increased visitation could have unavoidable effects. However, in our professional judgment none of those effects would rise to a significant level.

As we noted previously, many of the habitat and facility construction projects in the alternatives have a certain level of unavoidable adverse effects, especially during the actual construction. Those effects are mitigated to some degree by the use of practices and precautions that safeguard water quality, avoid sensitive or irreplaceable habitats, or time the actions or include features to avoid or minimize impacts on fish and wildlife. The adverse effects generally are short-term and more than offset by the long-term gains in habitat quality and fish, wildlife, and plant productivity.

Some habitat types on the refuge will be adversely affected. In alternative C, for example, if our analysis determines that wildlife values are better served by allowing the fields to transition to shrub and forest, the fields of grassland would convert to shrub or forest habitat. That would affect the wildlife that depends on grassland habitat. However, it is important to recognize that in virtually all situations where that might happen, the original, historic habitat type was likely forest.

Forest habitat is also likely to undergo changes in species composition and structure as we create a more natural forest composition in loblolly pine plantations and treat invasive species. We know of no species tied specifically to those loblolly pine plantations, so we do not expect significant adverse consequences.

All of these unavoidable adverse effects on the physical and biological environment will be relatively local and more than offset by the long-term benefits for the diversity and ecological health of the broader landscape.

Refuge land acquisition entails an unavoidable impact on local units of government, most noticeably due to the loss of tax revenue as ownership changes from private to public. The potential economic impacts associated with establishing a refuge of up to 20,000 acres are presented in the 1995 Final EA creating the refuge. That document describes economic impacts on land use, property taxes, land values, population, employment and area income levels, visitors, as well as the contributions of Refuge Revenue Sharing payments, which would largely offset any adverse economic impact.

All of the alternatives, in varying degrees, will have adverse impacts on a certain segment of the public that does not desire any change in our current public use programs and regulations or may have differing views on the course of action. Some will be concerned about increased visitation in refuge areas that, until this plan, they had to themselves. Others may become concerned as we open new tracts for public use adjacent to their residences.

Some impacts on certain individuals or neighbors are unavoidable, but our responsibility is to provide equal opportunities to the American public, not a select few. We believe we have sought a fair balance in minimizing and mitigating adverse impacts while providing quality recreational opportunities to the public. All of what we propose in the arena of public use results from public involvement and input during the planning process.

Potential Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be undone, except perhaps in the extreme long-term. One example is an action that contributes to a species' extinction. Once extinct, it can never be replaced and is an irreversible loss. By comparison, irretrievable commitments of resources are those that are lost for an extended period of time, but could be undone given sufficient time and resources, although there may be a loss in productivity or use for a time. An example of an irretrievable commitment is converting what was once a mature forest and actively managing and maintaining it in an early successional forest habitat condition. If, for some reason, that early successional habitat was no longer an objective, those acres could progress gradually to mature forest again over a period of 70 or more years, or we could determine it best to expedite that reversion by planting shrubs and trees and controlling invasive plants.

In our professional judgment we do not believe there are any actions proposed under any alternative that are irreversible. With regards to irretrievable actions, only a few examples fall into this category and primarily relate to the construction of administrative and visitor facilities, such as buildings, roads and trails. They are considered irretrievable because in the future, any facility we construct could potentially be dismantled and the site restored; however, while standing, they represent a loss in habitat productivity.

Alternatives B and C propose to build a new refuge headquarters and additional trail and parking facilities. We describe the site-specific impacts of those actions earlier in this chapter. Based on the impact footprint of those facilities, in comparison to other developments in this rural landscape, and coupled with the benefits we believe would result from engaging the community and visitors in natural resources, we do not believe a significant cumulative impact would occur.

Environmental Justice

President Clinton signed Executive Order No. 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” on February 11, 1994, to focus Federal attention on the environmental and human health conditions of minority and low-income populations, with the goal of achieving environmental protection for all communities. The order directs Federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high, adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The order is also intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority and low-income communities access to public information and participation in matters relating to human health or the environment.

Overall, we expect none of the alternatives would place a disproportionately high, adverse environmental, economic, social, or health effects on minority or low-income persons. Our programs and facilities are open to all who are willing to adhere to the established refuge rules and regulations, we acquire land only from willing sellers, and we do not discriminate in our responses for technical assistance in managing private lands.

