

Chapter 3.



USFWS

Ailanthus Webworm Moth

Alternatives

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3.1 Introduction

This chapter describes our process for formulating alternatives, the actions that are common to all of the alternatives, the actions or alternatives we considered (but did not fully develop), and the three alternatives we analyzed in detail. At the end of this chapter, table 3-3 compares how each of the alternatives addresses key issues, supports major programs, and achieves refuge goals.

3.2 Formulating Alternatives

Relating Goals, Objectives, and Strategies

The refuge goals developed are intentionally broad, descriptive statements of the desired future condition of refuge resources. Goals articulate the principal elements of the refuge purposes and our vision statement, and provide a foundation for developing specific management objectives and strategies. All of the alternatives analyzed address the same goals.

The objectives are essentially incremental steps toward achieving a goal; they further define management targets in measurable terms. Typically, they vary among the alternatives, and provide the basis for determining strategies that are more detailed, monitor refuge accomplishments, and evaluate our successes. “Writing Refuge Management Goals and Objectives: A Handbook” (USFWS 2004) recommends writing SMART objectives that possess five characteristics: specific, measurable, achievable, results-oriented, and time/fixed. A rationale accompanies each objective to explain its context and importance. The objectives outlined in the alternative selected for the final CCP will guide the future development of refuge step-down plans, which we describe later in this chapter.

Strategies are the specific or combined actions, tools, or techniques we may use to achieve the objectives. The list of strategies in each objective represents the potential suite of actions we may implement. We will evaluate most of them further as to how, when, and where we should implement them when we write our refuge step-down plans. We will measure our successes by how well our strategies achieve our objectives and goals.

Developing Alternatives, Including the No Action Alternative

Over the course of several months, the core planning team, refuge staff, and partners held meetings and conference calls to identify a wide range of possible management objectives and strategies that could achieve our goals. After these were initially developed, the process of designing detailed management alternatives began. Each management alternative is intended as an alignment of complementary objectives and strategies designed to meet refuge purposes, vision, and goals, and the Refuge System mission and goals, while responding to the issues and opportunities that arose during the planning process.

Beginning in 2010, we gathered information about refuge habitats and species, combined with refuge, State, regional and national priorities. We used that information to develop lists of priority resources of concern to help guide our alternatives development. The resources of concern are described in each of the rationales for the objectives under each alternative. By focusing on the resources of concern, we were able to narrow our focus to the alternatives that are presented in this chapter. There are an infinite number of ways that we could arrange possible habitats on the refuge. Alternative B provides a high amount of forest restoration, which is proposed as the area that the refuge can provide the greatest conservation benefit. Alternative B also balances other habitat types that would benefit other priority species as well as a range of habitat types for potential research projects.

Objectives were formed into three management alternatives and were evaluated as to how well they would fulfill the refuge purposes. In this chapter, we fully analyze the three alternatives that characterize different ways of managing the refuge over the next 15 years. As required by NEPA, we believe they represent a reasonable range of alternatives for achieving the refuge purpose, vision, and goals, and addressing the issues described in chapter 1. Unless otherwise noted, refuge staff would implement all actions.

Alternative A addresses the NEPA requirement of a “no action” alternative, which we define as continuing current management. It describes our existing management priorities and activities, and serves as a baseline for comparing and contrasting alternatives B and C. To better understand the scope and context embodied within the various alternatives, please see Chapter 2, “Affected Environment,” for detailed descriptions of current refuge resources and programs.

Many of the objectives in alternative A do not strictly follow the guidance in the Service goals and objectives handbook, because we are describing current management decisions and activities that we established prior to that guidance. Those activities evolved from a variety of formal and informal management decisions and planning documents. Thus, the objectives in alternative A are fewer and more subjective than are those in alternatives B or C.

Alternative B, the Service-preferred alternative, combines the actions we believe would achieve most effectively the refuge purposes, vision, and goals, and respond to public issues. It emphasizes the management of specific refuge habitats to support focal species whose habitat needs benefit other species of conservation concern in the Chesapeake Bay region. In particular, it emphasizes forest biodiversity and ecosystem function. This includes the restoration of a number of impoundments and grasslands to forested areas to support forest interior dwelling bird species and other forest-dependent species. The planning team reviewed landscape plans, the State wildlife action plan, and regional bird conservation plans and determined that Patuxent Research Refuge could make the biggest contribution to breeding migratory forest birds. By focusing on forest restoration and maintaining some of the impoundments and grasslands, alternative B provides the best conservation benefit across all of the habitat goals. In addition, alternative B would enhance our present visitor services programs in a manner that addresses the national and

regional Service policies and mandates of the refuge. It strives to provide opportunities for wildlife-dependent public uses found to be compatible and additional non-priority public uses that offer opportunities to introduce others to the Refuge System in general and Patuxent Research Refuge in particular.

Alternative C proposes that the refuge begin a path towards maximizing interior forested habitat. This would require active management to restore a majority of impoundments and grasslands into forested areas and would support forest interior dwelling species, in addition to other species of conservation concern identified in the draft habitat management plan. Alternative C also focuses on accommodating wildlife-dependent uses while minimizing non-wildlife-dependent uses.



Steve Noyes

Valley Trail

3.3 Actions Common to All of the Alternatives

All of the alternatives share some common actions. Some are required by law or policy, or represent actions that have undergone previous NEPA analysis, public review, agency review, and approval. Others may be administrative actions that do not require public review, but that we want to highlight in this public document.

All of the following actions are current practices or policies that would continue under all alternatives:

- Coordinate with USGS to house and support research efforts and encourage basic and applied scientific work on the refuge that furthers the goals of Service and

USGS in coordination with refuge management (e.g., propagation of endangered species).

- Use an adaptive management approach where appropriate.
- Develop a separate land protection plan with public and agency involvement in compliance with Service policy and NEPA.
- Monitor and control invasive species.
- Monitor and abate diseases affecting wildlife and plant health.
- Continue existing projects managed by outside programs.
- Protect cultural resources, including National Register of Historic Places-eligible buildings and historic districts.
- Complete findings of appropriate use and compatibility determinations.
- Provide quality wildlife-dependent recreation programs.
- Provide non-wildlife-dependent activities.
- Provide refuge staffing and administration.
- Conduct Wild and Scenic Rivers and Wilderness Reviews.

Biological and Ecological Research and Investigations

In establishing the refuge in 1936, Executive Order 7514 stipulated: "...in order to effectuate further the purposes of the Migratory Bird Conservation Act, it is ordered that all lands acquired...are hereby reserved and set apart...as a wildlife experiment and research refuge." While research has evolved through the years, it inherently remains of a nature that addresses national and international questions about wildlife conservation. In addition, much of the research has direct application to the Refuge System and other land management and conservation agencies.

The refuge works under a memorandum of agreement (MOA) with USGS PWRC that identifies the coordination of priority research between the two agencies. The MOA specifically defines priority research as, "Those projects that are considered important to: Agencies of the Department of the Interior, the U.S. Fish and Wildlife Service, the National Wildlife Refuge System, and State Fish and Game Agencies, and that address important management issues or demonstrate techniques for management of species and/or habitats" (MOA July 28, 2000/FWS Agreement No 1448-50181-97-H-006).

In addition, the Refuge Manual and the Service Manual both contain guidance on conducting and facilitating biological and ecological research and investigations on refuges. In 1982, the Service published three objectives in the Refuge Manual for supporting research on units of the Refuge System (4 RM 6.2):

- 1) Promote new information and improve the basis for, and quality of, refuge and other Service management decisions.

- 2) Expand the body of scientific knowledge about fish and wildlife, their habitats, the use of these resources, appropriate resource management, and the environment in general.
- 3) Provide the opportunity for students and others to learn the principles of field research.

In 2006, the Service Manual provided supplemental guidance on the appropriateness of research on refuges: “We actively encourage cooperative natural and cultural research activities that address our management needs. We also encourage research related to the management of priority general public uses. Such research activities are generally appropriate. However, we must review all research activities to decide if they are appropriate or not as defined in section 1.11. Research that directly benefits refuge management has priority over other research” (603 FW 1.10D (4)).

Just as all refuge management activities on the refuge should be compatible with its primary purpose, which is to conduct research, all research projects should be consistent with an approved finding of appropriateness and compatibility determination. Research projects may also contribute to a specific need identified by the refuge or the Service. As we note in chapter 2, we have allowed many research projects that meet these criteria. We expect additional opportunities to arise under any of the alternatives proposed in this draft CCP. Special use permits will be issued for all research projects we allow. In addition, we will employ the following general strategies to further activities under this goal:

- Encourage and support the use of Patuxent Research Refuge’s lands for the purpose of conducting wildlife research that addresses important questions of a national and international nature.
- Seek qualified researchers and funding to help answer refuge-specific management questions.
- Participate in appropriate multi-refuge studies conducted in partnership with the USGS or other research entities.
- Facilitate appropriate and compatible research by providing access and utilization of the refuge as a location for ongoing research.
- Promote the refuge as a stable area where long-term studies have thrived, and where opportunities for additional long-term studies that address emerging environmental and conservation issues can be accommodated.
- Provide an outlet for dissemination of biological and ecological scientific information through use of the NWVC as a site for symposia, conferences, and open houses.

Adaptive Management

All of the alternatives will employ an adaptive management approach for improving resource management by learning from management outcomes. To provide guidance on

policy and procedures for implementing adaptive management in departmental agencies, an intra-departmental working group developed a technical guidebook to assist managers and practitioners (Williams et al. 2007). It defines adaptive management, the conditions under which we should consider using it, the process for implementing it in a structured framework, and evaluating its effectiveness (Williams et al. 2007). In the guidebook, adaptive management is defined as, “A decision process that promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood.”

Harding Spring Pond Outlet - USFWS



At the refuge level, monitoring key resources and management actions and outcomes will be important to implementing an adaptive management process. Forest restoration and management, invasive species, and impoundment management activities are examples of refuge programs or activities where an adaptive management approach will be implemented. The refuge manager will be

responsible for changing management actions and strategies if they do not produce the desired conditions. Significant changes from what we present in our final CCP may warrant additional NEPA analysis and public comment. Minor changes will not, but we will document them in our project evaluation or annual reports.

Protecting Land

In July 2011, the Director approved a preliminary project proposal that starts the process for exploring land protection options in southern Maryland and detailed planning for a potential Refuge System expansion that could include six focus areas in three relatively intact Chesapeake Bay river landscapes. This includes portions of the Lower Potomac River and the entire Patuxent River and South River watersheds. The focus of the planning process will begin with the following focus areas: Patuxent River, South River, Mattawoman Creek, Nanjemoy Creek, Zekiah Swamp, and McIntosh Run. We would build upon existing conserved lands to enhance and strengthen the ecosystem function of rivers and migratory corridors.

The initial description of the project includes up to 40,000 acres (16,187 hectares) within an approved refuge acquisition boundary. Following the CCP, the refuge will develop a separate land protection plan with public and agency involvement in compliance with Service policy and NEPA. The Service’s role will involve working with the Chesapeake Bay Field Office and other Federal, State, local, and nongovernmental organization

partners to target conservation efforts, acquire conservation easements, and acquire property. If we decide to increase the lands of the refuge we will amend the CCP to guide the management of these new lands. The ultimate objective is to employ the combined land conservation and management strength of all partners to conserve and link the exceptional wildlife and public use values in the internationally recognized Chesapeake Bay watershed.

Managing Invasive Species

The permanent protection of land is the keystone of wildlife and habitat conservation. Land protected by the Refuge System will be available forever to support fish, wildlife, and plants. We can restore, enhance, or maintain the land we own to provide optimal conditions for Federal trust resources such as threatened or endangered species and those species whose populations are in decline.

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.”

Guidance on managing invasive species on refuges appears in the Service Manual (620 FW 1.7G). The following actions, define our general strategies on the refuge:

- Manage invasive species to improve or stabilize biotic communities to minimize unacceptable change to ecosystem structure and function and to prevent new and expanded infestations of invasive species.
- Conduct refuge habitat management to prevent, control, or eradicate invasive species using techniques described through an integrated pest management plan, or other similar management plan. The plan will comprehensively evaluate all potential integrated management options, including defining threshold of risk levels that will initiate the implementation of management actions.
- Evaluate native habitat management activities with respect to their potential to accidentally introduce or increase the spread of invasive species and modify our habitat management operations to prevent increasing invasive species populations.
- Refuge integrated pest management planning addresses the abilities and limitations of potential techniques including chemical, biological, mechanical, and cultural techniques.
- Manage invasive species on refuges under the guidance of the National Strategy for Invasive Species Management (USFWS 2003) and within the context of

applicable policy.

The following actions define our specific strategies for the refuge:

- Continue to promote research into biological control alternatives.
- Continue the treatment of the most problematic species ranked in management priority based on the extent to which the species is established on the refuge, their potential to negatively impact sensitive or priority refuge plant communities by virtue of their proximity to these resources, and the degree of management difficulty involved in controlling the species.
- Maintain early-detection and rapid-response readiness regarding new invasions.
- Maintain accessibility to affected areas for control and monitoring.
- Continue and increase efforts to involve the community in promoting awareness of invasive species issues and seek assistance for control programs on- and off-refuge.

Monitoring and Abating Wildlife and Plant Diseases

The Service has not yet published its manual chapter on disease prevention and control. In the meantime, we derive guidance on this topic from the Refuge Manual and specific directives from the Director of the Fish and Wildlife Service or the Secretary of the Interior. The Refuge Manual (7 RM 17.3) lists three objectives for the prevention and control of disease:

- 1) Provide for the early detection and identification of disease mortality when it occurs.
- 2) Manage wildlife populations and habitats to minimize the likelihood of the contraction and contagion of disease.
- 3) Minimize the losses of wildlife from outbreaks of disease.

Currently, the refuge partners with MD DNR for deer disease monitoring. Samples from deer harvested on the refuge are taken for chronic wasting disease and epizootic hemorrhagic disease. Aerial pellet drops for raccoon rabies control is also conducted on the refuge in conjunction with the State. Emerald ash borer traps are distributed throughout the refuge and monitored by MD DNR's forestry division.

USGS also conducts monitoring and research on the refuge related to a variety of wildlife and plant diseases. Recent onsite studies conducted by USGS include Cache Valley disease as related to mosquitoes and a recent die-off of wood frogs related to chytrid fungus.

Other efforts include monitoring for Rana virus, avian influenza, West Nile virus, and a variety of oak diseases (sudden oak death, gypsy moth, and oak wilt) and other tree-related diseases.

Continuing Existing Projects Managed by Outside Programs

Fort Meade Groundwater Monitoring

A number of hazardous substances, unexploded ordnance, and munitions have been associated with the transfer of former military trainings grounds (North Tract's 8,100 acres/3,278 hectares) from Fort Meade through the Base Realignment and Closure Act. Hazardous substances include, but are not limited to, lead, petroleum-based waste, and unexploded ordnance. The refuge has cooperated with DOD in establishing monitoring wells at several locations on the North Tract for continuous long-term monitoring of ordnance and demolition-related compounds such as cadmium and volatile organic compounds. Groundwater monitoring wells have also been established to monitor contaminants moving from Fort Meade sites through underground aquifers underlying refuge property, including trichloroethylene and perchloroethylene (URS 2010). In total, 12 groundwater monitoring wells have been installed on North Tract by Fort Meade.

Unexploded Ordnance Sweeps and Removal

An abandoned trap and skeet range may undergo a soil removal action to eliminate lead-contaminated soil. Ordnance is removed as it is encountered in the field by ordnance demolition teams supplied by Fort Meade or other nearby military bases (URS 2010).

Cemetery Maintenance

The North Tract includes 10 Fort Meade inholdings that are historic cemeteries, totaling approximately 3.4 acres. These have headstones dating back to the 1700s, with some in use as recently as 1969 (Hileman 1998). They include graves and headstones of former landowners and their extended families. Since Fort Meade owns the cemeteries, they are responsible for management and preservation, although the refuge does minimal cosmetic maintenance such as fence repair, tree removal, etc., as the public's perception is that the refuge owns these plots.

Four of the ten cemeteries were part of the former Fort Meade lands transferred to the refuge in 1991 and 1992. These are the John Penn Cemetery, and three others that are unmarked. The refuge performs minimal custodial work at the John Penn site.



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North Tract Cemetery

Baltimore Gas and Electric (BG&E) and Potomac Electric Power Company (Pepco) Right-of-Ways

BG&E manages 5.5 miles (9 kilometers) of powerline right-of-ways through the refuge's North Tract. Pepco manages 3.5 miles (6 kilometers) of powerline right-of-way on the refuge, which crosses the Central and South Tracts. The refuge has completed compatibility determinations for the BG&E right-of-way, which is included in appendix C. PEPCO applied to renew the right-of-way prior its expiration in 2010; however, the application is still pending. As a part of the permitting process, we will issue a new compatibility determination that will include any needed environmental and policy compliance measures.

Protecting Cultural Resources

As a Federal land management agency, we are responsible for locating and protecting all historic resources, specifically, archaeological sites and historic structures eligible for listing or already listed on the National Register of Historic Places. That applies not only to refuge land, but to land affected by refuge activities, and to any museum properties.

The refuge contains archaeological resources that have and may contribute to the understanding of State, regional, and national prehistory and history. A total of 41 archaeological sites registered with the Maryland Historical Trust and the Service are present within the refuge boundary (Grubb 2011). Additionally, three registered historic districts are contained within the refuge boundary. See chapter 2 for more information.

In July 2011, a MOA was signed between the Service, USGS, and Maryland Historical Trust to facilitate treatment of 51 previously identified, historic-eligible structures on the Central and South Tracts. The MOA allowed for the retention or adaptive reuse of 16 of those structures and the demolition of 35 of those structures. Eleven of the demolition-ready assets were removed in 2011. The MOA also mandated a series of actions to mitigate the impact of demolition of the structures, and included commitments by the Service to develop a short documentary film, an interactive display, and brochure that interpret the importance of their cumulative history at Patuxent Research Refuge. These mitigating efforts were completed in September 2011.

Under all the alternatives, we will evaluate the potential for our management activities to impact archaeological and historical resources as required, and will consult with the Service's regional archaeologists and the State Historic Preservation Office to ensure compliance with Section 106 of the National Historic Preservation Act and any other applicable laws and regulations, regardless of the alternative implemented. That compliance may require any or all of the following: a State historic preservation records survey, literature survey, or field survey.

Appropriateness and Compatibility Determinations

Chapter 1 describes the requirements for determinations of appropriateness and compatibility. Appendix C includes appropriateness and compatibility determinations consistent with implementing alternative B, the Service-preferred alternative. All existing findings of appropriateness and compatibility determinations will be updated for the

alternative selected under the final CCP. These activities would be evaluated based on whether or not they contribute to meeting or facilitating refuge purposes, goals, and objectives. As noted above, hunting, fishing, wildlife observation and photography, and environmental education and interpretation, when compatible, are the priority wildlife-dependent, public uses of the Refuge System. According to Service Manual 605 FW 1, these uses should receive preferential consideration in refuge planning and management before the refuge manager analyzes other public uses for appropriateness and compatibility.

Wildlife-dependent Recreation

The Refuge System Improvement Act of 1997 designated six priority public uses on national wildlife refuges: hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Per the general guidelines for wildlife-dependent recreation (Fish and Wildlife Service Manual 605 FW 1), we will continue to use the following criteria for quality, wildlife-dependent recreation in developing refuge programs. According to Service policy, a quality and wildlife-dependent recreation opportunity:

- Promotes safety of participants, other visitors, and facilities.
- Promotes compliance with applicable laws and regulations and responsible behavior.
- Minimizes or eliminates conflict with fish and wildlife population or habitat goals or objectives in an approved plan.
- Minimizes or eliminates conflicts with other compatible wildlife-dependent recreation.
- Minimizes conflicts with neighboring landowners.
- Promotes accessibility and availability to a broad spectrum of the American people.
- Promotes resource stewardship and conservation.
- Promotes public understanding and increases public appreciation of America's natural resources and our role in managing and conserving these resources.
- Provides reliable and reasonable opportunities to experience wildlife.
- Uses facilities that are accessible to people and blend into the natural setting.
- Uses visitor satisfaction to help to define and evaluate programs.

The refuge supports all of the six priority public uses. In 2006, the region 5 visitor services program assessed all of the refuges to determine what the most appropriate areas of emphasis for wildlife dependent public uses should be. That team identified environmental education and interpretation for Patuxent Research Refuge. A formal visitor survey in conjunction with USGS was conducted from 2010 to 2011 to analyze visitor use in relation to local economic benefits. The results of this survey have not yet

been compiled. However, staff and volunteer observations indicate that most visitors to the refuge engage in some form of wildlife-dependent recreation. As with many refuge programs, our partners, Friends of Patuxent, and volunteers will continue to help us expand these priority public use programs.

Under all alternatives, the refuge would continue to allow deer, turkey, and waterfowl hunting according to refuge and State regulations, because the hunt program has been effective at providing quality hunting opportunities and maintaining healthy populations of hunted species. Minor changes to hunt areas, days, and small game species may be pursued under each of the alternatives, but the refuge would continue to work with the Meade Natural Heritage Association (MNHA) to manage hunting on the refuge.

Non-wildlife-dependent Activities

Some activities have been ongoing and have been reviewed under previous appropriateness findings and compatibility determinations. The CCP policy requires that we reevaluate all uses during the CCP process. The ongoing uses include research and monitoring, jogging, hiking, dog walking, cross country skiing, horseback riding, search and rescue, dog training, secret service training, and bicycling. Other non-wildlife-dependent uses include softball fields, primitive scout camping, and shooting ranges.

Current compatibility determinations for non-wildlife-dependent activities have been completed, as necessary, and can be found in appendix C.