Table 4.2. Summary comparing the effects of management alternatives at the Rappahannock River Valley refuge

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
Air Quality	<p>Long-term benefits in air filtration and carbon sequestration from protecting up to 20,000 acres within the approved refuge boundary: vegetated upland, riparian, and wetland habitats</p> <p>We would continue energy-efficient practices and adopt additional practices as feasible, including the use of a solar array at the new Wilna House visitor contact facility, hybrid vehicles, and compact fluorescent lighting.</p> <p>Negligible adverse effects from prescribed burning on up to 500 acres/year to maintain grassland and control invasive plants. Negligible contribution to regional vehicle emissions from approximately 1,300 visitors each year</p> <p>Some potential for windborne dust from 210 acres in co-op farming, and from unsurfaced refuge roads and trails; however, no substantive new construction, so no new sources of dust</p>	<p>Long-term benefits for air filtering and carbon sequestration from land protection would be similar to those in alternative A.</p> <p>Same energy-efficient practices as in alternative A, which would extend to the new proposed headquarters/visitor contact facility.</p> <p>Small increase, but still negligible adverse effects from particulate emissions from prescribed burning given increased grassland maintenance and invasive plant control (on up to 700 acres/year). In addition, a small increase in regional vehicle emissions results from the increase in visitation to approximately 4,300 visitors each year.</p> <p>Potential for windborne dust from co-op farming would reduce with the phasing out of the program by 2012. Sources from unsurfaced refuge roads and trails would remain. Some additional sources during construction of proposed new refuge headquarters/visitor contact station.</p>	<p>Minor beneficial increase in air filtering and carbon sequestration, compared to alternatives A and B, since alternative C allows most of the upland to succeed to forest, including 700 acres of existing grassland.</p> <p>Same energy-efficient practices as in alternative A</p> <p>Reduced adverse effects from particulate emissions, compared to alternative A or B, due to less prescribed burning, on approximately 300 acres/year, only for invasive plant control.</p> <p>Similar to alternative B in predicted vehicle emissions based on expectation of same level of visitation.</p> <p>Potential for windborne dust from same sources and at same levels as alternative B</p>
	<p>None of our proposed refuge management activities should adversely affect regional air quality. None would violate EPA standards for criteria air pollutants; each would comply with the Clean Air Act. None would affect visibility due to emission-caused haze at the nearest Class I airshed, the Shenandoah National Park Wilderness Area. Management actions and public uses at the refuge would contribute a negligible increment to regional emissions.</p>		

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
<p>Socioeconomic</p>	<p>We would continue to contribute minimally to the local economy, in terms of refuge staff jobs, income, expenditures, and purchases of goods and services for refuge activities. We would also continue to contribute negligibly to the local agricultural sector with our co-op farming program on 210 acres.</p> <p>Minimal contribution to the local economy because of approximately 1,300 visitors each year and their expenditures to support refuge activities</p>	<p>Adding four refuge staff would minimally increase benefits for the local economy in jobs, income, and expenditures. Refuge headquarters/visitor contact station construction and work to upgrade refuge management infrastructure would also add expenditures in the local economy for labor, materials, and services.</p> <p>Enhancing refuge programs would increase public use to approximately 4,300 visitors each year, thereby increasing their expenditures in the local economy. That increase, however, would remain negligible in the context of the county economies within which refuge lands lie.</p> <p>Eliminating coop farming by 2012 would directly affect income for the local farmer, but would affect only negligibly the agricultural economic sector, since the contribution is relatively small.</p>	<p>Same as alternative B</p>
	<p>Regardless of which alternative we select, we would continue to pay refuge revenue sharing each year to the counties within which refuge lands lie. Those county economies are so large in comparison to those payments that their contribution is relatively small to the county budget. Regardless of the selected alternative, refuge management jobs, income, and expenditures would negligibly affect the local economy, but the expenditures of refuge visitors would continue to add some minor benefits for the local economy.</p>		

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
<p>Soils</p>	<p>Long-term benefits for soils from our protecting up to 20,000 acres within the approved refuge boundary</p> <p>No significant adverse impacts on refuge soils would result from continuing current management. No major construction activities planned. Coop farmer would continue to farm 210 acres and use best management practices. Herbicide use in managed grasslands would continue to adhere to regional and national Service standards for review and approval to insure minimal environmental risk. Mowing and disking grasslands also disturbs soils, but only temporarily, and does not affect long-term productivity, soil structure, or result in erosion.</p> <p>Some compaction and soil disturbance occurs on unsurfaced access roads and trails, but most of the roads are to be rehabilitated in 2008.</p> <p>A prescribed burn program, to maintain grasslands or control invasive plant species, would continue with some risk to soils on up to 500 acres/year.</p> <p>No noticeable impact on soils from visitor activities, such as hiking off designated trails, bank fishing from streams or ponds, or around facilities</p> <p>Removing old buildings and restoring the site is benefiting long-term soil conditions.</p> <p>The soils of the refuge are in good condition. They would remain so under all of the alternatives. We would continue to maintain the refuge protective vegetative cover that minimizes soil losses through erosion. We would continue to prohibit recreational activities such as ATV's, or off-road and off-trail travel that would damage soils on the refuge. Hiking trails, boat launch sites, wildlife observation areas, parking areas and other high-use areas would continue to be maintained well to keep soil effects to a minimum. We will note any erosion problems during routine refuge monitoring and correct them as soon as feasible. Regardless of which CCP alternative we select, we will continue to use best management practices in all management activities that might affect refuge soils to ensure that we maintain soil productivity.</p>	<p>Long-term benefits for soils from land protection would be similar to alternative A.</p> <p>Soil displacement and loss would result from proposed new headquarters/visitor contact facility and on up to 3 acres of proposed new trails and parking areas.</p> <p>Soil impacts from co-op farming would be phased out by 2012. Those could result from heavy farm equipment, mowers, herbicides, and other site disturbances.</p> <p>We would slightly increase risk to soils by an annual burning of up to 700 acres to manage grassland and control invasive plants. Impacts from other grassland management treatments are the same as in alternative A.</p> <p>Increased annual visitation to approximately 4,300 visitors might result in increased trampling along trails and around visitor facilities. We would design our monitoring, outreach, and education programs to reduce risk.</p> <p>Removal of unnecessary buildings and old grain silos would continue to the benefit of long-term soil conditions.</p>	<p>Long-term benefits for soils exceed those of alternatives A & B. Alternative C would be the most beneficial alternative for soil restoration and protection with elimination of grassland management, and reduced use of prescribed fire, and the phase-out of coop farming by 2012. A return to forest would best protect soils from erosion. Some risk still associates with invasive plant control, using herbicides and prescribed fire on up to 300 acres/year.</p> <p>Replanting trees to restore forest more quickly may cause short-term soil disturbance, compaction and localized erosion depending on site conditions and site preparation methods. Those would be minimal with use of best management practices. In the long term, establishment of native species would help restore and maintain soil productivity at those sites.</p> <p>As in alternative B, there would be some localized increase in soil impacts where public access and uses occurs. Design and monitoring of those more intensive public use areas would mitigate any potential for long-term impacts.</p>

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
Hydrology and Water Quality	<p>Long-term benefits for hydrology and water quality would result from protecting up to 20,000 acres within the approved refuge boundary. In addition, significant management emphasis on maintaining riparian buffers, treating invasive plants, especially <i>Phragmites</i>, and restoring natural hydrology to disturbed refuge uplands would increase benefits for hydrology and water quality.</p> <p>Some risks for water quality from prescribed fire and herbicide use on up to 500 acres/year in conjunction with invasive plant and grasslands management programs. That is mitigated by using only approved herbicides, having a spill plan and fire plan in place, and using best management farming practices.</p> <p>Negligible impacts may also occur from anglers disturbing pond bottoms, but we do not expect, nor have we ever observed, even minor adverse impacts that would cause long-term effects.</p>	<p>Long-term benefits for hydrology and water quality from land protection and restoration would increase slightly over alternative A as we seek to extend riparian buffers up to 1,600 feet wide and increase the restoration of our shorelines and disturbed refuge uplands. We would also continue our land protection on up to 20,000 acres.</p> <p>The potential risks to water quality would increase slightly over alternative A, due to the increased grasslands management. We would treat up to 700 acres/year with herbicides or prescribed fire to control invasive plants and benefit grasslands.</p> <p>Potential impacts from recreational users would also slightly increase over alternative A with expanded fishing opportunities. We plan a public canoe launch at Mount Landing Creek and a public fishing pier on the Laurel Grove tract. Increased risk from shoreline erosion or debris and other waste could affect water quality. However, we plan to monitor those sites closely and address any elevated concerns.</p>	<p>Overall, beneficial impacts would be similar to alternative B, although the risk to hydrology and water quality decreases as we eliminate the intensive grassland management program. We would expect to treat only 300 acres/year maximum with herbicides and prescribed fire, primarily to treat invasive plants and establish tree seedlings.</p>
	<p>None of our proposed refuge management activities should adversely affect local or regional hydrology and water quality. None would violate Federal or state standards for contributing pollutants to water sources; all three would comply with the Clean Water Act.</p>		