Shooting Range Management

Under any alternative, the refuge will continue its efforts to minimize impacts from the ten active shooting ranges located on the North Tract. These ranges are on the property the Service received from the DOD in 1991 and 1992, as part of the Base Realignment and Closure Act of 1988, and we provide for continued use of each range, to the extent that certain Federal agencies used it, when this use is consistent with the paramount purposes of the refuge for wildlife conservation (Pub. L. 101-519, Sec. 126(b) (Nov. 5, 1990):

“The Secretary of the Interior shall administer the property transferred pursuant to subsection (a) consistent with wildlife conservation purposes and shall provide for the continued use of the property by Federal agencies to the extent such agencies are using it on the date of the enactment of this Act, including activities of the Department of Defense that are consistent with the recommendations of the Base Realignment and Closure Commission.”

In 1990, PWRC Director, Harold O’Connor issued an initial determination that ongoing uses by other Federal agencies were compatible with ongoing and proposed research at the PWRC.

The shooting ranges are managed by the National Security Agency (NSA), through a special use permit issued by the refuge. They are used by 18,000 to 24,000 shooters a year. There are multiple issues with the ranges, including the negative impact on other

refuge operations and public use, reducing opportunities for wildlife research, and potential contamination from the deposition of lead and other heavy metals.

The compatibility determination that is referenced above is out of date and requires site investigations and analyses to comply with existing Service policy regarding compatibility determinations. Since the transfer of the North Tract to the Service, we have been issuing a special use permit that is renewed on a 5-year interval. Beginning in 2012, we will begin issuing the permit on a 2-year interval with the intent of completing a compatibility determination, including any necessary stipulations to maintain compatibility, within 10 years of completion of the CCP. We anticipate that information about direct and indirect impacts to wildlife, habitat, contamination, and other refuge uses will need to be gathered during that time. We will require the Federal agencies using each range to fund the required contaminant studies. The refuge has worked with NSA, the U.S. Secret Service and many of the other range users to coordinate schedules, and reduce impacts to refuge operations. This coordination will continue, and we plan to increase analysis and implementation of options that may help minimize or eliminate some of the management issues. These strategies may include bullet traps, field-of-fire shutters, bullet recycling rules, reconfiguration of active ranges, decontamination of closed ranges and possible range relocation (on or off refuge). The expectation is that the costs associated with any strategies that are implemented will be borne by the primary users.

Ballfields on the North Tract

The NSA operates four softball fields at the entrance to the North Tract. The fields are located on refuge land and were in operation at the time that the land was transferred to the Service. The NSA manages softball leagues that include 36 teams and occur from April through August. We have previously issued a special use permit to NSA for the operation of the fields. When the lands were transferred, Congress expected that Federal uses of the land would be allowed to continue as long as they are consistent with wildlife conservation. As a part of our review of all refuge uses as required in our CCP process, we have determined that the use of ballfields is not compatible with the purposes for which the refuge was established. After the 2012 league season, the ballfields would be closed and restored to natural conditions (16 U.S.C. 668dd(d)(3)(B)(vi)).

Refuge Staffing and Administration

Our proposals in this document do not constitute a commitment for staffing increases or funding for operations, maintenance, or future land acquisition. Congress determines our annual budgets, which our headquarters and regional offices distribute to the field stations. Chapter 2 presents our levels of staffing, operating, and maintenance funds for the refuge over the last 5 years.

Permanent Staffing and Operational Budgets

In all the alternatives, our aim is to sustain levels of annual funding and staffing that allow us to achieve refuge purposes, as interpreted by the goals, objectives, and strategies that we will establish in the final CCP.

In all the alternatives, we would seek to fill any currently approved, but vacant, positions,

which we believe are necessary to accomplish our highest priority projects. Alternatives B and C also propose additional staff to support maintenance, law enforcement, and visitor services programs. We identify our recommended priority order for new staffing in the RONS tables in appendix D.

Facilities Construction and Maintenance

The refuge has an unusually high amount of infrastructure, much of it supporting other Federal entities located onsite. It is the headquarters for the USGS PWRC, which employs approximately 150 people onsite. The Service Division of Migratory Bird Management also employs approximately 45 people onsite. This additional staff necessitates a high amount of infrastructure (offices, animal colonies, labs, mailing facilities, etc.) and impacts refuge assets which are further described below.



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NWVC Side Entrance

The refuge manages the NWVC, one of the largest science and environmental education centers operated by DOI, the North Tract Visitor Contact Station, MNHA Hunting Control Station, and the North Tract environmental education classroom, plus outdoor education sites that include an environmental education pavilion and schoolyard habitat (for more information on these facilities and grounds, please refer to chapter 2).

The presence on the refuge of USGS PWRC, one of the country's premier biological research centers, enables a capability found nowhere else in DOI to support the research needs of its land management bureaus. The refuge's land base and animal research facilities enable scientists to work on the propagation of endangered species, the most notable recent example being the whooping crane. Collocation onsite with the Service Division of Migratory Bird Management enables USGS PWRC to more effectively support research and monitoring activities including the National Bird Banding Laboratory, Breeding Bird Survey, North American Waterfowl Harvest Management Program, and numerous studies of migratory birds. USGS scientists use the refuge as a laboratory for studies that generate results that are used at refuges across the country.

Until 1994, the Service directed both PWRC and refuge management activities on the refuge. In 1994, all DOI biological research functions were separated from the Service, transferred to the newly established National Biological Service, and to USGS a few years later. The transfer resulted in the organizational separation of PWRC and the refuge. The biological research functions are now administered by USGS, which is headquartered in Reston, Virginia. The refuge management functions

remain the responsibility of the Service. The lands, buildings, and infrastructure are the sole property of the Service. A MOA between the Service and USGS, established and signed in 2000, outlines the administration, operations, and maintenance of facilities of the refuge and of PWRC (MOA July 2000). The MOA also includes a list of all of the buildings on the refuge and designates which are proposed for demolition or retention (appendix E).

In addition to a multitude of facilities, the refuge has 13.68 miles (22 kilometers) of paved public roads, 3.97 miles (6 kilometers) of gravel public roads, and 6.38 miles (10 kilometers) of administrative roads.

The activities at the refuge and PWRC require g-of-the-art laboratory space, animal handling facilities, and staff quarters. The separate but interrelated needs lead to complex facility issues, largely as the result of the number and age of the facilities (many of the facilities were constructed in the late 1930s, and most of the newer assets were constructed prior to the mid-1960s), and the collocated functions. Facility issues include facility operations and maintenance, many historic and cultural resource considerations (refuge facilities encompass three historic districts), highly specific and technical research facilities requirements, and complex coordination of activities between the two agencies.

Given the many facilities and infrastructure challenges facing the refuge, a facilities modernization plan has been developed to ensure that renovation, construction, demolition, and other proposed activities and priorities fit appropriately within the bureaus' missions and DOI asset management principles. To address these requirements, the bureaus developed strategic priorities for the modernization of DOI assets on the refuge. These include:

- Consolidation of resources and facilities on to the Central Tract of the refuge, resulting in an overall reduced and more economical footprint.
- Conversion to publicly owned and maintained utility services.
- Reforestation of a portion of the South Tract.
- Relocation to the refuge of USGS staff currently housed in offices on the Beltsville Agricultural Research Center.
- Collocation of Service and USGS.
- Improvement of the work environment for DOI workforce.
- Renovation of animal research assets.
- Energy efficiency and green building design (Dyrlund et al. 2009).

Wild and Scenic River Review

As discussed in chapter 1, we are required to review river segments that cross the refuge as to their potential for inclusion in the National Wild and Scenic River System. As a first

step, we reviewed the National Rivers Inventory. The inventory is a listing of more than 3,400 free-flowing river segments in the U.S. that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance. Patuxent Research Refuge does not include any river segments that are on the inventory and the nearest river segment is a section of the Patuxent River approximately 20 miles downstream.

As stated earlier, the refuge includes sections of the Patuxent and Little Patuxent Rivers. The sections of river through the refuge are impacted by former military operations, management access roads, and altered hydrology from on and off stream impoundments. In addition, the river segments are too short in length to effectively manage for wild and scenic characteristics. Therefore, we do not recommend that these sections of the Patuxent and Little Patuxent Rivers be included in the National Wild and Scenic River System.

Wilderness Review

As discussed in chapter 1, we are also required to review refuge lands and waters for inclusion in the National Wilderness Preservation System. The Wilderness Review is included as appendix B. The CCP planning team found that each of the three Wilderness Inventory Areas that were examined and therefore, the entire Patuxent Research Refuge do not meet the minimum criteria for wilderness as identified in Section 2(c) of the Wilderness Act. While there are ecological and historic values on the refuge, these do not, in and of themselves, warrant wilderness recommendation. In summary, Patuxent Research Refuge does not qualify as a Wilderness Study Area, and will not be considered further for wilderness designation in this CCP.

3.4 Actions Common to Alternatives B and C

In addition to the comprehensive framework that was developed and is underway, alternatives B and C identify specific actions to improve facilities and address visitor use issues. Common to alternatives B and C are the following:

- Expand hours for South Tract trails and grounds from dawn to dusk.
- Utilize green technology to update NWVC and modify building structure and grounds to be more wildlife friendly (e.g., window screening to reduce bird strikes).
- Update and modify the Wisdom of Wildness exhibits.
- Construct additional space for environmental education and interpretation classes.
- Collaborate with Fort Meade and other stakeholders on a comprehensive redesign of the shooting ranges on the North Tract, including design and operational protocols, to reduce the deposition and accumulations of lead ammunition into areas D, E, and F, and protect the health of wildlife and safety of users of those areas; assess the quantity and distribution of lead deposition; study the feasibility and implementation of cleanup; and consider range by range renovations (bullet

traps, berm enhancement, “no-sky” shooting stations, etc.) if a comprehensive rehabilitation is not possible. In addition, pursue range renovations to reduce impact zone, recycle spent ammunition, clean up lead, and further implement EPA’s best management practices for outdoor ranges. We will revise the current 5-year special use permit length to a 2-year special use permit. If necessary, we will perform additional NEPA analysis and public involvement to implement any changes in range operation.

- Obtain funding from the DOD for all needed remediation (such as soil sifting, phyto-remediation, phosphate immobilization) excavation of hot spots, and disposal of accumulated lead-based ammunition on soils and streams in areas D, E, F, G, H, I, and J on the North Tract.
- Assess the cause of poor revegetation in former firing range area NT-7 (e.g., result of soil type and soil contamination).

Impoundment Management

Under alternatives B and C, refuge staff along with partners within the Service, MD DNR, and PWRC examined the management of impoundments across the refuge. Table 3-1 compares the management of the impoundments included in that process for all of the alternatives.

Table 3-1. Comparison of Management of Impoundments under each Alternative

Impoundment	Alternative A	Alternative B	Alternative C
Bailey Bridge Marsh	Open Water (0.7 acres)	Floodplain Forest and Swamp (0.7 acres)	
Bluegill	Open Water (1.4 acres)	Deciduous, Pine, and Mixed Forest (1.4 acres)	
Borrow Pit 1	Open Water (0.5 acres)		Deciduous, Pine, and Mixed Forest (0.5 acres)
Borrow Pit 2	Open Water (0.7 acres)		Deciduous, Pine, and Mixed Forest (0.7 acres)
Borrow Pit 3	Depressional Forested Wetland (0.3 acres)		Deciduous, Pine, and Mixed Forest (0.5 acres)
	Emergent Wetland (0.2 acres)		
Bullfrog	Floodplain Shrub Wetland (1.3 acres)		Floodplain Forest and Swamp (1.9 acres)
	Open Water (5.7 acres)		Floodplain Shrub Wetland (1.3 acres)
			Open Water (3.8 acres)
Clay Pit Pond	Depressional Forested Wetland (0.1 acres)		
	Open Water (0.7 acres)		

Impoundment	Alternative A	Alternative B	Alternative C
Dragonfly Pond	Open Water (0.5 acres)		
Duvall 1	Open Water (15.0 acres)	Floodplain Forest and Swamp (15.0 acres)	Open Water (15.0 acres)
Duvall 2	Floodplain Forest and Swamp (1.0 acres)	Floodplain Forest and Swamp (7.7 acres)	
	Floodplain Shrub Wetland (0.3 acres)		
	Open Water (6.4 acres)		
Fire Control Pond	Depressional Forested Wetland (0.2 acres)		Depressional Forested Wetland (1.6 acres)
	Emergent Wetland (0.5 acres)		
	Open Water (0.8 acres)		
Goose Pond	Open Water (1.2 acres)	Deciduous, Pine, and Mixed Forest (1.2 acres)	
Gravel Pit Pond	Open Water (0.9 acres)		Floodplain Forest and Swamp (0.9)
Hance 1	Floodplain Shrub Wetland (2.7 acres)	Floodplain Forest and Swamp (7.4 acres)	
	Open Water (4.7 acres)		
Hance 2	Emergent Wetland (1.5 acres)	Floodplain Forest and Swamp (6.2 acres)	
	Floodplain Shrub Wetland (1.5 acres)		
	Open Water (3.2 acres)		
Harding Spring Pond	Open Water (1.7 acres)	Deciduous, Pine, and Mixed Forest (1.7 acres)	Open Water (1.7 acres)
Hobbs Pond	Open Water (10.8 acres)	Floodplain Forest and Swamp (10.8 acres)	
Kingfisher	Open Water (4.5 acres)		
Knowles 1	Floodplain Shrub Wetland (4.2 acres)	Floodplain Forest and Swamp (43.2 acres)	
	Open Water (39.0 acres)		
Knowles 2	Floodplain Forest and Swamp (0.2 acres)	Floodplain Forest and Swamp (19.3 acres)	
	Floodplain Shrub Wetland (7.3 acres)		
	Open Water (11.8 acres)		
Knowles 3	Floodplain Forest and Swamp (1.7 acres)	Floodplain Forest and Swamp (15.8 acres)	

Impoundment	Alternative A	Alternative B	Alternative C
	Floodplain Shrub Wetland (6.5 acres)		
	Open Water (7.6 acres)		
Lake Redington	Open Water (35.4 acres)		Deciduous, Pine, and Mixed Forest (35.4 acres)
Mabbott Pond	Deciduous, Pine, and Mixed Forest (4.1 acres)	Open Water (4.1 acres)	Deciduous, Pine, and Mixed Forest (4.1 acres)
Mallard Pond	Floodplain Forest and Swamp (0.4 acres)		Floodplain Forest and Swamp (4.0 acres)
	Open Water (3.7 acres)		
Millrace	Emergent Wetland (40.8 acres)	Floodplain Forest and Swamp (60.0 acres)	
	Floodplain Shrub Wetland (7.4 acres)		
	Open Water (11.8 acres)		
Old Gravel Pit Pond	Open Water (1.4 acres)		
Patuxent Marsh	Emergent Wetland (2.1 acres)	Floodplain Forest and Swamp (13.9 acres)	
	Floodplain Forest and Swamp (10.0 acres)		
	Floodplain Shrub Wetland (0.5 acres)		
	Open Water (1.2 acres)		
Salamander	Depressional Forested Wetland (0.1 acres)		
	Depressional Shrub Wetland (0.2 acres)		
	Open Water (1.3 acres)		
Shafer Farm Pond	Floodplain Forest and Swamp (1.6 acres)		
	Floodplain Shrub Wetland (0.3 acres)		
	Open Water (16.8 acres)		
Shafer Lake	Open Water (24.0 acres)		
Snowden Pond	Open Water (8.3 acres)	Depressional Forested Wetland (8.3 acres)	Open Water (8.3 acres)
Sundew Pond	Open Water (1.6 acres)		
Telegraph Swamp	Depressional Forested Wetland (4.7 acres)		
	Floodplain Forest and Swamp (4.2 acres)		

Under either alternative, we would acquire any necessary permits and approvals and would consult with any appropriate agencies before beginning work to alter any of the wetlands. In general, the work would change the type of wetland and would not result in an overall loss of wetlands (e.g., emergent wetland to forested wetland). Alternatives B and C propose changes to some of the impoundments on the refuge. In each case, we would accomplish the impoundment conversion through opening water control structures, replacing culverts, or other non-construction means of removing barriers to natural hydrologic conditions. Major construction or earth moving activities are not anticipated as a part of these actions.

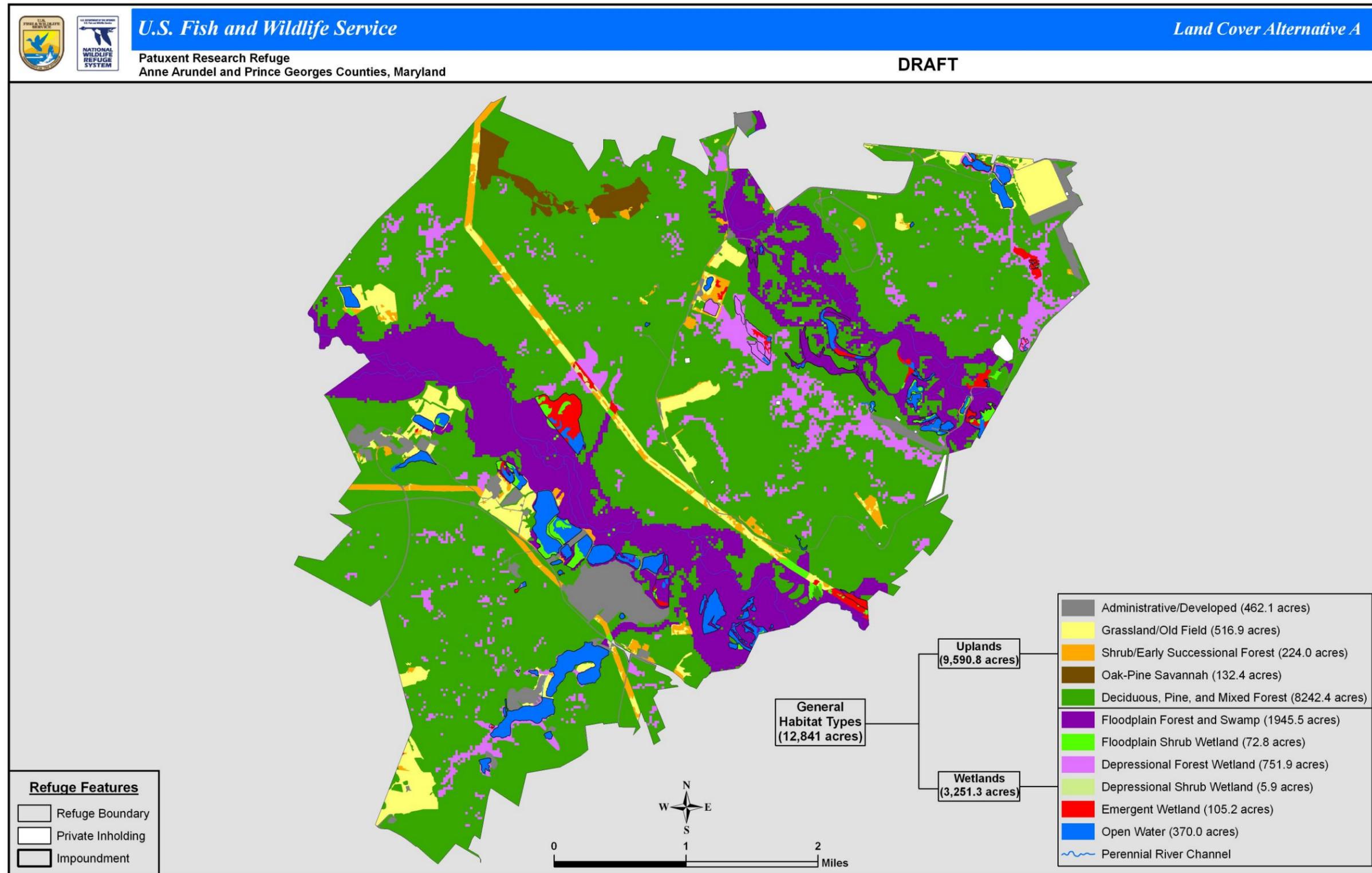
3.5 Alternative A. Current Management (No Action)

In addition to the actions common to all, this alternative describes our current refuge programs on 12,841 acres (5,197 hectares) for habitat management, fish and wildlife inventories and monitoring, administrative infrastructure and staffing, and visitor services. Although we intend this alternative to describe a snapshot in time of current management actions, we include activities we have put in motion but not yet brought to their final, desired state. It highlights predominant management efforts but is not inclusive of every kind of management.

Habitat Management

This chapter presents the existing refuge habitat types and management shown in map 3-1. Under current management, we would continue to manage for and maintain a diversity of habitats, including forests, forested wetlands, pine-oak savannah, grasslands, and scrub-shrub on the refuge. The refuge would continue to maintain 516 acres (209 hectares) of grasslands through seasonal mowing, prescribed fire, and herbicide application, while allowing for a few fields (less than 25 acres total) to revert to forest. The refuge would continue to manage 61 impoundments (total 553 acres/224 hectares.). A variety of early successional habitats, including grassland and scrub-shrub habitats, would be managed for within the 5.5-mile (9 kilometer) BG&E right-of-way and within the 3.5 mile (6 kilometer) Pepco right-of-way. The refuge would continue to manage for 2,775 acres (1,123 hectares) of floodplain forest and associated wetlands, and 8,300 acres (3,359 hectares) of upland forest and their associated wetlands. The refuge would maintain 50 acres (20 hectares) of savannah habitat through fire and mechanical management.

Map 3-1. Existing Habitat



Inventories and Monitoring

Under current management, baseline surveys and monitoring of selected management actions and wildlife populations occur. Ongoing inventories and monitoring include, but are not limited to, breeding bird, whip-poor-will, and woodcock surveys; spring frog and toad call counts; marsh bird, migratory and wintering waterfowl surveys; bat and white-tailed deer surveys; and blue bird and kestrel nest box monitoring. Invasive species monitoring and mapping also occurs. We would continue this level of monitoring and inventory, modifying existing protocols, adding new ones, and dropping old ones as necessary to gain information to inform adaptive management decisions (table 3-2).

As with all of our activities, the degree to which we can conduct monitoring and inventories depends on the availability of resources, including refuge funding and staff, and the contributions of partners and volunteers.

In addition to monitoring conducted by the Service, USGS is involved in multiple long-term monitoring studies that include, but are not limited to, box turtle, salamander, and frog surveys; native bee and pollinator surveys; operation of a banding station during the spring and fall migration periods, and during the nesting season for the monitoring avian productivity and survival program (administered by the Institute for Bird Populations); participation in the annual Bowie Christmas Bird Count, and occasional surveys of breeding bird distribution across the refuge and red-shouldered hawk and blue bird surveys.

Table 3-2. Current Inventory and Monitoring Activities, Listed in Priority Order

Survey	Season	Location	Staff Time Per Survey	Annual Staff Time	Reports	Duration	Coordinator
Waterbird survey	Year-round	All impoundments and wetlands in the refuge	0.10	7.0	Waterbird Census	Since 1989	Refuge volunteer
Waterfowl production monitoring	Breeding season (March to June)	All impoundments and wetlands in the refuge	0.07	5.5	Waterfowl Production Summary	Since 1997	Refuge volunteer
Invasive plant survey	Growing season (April to September)	Refugewide	0.20	12.0		Since 2005	Refuge biologist
Anuran call count survey	Late Feb. to mid-June, every other Thursday	Selected impoundments and wetlands in the refuge	0.07	3.5		Since 1999	Refuge biologist
Woodcock survey	Mid-Feb. to first week of May, every Monday	Selected locations in North Tract of the refuge	0.02	2.0		Since 1999	Refuge volunteer
Aerial detection survey for	Mid-June to early July	Refugewide	0.01	0.5		Since 2000	Forester, US Forest Service

Survey	Season	Location	Staff Time Per Survey	Annual Staff Time	Reports	Duration	Coordinator
gypsy moth							
Vascular plant inventory in North Tract	Growing season (April to September)	North Tract of the Refuge	0.02	2.0		Since Fall 2010	Refuge volunteer
Harvest data collection	Hunting season, Sept. 1 to Jan. 31 + spring turkey hunt	Refugewide	0.05	10.0		Since 1994	Refuge biologist
Acoustic bat survey	Two nights, late June	Refugewide	0.02	2.0		Initiated in 2010	Refuge biologist
Wood duck nest box monitoring	Breeding season (March to June)	All impoundments and wetlands in the refuge	0.01	2.0	Waterfowl Production Summary	Since 1997	Refuge volunteer
Whip-poor-will survey	Second week of May to end of July	Selected locations in North Tract of the refuge	0.02	2.0		Since 2000	Refuge volunteer
Songbird nest box monitoring	April to early August	Refugewide	0.01	1.0		Since 1993	Refuge volunteer
Deer survey	Two evenings in March	Refugewide	0.005	0.5		Since 1999	Refuge biologist
Raptor nest box monitoring	April to early August	North and Central Tracts	0.005	0.0		Since 1997	Refuge volunteer

Visitor Services

The refuge has a highly active visitor use program that supports the six priority public uses – environmental education and interpretation, hunting, fishing, and wildlife observation and photography. The following provides a brief summary of visitor use activities that occur on the refuge. The types of visitor service programs we provide would continue under the current management alternative.

The refuge would continue to provide exceptional environmental education and interpretive programs throughout the year. Staff would continue to update environmental education programs to reflect State learning standards, in addition to meeting Washington, DC learning requirements. Volunteers and staff would continue to provide a “meet and greet” to visiting school and youth groups and to provide assistance to those groups during their visit. Teacher, scout, and Jr. Duck Stamp workshops would continue to be offered and would run in accordance with teacher learning requirements.

Interpretation efforts would continue to focus on maintaining existing access points and infrastructure, including trails, parking, and interpretive exhibits, kiosks, printed materials, the refuge Web page, and signage. The refuge would continue to maintain and

utilize outdoor education areas such as the schoolyard habitat and would continue to offer multiple special events and a series of five to six multi-day youth camps. The refuge would continue to provide wildlife observation and photography opportunities, to host the Friend's annual art show and sale and the display of wildlife art work in the Hollingsworth Gallery, and to support the Junior Duck Stamp program and Maryland Black Bear Conservation Stamp program.

The refuge would continue to provide hunting opportunities for upland game, migratory game birds, and white-tailed deer from September through January, or according to State seasons. Select days in April and May would continue for wild turkey hunting. The refuge would also continue to provide fishing opportunities at established sites, in accordance with State regulations.

Refuge Staff and Volunteers - USFWS



The refuge would continue to provide a wide variety of volunteer opportunities and encourage community involvement. Volunteer opportunities cover a vast array of activities and literally keep the refuge going. The refuge would continue to maintain a quality internship program for both biological and environmental education/interpretation internships throughout the year; coordinate volunteer

activities between PWRC, MNHA, and the refuge; and promote community relations and recruit volunteers through outreach.

Refuge Administration

In this alternative, refuge staffing would remain at 25 positions for the refuge, all of which would be stationed on the refuge. Refuge staff are spread throughout the refuge with the majority of visitor services staff stationed at NWVC and at the North Tract Visitor Contact Station. Administrative staff, refuge law enforcement, maintenance, and biological staff are stationed on the Central Tract campus area of the refuge. We would maintain our present visitor services facilities as funds and staffing permit, but would construct no new ones.

In the discussion that follows, we describe in detail the goals, objectives, and strategies that we would implement under alternative A.

Existing visitor services infrastructure and opportunities are presented in maps 2-7 and 2-8.

Goals, Objectives, and Strategies under Alternative A

Goal 1: Maintain and actively promote Patuxent Research Refuge as an “outdoor laboratory,” providing a diversity of wildlife and natural resource research opportunities on the refuge in such areas as landscape conservation, habitat fragmentation, climate change, and other emerging issues, as well as the more traditional types of wildlife research, including inventory and monitoring techniques, land management, and understanding ecological processes. Research that supports the overall Service mission, and evaluates the best methods for protecting natural resources throughout the Refuge System and other land management agencies will be a priority.

Objective 1.1 Inventory and Monitoring

Conduct high-priority inventory and monitoring (survey) activities that evaluate resource management and public use activities to facilitate adaptive management. Patuxent Research Refuge staff and USGS staff developed a definition of priority research in an MOA for joint management issues. Priority research addresses important management issues and demonstrates proper wildlife management techniques.

Strategies

- Implement the draft inventory and monitoring plan developed for the refuge (22 surveys in fiscal year 2011).

Monitoring Elements

- Track the number of inventory and monitoring surveys conducted annually.
- Update the inventory and monitoring plan as additional resources of concern may be identified.

Rationale

Inventorying and monitoring of refuge resources will allow us to know if key wildlife and habitat objectives are being met. Data derived from inventory and monitoring efforts will be used to assess past management actions and potentially drive management actions to be taken in both the short and the long-term. Inventory and monitoring efforts may change, as the need to know about certain species may change.

Some long-term inventory and monitoring activities may be continued to provide a continuity of data on various species (e.g., waterfowl, waterbirds, etc.) over time, particularly as the data may pertain to climate change and other landscape-scale impacts.

Objective 1.2 Research and Scientific Assessments (Local, National, and International)

Facilitate research of a local, national, and international nature that benefits wildlife on refuge lands as well as all other natural areas. Facilitate scientific assessments to provide baseline information to expand knowledge regarding landscape-scale natural resource issues and to determine the status of onsite refuge resources to better inform resource management decisions.

Strategies

Continue to:

- Implement, conduct, and support wildlife/natural resource-related research projects from a broad range of researchers including USGS, other Federal agencies, universities, agencies of the State of Maryland, and independent researchers (33 studies in fiscal year 2011).
- Provide a secure land base for captive animal colonies, endangered species propagation, contaminant studies, etc.

Monitoring Elements

- Track the number of special use permits issued annually for research purposes.
- Track the number of multi-year research projects authorized over time.
- Track the number of reports, proceedings, and results published annually.

Rationale

This objective goes to the heart of why the refuge exists. The refuge was initially established in 1936 to serve as a wildlife experiment station and has since served as the site of multiple nationally and internationally significant breakthroughs in wildlife science. The PWRC has been a leading international research institution for wildlife and applied environmental research located on the refuge since its inception. The partnership, with the refuge providing the “outdoor lab” and secure locations for research and PWRC providing the research capability has been recognized internationally for its contributions to wildlife science.

The synergy achieved by allowing multiple partners and multiple entities and agencies to conduct their research essentially side by side is immeasurable. Facilitating multiple research opportunities for a variety of parties should remain paramount at Patuxent Research Refuge for the foreseeable future.

Goal 2: Protect, maintain, and restore, where possible, the biological integrity, diversity, and environmental health of forested ecological communities to provide habitat for species of conservation concern, including migratory birds, mammals, amphibians, reptiles, and invertebrates.

Objective 2.1 Floodplain Forest and Swamp, Depressional Forest, and Depressional Shrub Wetlands

Maintain the biological integrity of 1,920 (777 hectares) of native floodplain forest and shrub and the 729 acres (295 hectares) of depressional forest and shrub with 80 percent closed canopy and less than 10 percent invasive nonnative species along the Patuxent and Little Patuxent Rivers. Floodplain and depressional forest communities should be dominated by native riparian species common for this area, possess a well-developed under- and mid-story of native shrubs or recruiting trees, and provide functioning ecosystems and high water quality for breeding, migratory, and wintering habitat for bird species of conservation concern, including prothonotary warbler, Kentucky warbler, Louisiana waterthrush, rusty blackbird, and other forest-dependent species such as wood

frog, spotted turtle, eastern forest bats, and native insects. Total acreage under this alternative is 2,649.5 acres (1,072 hectares).

Strategies

- Control and reduce nonnative invasive species annually by using chemical, biological, or mechanical methods to increase native plant species diversity and richness.
- Prevent new invasive species from becoming established by utilizing early detection rapid response techniques to address invasive species populations through the appropriate control measures.
- Evaluate and adjust the white-tailed deer hunt program as necessary to meet native vegetation objectives. Coordinate management efforts with the MD DNR deer management program.

Monitoring Elements

- Conduct appropriate monitoring and survey programs to measure success with respect to objectives. The results may trigger adjustments to management strategies, or a reevaluation or refinement of objectives. Examples of monitoring or surveys may include:
 - Monitor invasive species prevention and control efforts through a combination of plant identification, inventories, and mapping.
 - Continue landbird surveys and migration counts to evaluate achievement of the objective for breeding and migrating birds.

Rationale

This habitat supports the greatest diversity of species within the refuge. Fifty-four species of invertebrates, birds, reptiles, and amphibians listed as species of greatest conservation need in the Maryland Wildlife Diversity Conservation Plan are found in the refuge's floodplain forests. Twenty-eight are priority bird species listed in either the BCR 30 or PIF 44 implementation plans.

These floodplain forests provide both nesting and migration habitat for bird species listed by regional conservation plans, including BCR 30 Implementation Plan, PIF 44 Bird Conservation Plan, the Maryland Wildlife Diversity Conservation Plan, and international plans like Saving Our Shared Birds and PIF Tri-National Vision for Landbird Conservation. High-priority nesting passerine birds common to these plans includes Acadian flycatcher, cerulean warbler, Kentucky warbler, Louisiana waterthrush, and prothonotary warbler. Other bird species benefiting from provision of this habitat types include migrating and nesting passerines such as Bicknell's thrush (*Catharus bicknelli*), black-and-white warbler (*Mniotilta varia*), black-billed cuckoo (*Coccyzus erythrophthalmus*), blackburnian warbler (*Dendroica fusca*), black-throated blue warbler (*Dendroica caerulescens*), black-throated green warbler (*Dendroica virens*), blue-headed vireo (*Vireo solitaries*), broad-winged hawk (*Buteo platypterus*), brown creeper (*Certhia americana*), Canada warbler (*Wilsonia canadensis*), golden-crowned kinglet (*Regulus satrapa*), hairy woodpecker (*Picoides villosus*), hermit thrush (*Catharus guttatus*),

hooded warbler (*Wilsonia citrine*), magnolia warbler (*Dendroica magnolia*), northern parula (*Parula americana*), pileated woodpecker (*Dryocopus pileatus*), red-eyed vireo (*Vireo olivaceus*), red-headed woodpecker (*Melanerpes erythrocephalus*), red-shouldered hawk (*Buteo lineatus*), scarlet tanager, veery (*Catharus fuscescens*), wood thrush, worm-eating warbler, and yellow-throated vireo.



Pileated Woodpecker – Charles Warren/NBII

The refuge contains the largest forested block in Maryland's Western Coastal Plain, and the Washington-Baltimore Corridor and is surrounded by a heavily urbanized landscape.

Floodplain forest communities have a well-developed and variable forest composition and structure with canopy and sub-canopy trees, understory shrubs, and a diverse ground cover. Frequency, duration, and severity of flooding vary seasonally and yearly, contributing to a rich diversity of species, vertical and horizontal structure, and ground cover, along with forest age, soils, elevation, slope, and disturbance frequency. Isolated local weather events impact small areas or individual trees and result in downed trees, snags, and broken branches.

Within this forest, several important small forested wetlands are found. Located on the broad flats between drainage streams, these wetlands are small, mostly closed canopy upland depression swamps. Magnolia bogs, a unique seepage wetland complex, are one example of the scattered, small (less than 25 acres), nontidal shrub wetlands found on the refuge. Small (less than 0.5 acre) vernal pools occur in low areas or as depressions or isolated floodwaters, backwaters of old beaver impoundments, old sinkholes, depressions created by military activity, or as perched spring or seep-fed basins.

Objective 2.2 Upland Deciduous, Pine, and Mixed Forest and Associated Wetlands

Maintain 8,242 acres (3,335 hectares) of native, mature upland forest communities with 80 percent closed canopy and less than 10 percent invasive species containing a diverse age structure and developed understory and midstory to provide breeding and migration winter habitat for whip-poor-will, scarlet tanager, cerulean warbler, eastern wood-pewee, wood thrush, worm-eating warbler, and yellow-throated vireo, and to benefit other forest-dependent species such as eastern forest bat (*Vespadelus pumilus*), eastern spadefoot toad, eastern chorus frog, eastern box turtle, hog-nosed snake, and native insects. Upland forest communities should be dominated by native tree species common to this area, such as American beech, hickories, tulip poplar, dogwood, persimmon (*Diospyros virginiana*), and upland oaks (northern and southern red oak, white oak, blackjack, post oak), and possess diverse shrub and herbaceous plant associations.

Strategies

- Control and reduce nonnative invasive species annually by using chemical, biological, or mechanical methods to increase native plant species diversity and richness.
- Prevent new invasive species from becoming established by utilizing early detection rapid response techniques to address invasive species populations through the appropriate control measure.
- Evaluate and adjust the white-tailed deer hunt program as necessary to meet native vegetation objectives. Coordinate management efforts with the MD DNR deer management program.

Monitoring Elements

- Conduct appropriate monitoring and survey programs to measure success with respect to objectives. The results may trigger adjustments to management strategies, or a reevaluation or refinement of objectives. Examples of monitoring or surveys may include:
 - Monitor invasive species prevention and control efforts through a combination of plant identification, inventories and mapping.
 - Continue landbird surveys and migration counts to evaluate achievement of the objective for breeding and migrating birds.

Rationale

This habitat supports the second highest diversity of species within the refuge. Fifty species of mammals, birds, reptiles, and amphibians listed as species of greatest conservation need in the Maryland Wildlife Diversity Conservation Plan are found in the refuge's upland forests. Forty-one are priority bird species listed by regional conservation plans, including the BCR 30 Implementation Plan, PIF 44 Bird Conservation Plan, and the Maryland Wildlife Diversity Conservation Plan, as well as international plans like Saving Our Shared Birds and Partners in Flight Tri-National Vision for Landbird Conservation. In addition to the priority nesting birds, other species that will benefit from the preservation of large blocks of such forest include migrating or nesting birds such as American redstart (*Setophaga ruticilla*), barred owl (*Strix varia*), Bicknell's thrush, black-and-white warbler, black-billed cuckoo, black-throated blue warbler, black-throated green warbler, broad-winged hawk, brown creeper, Canada warbler, dark-eyed junco (*Junco hyemalis*), eastern towhee, hairy woodpecker, hooded warbler, Kentucky warbler, least flycatcher (*Empidonax minimus*), northern parula, ovenbird (*Seiurus aurocapillus*), pileated woodpecker, red-eyed vireo, red-headed woodpecker, red-shouldered hawk, sharp-shinned hawk (*Accipiter striatus*), summer tanager (*Piranga rubra*), and veery.

Refuge upland forests are comprised of mesic deciduous and dry oak-pine forests. Mesic deciduous forests typically are an assortment of hardwoods in moist habitats, while dry oak-pine forests typically are found on more droughty, infertile soils. Most of the refuge's upland forests are mesic deciduous and many of the current pine forests are early successional mesic deciduous forests and reflect past timber management practices.

Upland forest communities have a well-developed and variable forest composition and structure with canopy and sub-canopy trees, understory shrubs, and a diverse ground cover. A rich diversity of species, vertical and horizontal structure, and ground cover result from age, soils, elevation, and slope. Isolated local weather events impact small areas or individual trees and result in downed trees, snags, and broken branches.

Within this forest, several important small forested wetlands are found. Located on the broad flats between drainage streams, these wetlands are small, mostly closed canopy upland depression swamps. Magnolia bogs, a unique seepage wetland complex, are one example of the scattered, small (less than 25 acre), nontidal shrub wetlands found on the refuge. Small (less than 0.5 acre) vernal pools and sphagnum bogs occur in low areas or as depressions or as isolated floodwaters, backwaters of old beaver impoundments, old sinkholes, depressions created by military activity, or as perched spring or seep-fed basins.

Objective 2.3 Oak-Pine Savannah

Continue to maintain 50 acres (20 hectares) of savannah habitat consisting of an open canopy dominated by native hardwoods (primarily oaks), and an understory dominated by native grasses such as broom sedge (*Carex scoparia*), little bluestem, and forbs such as asters and other composites for the benefit of rare darkling and tiger beetle species, upland chorus frog, native bees, Indian skipper (*Hesperia sassacus*) and other pollinators, and sandy barren plant communities.

Strategies

- Mechanically thin dense and stagnating pine stands to open up the understory and permit light penetration for germination of understory species associated with this habitat type and to release residual trees.
- Conduct prescribed fires to reduce debris from thinning and to maintain the open and early succession understory.
- Monitor and control invasive plant species such mile-a-minute weed, tree of heaven, sweetgum, black locust, and wisteria that are poised to overtake newly opened areas.

Rationale

In 1995, Warren E. Steiner, Jr., an entomologist with the Smithsonian Institution's Museum of Natural History, discovered sandy barrens on the North Tract. These small narrow barrens or deserts are located on deep sandy soils primarily on the northeastern side of the Patuxent River where the prevailing winds have deposited sand from marine and alluvial deposits exposed and reworked by the river (Droege et al. 2009). Since 1995, Steiner has identified 64 species of rare darkling beetles in the family *Tenebrionidae* in these sandy barrens. This diversity of species represents a distinct assemblage not found in any other habitat. In some cases, Patuxent Research Refuge represents the only known areas where some of these species can be found between the New Jersey pine barrens and the Carolina sandhills. The area also contains rare plants associated with this community

type. In 1996, USGS biologist Sam Droege also identified one of the few populations of chorus frog in this area. This species also depends on open, early succession habitat.

In 2001, Steiner, Droege and biologist Holly Obrecht, became concerned that increasing dominance of Virginia pine would shade out the sandy dry openings and threaten the survival of these specialized plants and insects unless action was taken to substantially reduce the pine canopy (Obrecht 2005 unpublished and Droege 1996 unpublished). An east-west orientation is recommended to capture the maximum amount of sunshine hours with least amount of shading cast by adjacent tall forest. A narrow, north-south orientation would result in long shadows cast by rising and setting sun angles for extended periods of time onto the savannah restoration acres, creating favorable growing conditions for competing forb and tree species, such as sweetgum, tulip poplar, and red maple.

Goal 3: Protect, maintain, and restore, where possible, the biological integrity, diversity, and environmental health of refuge aquatic habitats, located within the Patuxent, Little Patuxent, and Anacostia River watersheds, and impoundments, to provide habitat for species of conservation concern, including fish, invertebrates, and plants.

Objective 3.1 Coastal Plain River and Coastal Plain Stream Habitats

Maintain and protect the quality aquatic habitat of the approximately 68 riparian miles (109 kilometers) of Patuxent, Little Patuxent, and Anacostia River watersheds within the refuge, as well as their associated perennial streams, to provide spawning, nursery, foraging, and cover habitat for aquatic resources of conservation concern such as American brook lamprey, American eel, American and hickory shad, alewife, blueback herring, comely shiner, glassy darter, stripeback darter, and the State-endangered triangle floater. Provide quality foraging habitat for eastern forest bats, spotted turtle, and insectivorous birds such as prothonotary warbler and Louisiana waterthrush.

Strategies

- Provide opportunities for water sampling to occur via MD DNR and Anne Arundel and Prince George's Counties.

Monitoring Elements

- Conduct appropriate monitoring and survey programs to measure success with respect to objectives. The results may trigger adjustments to management strategies, or a reevaluation or a refinement of objectives. Examples of monitoring or surveys may include:
 - Monitor invasive species prevention and control efforts through identification, inventories, and mapping.