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
<p>Vegetation</p>	<p>Long-term benefits for vegetation from protecting up to 20,000 acres within the approved refuge boundary: vegetated upland, riparian buffers, and wetland habitats</p> <p>Additional long-term benefits would result from continued maintenance of riparian buffers and healthy, diverse forests on the majority of refuge lands, and, as a priority, treating invasive plants on up to 500 acres/year.</p> <p>Allowing deer hunting would insure that deer over-browsing does not result in extensive damage to vegetation.</p> <p>Other visitor services programs would produce some effects on refuge vegetation. We would continue to maintain or improve infrastructure, such as roads and trails, which would involve the occasional felling of trees. Some trampling may result from visitors walking off-trail. Impacts would generally occur within areas already disturbed and confined to existing infrastructure footprints.</p> <p>Under all alternatives, we would use best management farming and forest practices. We would monitor activities to insure no long-term or permanent adverse impacts on native vegetation. In particular, we would monitor areas of visitor and recreation concentration.</p>	<p>Long-term benefits for vegetation in alternative B would be slightly higher than in alternative A. In addition to land protection benefit, riparian buffers would extend to 1,600 feet, invasive plants would be treated on up to 700 acres, and the monoculture, overstocked loblolly pine and tulip polar stands would be managed to increase species and structural diversity.</p> <p>Other forest stands would be evaluated and treated as warranted through prescribed fire or thinning to reduce competition, vulnerability to disease, and to promote and sustain a more oak-dominated forest composition which is more natural for the area.</p> <p>Some increased adverse impacts from visitor services would arise from our visitor services program because we are planning new trails. However, we would build them on existing roads or in presently disturbed areas to the extent possible. Trails would be narrow, with a natural surface that we predict would affect less than 5 acres.</p>	<p>In addition to those noted under alternative B, beneficial impacts would be slightly greater than under alternative B since we would manage native forest on an additional 700 acres created from grasslands.</p> <p>Adverse impacts would be similar to alternative B.</p>