Rationale

Both stream and river habitat provides spawning, nursery, migration, and year-round habitat to many fish species that are rare, threatened, or endangered in Maryland or important economically and recreationally. Thirteen species of fish and four mussels

listed as species of greatest conservation need in the Maryland Wildlife Diversity Conservation Plan are found in the refuge's coastal plain river and stream habitat. Two



Duane Raver/USFWS

Blueback Herring

species are classified as endangered, three as threatened, and one as rare by Maryland. Five fish species are interjurisdictional or trust species. High-priority fish include American brook lamprey, American eel, American and hickory shad, blueback herring, comely shiner, glassy darter, and stripeback darter.

An overall stream health assessment for the refuge has not been completed. Assessments of the refuge's stream health surveys conducted on the North Tract found the benthic index of biological integrity moderately to severely impaired. Forty-seven percent of the sites sampled have pH levels associated with fish stress and one-third had stream stability issues (Anne Arundel County 2009).

The environmental quality of coastal plain streams in Maryland is fair, based on a combined biotic index utilizing fish and benthic macroinvertebrate communities as indicators (MD DNR 2005c). Forty-eight percent were severely degraded and only twenty percent were considered minimally impaired. Fifty-four percent of fish species are estimated to be lost from Maryland's coastal plain stream habitats (MD DNR 2005b). Coastal plain rivers are impacted by the degradation of streams and sedimentation and nitrogen enrichment from agriculture and urbanization. Dams and other stream blockages reduce upstream access to spawning habitats by migratory fishes. Other studies have shown degraded water quality from agriculture and urbanization in the Little Patuxent and Patuxent River watersheds (MD DNR 2001, Howard County 2002). Neither the Little Patuxent or Patuxent River meets water quality or other natural resource goals and both are classified as priority 1 systems (Howard County 2002).

The National Fish Habitat Action Plan outlines management strategies to guide aquatic habitat management on the refuge. Restoration efforts by local, county, State, and regional organizations within the Little Patuxent and Patuxent River watersheds support components of strategy 2 (restoring natural flow and habitat variability to streams and rivers). Removal of impoundments and other fish barriers along the refuge's tributary streams supports strategy 3 (reconnecting fragmented river systems and spawning/nursery habitats).

The refuge must embrace an active role in coordination and technical assistance of watershed efforts to improve aquatic health and fisheries on the refuge and within the watersheds. The geographic location midway between the Piedmont and Coastal Plain Provinces and the refuge's wildlife and research mission are ideal for this role.

Coastal plain rivers and streams are low gradient (less than one percent). Streams contain runs, glides, pools, and gravel riffles with silt, sand, gravel, and small cobble substrates.

Rivers are pool/glide systems with sand and silt substrates. Woody debris and aquatic vegetation provide habitat for fishes and stream insects, and control stream bank erosion. Exchange of organic material and refuge for aquatic species during periods of high flows is provided by river connectivity to the adjacent floodplain (MDNR 2005).

In the spring of 2011, biological stream monitoring was conducted on some streams on the refuge within Anne Arundel County. This included sampling of the benthic invertebrates and physical attributes and water chemistry of the streams and abiotic parameters of catchment areas in 16 random sites of two primary sampling units of the Big and Little Patuxent Rivers on the refuge. Interestingly, seven sites had depressed biological stream communities relative to available habitat quality and the least impaired communities were found in stream types typically associated with unstable bank conditions. This suggests that there are point source inputs being channeled to the streams. Over one-third of the sites had instability problems associated with their stream type, and this could be significantly larger since extensive portions of the North Tract were not sampled at all. All sites sampled showed some pH depression. The refuge needs to identify sources of impairment and investigate upstream drainage areas contributing contaminants from agricultural and landscaping activities. Heavy metal detection would also be an important investigation for North Tract streams within the surface danger and impacts zones of the firing ranges. Biological communities may still be trying to recover and reestablish from past military and past agricultural practices, as these have been shown to have severe impacts on benthic macroinvertebrates elsewhere (Victoria 2009).

Objective 3.2 Impoundments of Open Water, Emergent, Shrub, and Forested Wetlands

Manage the current 553 acres (224 hectares) in 65 impoundments of open water, emergent, shrub and forest wetlands, or green tree reservoirs to provide habitat for migratory bird species of conservation concern, including American black duck, solitary sandpiper (*Tringa solitaria*), green heron (*Butorides virescens*), greater (*Tringa melanoleuca*) and lesser yellowlegs (*Tringa flavipes*), and also to benefit other species of conservation concern, such as least bittern and elfin skimmer, and aquatic reptiles and amphibians.

Strategies

- Provide a mix of shallow water (less than 6 inches water depth) and mudflats to provide foraging habitat from mid-April to mid-May for migrating shorebirds and wading birds.
- Maintain approximately 50 percent open water and floating vegetation coverage, initiating draw down by June 21 when floating vegetation coverage of pond lily, water shield, and spatter dock exceeds 50 percent, then re-flooding to 6 to 12 inches depth immediately after first frost or by the end of October.
- Provide seeds and roots of red-rooted sedge (*Cyperus erythrorhizos*), barnyard grass (*Echinochloa spp.*), and smartweed (*Polygonum lapathifolium*) for waterfowl during peak migration in mid-November by re-flooding to 6 to 12 inches of water depth immediately after first frost or by the end of October.

- Provide forested wetlands with a mostly closed to semi-open canopy along the reaches of gently sloping streams with a vegetation mosaic of small shrubs and trees including black gum, swamp azalea (*Rhododendron viscosum*), sweetbay magnolia, highbush blueberry (*Vaccinium corymbosum*), and dwarf huckleberry (*Gaylussacia dumosa*) with open, sedge, and graminoid-dominated patches.
- Manage Patuxent Pond and the Green Tree Reservoir at the wildlife viewing area as green tree reservoirs by initiating draw down annually from leaf out in April to full leaf drop in November, then allowing refill to provide wintering waterfowl habitat.
- Control and reduce nonnative invasive species annually using chemical, biological, or mechanical methods to increase native plant species diversity and richness.
- Prevent new invasive species from becoming established by utilizing early detection rapid response techniques to address invasive species populations through the appropriate control measure.

Monitoring Elements

- Conduct appropriate monitoring and survey programs to measure success with respect to objectives. The results may trigger adjustments to management strategies, or a reevaluation or a refinement of objectives. Examples of monitoring or surveys may include:
 - Monitor effects of invasive species prevention and control efforts through a combination of plant identification, inventories, and mapping.
 - Monitor native plant community response to management actions.
 - Conduct inventories and monitoring of shorebird, waterfowl, waterbird, and wading bird use and abundance within the impoundments. Utilize data to document the ongoing effectiveness of water level management activities and adjust management protocols as necessary.

Rationale

Although creating habitat for research and wildlife purposes was the original objective for many of the impoundments, impacts to hydrology, stream flow, floodplain function, fisheries, forested wetlands, and other resources were not envisioned or assessed in the past. The biological contribution of these impoundments to the refuge's goals and objectives is unclear. The Refuge Improvement Act and the Biological Integrity Policy requires the Service to evaluate impoundment management and its contribution toward achieving the refuge's goals and objectives.

Waterbird-use data indicate the refuge's impoundments provide limited migration and nesting habitat, although they receive regular use during winter by ring-necked ducks (*Aythya collaris*), hooded mergansers (*Lophodytes cucullatus*), and occasional other species. Some bird species listed as species of greatest conservation need in the Maryland Wildlife Diversity Conservation Plan or as priority bird species in the BCR 30 and PIF 44 implementation plans do occur but in small numbers.

Canada geese comprised 54 percent of the mean 249,233 annual waterfowl-use days during 2007 to 2009. Wood duck (*Aix sponsa*), ring-necked duck, and mallard were 39 percent and American black duck 3 percent. In the same period, an average of 245 Canada geese and 393 wood ducks were produced annually. Production by other species was negligible. Canada geese production days, and probably a significant portion of the use days, consist of nuisance, resident Canada geese flocks and not the migrating Atlantic coast population of management concern.

Shorebird and wading bird-use days were low during the same period (3,455 and 5,202, respectively). Killdeer comprised 68 percent and common snipe (*Gallinago delicata*), solitary sandpiper (*Tringa solitaria*), and spotted sandpipers (*Actitis macularius*) were 24 percent of the shorebird use. Great blue heron (*Ardea herodias*) comprised 62 percent and green heron and great egret (*Ardea alba*) accounted for 37 percent of the wading bird-use days. Use by other species was negligible.

Objective 3.3 Emergent Wetlands (Freshwater, Nontidal)

Maintain the biological integrity of approximately 42 acres (18 hectares) of naturally occurring freshwater emergent wetlands and open bogs in native vegetation such narrowleaf cattail (*Typha angustifolia*), sedges, wetland grasses, pipeworts, arrow arum, pickerelweed, bur-reeds, arrowheads, smartweeds, spike-rushes (*Elocharis obicis*), asters and composites, and more persistent species such as swamp rose (*Hibiscus moscheutos*) and hibiscus to benefit priority wetland bird species of concern, such as American black duck and least bittern.

Strategies

- Monitor and control for invasive plant species.
- Observe best management practices for riparian zones to enhance water quality and flood management, such as maintaining at least 300 feet (91 meters) of forested buffer for soil erosion prevention measures.
- Promote and encourage growth of native tree and shrub species along riparian zone of emergent wetlands.



Mark Wilson

American Black Duck

Monitoring Elements

- Survey and map invasive species, particularly those that are stand-replacing and have the potential to alter the hydrology, such as phragmites.

Rationale

Emergent freshwater wetlands are the most productive habitat types, the source of the most abundant primary production, where plants convert energy into biomass that can be consumed or used by animals and other life supporting functions. Primary production in inland marshes is estimated conservatively at about 1,000 grams per square meter per year (Mitch and Gosselink 1993). Relatively few plants are adapted to complete submersion of their root systems in water, yet the high conversion rate by these plants contributes to important ecosystem functions such as filtering nutrients, providing clean water, and taking up carbon. The interspersion of emergent plant communities and small pockets of open water is prime habitat for spawning fish, ephemeral insects, breeding, migrating, and wintering waterfowl and wading birds, aquatic turtles, and insects with close associations with their host plants. The plankton and submerged phyto-plankton are important food sources for small minnows and other organisms, which in turn are prey for larger fish. The varying depths in such wetlands provide a diversity of annual and perennial seed producing plants such as wild rice, water millet, duckweed, duck potato, arrow arum, pickerel weed, hibiscus, buttonbush, marsh marigold (*Caltha palustris*), marsh milkweed (*Asclepias incarnata*), and polygonum species. These are essential food sources for many species of wetland birds. Emergent wetlands, when juxtaposed with forest habitats, are vital foraging grounds for native bats and aerial-foraging insectivorous birds (Mitch and Gosselink 1993).

Goal 4: Manage refuge non-forested upland communities to provide ecological structure, composition, and function to support native plants and wildlife, including species of conservation concern. Where appropriate, restore the biological integrity and diversity of these habitats.

Objective 4.1 Shrub and Early Succession Forest Habitat

Continue to provide up to 224 acres (99 hectares) currently in shrub and early succession forest habitat in the 5.5-mile (9-kilometer) BG&E powerline right-of-way and up to 70 acres (28 hectares) in the 3.5-mile (6-kilometer) Pepco powerline right-of-way and in scattered pockets and small fields throughout the refuge. Shrub habitat will be maintained in short-stature (less than 10 feet), moderate-density (50 to 75 percent) woody shrub and early succession herbaceous cover comprised of berry, seed, nectar-producing native species for breeding bird species of conservation concern, such as brown thrasher, field sparrow (*Spizella pusilla*), prairie warbler, eastern towhee, yellow-breasted chat (*Icteria virens*), and gray catbird; migratory and wintering habitat for a variety of bird species; and foraging habitat for eastern forest bats, whip-poor-will, native pollinators and other insects.

Strategies

- Maintain vegetation to heights less than 10 feet above ground level in the area of maximum conductor sag between towers. Prune vegetation and apply herbicides to tall-growing tree species encroaching in the right-of-way.
- Provide berry-producing trees, shrubs, and vines, such as dogwood, viburnums, Amelanchier, hollies, blueberry, sumac, and grape for migrating birds, nectaries,

and overwintering cover for pollinators, especially lepidopterans (moth and butterfly species) for whip-poor-will and bats.

- Encourage native herbaceous species such as milkweeds, asters and other composites, and broomsedge and other native grasses.
- On moist soils, encourage early succession trees and shrubs such as alder, dogwood, spicebush, sassafras, and viburnums for feeding, daytime cover, and nesting for American woodcock.
- Control and reduce nonnative invasive species by at least 10 percent utilizing chemical, biological, or mechanical methods to increase native plant species diversity and richness. Prevent new invasive species from becoming established by utilizing early detection rapid response techniques to address invasive species populations through the appropriate control measure.
- Continue the successful partnership with BG&E and Pepco and encourage similar management by other landowners.



USFWS

Powerline Right-of-way on the Refuge

Monitoring Elements

- Conduct appropriate monitoring and survey programs to measure success with respect to objectives. The results may trigger adjustments to management strategies, or a reevaluation or a refinement of objectives. Examples of monitoring or surveys may include:
 - Monitor effects of invasive species prevention and control efforts through a combination of plant identification, inventories, and mapping.

- Conduct landbird surveys and migration surveys to evaluate achievement of the objective for breeding and migrating birds.
- Conduct surveys for whip-poor-will, woodcock, bat, and lepidopterans and other insects to evaluate contribution of edge habitat in supporting these species.

Rationale

Nine species of birds listed as species of greatest conservation need in the Maryland Wildlife Diversity Conservation Plan are found in the refuge's shrub habitats. Six are priority bird species listed in either the BCR 30 or PIF 44 implementation plans.

Bats and whip-poor-will are forest edge-dependent species, relying on increased aerial insect abundance afforded by a diverse shrub, herbaceous, and grass community. Such areas also provide foraging habitat for migrating swallows and purple martins, and foraging and resting habitat for thousands of migrating songbirds. The refuge possesses the most significant known population of whip-poor-will in Central Maryland. The American woodcock also benefits from early succession habitat, particularly in the form of early succession forest on moist soils where there is a higher abundance of food (primarily earthworms) in close proximity to forest cover.

Historically, early successional forest was estimated to be 5 percent of the land area in Maryland (Frieswyk 2001). The refuge's scrub-shrub habitat is early successional forest dominated by shrubs and small trees. Shrub occurs as managed powerline right-of-ways, succession on lands cleared of timber, and natural forest canopy openings from natural disturbances. Natural disturbances vary over time and result from wind, ice storms, fire, beavers, tree senescence, insect outbreaks, and pathogens.

Objective 4.2 Grasslands and Old Fields

Maintain existing 517 acres (209 hectares) of grassland dominated by 70 percent native cool and warm season grasses, up to 25 percent forbs, and up to 5 percent shrub cover to provide breeding, migrating, and winter cover and forage for grassland bird species of conservation concern, including eastern meadowlark, eastern kingbird, field sparrow, savannah sparrow, swamp sparrow, and monarch butterfly and grasshopper sparrow, and to benefit native pollinating insects.

Strategies

- Mow, burn, and use selective herbicide treatments to set back succession and improve percentage coverage of grass.
- Provide open habitat adjacent to nearby perches for foraging passerine birds, including the eastern kingbird.
- The mowing regime staggers a three to five year rotation to provide a variety of old field habitat and to ensure overwintering cover for native insects, small mammals, and birds. Mow on August 15 or later to avoid injury to ground nesting birds.

- Control and reduce nonnative invasive species annually by utilizing chemical, biological, or mechanical methods to increase native plant species diversity and richness.
- Encourage native stands of milkweed, asters, and other composite flowering plants for pollinating insects.
- Prevent new invasive species from becoming established by utilizing early detection rapid response techniques to address invasive species populations through the appropriate control measure.

Monitoring Elements

- Conduct appropriate monitoring and survey programs to measure success with respect to objectives. The results may trigger adjustments to management strategies, or a reevaluation or a refinement of objectives. Examples of monitoring or surveys may include:
 - Monitor effects of invasive species prevention and control efforts through a combination of plant identification, inventories, and mapping.
 - Evaluate achievement of the objective for migrating birds. Continue to conduct landbird surveys and migration counts. Include habitat measurements in those surveys.
 - Evaluate grasslands for grassland-dependent songbirds, conduct periodic vegetation surveys at landbird point counts for height, density measurements, and species composition or grass-forb ratio.
 - Conduct baseline inventories of lepidopterans and other pollinator and insect species to determine species richness, to assess the value of refuge grassland habitat for rare species, and to inform management options commensurate with bird objectives.

Rationale

Although significant grasslands occurred in northern Maryland and nearby Pennsylvania (Mayre 1920, Mayre 1955, MD DNR 2005a), it is unlikely that grasslands occurred to any extent in the coastal plain. A review of natural disturbances conducted in the Mid-Atlantic Coastal Plain suggests that large-scale disturbances were extremely rare (Nature Conservancy 2002) and it's unlikely that Native Americans maintained grassland on the refuge.

The refuge's grasslands consist of 95 parcels totaling 515 to 535 acres (208 to 217 hectares) of mowed agricultural fields and abandoned military ranges/administrative areas that would become forested habitat, if not mowed. Only six mowed fields are greater than 25 acres (10 hectares), a minimum size recommended for nesting obligate grassland birds that are area-and configuration-sensitive, such as the grasshopper sparrow. Those fields are linear in shape, greatly reducing their value to breeding obligate grasslands birds. Forty-nine parcels are less than five acres. These small grassland parcels increase forest hard edge, reduce the value of adjacent forests to forest dwelling birds by fragmenting the forest, and have limited potential to host breeding birds, although they

likely receive use during the non-breeding period by a variety of bird species. These small and scattered grasslands are not significant in a landscape perspective. Small openings in proximity to forest are valuable for whip-poor-will, bats, and box turtles.

Although the refuge's grassland habitat provide limited value to breeding grassland obligate species, they benefit breeding species that are more tolerant of old field succession, such as field sparrow, dickcissel, yellow-breasted chat, indigo bunting, eastern kingbird, orchard oriole, blue grosbeak (*Passerina caerulea*), American woodcock, northern bobwhite (*Colinus virginianus*), and wild turkey, as well as wintering species such as swamp sparrow, song sparrow, and short-term migratory visitors such as bobolink. Some bird species listed as species of greatest conservation need in the Maryland Wildlife Diversity Conservation Plan or as priority bird species in the BCR 30 and PIF 44 implementation plans may occur in small numbers but specific, intensive surveys to detect these species have been limited in recent decades.

Goal 5: Provide high-quality recreation, environmental education, and interpretive programs to enhance refuge visitors' understanding and appreciation of fish and wildlife conservation.

Objective 5.1 Wildlife Observation and Photography

Provide high-quality opportunities for wildlife observation and photography on the refuge.

Strategies

- Maintain observation towers and areas, trails (25 miles/40 kilometers), wildlife drive, viewing blinds, and wildlife and nature photo gallery.

Monitoring Elements

- Complete annual evaluation that summarizes wildlife observation and photography opportunities provided on the refuge (number of opportunities, events) and document their utilization (number of visits, type of activity, and number of participants engaged).
- Solicit informal participant feedback and take note of repeat visitors.

Rationale

The refuge currently offers numerous opportunities for wildlife observation and photography, including accessible roads, trails, boardwalks, three photo blinds throughout the North and South Tracts, and an electric tram tour on the South Tract. The refuge also accommodates photo classes and exhibits, and lends out binoculars to visitors.

Objective 5.2 Interpretation

Promote a stewardship ethic and instill a sense of wonder and appreciation of natural resources, wildlife and research in visitors by providing engaging interpretive programs and activities for visitors of all abilities, ages, and community groups.

Strategies

Continue to:

- Offer a variety of seasonally related monthly interpretive programs year-round by reservation. These programs are offered free of charge with the exception of tram tours or when otherwise stated. (The refuge offered 353 interpretive programs with 9,761 total participants in fiscal year 2010 – this total includes tram tours.)
- Offer interpreter-led tram tours from mid-March through mid-November, with increased hours of operation during the summer months.
- Charge a nominal fee for tram tours for the general public tours; reserved tours can be arranged for a group fee and accommodate schools and other organized groups. Tram tours operated by the Friends of Patuxent.
- Utilize outreach tools to enhance visitation and participation at interpretive programs and special events.
- Offer current opportunities for interpretive programs, updating them as demand dictates.
- Maintain and utilize outdoor exploration areas, such as schoolyard habitat.
- Offer major special events (seven offered in fiscal year 2010).
- Offer summer series of five to six multi-day youth camps, including one-week day camp for underserved youth.
- Offer periodic, guided tours to the Central Tract and the Whooping Crane Observatory.

Monitoring Elements

- Complete an annual evaluation that summarizes interpretive opportunities provided both on and offsite (number of opportunities and events) and document their utilization (number of visits, type of activity, and number of participants engaged).
- Solicit informal participant feedback and take note of repeat visitors.

Rationale

The Refuge Improvement Act identifies environmental interpretation as one of the six priority public uses. Environmental interpretation includes activities, talks, publications, events, programs, audio-visual media, signs, and exhibits that convey key messages about natural and cultural resources to visitors, but that do not address a specific educational curriculum requirement. It provides opportunities for visitors to make their own connections to nature and wildlife, which invites participation in resource stewardship and helps refuge visitors understand their relationships to, and impacts on, those resources.