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
Bald Eagles	<p>Long-term benefits for bald eagles would result from protecting up to 20,000 acres within the approved refuge boundary. Maintaining intact forest riparian areas close to the river would directly benefit bald eagles by providing nesting and roosting habitat.</p> <p>Some impacts may result from allowing public access to the shoreline and the rivers and creeks. The presence of humans occasionally disturbs bald eagles or displaces them from foraging. However, no refuge public use sites lie near bald eagle nesting or roost sites, or other concentration areas, so we predict a minimal impact.</p>	<p>Long-term benefits for bald eagles in alternative B would be slightly higher than in alternative A. In addition to the land protection benefit, riparian buffers would extend to 1,600 feet. Phasing out farming by 2012 would also increase riparian forest habitat by approximately 50 acres, providing direct benefits for bald eagles using the area. Under alternative B, we would pursue ways to prevent additional erosion at the Wilna unit bald eagle roost site and implement feasible strategies.</p> <p>Impacts on bald eagles from public use and access would be greater than alternative A given the new infrastructure planned at Mount Landing Creek and Laurel Grove pond. Although bald eagles have been observed there, neither of those two areas is a nesting site, roost site, or known concentration area. Some disturbance or displacement is likely, but we do not expect it to affect bald eagle nesting or productivity or cause undue stress.</p>	<p>Long-term benefits for bald eagles under alternative C would be slightly higher than those we describe for alternative B, because we would allow 700 acres of managed grasslands to succeed to forest. Most of the resulting forest would not lie in prime riverfront bald eagle habitat, but its proximity would indirectly benefit bald eagles by reducing management activities that may cause disturbance, creating visual barriers, and promoting an intact, unfragmented forest.</p> <p>Potential impacts from public use are similar to alternative B.</p>
Sensitive Joint-Vetch (Federal-listed)	<p>Under all alternatives, we would enforce state and Federal laws protecting bald eagle nesting and roosting habitat.</p> <p>Long-term benefits for the Federal-listed sensitive joint-vetch from pursuing protection for up to 20,000 acres within the approved refuge boundary. Maintaining intact forest riparian areas close to the river would directly benefit that plant.</p> <p>Some potential risk for sensitive joint-vetch from our <i>Phragmites</i> control program; however, ESA section 7 consultation is complete, and all treatments implemented to insure compliance.</p> <p>Some impacts may result from allowing public access to the shoreline and the rivers and creeks; however, we do not currently allow visitor activities in any known sensitive joint vetch locations. We would continue to survey before opening new areas.</p> <p>Under all alternatives, we would enforce Federal laws protecting this listed species to insure compliance with the Endangered Species Act. We would continue to work with the Recovery Team and continue to monitor known sites to remain vigilant to any threats.</p>	<p>Long-term benefits for bald eagles in alternative B would be the same as alternative A.</p> <p><i>Some increased risk due to the planned new fishing and trail access in riparian areas, but to date, no surveys in those project areas have documented sensitive joint-vetch. Inventories and monitoring would continue in known and suspected to minimize loss or reduce threats. The goal is to maintain or expand existing populations on the refuge.</i></p>	<p>Same impacts as described for alternative B.</p>

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
<p>Landbirds</p>	<p>Long-term benefits for landbirds from protecting up to 20,000 acres within the approved refuge boundary. In particular, forest landbirds would benefit from our emphasis on acquiring riparian buffers and other forest habitats. Forest birds also benefit from the continued maintenance of existing riparian buffers and forest restoration in disturbed areas, as well as from invasive plant control program.</p> <p>Grassland dependent birds would continue to benefit from the 700 acres of managed grasslands throughout most of the year, depending on whether they nest, migrate or winter on refuge lands.</p> <p>Shrub-dependent birds would continue to use the refuge opportunistically as we are not actively managing for that habitat. It would continue to shift around on the refuge with the schedule for managing grasslands. It grows along field and road edges or in rested fields after 2 years. No more than about 30 acres of quality shrub habitat is available on the refuge at any given time.</p> <p>Despite the benefits above, management activities associated with maintaining grasslands (e.g., fire and mechanical treatments) would continue to have some minor risk to wintering or migrating grassland birds. We apply the treatments in late winter or early spring, when there is the least likelihood that many birds are present. That is prior to any nesting activity; thus, the birds are more mobile and can move easily to adjacent fields temporarily.</p>	<p>Long-term benefits for landbirds under alternative B would be slightly higher than in alternative A, especially for forest landbirds. In addition to the land protection benefit, riparian buffers would extend to 1,600 feet. Phasing out farming by 2012 would also increase riparian forest habitat by approximately 50 acres, providing direct benefits for forest landbirds.</p> <p>Benefits for grassland-dependent birds would also increase under alternative B since managed grasslands may increase up to 1,200 acres in conjunction with additional land acquisition. While some risk is associated with management, as described under alternative A, the long-term benefits for nesting grassland birds outweigh those potential impacts.</p> <p>Impacts to shrub-dependent birds would be the same as under alternative A.</p> <p>Impacts from visitor activities would be similar to those described under alternative A. Also under alternative B, we would design any new infrastructure to minimize impacts to the interior of sensitive habitat areas (e.g., the interior of grasslands and forests). The larger an undisturbed patch of habitat is, the greater the number of birds that would benefit.</p>	<p>Long-term benefits for forest landbirds would increase over alternative B. Although other benefits described for forest birds are similar, eliminating 700 acres of managed grassland and allowing it to transition to forest under alternative C is an important distinction. Within approximately 3 years, grassland bird populations on the refuge would dramatically decline with the loss of grassland habitat.</p> <p>Shrub-dependent birds would benefit over the short term compared to alternatives A and B because the grasslands would first transition to shrub habitat before finally succeeding to forest. However, those benefits would be temporary, not likely to last beyond 10 years.</p> <p>Impacts from visitor activities would be the same as alternative B.</p>