Interpretation has been identified as an area of emphasis for the refuge. Interpretation of natural resources creates an opportunity to connect the hearts and minds of visitors with

places, objects, and resources that refuges strive to protect. Interpretive programs provide visitors with intellectual and emotional opportunities to connect with natural and cultural resources. Interpretive programs at the refuge include, but are not limited to, interactive tram tours, monthly interpretive programs, special events, publications, audio-visual media, signs, and exhibits. Through participation in the refuge's interpretive programs, we hope that visitors will understand their relationships to and impacts on our natural resources, and will join us as stewards of the land.



USFWS

Display at the NWVC

Objective 5.3 Environmental Education

Promote a stewardship ethic through environmental education with students, teachers, scout leaders, and organized community groups to understand and appreciate ecological relationships and the role of refuges nationwide and the role of Patuxent Research Refuge. (There were 14,736 environmental education participants both on and offsite for fiscal year 2010, including students, teachers, scout leaders and other educators).

Strategies

Continue to:

- Offer naturalist-led and self-guided programs for school and scout groups year-round.
- Offer teacher workshops year-round, designed to meet Maryland State outcomes and with opportunities for Maryland State Department of Education credits.
- Accommodate requests from neighboring school communities and other organizations to participate in onsite environmental education program.
- Offer current environmental education opportunities both onsite and offsite (approximately ten per year offsite).
- Maintain and utilize outdoor exploration areas such as schoolyard habitat.

- Provide workshop opportunities for scouts and scout leaders to meet advancement requirements.
- Provide scout program links to scout leaders.
- Support Federal Junior Duck Stamp Program administered by the MD DNR.

Monitoring Elements

- Complete annual evaluation that summarizes environmental education opportunities provided both on and offsite (number of opportunities and events) and document their utilization (number of visits, type of activity, and number of participants engaged).
- Solicit informal participant feedback and take note of repeat visitors.

Rationale

The Refuge Improvement Act also identifies environmental education as a priority public use on refuges. Environmental education teaches students the history and importance of conservation and ecological principles, and scientific knowledge of our nation's natural resources. In doing so, we can help develop a citizen base that has the awareness, knowledge, attitudes, skills, motivation, and commitment to work cooperatively toward the conservation of our Nation's environmental resources.

Environmental education has been identified as an area of emphasis for the refuge. As one of the largest science and environmental education centers in DOI, NWVC offers unique educational opportunities for school groups, scouts, youth groups, etc. NWVC exhibits are designed to provide visitors with greater knowledge and appreciation of the environmental problems affecting our planet and the role wildlife research plays in preserving the earth's natural resources. The environmental education program is also designed with that thought in mind. Programs strive to instill a general appreciation and understanding of natural resources and environmental concepts, with the ultimate goal of environmental stewardship. By using both indoor and outdoor resources, the environmental education team is able to provide opportunities and curriculum designed to meet the needs of the diverse ethnic and multi-cultural youth population that visit the refuge.

Objective 5.4 Non-wildlife-dependent Public Uses

Allow non-wildlife-dependent uses when they are appropriate and compatible.

Strategies

Continue to:

- Allow horseback riding on North Tract.
- Allow jogging on North and South Tracts.
- Allow bicycling on the North Tract.
- Allow cross-country skiing on North and South Tracts.

- Allow hiking on North and South Tracts.
- Allow dog walking with current stipulations on North and South Tracts.
- Allow search and rescue training via special use permit on the North and South Tracts.
- Provide primitive camping opportunities for scout and 4H groups on the North Tract pursuant to Nationwide memoranda of agreement with those organizations.
- Allow limited dog training in designated areas on the North Tract.

Monitoring Elements

- Continue to track other visitor uses through Visitor Contact Station check-in/access pass.
- Solicit informal participant feedback and take note of repeat visitors.

Rationale

The refuge manages firing range and softball field use through special use permits in which the daily oversight and maintenance is delegated to National Security Agency for the ranges and the Civilian Welfare Fund for the softball fields. Due to these agreements, no additional staff or costs are incurred by the refuge.

We propose to continue to allow jogging, bicycling, cross-country skiing, horseback riding, and dog walking to provide compatible recreational opportunities for visitors to enjoy the refuge and to gain a better understanding and appreciation for fish and wildlife, ecology and the relationships of plant and animal populations within various ecosystems, wildlife management, the refuge, and the Refuge System. Although these uses are not priority public uses, they do support wildlife observation which is a priority public use.

Goal 6: Provide high-quality hunting and fishing experiences for hunters and anglers.

Objective 6.1 Hunting

Provide safe, high-quality hunting opportunities on the refuge.

Strategies

- Continue to provide hunting opportunities for upland game, migratory game birds, and white-tailed deer from September through January, and select days in April and May for wild turkey hunt (Obrecht 1992).
- Within 3 years, complete a new refuge hunt plan along with any necessary associated NEPA compliance.
- Assess effectiveness of quality deer management for hunting and maintaining healthy deer populations and revise regulations as needed.
- Area X on the North Tract is currently open with a 50-yard (150-foot) buffer and the wildlife viewing area is currently open except during firearms season. Close Area W on the North Tract every other week to allow hiking on Forest Trail.

Monitoring Elements

- Complete annual evaluation that summarizes hunting opportunities (types of hunts and seasons) and documents their utilization (number of visits, type of activity, and number of participants engaged).
- Compile and analyze harvest data to document trends in use and variations in hunt seasons, and to better understand impacts to wildlife and habitats.
- Solicit informal participant feedback and take note of repeat visitors.

Rationale

Hunting on the refuge is guided by hunting regulations that are updated annually. The hunt program is administered in conjunction with MNHA. Regulations are jointly reviewed by the association and refuge staff annually, and clarified as needed. Hunting is permitted only during established Maryland hunting seasons (typically September through January). Current hunting includes opportunities for upland game, waterfowl, and white-tailed deer (bow, muzzleloader, and shotgun). The majority of the hunting occurs on North Tract. MNHA conducts daily hunt control operations, including permit sales, daily sign-ins, and harvest recording. The majority of North Tract remains closed to general public use during the hunt season. There are also hunting opportunities on the South Tract for white-tailed deer and lottery hunt opportunities on the Central Tract for white-tailed deer. The refuge's hunt program has the distinction of being one of the largest Federal public use hunting programs in terms of season length, variety of hunts, and numbers of hunter days.

Objective 6.2 Fishing

Provide high-quality fishing opportunities at established sites and according to State regulations.

Strategies

- Continue to provide year-round fishing opportunities at North Tract, which includes Lake Allen, New Marsh, Cattail Pond, Rieve's Pond, Bailey Bridge Marsh, and the Little Patuxent River areas.
- Continue to provide fishing opportunities seasonally on the South Tract at Cash Lake (June to October).
- Continue to improve quality of fishing through vegetation management, which may include temporary impoundment draw-downs and herbicide treatments.

Monitoring Elements

- Complete annual evaluation that summarizes fishing opportunities (through seasonal permits issued and special use/group permits issued).
- Collect and analyze creel reports that are voluntarily contributed by anglers.
- Collect angler data through check-in and staff/volunteer observation.
- Solicit informal participant feedback and take note of repeat visitors.



Kids' Fishing Day

Rationale

The refuge provides opportunities for fishing on both the North and South Tracts. However, fishing is limited on North Tract due to closures during the hunting season and when firing ranges are active. A kids' fishing day is offered annually on the South Tract. Kids' fishing day allows not only for youth to experience a traditional recreational activity, but also for the public to engage with refuge staff and volunteers while participating in a priority public use.

Goal 7: Enhance partnerships with local communities and various organizations to garner support and promote refuge programs and resources.

Objective 7.1 Volunteer Opportunities

Provide a wide variety of volunteer opportunities to support the refuge and to encourage community involvement and support of refuges and natural resources.

Strategies

Continue to:

- Maintain the current volunteer program to assist the refuge in all aspects of day-to-day operations (28, 140 total volunteer hours for fiscal year 2010).
- Maintain quality internship program (currently 12 to 15 interns annually).
- Promote organized group participation (e.g., Scout groups) for one-time volunteer projects.
- Maintain coordination between PWRC, MNHA, and the refuge.
- Provide volunteer award and recognition programs/events.

Monitoring Elements

- Maintain volunteer hours through online program which documents volunteer activities that occurred, location, and duration.
- Continue to solicit feedback from volunteers regarding refuge programs.

Rationale

The refuge's volunteer program delivers a significant contribution of over 30,000 hours through the participation of 250 volunteers. The refuge's active volunteer numbers remain fairly consistent at around 120. The volunteers help run NWVC and the Visitor

Contact Station, maintain refuge grounds, and support wildlife management. On-the-job training is provided until volunteers feel comfortable operating the information desks on their own. Volunteers receive a half hour customer service training during volunteer orientation. The majority of the volunteers are age 55 or above. Internship opportunities for environmental education/interpretation and wildlife biology positions are available through the majority of the year. The volunteers sign in and out themselves and keep a log of their hours via an online program. Volunteers are recognized at an awards event and are also thanked at an annual picnic.

Objective 7.2 Outreach

Foster community relations and recruit visitors through outreach and community involvement.

Strategies

- Send notices and press releases to local media and partners about upcoming events and programs.
- Participate with an information table and/or activities at community events such as Bowiefest, Montpelier festivals, and others.
- Participate in events/programs of neighboring county conference and visitors' bureaus.
- Participate in tourism and educational events of the Maryland Tourism Council.
- Participate in meetings/events of local chambers of commerce.
- Participate in events/promotions sponsored by the Maryland Tourism industry, such as the annual calendar of events, marketing opportunities, etc.
- Participate in events/promotions of other community organizations, such as the Prince George's History Consortium, Anacostia Trails Heritage Area, etc.
- Allow above partners to utilize meeting space for events/meetings.
- Continue to publicize NWVC through rack card distribution service to motels and attractions.
- Continue to fund attraction signs on nearby highways (through the State Highway Administration).
- Continue to maintain and update the Web site.
- Encourage Friends and staff to utilize social media to publicize refuge events and programs.
- Continue to maintain email listserv (3,828 members in 2010).

Monitoring Elements

- Track number of outreach contacts.
- Solicit informal feedback from partners.

Rationale

Outreach is two-way communication between the Service and the public to establish mutual understanding, promote involvement, and influence attitudes and actions, with the goal of improving joint stewardship of our natural resources. Outreach includes, but is not limited to:

- Congressional relations
- Corporate relations
- News media relations
- Relations with constituent groups
- Community relations
- State and local government relations
- Relations with State wildlife agencies
- Environmental education and interpretive activities
- Public involvement
- Traditional public information such as speeches, open houses, etc.
- Information products, such as brochures, leaflets, exhibits, slide shows, videos, public service announcements, etc.

Refuge Staffing, Facilities, and Grounds Necessary to Implement Alternative A

- Maintain current staff (as shown in the existing staffing chart dated April 29, 2010 in appendix F).
- Continue to work with youth and student employment programs.
- Maintain existing buildings and facilities.
- Continue to make temporary housing available (at assessed fair market value) to field assistants or visiting scientists.
- Guide Central Tract facility usage and maintenance with the facilities modernization program.
- Continue NWVC hours of operation from 9 a.m. to 4:30 p.m. daily (except Federal holidays) for building and sunrise to 4:30 p.m. daily (except Federal holidays) for trails and grounds.
- Continue Visitor Contact Station hours of operation from 8 a.m. to 4 p.m. daily (except Federal holidays).
- Continue to issue keys or cards to open refuge gates to researchers needing to access field sites outside of regular hours.
- Continue to provide conference facilities for scientific, educational, agency, and partner-related information exchange.

3.6 Alternative B. Forest Restoration and Mixed Public Use (Service-preferred Alternative)

Alternative B combines the actions we believe most effectively achieve the refuge purposes, vision, and goals, and respond to public issues. It emphasizes the management of specific refuge habitats to support focal species whose habitat needs benefit other species of conservation concern in the Chesapeake Bay region. In particular, we emphasize increasing forest acreage by allowing smaller fields and openings to reforest and promoting a mix of forest restoration in conjunction with active management of diverse habitat types. This includes the restoration of a number of impoundments and grasslands to forested areas to support forest interior dwelling bird species. In addition, alternative B would enhance our present visitor services programs in a manner that addresses the national and regional Service policies and the mandates of the refuge. It strives to strike a balance between wildlife-dependent and non-wildlife-dependent uses found to be compatible on the refuge.

Habitat Management

Under alternative B, habitat management would expand forested areas throughout the refuge. This alternative includes the restoration of approximately 478 acres (193 hectares) to forest. The land under the proposed reforestation currently exists as impoundments or grassland areas. Reforesting impoundments and grassland areas would benefit forest interior dwelling species by increasing the acreage of interior, contiguous forest surrounded by highly urbanized areas. It would also improve water quality as related to the Patuxent and Little Patuxent Rivers, and ultimately the Chesapeake Bay watershed.

A pine-oak savannah, indicated by soil type and an assemblage of rare fauna, would be maintained to promote this rare, native habitat type and support species such as the darkling beetle and tiger beetle. Grasslands of suitable size for obligate grassland nesting birds and open-field generalist would be provided. Impoundments that support fishing or important amphibian breeding areas would also be maintained. Of the 553 acres of impoundments, only 357 acres were considered for potential conversion in the structured decision-making process, because we did not include impoundments that would require extensive filling or that were heavily used for recreation. Habitat types and management proposed under alternative B are displayed in map 3-2.

Inventory and Monitoring

Under this alternative, we would improve our monitoring and inventory efforts to better inform and support these goals and alternatives, the effectiveness of habitat management, habitat adaptation to climate change, and to ensure we have the necessary resources to accomplish them. We would target any alterations or additions to these ongoing surveys that would help us better understand the implications of our management actions and ways to improve our efficiency and effectiveness. We would also continue to seek ways to reduce our management costs for establishing and maintaining monitoring protocols.

We would strengthen partnerships with USGS and other agencies, State partners, academic institutions, nonprofit organizations, and volunteers in the conservation

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Refuge Bird Banding

community to obtain needed information on habitat quality, wildlife use, and impacts relevant to CCP goals and objectives and for more current baseline data. Through these endeavors we would be able to expand our biological inventories and monitoring projects to better understand species composition and utilization of the refuge, particularly in response to reforestation efforts.

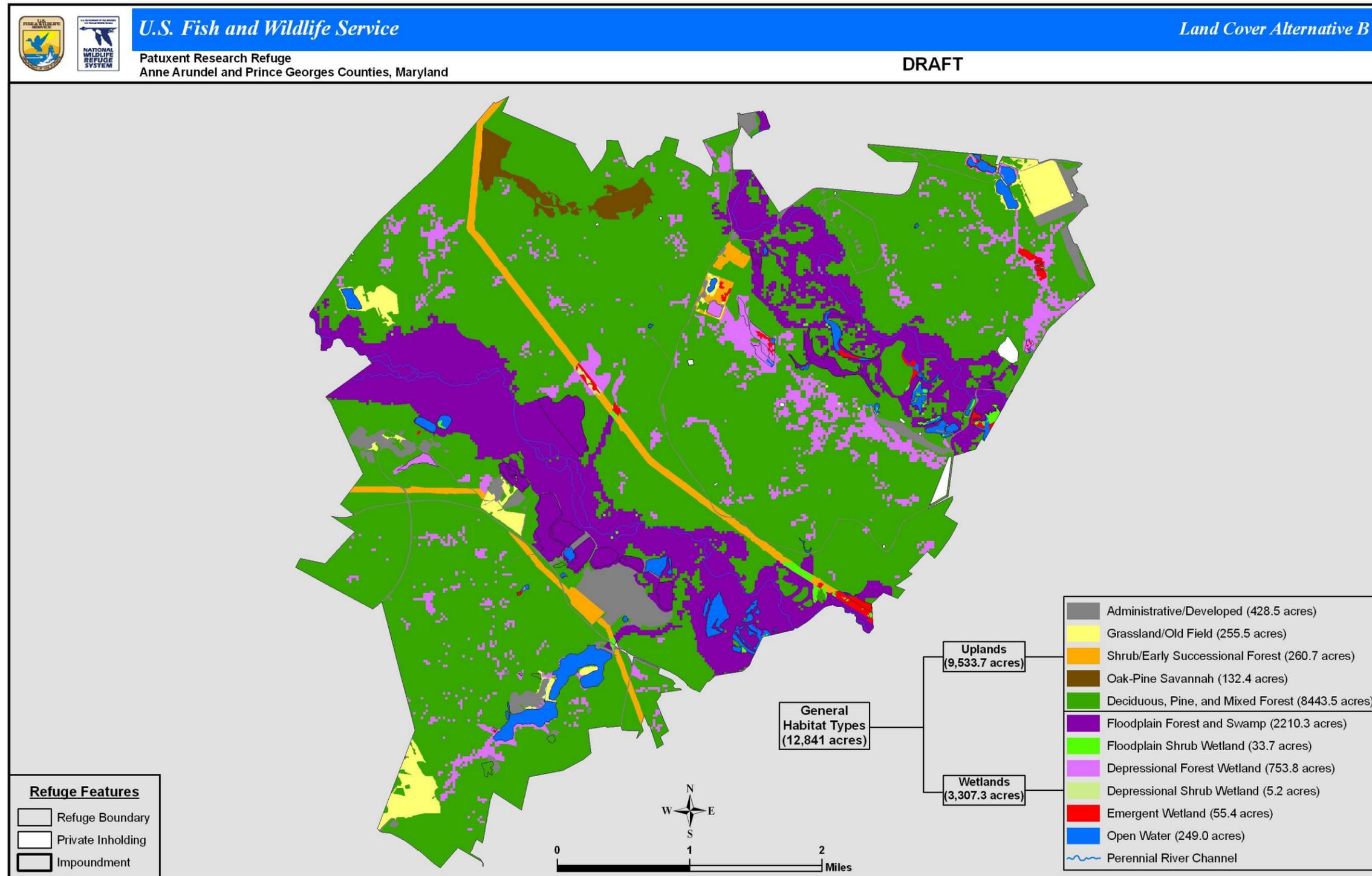
Visitor Services

Under alternative B, we would strive to increase wildlife-dependent public use opportunities and allow for appropriate, compatible non-wildlife-dependent uses (maps 3-3 and 3-4). We would promote high quality hunting and fishing programs through improved habitat management strategies. In addition, we would expand wildlife observation, viewing, and photography opportunities and initiate new interpretive programs and environmental education opportunities both on and offsite.

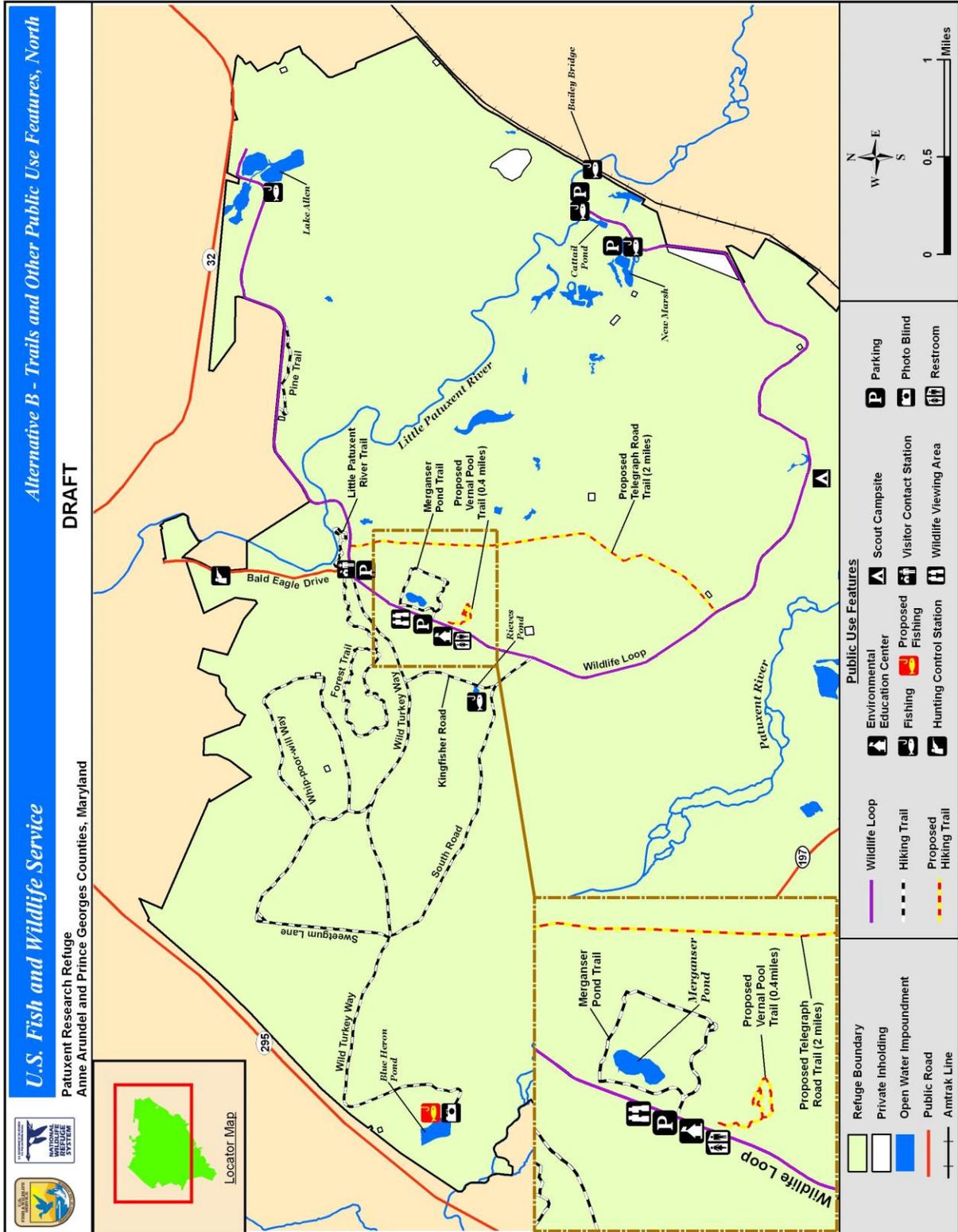
Refuge Administration

Under this alternative, we would expand refuge staff to support habitat management efforts, facilities maintenance, and visitor use. As identified in the 2009 Refuge System staffing model, we propose to fill five positions, which include two maintenance workers (grounds and buildings), one contracting officer, one law enforcement officer, and one visitor services park ranger. There is some degree of flexibility to alter these proposed positions as priorities and/or needs change. In order to fill the positions identified, permanent sources of funding would need to exist.

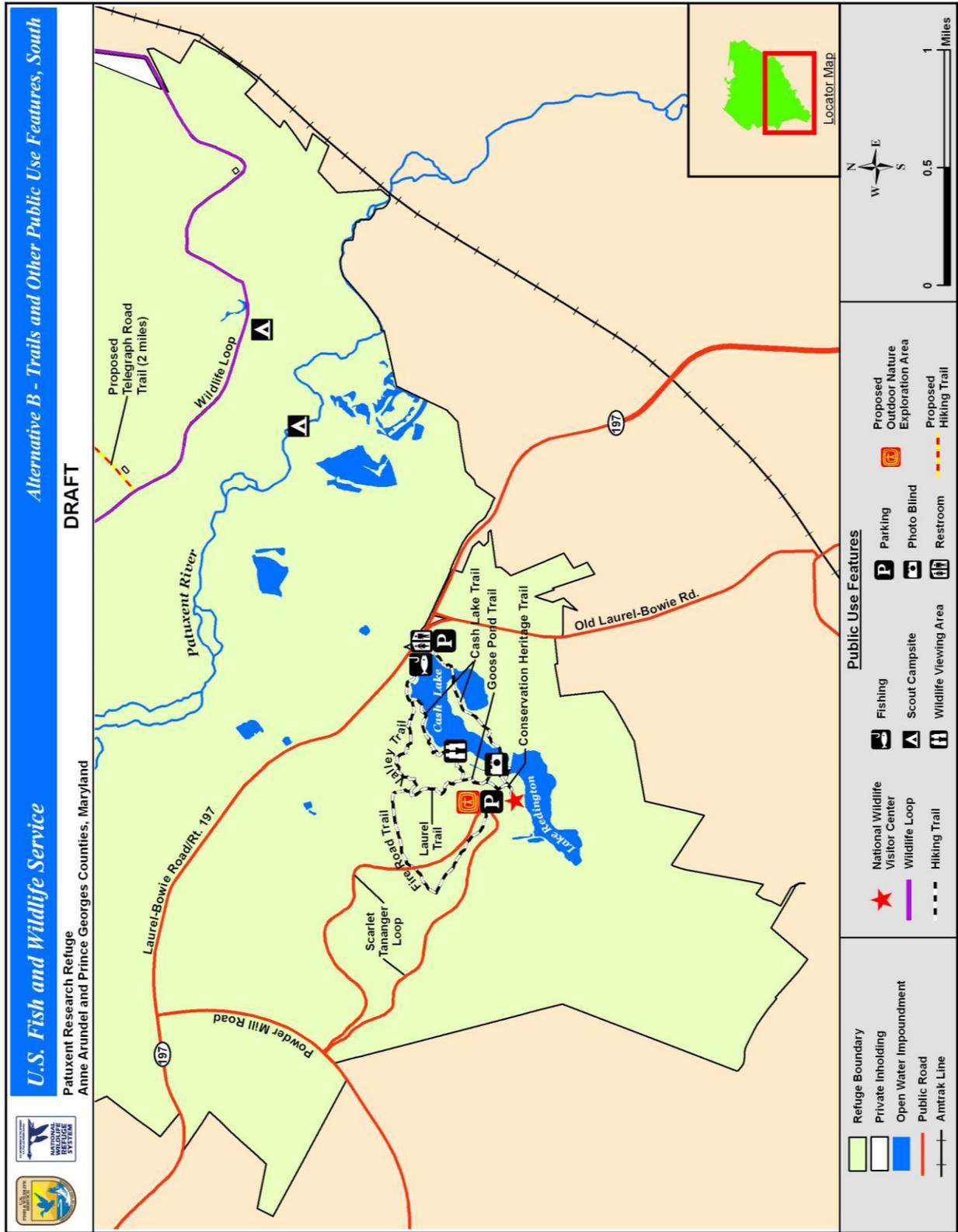
Map 3-2. Anticipated Habitat under Alternative B



Map 3-3. Proposed Public Use under Alternative B, North



Map 3-4. Proposed Public Use under Alternative B, South



Goals, Objectives, and Strategies under Alternative B

Goal 1: Maintain and actively promote Patuxent Research Refuge as an “outdoor laboratory,” providing a diversity of wildlife and natural resource research opportunities on the refuge in such areas as landscape conservation, habitat fragmentation, climate change, and other emerging issues, as well as the more traditional types of wildlife research, including inventory and monitoring techniques, land management, and understanding ecological processes. Research that supports the overall Service mission, and evaluates the best methods for protecting natural resources throughout the Refuge System and other land management agencies will be a priority.

Objective 1.1 Inventory and Monitoring

Conduct high-priority inventory and monitoring (survey) activities that evaluate resource management and public use activities to facilitate adaptive management.

Strategies same as alternative A, plus:

- Develop and strengthen partnerships with USGS and other agencies, State partners, academic institutions, nonprofit organizations, and volunteers in the conservation community to obtain needed information on habitat quality, wildlife use, and impacts relevant to CCP goals and objectives. Examples may include:
 - Identify sections and conduct feasibility study and options for floodplain stream restoration.
 - Understand the contribution and importance of refuge forests to pollinator species (their contribution to forest health on the refuge and Mid-Atlantic Coastal Plain).
 - Design a monitoring protocol for assessing succession of the savannah restoration.
 - Estimate and model deer population and habitat response to adaptive deer harvesting.
 - Monitor bat and amphibian use and health in eastern forest habitats and disease.
 - Monitor forest disease.

Monitoring Elements and Rationale same as alternative A

Objective 1.2 Research and Scientific Assessments (Local, National, and International)

Facilitate research of a local, national, and international nature that benefits wildlife on refuge lands as well as all other natural areas. Facilitate scientific assessments to provide baseline information to expand knowledge regarding landscape-scale natural resource issues and to determine the status of onsite refuge resources to better inform resource management decisions.

Strategies same as alternative A, plus:

- Work with PWRC and partners to facilitate long-term research studies focused on landscape-scale issues such as climate change, habitat fragmentation, urban impacts to wildlife, and ecosystem services derived from the refuge and surrounding natural lands.
- Continue to provide gate keys or cards to researchers who need to access refuge field sites outside of refuge daily open hours.
- Reduce hunting hours during some week day mornings (except during the deer firearms season) to encourage and allow researcher access to the North Tract during the hunting season.
- Work with PWRC to develop refuge-based collaborative research opportunities. Examples may include:
 - Assess lead deposition and other impacts to forest and wildlife beyond firing ranges.
 - Assess raccoon population size, density, and predation upon ground-nesting birds, turtles.
 - Assess bat breeding, migrating, and wintering diversity, distribution, seasonal hibernating, and maternal roosting and foraging habitats.
 - Assess the effects of right-of-way management on priority species of birds dependent on shrub habitat, important pollinators, and deer foraging response.
 - Assess refuge fish population and fish passage for migratory fish.
 - Monitor amphibian disease, such as chytrid fungus impacts on wood frog populations.

Monitoring Elements and Rationale same as alternative A

Goal 2: Protect, maintain, and restore, where possible, the biological integrity, diversity, and environmental health of forested ecological communities to provide habitat for species of conservation concern, including migratory birds, mammals, amphibians, reptiles, and invertebrates.

Objective 2.1 Floodplain Forest and Swamp, to also include Depressional Forests and Shrub Wetlands

In addition to alternative A, provide approximately 72 additional acres (29 hectares) of floodplain forest and depressional forest and shrub wetlands along the Patuxent and Little Patuxent Rivers, totaling about 2,722 acres (1,102 hectares).

Strategies same as alternative A, plus:

- Restore forests through natural succession, whenever possible, primarily from conversion of scattered pockets of small, wet meadows, including meadows around Uhler marshes (approximately 34 acres or 14 hectares) and similar areas.

Seventy-two acres will be gained as a result of restoring 17 impoundments to natural hydrology or green tree reservoir.

- Maximize forest interior, which is the forested area greater than 300 feet (91 meters) from the forest edge. Restore forests into large contiguous forested polygons, as close to 500 acres (202 hectares) as possible, and in shapes that maximize forest interior habitat. Restore gaps, openings, and peninsulas in existing forested areas to decrease forest edge and maximize forest interior.
- Consider a range of active forest management when objectives cannot be achieved through natural processes, such as uneven-age forest management (single tree and group selection) to create a multi-structured, multi-aged forest, and mechanical and herbicidal treatments to reduce undesirable species and create snag and cavity trees. Plant desirable flora on sites as needed.
- Reduce white-tailed deer population to encourage natural redevelopment of mid and understory vegetation where depleted due to herbivory or intense scouring from flooding.
- Explore remediation for steeply down-cut streambanks.
- Review and evaluate transportation needs for management purposes and public access. Close and restore unnecessary roads and adjacent berms/ditches to forested habitat.
- Maintain roads to ensure safe passage for vehicles at posted speeds. Road width and footprint should be constrained to the minimum width needed to allow vehicle passage, vegetation management actions to facilitate water flow from road surface to drainage facilities where they exist, and to protect paved surfaces from tree root damage. Forest habitat should not impinge upon drainage ditch or culvert flow.
- Ensure all stream crossings do not impact stream hydrology or aquatic resources.
- Conduct a timber cruise and forest health assessment with special attention to indications of forest pests and disease.
- Support ongoing big-tree surveys and conduct native plant surveys and plant mapping on the refuge.
- Protect areas containing rare native plant communities.

Monitoring Elements same as alternative A, plus:

- Develop long-term forest monitoring surveys to evaluate species, community, and structure changes from various environmental stressors, including air and water quality and climate change.
- Conduct acoustical bat monitoring surveys to determine species diversity and composition during breeding and migration.

- Determine the effectiveness of the white-tailed deer management program by evaluating species composition, abundance, diversity, and regeneration of native shrubs and forbs.
- Inventory and map floodplain forest communities and forested wetlands and incorporate the maps and data sets into the Patuxent Research Refuge Geographic Information System.
- Identify and map areas of concentration of amphibians of concern, such as wood frog, salamanders, and vernal pools to ensure their conservation and protection. Maintain vigilance for chytrid fungus and enact measurements to prevent spread of fungus between vernal pools.



White-tailed Deer

USFWS

Some metrics to consider for management or evaluation of floodplain forest habitat for priority species:

- Dense underbrush along streams and nesting snags (average height of 3 to 6 feet and a diameter at breast height of at least 6 inches) for prothonotary warbler.
- Closed forest canopy (greater than 80 percent), sparse herbaceous canopy cover (less than 25 percent), and sparse to moderate shrub canopy cover (75 percent) for Louisiana waterthrush.
- A slightly open canopy, dense understory, and well-developed ground cover for Kentucky warbler.
- Canopies 5 to 20 feet (1.5 to 6 meters) above the ground and open underneath for summer roosting of eastern red bats.

Rationale same as alternative A

Objective 2.2 Upland Deciduous, Pine, and Mixed Forest and Associated Wetlands

In addition to alternative A, restore 201 additional acres (81 hectares) of upland forest with an emphasis on large block management (500 acres/202 hectares or larger) and reduced fragmentation to further support area-sensitive, breeding, forest-dwelling species such as scarlet tanager, woodthrush, and box turtle, totaling approximately 8,443 acres (3,417 hectares).

Strategies same as alternative A, plus:

- Restore forests through natural succession whenever possible. Maximize forest interior, which is the forested area greater than 300 feet (91 meters) from the forest edge. Restore forests into large contiguous forested polygons, as close to

500 acres (202 hectares) as possible, and in shapes that maximize forest interior habitat. These additional acres of upland forest would come from the conversion of scattered grassy areas that were administratively managed or early successional old fields that are shrubby and too small to manage. This includes 8.5 acres gained from impoundment restoration. Restore gaps, openings, and peninsulas in existing forested areas to decrease forest edge and maximize forest interior.

- Consider a range of active forest management when objectives cannot be achieved through natural processes, such as uneven-age forest management (single tree and group selection), to create a multi-structured, multi-aged forest and mechanical and herbicidal treatments to reduce undesirable species and create snag and cavity trees. Plant desirable flora onsite as needed.
- Avoid dense, monoculture pine forests, as the distribution of breeding cerulean warblers has been negatively correlated with percent canopy cover by coniferous trees (Robbins et al. 1989).
- Reduce white-tailed deer population to encourage natural redevelopment of mid and understory vegetation where depleted due to herbivory or intense scouring from flooding.
- Explore remediation for steeply down-cut streambanks.
- Scout for and control stand-replacing invasive plant species that threaten to overtake intact healthy forest communities.
- Maintain roads to ensure safe passage for vehicles at posted speeds. Road width and footprint should be constrained to the minimum width needed to allow vehicle passage, vegetation management actions to facilitate water flow from road surface to drainage facilities where they exist, and to protect paved surfaces from tree root damage. Forest habitat should not impinge upon drainage ditch or culvert flow.
- Ensure all stream crossings do not impact stream hydrology or aquatic resources.
- Conduct a timber cruise and forest health assessment with special attention to indications of forest pests and disease.
- Support ongoing big tree surveys and conduct native plant surveys and plant mapping on the refuge.
- Protect areas containing rare native plant communities.

Monitoring Elements same as alternative A, plus:

- Develop long-term forest monitoring surveys to evaluate species, community, and structure changes from various environmental stressors, including air and water quality and climate change.
- Conduct acoustical bat monitoring surveys to determine species diversity and composition during breeding and migration.

- Determine the effectiveness of the white-tail deer management program by evaluating species composition, abundance, diversity, and regeneration of native shrubs and forbs. Develop an improved deer population assessment and monitoring technique.
- Inventory and map floodplain forest communities and forested wetlands and incorporate the maps and data sets into the Patuxent Research Refuge Geographic Information System.
- Identify and map areas of concentration of amphibians and reptiles of conservation concern, particularly wood frogs, spotted turtle, eastern box turtle, and vernal pools to ensure their conservation and protection. Maintain vigilance for chytrid fungus and implement measures to prevent spread of fungus between vernal pools.
- Monitor for gypsy moth and oak diseases.

Some metrics to consider for management or evaluation of upland forest habitat for priority species:

- Closed canopy and dense understory.
- Forest canopy cover (greater than 85 to 90 percent, not less than 65 percent), large trees (greater than 12 inches diameter at breast height) and subcanopy cover (65 to 70 percent, not less than 45 percent) for cerulean warblers.
- Incomplete or sparse canopy layer with understories to 15 to 20.5 feet (5 to 6 meters) height.
- Minimum snag densities of 8 per acre for silver-haired bat roosts.

Rationale same as alternative A

Objective 2.3 Oak Pine Savannah

In addition to alternative A, increase savannah habitat up to 135 acres (55 hectares).

Strategies

- This increase of 85 acres (34 hectares) comes from the NT-8 (Drop Zone), approximately 40 acres (16 hectares), and areas in the northwest section of North Tract that have been identified for clearing, thinning, and burning to create the savannah.
- Mechanically thin dense and stagnating pine stands to open up the understory and permit light penetration for germination of understory species associated with this habitat type and to release residual trees.
- Conduct prescribed fires to reduce accumulated debris from thinning operations, maintain the open understory, and promote a fire-adapted native woodland community.

- Conduct a soil survey (at finer resolution than that provided by the USDA Soil Survey) to delineate the extent of the deep sandy soils formations associated with the savannah habitats along the Patuxent River. Savannah restoration and maintenance should be confined to appropriate soil types.
- Prevent invasive plant species such mile-a-minute weed, Chinese lespedeza, Japanese honeysuckle, sweetgum, tulip poplar, red maple, and black locust that are poised to overtake newly opened areas. Scout for, and eradicate, parent trees of such species along perimeter.

Monitoring Elements

- Conduct visual assessments annually to determine extent of invasion of deciduous, stand-replacing pioneer species such as sweetgum and black locust.
- Conduct bee, beetle, and other pollinator/insect surveys.
- Conduct vegetation surveys that measure percent canopy cover of upper canopy species such as oaks and pines and understory cover such as grasses and forbs and heath shrubs.

Rationale same as alternative A

Goal 3: Protect, maintain, and restore, where possible, the biological integrity, diversity, and environmental health of refuge aquatic habitats, including the Patuxent, Little Patuxent, and Anacostia River Watersheds, and impoundments, to provide habitat for species of conservation concern, including fish, invertebrates, and plants.

Objective 3.1 Coastal Plain River and Coastal Plain Stream Habitats

In addition to alternative A, restore biological integrity and water quality of impaired stream segments.

Strategies

- Provide a variety of substrates including:
 - Pea gravel for spawning American brook lamprey
 - Fine sand and muck for American brook lamprey larvae
 - Stony riffles for spawning stripeback darter
 - Gravel, sand, and detritus for spawning alewife
 - Streams with a pH greater than 6.4, turbidity less than 15 NTU, and depths less than 20 inches for glassy darter
- Establish monitoring sites utilizing MD DNR index of biological integrity to assess and inventory habitat parameters, particularly those affecting the anadromous species, glassy darter, and stripeback darter.
- Identify stream reaches with glassy darters, and conduct abiotic stream quality measurements such as pH, NTU, and water depths.
- Coordinate with MD DNR and utilize MD DNR Index of Biological Integrity to assess and inventory biological, chemical, and physical parameters affecting

- riverine and stream habitat on the refuge. Develop a long-term database to identify environmental stressors, including climate change, to assess the efficacy of habitat restoration; evaluate stressors to floodplain function, including roads and impoundments; and evaluate stressors to stream water quality, flows, and fish passage from refuge structures, including buildings, culverts, impoundments, parking lots, roads, and runoff waters. Restore or mitigate where possible.
- Participate in local, county, State, and Federal partnerships in the Patuxent, Little Patuxent, and Anacostia River watersheds to improve biological, chemical, and physical components of stream and river health.
 - Prevent new invasive species from becoming established by utilizing early detection rapid response techniques to address invasive species populations through the appropriate control measure.
 - Restore floodplain function where possible.
 - Coordinate with MD DNR to evaluate options to provide fish passage at Cash Lake. Cash Lake has been identified by MD DNR as the 135th most important blockage of over 800 blockages within Maryland. Assess fish passage capability of permanent streams leading to river and prioritize areas for removal of obstruction and restoration for passage.
 - Identify and restore impaired reaches of streams degraded by cutbank erosion, downcutting, turbidity, biodegradation, pollution, and detachment from groundwater table; restore floodplain function where possible. Conduct stream walks to identify problem areas, accessibility issues, and threatened plant communities or other threatened resources. Collaborate with State partners, the Chesapeake Bay Field Office, and stream restoration professionals to target priority areas (locations where corrective measures will yield the most benefit). Identify worst affected reaches with highest potential for benthic recovery.
 - Identify and retrofit any undersize culverts on the refuge. Replace culverts with bottomless arches where feasible and affordable.
 - Widen vegetation buffers where necessary and reduce impervious surfaces near heavily impacted areas through natural establishment or plantings.



Bailey Bridge - USFWS

- Continue water quality assessment for physical and chemical properties (heavy metals, oxygen, and pH) to determine suitability for passage and nursery habitat for interjurisdictional and trust fish species.

Monitoring Elements same as alternative A, plus:

- Conduct periodic surveys along appropriate reaches for triangle floater.
- Investigate contamination from lead deposition.
- Establish long-term monitoring stations for biotic and abiotic water quality parameters at refuge inflow and outflow points on Patuxent and Little Patuxent Rivers.
- Conduct stream walks to identify new sources of degradation and to check function of remediating structures or devices such as replaced culverts, bottomless arches, and bank stabilization works. Conduct periodic aquatic invertebrate surveys.

Rationale same as alternative A

Objective 3.2 Impoundments of Open Water, Emergent, Shrub, and Forested Wetlands

Restore the natural hydrology or manage as green tree reservoirs up to 212 acres (86 hectares) of impoundments, resulting in approximately 129 acres (52 hectares) less of open water, 44 acres (18 hectares) less of emergent wetlands, and 31 acres (13 hectares) less of floodplain shrub wetlands. This action will result in approximately 197 more acres (80 hectares) of floodplain or depression forest and about 9 more acres of upland forest. Impoundments selected for restoration to natural hydrology are based on maximizing conservation values for species of concern described in alternative A.

Strategies

- Remove or permanently open water control structures to permit return of natural hydrological flow or floodplain flooding based on topography and placement relative to stream input. The additional 197 acres are gained from impounded areas versus the 72 acres gained in objective 1.1, which are acres from un-impounded areas.
- Allow natural succession to restore impoundments to natural vegetation.
- Convert select impoundments to green tree reservoirs, which will move the refuge closer towards biological integrity, diversity, and environmental health goals and provide for needs of waterfowl and amphibians through manipulation of the annual hydrological cycle.
- Conduct stream walks to identify problem areas, accessibility issues, and threatened plant communities or other threatened resources. Widen vegetation buffers where necessary and reduce impervious surfaces near heavily impacted areas through natural establishment or plantings. Identify and restore impaired

reaches of refuge streams impacted by cutbank erosion, downcutting, turbidity, biodegradation, pollution, and detachment from groundwater table.