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity <i>The Service-preferred Alternative</i>	Alternative C Forest Emphasis
Landbirds (continued)	<p>Visitor activities and improvements have the potential to disturb birds. Off-trail visitor use has the greatest potential to impact nesting birds, but the extent of disturbance depends of vegetation density and visibility. Different species of birds react differently to human presence, so the impact is varied. Sensitive birds such as wood thrush may avoid areas frequented by people. Other birds, such as Carolina chickadee or Carolina wren may flush at first, but then quickly return to nests. To minimize that impact, visitors are limited to trails during the nesting season. Maintenance or construction activities would displace birds temporarily, but we would avoid sensitive areas during the nesting season.</p>		

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
<p>Open Water and Wetland Bird Species</p>	<p>Long-term benefits for open water and wetland bird species from pursuing protection for up to 20,000 acres within the approved refuge boundary, as those acres are likely to include wetlands and open water habitats.</p> <p>We would continue to monitor those habitats types to insure we are alert to any threats so that we can deal with them as quickly as possible. Our emphasis on <i>Phragmites</i> control would benefit those birds by improving conditions for the native food plants. Maintenance of riparian buffers would help mitigate impacts from land use activities that pose a threat to wetlands (e.g. agricultural runoff, soil erosion).</p> <p>Outreach and education programs to visitors and private landowners would continue to promote conservation wetlands and associated species.</p> <p>Spraying herbicides for <i>Phragmites</i> raises the risk to wetland birds, although spraying in Aug—Sept minimizes chances of impacts on wintering waterfowl, which typically have not arrived yet, and occurs after the breeding cycle of marsh and wading birds. Some birds may be present during spraying, and if they do not flush ahead of applications, they may come in direct contact with herbicide. Because we use only approved herbicides that are not toxic to birds, the short-term impact is that the birds temporarily get wet.</p>	<p>Long-term benefits are similar to alternative A.</p> <p>Adverse impacts are the same as alternative A with the additions of the proposed waterfowl hunt and increased fishing opportunities. Waterfowl hunting results in the direct loss of birds, but the annual seasons and harvest would be set within Atlantic Coast migratory bird state regulations and would not jeopardize population viability. Exerting control over placement of hunting blinds on the refuge may help disperse hunting pressure, provide for more waterfowl resting areas, and better manage the extent and duration of hunting disturbance.</p> <p>Fishing impacts would be similar to those described under alternative A, but establishing new designated fishing areas at Laurel Grove, Mount Landing Creek, and the Hutchinson tracts would increase the potential of direct and indirect impacts. We would continue to designate fishing access spots. We would also continue to work with VDGIF to conduct outreach, education and law enforcement.</p>	<p>Same impacts as described for alternative B</p>

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity <i>The Service-preferred Alternative</i>	Alternative C Forest Emphasis
<p>Open Water and Wetland Bird Species (continued)</p>	<p>Hunting, especially when dogs are present, results in the direct, short-term disturbance of marsh birds and waterfowl as hunters attempt to flush deer in marshes and creeks. Birds flush in alarm and fly to other areas nearby where they feel secure. We predict no long-term impacts on individual birds or a population, because the disturbance is outside the nesting season. Hunters and dogs tend to move through the area, so impact is of limited duration, and generally, birds can fly to habitat available close by.</p> <p>The effects of fishing are more of a concern. The potential for anglers to disrupt directly the birds that are resting or foraging near water, disturb their nests, and leave debris they can ingest or entangle themselves in can occur during sensitive times of the year for birds (e.g., breeding, nesting and wintering). Designated fishing access points would concentrate use and disturbance. We would continue to work with VDGIF on outreach, education and law enforcement.</p>		