Monitoring Elements

- Periodically check water control structures to ensure functionality and capacity to drain impoundment and serve as conduit to natural streams and floodplain.
- Monitor for invasive wetland species such as phragmites, Japanese knotweed (*Polygonum cuspidatum*), and lesser celandine.
- Conduct benthic soil sampling prior to drainage to learn composition of potentially toxic substances sequestered from previous land uses.
- Monitor success of conversion to green tree reservoir on targeted impoundments.

Rationale

The restoration of impoundments to forest would move the refuge closer to achieving ecological integrity. Ecological integrity has been defined as allowing natural processes that shape ecosystems to occur, along with provision of the biological communities that should normally be found within a site.

To achieve greater ecological integrity of the refuge landscape, each artificial wetland was evaluated as to its deviation from a natural hydrological regime and vegetation communities that are not a part of the North Atlantic Coastal Plain Stream and River Ecological System (CES 203.070).

The refuge's draft habitat management plan has identified that the refuge can make a significant contribution toward supporting forest interior dwelling species. The draft plan also identified that many of the refuge's artificial wetlands are contributing to forest fragmentation that adversely impacts forest interior dwelling species, while at the same time they provide little contribution to waterfowl and waterbirds (SDM Draft May 2011).

Objective 3.3 Emergent Wetlands (Freshwater, Nontidal)

Same as alternative A, but total acreage may potentially be reduced to 36 acres (15 hectares) because of actions to adjacent impoundments.

Strategies, Monitoring Elements, and Rationale same as alternative A

Goal 4: Manage refuge non-forested upland communities to provide ecological structure, composition, and function to support native plants and wildlife, including species of conservation concern. Where appropriate, restore the biological integrity and diversity of these habitats.

Objective 4.1 Shrub/Early Succession Forest Habitat

In addition to alternative A, allow 75 acres to become shrub habitat, totaling 300 acres (121 hectares) overall.

Strategies same as alternative A, plus:

- Confine shrub habitat management to the 200 acres (81 hectares) in the BG&E right-of-way and up to 70 acres (28 hectares) in the Pepco right-of-way and to selected smaller fields (less than 25 acres) next to forest. Existing early succession or shrub habitats that are very small (less than 20 acres/8 hectares) and surrounded by forest will be allowed to undergo natural succession.
- Create new habitat in large blocks (greater than 25 acres), adjacent to grassland or other habitats, and without gaps, openings, and peninsulas into existing forested areas to reduce forest edge and maximize forest interior, which is the forested area greater than 300 feet (91 meters) from the forest edge.

Monitoring Elements same as alternative A, plus:

- Include metrics that measure plant response to management, such as percent cover, vegetation height-density, and dominant species composition.

Rationale same as alternative A

Objective 4.2 Grasslands/Old Fields

Reduce grassy, early succession cover to 255 acres (103 hectares) and allow balance to revert to forest or shrub habitat. Of this acreage, approximately 205 acres (83 hectares) of selected fields will be managed as priority grassland habitat for 80 percent use by priority breeding generalist species such as field sparrow, eastern meadowlark, eastern kingbird, and monarch butterfly, and to provide migrating and wintering cover and food for bobolink, savannah and swamp sparrow, overwintering insects, and foraging bats. Potentially 50 acres (20 hectares) of mowed areas around buildings and facilities will be maintained for administrative purposes, environmental education, public use, or public viewing in a less-intensive management regime. Wherever possible, permit native grasses, forbs, and some shrubs to establish and provide food and cover throughout the year. Priority grasslands shall be maintained in short- to medium-stature in large, nonlinear blocks greater than 25 acres (10 hectares), dominated by 70 percent native cool and warm season grasses, up to 25 percent native forbs such as milkweeds and asters, and up to five percent shrub cover.

Strategies

- Priority grasslands were identified based on size and configuration. The 205 acres (83 hectares) of priority grassland habitats is comprised of the powerline right-of-way near duck pens at 25 acres (10 hectares), Range 1 at 67 acres (27 hectares), NT-10 (field by Blue Heron Pond) at 28 acres (11 hectares), and the retiring crop fields on South Tract at 85 acres (34 hectares).
- Consolidate North Tract grassland management to a limited number of larger fields (greater than 25 acres) in close proximity to already open land and with minimal forest fragmentation.
- Allow small fields (less than 25 acres) to revert to forest habitat, unless mowing is required for administrative purposes, environmental education, public use, or public viewing. Grassland blocks, less than 25 acres (10 hectares), are subject to

intense edge effects and are difficult to maintain. Small, scattered pockets of grassy areas and fields that are too small to manage, which include NT-1, Range 9 and Range 10, grasslands around wildlife viewing area, horse stable, and dog training fields are among those that would be allowed to revert to forest.

- Use prescribed fire, selective herbicide, selective mowing, and planting to provide short- to medium-height bunch grasses interspersed with patches of bare ground, shallow litter layer, scattered forbs, and few shrubs for foraging, nesting, and winter cover.
- Plant and encourage a mix of flowering native species for pollinating insects.
- Initiate a mowing regime that staggers mow sections in a rotation to ensure old field habitat for overwintering insects and seed sources. Mow on August 15 or later to avoid ground nesting birds.
- Control and reduce nonnative invasive species, annually utilizing chemical, biological, or mechanical methods to increase native plant species diversity and richness.
- Prevent new invasive species from becoming established by utilizing early detection rapid response techniques to address invasive species populations through the appropriate control measure.
- Assess the value of refuge grassland habitat for rare butterflies and other pollinators to develop management options commensurate with bird objectives.



USFWS

Juvenal's Duskywing

Monitoring Elements

- Monitor effects of invasive species prevention and control efforts through a combination of plant identification, inventories, and mapping.
- Conduct point count surveys at a density to detect 80 percent use of fields by breeding grassland birds. Conduct migration and winter surveys.
- Conduct periodic vegetation surveys at landbird point counts for height, density measurements, and species composition or grass-forb ratio.
- Conduct baseline inventories of butterflies and other pollinator species to determine species composition.

Rationale

Although significant grasslands occurred in northern Maryland and nearby Pennsylvania (Mayre 1920, Mayre 1955, MD DNR 2005a), it is unlikely that grasslands occurred to any extent in the coastal plain. A review of natural disturbances conducted in the Mid-

Atlantic Coastal Plain suggests that large-scale disturbances are extremely rare (Nature Conservancy 2002) and it's unlikely that Native Americans maintained grassland on the refuge.

The refuge's grasslands consist of 95 parcels totaling 515 to 535 acres (208 to 217 hectares) of mowed agricultural fields and abandoned military ranges/administrative areas that would become forested habitat, if not mowed. Only six mowed fields are greater than 25 acres (10 hectares), a minimum size recommended for nesting obligate grassland birds that are area-and configuration-sensitive, such as the grasshopper sparrow. Those fields are linear in shape, greatly reducing their value to breeding obligate grasslands birds. Forty-nine parcels are less than five acres. The grassland parcels increase forest hard edge, reduce the value of adjacent forests to forest dwelling birds by fragmenting the forest, and have limited obligate grassland bird species nesting potential. These small and scattered grasslands are not significant in a landscape perspective. Small openings in proximity to forest are valuable for whip-poor-will, bats, and box turtles.

Although the refuge's grassland habitat provide limited value to breeding grassland obligate species, they benefit breeding species that are more tolerant of old field succession, such as field sparrow, dickcissel, yellow-breasted chat, indigo bunting, eastern kingbird, orchard oriole, blue grosbeak, and non-migratory northern bobwhite and wild turkey, and migratory wintering bird species such as savannah sparrow, swamp sparrow, American woodcock, and short-term migratory visitors such as bobolink. Some bird species listed as species of greatest conservation need in the Maryland Wildlife Diversity Conservation Plan or as priority bird species in the BCR 30 and PIF 44 implementation plans may occur in small numbers but specific, intensive surveys to detect these species suites have been limited in recent decades.

Fields that are linear in shape maximize forest edge and minimize grassland interior. Field size and perimeter-to-interior (or edge-to-interior) ratio is important criteria for determining whether a given field is potentially suitable for breeding grassland-dependent birds. If grassland patches are too small in size or too linear in shape, there is greater potential for adverse edge effects, such as predation or nest parasitism, as well as woody or invasive plant encroachment. The nesting potential of grassland bird species on these small patch grasslands is limited. A hard forest edge also reduces the habitat values associated with adjacent forested lands for forest birds. An ideal grassland patch would be large enough to accommodate a buffer zone of approximately 300 feet (91 meters) around the edge and provide ample effective interior for the target species nesting territories. Vickery et al. (1999) recommends conserving grassland patches of 250 acres (101 hectares) or more to benefit more area-sensitive species. Watts et al. (1997) determined that grassland patches of less than 25 acres (10 hectares) are better suited for shrub-dependent birds. The value of these areas for wintering and migrating birds and pollinators is unknown.

Goal 5: Provide high-quality recreation, environmental education, and interpretive programs to enhance refuge visitors' understanding and appreciation of fish and wildlife conservation.

Objective 5.1 Wildlife Observation and Photography

Provide high-quality opportunities for wildlife observation and photography on the refuge by expanding facilities.

Strategies same as alternative A, plus:

- Create two additional trails at North Tract (Telegraph Road 2.5 miles/ 4km and Vernal Pool Trail 1.25 miles/ 2km).
- Create opportunities for photo exhibits with local photo clubs.
- Construct new observation tower at the wildlife viewing area on the North Tract and remove existing tower.
- Designate and develop an additional outdoor nature exploration area for visitors on the South Tract.

Monitoring Elements same as alternative A

Rationale

Wildlife observation and photography are two of the six priority public uses required by the Refuge Improvement Act to receive enhanced consideration on refuges. The refuge provides opportunities to view and photograph wildlife in natural settings at nature trails and overlooks (map 3-5). The refuge has historically been a popular birding site and has been recognized as an Important Bird Area by the National Audubon Society. The refuge is a stopover point for migratory waterfowl and attracts hundreds of thousands of birds during migration. The refuge's diverse habitat also attracts songbirds, shorebirds, raptors, marsh birds, reptiles, amphibians and mammals.



USFWS

Birdwatching on the Refuge

Providing a high-quality wildlife observation and photography on the refuge promotes visitor appreciation and support for refuge programs. According to Service policy (605 FW 4 and 5; USFWS 2011), the guiding principles for these two programs include:

- Provide safe, enjoyable, and accessible wildlife viewing opportunities and facilities.
- Promote visitor understanding of, and increase visitor appreciation for, America's natural resources.
- Provide opportunities for quality recreational and educational experiences consistent with criteria describing quality found in 605 FW 1.6.
- Minimize conflict with visitors participating in other compatible wildlife-dependent recreation activities.

The refuge currently offers numerous opportunities for wildlife observation and photography. The refuge provides handicapped-accessible roads, trails, boardwalks, three photo blinds, and an electric tram tour on the South Tract. The refuge accommodates photo classes and exhibits and lends out binoculars to visitors.

The proposed trails on the North Tract would follow existing disturbed areas. The Telegraph Trail would follow the former Telegraph Road. The Vernal Pool Trail, which has been closed since 2010, would be re-established under this alternative by clearing trees that have fallen across a number of sections of the former trail. Since previously disturbed areas are available to meet needs for additional trails, we did not look at other trail location alternatives. The range of alternatives in this case is to either have the trails or not. We viewed construction of trails through undisturbed vegetation and soils to be unwarranted.

Objective 5.2 Interpretation

Promote a stewardship ethic and instill a sense of wonder and appreciation of natural resources, wildlife, and research in visitors by providing engaging interpretive programs and activities for visitors of all abilities, ages, and community groups.

Strategies same as alternative A, plus:

- Increase the quality and diversity of interpretive monthly program opportunities by developing four to six new or revised interpretive programs annually.
- Create and offer limited historical/interpretive guided tours on the Central and North Tracts.
- Promote more hands-on, physically active outdoor activities.

Monitoring Elements and Rationale same as alternative A

Objective 5.3 Environmental Education

Promote a stewardship ethic through environmental education with students, teachers, scout leaders, and organized community groups to understand and appreciate ecological

relationships and the role of refuges Nationwide and understand the role of Patuxent Research Refuge.

Strategies same as alternative A, plus:

- Offer a schoolyard habitat-related teacher workshop series in accordance with local and State education standards.
- Increase refuge staff/volunteer involvement by ten percent by providing offsite conservation-related programs to local schools with emphasis on Jr. Duck Stamp curricula.
- Increase refuge staff/volunteer led scout workshop opportunities by 10 percent over 15 years.
- Incorporate additional climate change and research related information into workshops/programs particularly by partnering with other educational facilities/programs.
- Explore grant and sponsorship opportunities for transportation to public programs (with focus on transportation for underserved audiences).
- Increase number of visiting school groups by 10 percent over 15 years.
- Increase number of teacher workshops offered by 20 percent over 15 years.
- Expand teacher workshop programs and curricula in accordance with Washington, DC and Virginia learning outcomes.
- Explore credit opportunities for Washington, DC and Virginia schools.

Monitoring Elements and Rationale same as alternative A

Objective 5.4 Non-wildlife-dependent Public Uses

Support non-wildlife-dependent uses when deemed to be an appropriate use and compatible with the refuge purpose and mission of the Refuge System.

Strategies same as alternative A, plus:

- Continue to allow horseback riding at the North Tract.
- Allow limited virtual and no-impact geocaching along designated trails, if found compatible at the North and South Tracts.
- Allow waterfowl related dog training with hunting permit in designated areas at North Tract (Cattail Pond and New Marsh), while prohibiting all dog training that is not hunting related.

Monitoring Elements and Rationale same as alternative A

Goal 6: Provide high-quality hunting and fishing experiences for hunters and anglers.

Objective 6.1 Hunting

Provide robust and diverse, quality hunting opportunities to hunters of all ages while promoting hunter and visitor safety, wildlife health, and increasing other public use opportunities.

Strategies same as alternative A, plus:

- Increase specialty hunts/organized hunts for youth and persons with disabilities.
- Assess effectiveness of quality deer management for hunting and maintaining healthy deer populations and revise regulations as needed.
- Reduce hunting hours on some week days to allow researchers and the non-hunting public greater access to the North Tract during the hunting season.

Monitoring Elements same as alternative A

Rationale

Hunting is one of the six priority public uses required by the Refuge Improvement Act to receive enhanced consideration on refuges. Hunting is a popular and traditional activity in the area and a management tool to keep wildlife populations at healthy numbers to maintain healthy habitats. When managed appropriately, hunting can instill a unique understanding and appreciation of wildlife, their behavior, and their habitat needs.

Providing a high-quality hunt on the refuge promotes visitor appreciation and support for refuge programs. The Service defines a quality hunting experience as one that achieves the following (605 FW 2; USFWS 2011):

- Manage wildlife populations consistent with the Refuge System, specific management plans approved after 1997, and to the extent practicable, State fish and wildlife conservation plans.
- Promote visitor understanding of, and increase visitor appreciation for, America's natural resources.
- Provide opportunities for quality recreation and interpretive experiences consistent with criteria describing quality found in 605 FW 1.6 (USFWS 2011).
- Encourage participation in hunting to help preserve it as a tradition deeply rooted in America's natural heritage and conservation history.
- Minimize conflicts with visitors participating in other compatible wildlife-dependent recreational activities.

Hunting on the refuge is guided by hunting guidelines that are updated annually. The hunt program is administered in conjunction with MNHA. Guidelines are jointly reviewed by MNHA and refuge staff annually, and clarified as needed. Hunting is typically permitted only during established Maryland hunting seasons (typically

September through January). Current hunting includes opportunities for upland game, waterfowl, and white-tailed deer (bow, muzzleloader, and shotgun).



USFWS

North Tract Hunter Contact Station

and lottery style hunt opportunities on the Central Tract for white-tailed deer. The refuge's hunt program has the distinction of being one of the largest Federal public use hunting programs in terms of season length, variety of hunts, and numbers of hunters use days.

The majority of the hunting occurs on North Tract. MNHA conducts daily hunt control operations, including permit sales, daily sign-ins, and harvest recording. The majority of North Tract will remain closed to general public use during firearms and shotgun seasons. There are also hunting opportunities on the South Tract for white-tailed deer

Objective 6.2 Fishing

Provide additional fishing opportunities to anglers of all ages while promoting angler and visitor safety, and wildlife health.

Strategies same as alternative A, plus:

- Open Blue Heron Pond to fishing access via hiking and biking. Allow vehicular access to Blue Heron Pond for visitors with impaired mobility.
- Expand calendar days for fishing on the South Tract at Cash Lake to start in mid-March (contingent on harvest population surveys).
- Expand fishing hours at North Tract (contingent on operating hours changing).
- Evaluate potential new fishing areas at North Tract (upstream of Bailey Bridge and Wood duck Pond).
- Assess fish populations refugewide to ensure biological integrity and health in accordance with providing a quality fishing experience.
- Expand North Tract events to include youth fishing activities.

Monitoring Elements same as alternative A

Rationale

The Refuge Improvement Act identifies fishing as one of the six priority, wildlife-dependent public uses. It states, "Compatible wildlife-dependent recreation is a legitimate and appropriate general public use of the [Refuge] System."

Providing high-quality fishing opportunities on the refuge promotes visitor appreciation and support for refuge programs. According to Service policy (605 FW 3; USFWS 2011), the guiding principles for our fishing program include the following:

- Effectively maintain healthy and diverse fish communities and aquatic ecosystems through the use of scientific management techniques.
- Promote visitor understanding of, and increase visitor appreciation for, America's natural resources.
- Provide opportunities for quality recreational and educational experiences consistent with criteria describing quality found in 605 FW 1.6 (USFWS 2011).
- Encourage participation in this tradition deeply rooted in America's natural heritage and conservation history.
- Minimize conflicts with visitors participating in other compatible, wildlife-dependent recreational activities.

As with hunting, we recognize fishing as a healthy, traditional outdoor pastime. It, too, promotes public understanding and appreciation of natural resources and their management on all lands and waters in the Refuge System. The refuge provides opportunities for fishing on both the North and South Tracts. However, fishing is limited on North Tract due to closures during the hunting season and when firing ranges are active. A kids' fishing day is offered annually on the South Tract. Kids' fishing day allows not only for youth to experience a traditional recreational activity, but also for the public to engage with refuge staff and volunteers while participating in a priority public use.

Goal 7: Enhance partnerships with local communities and various organizations to garner support and promote refuge programs and resources.

Objective 7.1 Volunteer Opportunities

Provide a wide variety of high-quality volunteer opportunities to support Patuxent Research Refuge and PWRC and to encourage community involvement and support of refuges and natural resources.

Strategies same as alternative A, plus:

- Increase participation with youth volunteers and youth community service organizations by 10 percent over 15 years.
- Accommodate two to four service related organizations per year for work projects.
- Organize/implement a refugewide project database outlining possible volunteer projects (identify seasonality of work, age appropriateness, etc.).
- Better integrate volunteer opportunities with PWRC, MNHA, and Friends of Patuxent.

- Encourage/recruit diverse volunteer workforce.
- Increase volunteer recognition, award, social, and interactive opportunities.

Monitoring Elements and Rationale same as alternative A

Objective 7.2 Outreach

Continue to foster community relations and recruit visitors through outreach and community involvement.

Strategies same as alternative A, plus:

- Increase outreach referenced above by at least ten percent per category.
- Reactivate speakers' bureau.
- Investigate highway radio announcement opportunities (on special frequency).
- Reorganize refuge Web site to make site more user-friendly and be in accordance with Service guidelines.
- Increase media partner mailings and communications for events and develop target mailing lists for events.
- Actively participate in social media.

Monitoring Elements and Rationale same as alternative A

Refuge Staffing, Facilities, and Grounds Necessary to Implement Alternative B

- In addition to 2010 staffing org chart, the following positions were identified in 2009 Refuge System staffing model as a need for the refuge:
 - WG-09 Maintenance Worker – Grounds (FEM)
 - WG-09 Maintenance Worker – Buildings (FEM)
 - GS-12 Contracting Officer (BMA)
 - LE-11 Law Enforcement Officer (RLE)
 - GS-11 Visitor Services (VCS)
- Continue NWVC hours of operation from 9 a.m. to 4:30 p.m. daily, including most Federal holidays (except Thanksgiving, Christmas, and New Year's Day).
- Expand hours of operation for South Tract trails and grounds from dawn to dusk.
- Utilize green technology to update NWVC and modify building structure and grounds to be more wildlife friendly (e.g., window screening to reduce bird strikes).
- Update and modify the Wisdom of Wildness exhibits.

- Construct additional space for environmental education and interpretation classes and storage on South Tract.
- Continue to allow scientific, educational, and agency partners to use conference facilities for information exchange.

3.7 Alternative C. Maximize Forest Interior Restoration and Emphasize Wildlife-Dependent Public Use Activities

Habitat Management

Under alternative C, habitat management would maximize forest interior areas throughout the refuge (map 3-5). This alternative includes the restoration of 767 acres (310 hectares) to forest. The land under the proposed reforestation currently exists as impoundments or grassland areas. Reforesting impoundments and grassland areas would benefit forest interior dwelling species by creating larger pockets of contiguous forest surrounded by a highly urbanized area. It would also improve water quality as related to the Patuxent River and Little Patuxent River, and ultimately the Chesapeake Bay watershed.

An oak-pine savannah habitat, as indicated by soil type and an assemblage of rare fauna, would be maintained to promote this rare and native habitat type and support species such as the darkling beetle and tiger beetle. Impoundments that support fishing would also be maintained. Approximately 280 acres (113 hectares) of shrub and early successional forest habitat would be maintained in the powerline right-of-ways. Grasslands/old field habitats would be allowed to reforest, except where maintaining open field is mandated for other purposes.