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
<p>Fisheries</p>	<p>Long-term benefits for open water and wetland bird species from pursuing protection for up to 20,000 acres within the approved refuge boundary, as those acres are likely to include wetlands, riparian, and open water habitats.</p> <p>Continued enforcement against deliberate introductions of non-native fish, and outreach and educations to explain the impacts of those introductions as well as accidental introductions of invasive plants, pathogens, and exotic, invasive invertebrates</p> <p>State regulations for fishing would be adhered to, which establish species and harvest limits to insure no cumulative impact on any fish populations.</p>	<p>Fishing impacts similar to those described under alternative A, except establishing new designated areas for fishing at Laurel Grove, Mount Landing Creek, and the Hutchinson tracts would create the potential for those direct and indirect impacts to fisheries in the new areas. Designated fishing access points would concentrate use and disturbance. We would continue to work with VDGIF on outreach, education and law enforcement.</p>	<p>Same impacts as described for alternative B</p>

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
<p>Other Native Wildlife—Mammals, Reptiles, Amphibians, and Invertebrates</p>	<p>Long-term benefits for those taxa of wildlife from protecting up to 20,000 acres within the approved refuge boundary: vegetated upland, riparian, and wetland habitats. Additional acquisition would increase capacity to meet all life stages for a greater diversity of species, especially those that are wide-ranging.</p> <p>Management emphasis on invasive plant control improves overall habitat quality for those taxa. Some risk to all or certain life stages for many species in those taxa from herbicide application. Only those herbicides approved for refuges by our Regional Contaminants Coordinator with wildlife protection given a priority. No direct loss of wildlife from herbicide applications has ever been documented on refuge lands.</p> <p>Managing up to 700 acres of grasslands makes an important contribution to area habitat diversity and supports life stages of many species from those taxa. Grasslands adjacent to forest enhance area forests for many forest-dependent species, such as bats, which often forage in fields. However, activities associated with management, such as mechanical brushing, mowing, and prescribed fire, may directly result in loss of individuals. Loss may also occur when removing protective cover exposes animals to predation or weather. We do not expect that to jeopardize species populations. Impacts are of short duration, seasonal, and temporary. Fields are not manipulated more than once/year and not during the breeding season for most species.</p>	<p>Long-term benefits from land protection and invasive species control are similar to alternative A. Increased benefits for many species from grasslands management under alternative B since we would manage up to 1,200 acres. Potential for adverse impacts from invasive species control and grasslands management techniques identified under alternative A would increase commensurate with increased acres, but is still not predicted to jeopardize species populations in the area.</p> <p>Impacts from deer hunting would be similar to alternative A. Under alternative B, individual beaver control would result in a direct loss of individuals to the population (~1 beaver/per 3--5 years). We do not predict that level of harvest would jeopardize beaver populations in the area. Animals would be harvested outside of the times when young are dependent.</p> <p>Impacts from public use/access would increase over alternative A due to the expanded fishing access, and development of up to 5 miles of new trails. Monitoring would identify significant impacts to wildlife; we would modify the programs as needed to reduce impacts.</p>	<p>Long-term benefits are similar to alternative B. The primary difference is that 700 acres of grasslands would not be managed. That would benefit those individuals at risk from managed fields, but would not allow for the enhanced habitat diversity contribution of those fields, which supports many species from those taxa that use the fields for all or part of their lifespan. On the other hand, allowing fields to transition to forest would benefit many interior forest-dwelling species. Over the long-term, grassland-dependent wildlife would be lost from the landscape.</p> <p>Other beneficial and adverse impacts similar to alternative B</p>
	<p>Regardless of which alternative we select, we would continue to manage our current refuge lands to support native vegetation and a diversity of ecosystem components including a wide array of native wildlife. We do not predict that our management activities would jeopardize any species populations, although some individuals may be injured or die after mechanical or prescribed fire treatments.</p>		

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
<p>Other Native Wildlife—Mammals, Reptiles, Amphibians, and Invertebrates (continued)</p>	<p>Deer hunting results in a direct removal of individuals. Current harvest levels (<200 deer/year) do not jeopardize area populations. Harvest occurs outside the times when dependent young are affected, and at a level designed to stabilize populations within or below the carrying capacity of the area. It benefits the health of remaining individuals in the herd, and benefits species negatively affected by deer over-browsing.</p> <p>Some impacts result from the presence of public use infrastructure. Roads and trails may create barriers or hazards to movement for small wildlife. Use of roads and trails by visitors may disturb species along those corridors or at shoreline access points. Night-lights may affect the movement or presence of nocturnal animals. Those impacts are localized, concentrated in size and distribution, and relatively insignificant when considering the extent of all refuge lands.</p>		
			<p>Regardless of which alternative we select, we would continue to manage our current refuge lands to support native vegetation and a diversity of ecosystem components including a wide array of native wildlife. We do not predict that our management activities would jeopardize any species populations, although some individuals may be injured or die after mechanical or prescribed fire treatments.</p>

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
Public Use and Access	<p>Long-term benefits for public use and access from pursuing refuge acquisition on up to 20,000 acres within the approved refuge boundary. We would provide public opportunities for wildlife-dependent recreation on acquired land.</p> <p>We would maintain the existing programs for all six priority public uses. Demand would continue to be satisfied for all but interpretation and environmental education. No major conflicts among visitors engaged in respective wildlife dependent uses or programs.</p> <p>Beach use near eagle sites and running dogs would continue to represent most frequent violations of refuge regulations.</p> <p>Implementing public access closures, for either wildlife protection (some seasonal/temporary) or at Wilina Pond education site when students are present, would continue to inconvenience some visitors.</p>	<p>Same long-term benefits as alternative A.</p> <p>Enhanced interpretation and environmental education programs under alternative B, especially with planned new contact facility, would move refuge closer to satisfying demand, but not fully.</p> <p>Expanded capacity to handle predicted increase in visitors given plans to open previously closed refuge units to certain activities, including new trails and fishing access. Would increase opportunity to conduct outreach and raise awareness and appreciation of the refuge and NWRs.</p> <p>Evaluating opportunities for a waterfowl and wild turkey hunt could expand the current deer-only hunt program, thus reaching a different hunting public.</p> <p>Increased visitation coupled with expanded programs might increase likelihood of conflicts among visitors, especially if certain activities may require closing off areas of the refuge to others.</p> <p>Increased outreach and enforcement presence over time would also reduce violations associated with beach use and dog running. Area closures to protect wildlife would continue to inconvenience some visitors.</p>	<p>Same impacts as described for alternative B</p>
	<p>Under all alternatives, we would continue to provide compatible wildlife-dependent activities that can be supported with respective staff and budget projections. We would maintain our infrastructure to support those activities and provide safe access. We would continue to conduct outreach to visitors and the local communities to instill an appreciation of the NWRs and the refuge, its resources and our priorities for management.</p>		

Resources	Alternative A Current Management	Alternative B Enhanced Habitat Diversity The Service-preferred Alternative	Alternative C Forest Emphasis
<p>Cultural and Historic Resources</p>	<p>Long-term benefits for cultural and historical resources from protecting up to 20,000 acres within the approved refuge boundary. Refuge status ensures that none of the substantial impacts related to residential and commercial development would occur, and protection would be afforded for known and yet undiscovered cultural and historic resources.</p> <p>Some risk that refuge visitors may inadvertently or intentionally damage or disturb cultural and historic sites. Known sites would continue to be monitored and protected to ensure compliance with Section 106 of the National Historic Preservation Act (NHPA) and the Antiquities Resource Protection Act (ARPA). ARPA language to be included in appropriate materials to warn visitors about illegal looting. Law enforcement personnel would be trained in ARPA enforcement.</p> <p>Areas with known cultural or historic resources would be protected regardless of which alternative we select. We would take all necessary precautions to ensure that no sites or structures on, or eligible for, the National Historic register would be impacted. We will send the draft CCP to the VA SHPO for review and NHPA 106 compliance. We would also continue the appropriate level of NHPA 106 compliance on all individual projects.</p>	<p>In addition to the beneficial impacts as described for alternative A, our planned increase in interpretive and educational programs would include cultural resources resulting in increased awareness and stewardship of these resources.</p> <p>There is some increased risk to cultural resources over alternative A because of increased grasslands management and associated treatments. However, we would continue to assess all projects for their potential to impact cultural resources and follow all compliance requirements.</p>	<p>Beneficial impacts similar to alternative B.</p> <p>Adverse impacts may increase over alternative B due to proposed forest management, including thinning and other stand treatments that would be more widespread. However, similar to alternatives A and B, we would continue to assess all projects for their potential to impact cultural resources and follow all compliance requirements.</p>