Of the 553 acres of impoundments, only 357 acres were considered for potential conversion in the structured decision-making process. The additional acreage was not included because some of the impoundments do not lend themselves to restoration (i.e., they are used extensively for public use) or restoration would be cost-prohibitive.

Inventory and Monitoring

As with alternatives A and B, we would continue existing monitoring and inventory efforts as long as we have the necessary resources and as long as they continue to provide useful information that will inform us about the quality of forest health and diversity and ecosystem function (including water resources); the status of forest interior, shrub, and grassland/savannah priority species; effectiveness of habitat management; and habitat adaptation to climate change. We would target any alterations or additions to these ongoing surveys toward helping us understand better the implications of our management actions and ways to improve our efficiency and effectiveness. We would also continue to seek ways to reduce our management costs for establishing and maintaining monitoring protocols.

Visitor Services

Under alternative C, we would maintain a mix of visitor use that is compatible with maximizing forest interior habitats. We would expand wildlife observation, viewing, and

photography opportunities. We would reduce the number of special events and interpretive programming both on and offsite. We would also explore the implementation of a recreational use fee for programs and activities.

We would eliminate the January hunt season refugewide, with the exception of firearms season for deer, but we may reserve the option to implement special deer hunts to ensure attainments of population management goals for forest health. In addition, we would explore closure of areas to hunting to accommodate other public uses.

We would also reduce or eliminate non-wildlife-dependent uses.



Refuge Staff - USFWS

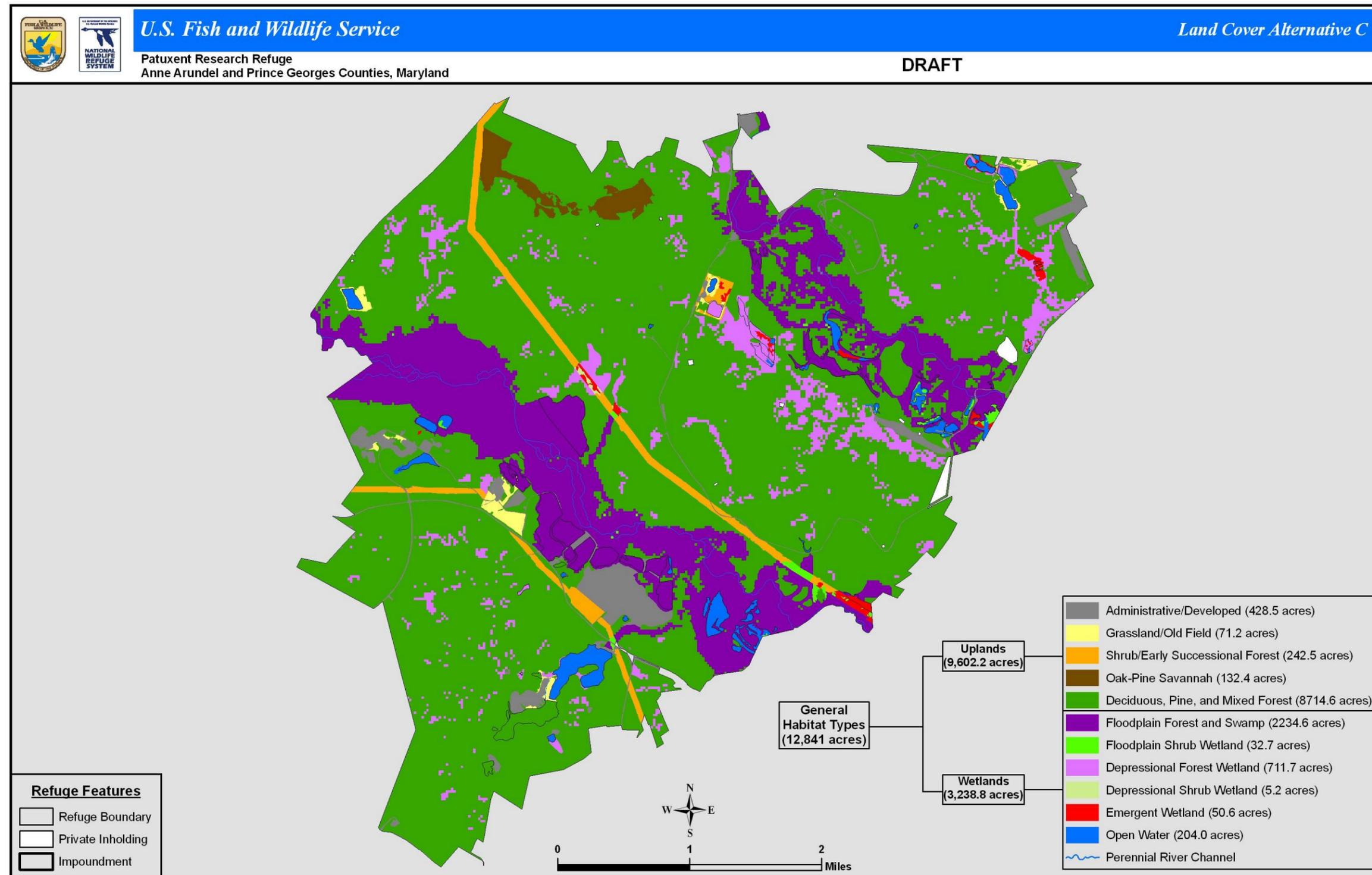
Refuge Administration

Under this alternative, we would expand refuge staff to support habitat management efforts, facilities maintenance, and visitor use. As identified in the 2009 Refuge System staffing model, we propose to fill five positions which include: two maintenance workers (grounds and buildings), one contracting officer, one law enforcement officer, and one visitor services park ranger. In addition to the positions identified in the staffing model, we would propose to fill one forester position to address the increased role of forest management. In order to fill the positions identified, permanent sources of funding would need to exist.

In addition to staffing, we would continue to update and maintain

facilities as identified in the Facilities Modernization Program. Proposed staffing charts can be viewed in appendix F.

Map 3-5. Anticipated Habitat under Alternative C



Goals, Objectives, and Strategies under Alternative C

Goal 1: Maintain and actively promote Patuxent Research Refuge as an “outdoor laboratory,” providing a diversity of wildlife and natural resource research opportunities on the refuge in such areas as landscape conservation, habitat fragmentation, climate change, and other emerging issues, as well as the more traditional types of wildlife research, including inventory and monitoring techniques, land management, and understanding ecological processes. Research that supports the overall Service mission, and evaluates the best methods for protecting natural resources throughout the Refuge System and other land management agencies will be a priority.

Objective 1.1 Inventory and Monitoring

Conduct high-priority inventory and monitoring (survey) activities that evaluate resource management and public use activities to facilitate adaptive management.

Strategies, Monitoring Elements, and Rationale are the same as alternative B

Objective 1.2 Research and Scientific Assessments (Local, National, and International)

Facilitate research of a local, national, and international nature that benefits wildlife on refuge lands as well as all other natural areas. Facilitate scientific assessments to provide baseline information to expand knowledge regarding the status of refuge resources to better inform resource management decisions.

Strategies, Monitoring Elements, and Rationale are the same as alternative B

Goal 2: Protect, maintain, and restore, where possible, the biological integrity, diversity, and environmental health of forested ecological communities to provide habitat for species of conservation concern, including migratory birds, mammals, amphibians, reptiles, and invertebrates.

Objective 2.1 Floodplain Forest and Swamp, including Depressional Forests and Shrub Wetlands

In addition to alternative A, provide approximately 42 additional acres (17 hectares) of floodplain or depressional forest and shrub wetlands along the Patuxent and Little Patuxent Rivers, totaling 2,691 acres (1,089 hectares).

Strategies

- Restore forests through natural succession, whenever possible, primarily from conversion of scattered pockets of small, wet meadows, including meadows around Uhler marshes (approximately 34 acres or 14 hectares) and similar areas. Also, 42 acres will be gained in this objective as a result of restoring 19 impoundments to natural hydrology or green tree reservoirs.

Monitoring Elements and Rationale are the same as alternative B

Objective 2.2 Upland Deciduous, Pine, and Mixed Forest and Associated Wetlands

In addition to alternative A, restore an additional 475 acres (192 hectares) of native upland forest habitat, totaling about 8,717 acres (3,527 hectares).

Strategies

- Acreage would primarily come from conversion of grassland habitats which would incorporate the 205 acres (83 hectares) of priority grassland habitats comprised of the powerline right-of-way near the duck pens at 25 acres (10 hectares), Range 1 at 67 acres (27 hectares), NT-10 (field by Blue Heron Pond) at 28 acres (11 hectares), the retiring crop fields on South Tract at 85 acres (34 hectares), and includes 43.9 acres gained from impoundment restoration. Additional acreage will come from conversion of administratively mowed grassy areas and scattered pockets of grasslands that are too small to manage.

Monitoring Elements and Rationale are the same as alternative B

Objective 2.3 Oak-Pine Savannah

Strategies, Monitoring Elements, and Rationale are the same as alternative B

Goal 3: Protect, maintain, and restore, where possible, the biological integrity, diversity, and environmental health of refuge aquatic habitats, located within the Patuxent, Little Patuxent, and Anacostia River watersheds, and impoundments, to provide habitat for species of conservation concern, including fish, invertebrates, and plants.

Objective 3.1 Coastal Plain River and Coastal Plain Stream Habitats

Strategies, Monitoring Elements, and Rationale are the same as alternative B

Objective 3.2 Impoundments of Open Water, Emergent, Shrub, and Forest

Restore the natural hydrology or manage as green tree reservoirs up to 240 acres (97 hectares) of impoundments, resulting in approximately 167 acres (68 hectares) less of open water, 44 acres (18 hectares) less of emergent wetlands, and 31 acres (13 hectares) less of floodplain shrub wetlands. This action will result in approximately 200 acres (81 hectares) of floodplain or depression forest and about 40 acres of upland forest. Impoundments selected for restoration to natural hydrology are based on maximizing conservation values for forest interior dwelling species of concern described in alternative A.

Strategies

- Acreage comes from impoundments targeted for conversion through the structured decision-making process. Refer to the structured decision-making table in appendix G to see conversion of acreage. The 200 acres comes from manipulations to 19 impoundments, versus 42 acres gained in objective 1.1, which are unimpounded areas.

Monitoring Elements and Rationale are the same as alternative B

Objective 3.3 Emergent Wetlands (Freshwater, Nontidal)

Same as alternative A, but total acreage may potentially be reduced to 32 acres (13 hectares) because of actions to adjacent impoundments.

Strategies, Monitoring Elements, and Rationale are the same as alternative B

Goal 4: Manage refuge non-forested upland communities to provide ecological structure, composition, and function to support native plants and wildlife, including species of conservation concern. Where appropriate, restore the biological integrity and diversity of these habitats.

Objective 4.1 Shrub/Early Successional Forest Habitat

In addition to alternative A, allow 20 to 30 acres (8 to 12 hectares) of shrub habitat in North Tract revert to forest, resulting in only 270 to 280 acres (109 to 113 ha) of shrub habitat overall.

Strategies

- The reduced acreage in this alternative comes from allowing field NT-1, which is about 22 to 30 acres, to revert to forest instead of maintain as shrub habitat.

Monitoring Elements and Rationale are the same as alternative B

Objective 4.2 Grassland/Old fields

Reduce grassy, early successional cover to about 70 to 75 acres (28 to 30 hectares). About 185 acres (75 hectares) of priority grassland habitat will be converted to mixed hardwood forest dominated by oaks and other native canopy species. Under this alternative, the remaining grassy, early successional acres around buildings and facilities will be maintained for administrative purposes, environmental education, public use, or public viewing in a less-intensive management regime wherever possible to permits native grasses, forbs, and some shrubs to establish and provide food and cover throughout the year.

Strategies

- To achieve this objective, all but 20 to 25 of the 205 acres of the priority grasslands would be converted to forest. The 20 to 25 acres by the duck pens and the 50 acres of administratively mowed grassy areas would still be maintained.
- Acreage to reforest will come from conversion of small, scattered pockets of grassy areas and fields that are too small to manage, which include NT-1, Range 9, and Range 10, grasslands around wildlife viewing area, horse stable, and dog training fields. These areas have been identified in alternative C map.
- Implement a less-intensive mowing regime in larger grassland areas near buildings and facilities that need to be kept relatively short. In these areas, use selective herbicide, rotational and selective mowing, and supplemental planting to

provide short- to medium-height bunch grasses interspersed with patches of bare ground, shallow litter layer, scattered forbs, and few shrubs for foraging, nesting, and winter cover. Plant and encourage a mix of flowering native species where feasible for pollinating insects. Follow Bayscape principles.

- Limit grassland management to only large fields (approximately 50 fields) on the North Tract which are in close proximity to similarly open lands. Allow the 84 fields (363 acres/147 hectares) in the Central and South Tracts to revert to forest habitat (unless mowing is required for administrative purposes, environmental education, public use, or public viewing). Grassland blocks less than 25 acres increase forest edge and fragment forests. All Central or South Tracts are less than 25 acres.
- Control and reduce nonnative invasive species by ten percent utilizing chemical, biological, or mechanical methods to increase native plant species diversity and richness.
- Prevent new invasive species from becoming established by utilizing early detection rapid response techniques to address invasive species populations through the appropriate control.

Monitoring Elements

- Monitor effects of invasive species prevention and control efforts through a combination of plant identification, inventories, and mapping
- Evaluate achievement of the objective for migrating birds. Continue to conduct landbird surveys and migration counts. Include habitat measurement in those surveys.
- Conduct baseline inventories of butterflies and other pollinator species to determine species composition.

Rationale is the same as alternative B

Goal 5: Provide high-quality recreation, environmental education, and interpretive programs to enhance refuge visitors' understanding and appreciation of fish and wildlife conservation.

Objective 5.1 Wildlife Observation and Photography

Provide additional opportunities for wildlife observation and photography on the refuge.

Strategies, Monitoring Elements, and Rationale are the same as alternative B

Objective 5.2 Interpretation

Promote a stewardship ethic and instill a sense of wonder and appreciation of natural resources, wildlife, and research in visitors by providing engaging interpretive programs and activities for visitors of all abilities, ages, and community groups.

Strategies different from alternative B

- Explore fee options for refuge entry, programs, and activities to allow refuge staff to develop new interpretive and education programs.
- Reduce the number of special events offered at the refuge to allow refuge staff to focus on habitat management and provision of wildlife observation, interpretation, environmental education, photography, hunting, and fishing opportunities.

Monitoring Elements and Rationale are the same as alternative B

Objective 5.3 Environmental Education

Promote a stewardship ethic through environmental education with students, teachers, and organized community groups to understand and appreciate ecological relationships and the role of refuges nationwide and understand the role of Patuxent Research Refuge.

Strategies same as A, plus:

- Offer schoolyard habitat related teacher workshop series in accordance with local and State education standards.
- Increase involvement in offsite conservation-related programs to local schools and number of visiting schools by 10 percent over 15 years.
- Explore grant and sponsorship opportunities for student transportation to public programs.
- Increase number of teacher workshops. Increase number offered by 20 percent over 15 years.



Habitat Camp - USFWS

Monitoring Elements

- Complete annual evaluation that summarizes environmental education opportunities provided both on and offsite (number of opportunities and events) and document their utilization (number of visits, type of activity, and number of participants engaged).

Rationale

Environmental education is priority public use and has been identified as an area of emphasis for the refuge. As one of the largest science and environmental education centers in the DOI, NWVC offers unique educational opportunities for school groups, scouts, youth groups etc. NWVC exhibits are designed to provide visitors with greater knowledge and appreciation of the environmental problems affecting our planet and the role wildlife research plays in preserving the earth's natural resources. Programs strive to

instill a general appreciation and understanding of natural resources and environmental concepts, with the ultimate goal of environmental stewardship. By using both indoor and outdoor resources, the environmental education team is able to provide opportunities and curriculum designed to meet the needs of the diverse ethnic and multi-cultural youth population that visit the refuge.

Objective 5.4 Non-Wildlife-Dependent Public Uses

Reduce or eliminate non-wildlife-dependent public uses of the refuge to reduce impacts to wildlife species from disturbance and to focus on allowing only the six wildlife-dependent public uses explicitly mentioned in the Refuge Improvement Act.

Strategies different from alternative B

- Prohibit horseback riding.
- Prohibit dog walking and waterfowl training.
- Prohibit search and rescue training.
- Implement a fee program for primitive camping opportunities.

Monitoring Elements

- Continue to track visitor uses through the Visitor Contact Station check-in/access pass.
- Solicit informal participant feedback and take note of repeat visitors.

Rationale

Non-wildlife-dependent public uses that have occurred on the refuge include bicycling, jogging, cross-country skiing, and hiking. Under alternative C, we would eliminate all of the above referenced activities. Under this alternative, we would focus on reducing dispersed recreational activities and focus any non-wildlife-dependent public uses at NWVC and Visitor Contact Station.

Implementing a fee program for primitive camping opportunities will help defray the administrative costs of allowing this use. It will also make last-minute cancellations less likely.

Goal 6: Provide high-quality hunting and fishing experiences for hunters and anglers.

Objective 6.1 Hunting

Provide robust and diverse hunting opportunities to hunters of all ages while promoting hunter and visitor safety, and wildlife health and increasing other public use opportunities.

Strategies same as alternative B, plus:

- Keep Little Patuxent River trail open during hunting with 50-yard (150-foot) buffer.

- Evaluate the need to close some hunt areas seasonally to allow for other permitted uses (e.g., Area N for fishing access at Rieve’s Pond).
- Eliminate January hunt season refugewide with the exception of January deer firearms season.

Monitoring Elements and Rationale are the same as alternative B

Objective 6.2 Fishing

Provide additional fishing opportunities to anglers of all ages while promoting angler and visitor safety and wildlife health.

Strategies, Monitoring Elements, and Rationale are the same as alternative B

Goal 7: Enhance partnerships with local communities and various organizations to garner support and promote refuge programs and resources.

Objective 7.1 Volunteer Opportunities

Provide a wide variety of high-quality volunteer opportunities to support the refuge and to encourage community involvement and support of refuges and natural resources.

Strategies, Monitoring Elements, and Rationale are the same as alternative B

Objective 7.2 Outreach

Continue to foster community relations and recruit visitors through outreach and community involvement.

Strategies, Monitoring Elements, and Rationale are the same as alternative B

Refuge Staffing, Facilities, and Grounds Necessary to Implement Alternative C

Strategies same as alternative B, plus:

- In addition to 2010 staffing org chart, the following positions were identified in 2009 Refuge System staffing model as a need for the refuge:
 - WG-09 Maintenance Worker – Grounds (FEM)
 - WG-09 Maintenance Worker – Buildings (FEM)
 - GS-12 Contracting Officer (BMA)
 - LE-11 Law Enforcement Officer (RLE)
 - GS-11 Visitor Services (VCS)
- In addition to the positions listed above, a forester position (GS-09) would be needed to address the increased role of forest management.
- Increase weekend seasonal hours of operation for NWVC and Visitor Contact Station, including most Federal holidays (except Thanksgiving, Christmas, and New Year’s Day).

Table 3-3. Summary of Comparison of Alternatives

Common to All Alternatives
<ul style="list-style-type: none"> • Continue to acquire land within the approved acquisition boundary. • Maintain current facilities and/or implement provisions of the facilities modernization plan. • Monitor and control nonnative invasive species. • Develop a separate land protection plan with public and agency involvement in compliance with Service policy and NEPA. • Protect cultural resources, including National Register of Historic Places eligible buildings and historic district. • Coordinate with USGS to house and support research efforts; encourage basic and applied scientific work on the refuge that furthers the goals of Service and USGS in coordination with refuge management (e.g., propagation of endangered species). • Work with Fort Meade to ensure protection of cemeteries that are surrounded by refuge lands.

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
<p>Goal 1: Maintain and actively promote Patuxent Research Refuge as an “outdoor laboratory,” providing a diversity of wildlife and natural resource research opportunities on the refuge in such areas as landscape conservation, habitat fragmentation, climate change, and other emerging issues, as well as the more traditional types of wildlife research, including inventory and monitoring techniques, land management, and understanding ecological processes. Research that supports the overall Service mission, and evaluates the best methods for protecting natural resources throughout the National Wildlife Refuge System and other land management agencies will be a priority.</p>			
<i>Inventory and Monitoring</i>	Objective 1.1: Conduct high-priority inventory and monitoring (survey) activities that evaluate resource management and public use activities to facilitate adaptive management.	Objective 1.1: Conduct high-priority inventory and monitoring (survey) activities that evaluate resource management and public use activities to facilitate adaptive management.	Objective 1.1: Conduct high-priority inventory and monitoring (survey) activities that evaluate resource management and public use activities to facilitate adaptive management.
<i>Research and Scientific Assessments (Local, National, and International)</i>	Objective 1.2: Facilitate research of a local, national, and international nature that benefits wildlife on refuge lands as well as all other natural areas. Facilitate scientific assessments to provide baseline information to expand knowledge	Objective 1.2: Facilitate research of a local, national, and international nature that benefits wildlife on refuge lands as well as all other natural areas. Facilitate scientific assessments to provide baseline information to	Objective 1.2: Facilitate research of a local, national, and international nature that benefits wildlife on refuge lands as well as all other natural areas. Facilitate scientific assessments to provide baseline information to

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
	regarding landscape-scale natural resource issues and to determine the status of onsite refuge resources to better inform resource management decisions.	expand knowledge regarding landscape-scale natural resource issues and to determine the status of onsite refuge resources to better inform resource management decisions.	expand knowledge regarding the status of refuge resources to better inform resource management decisions.
Goal 2: Protect, maintain, and restore, where possible, the biological integrity, diversity, and environmental health of forested ecological communities to provide habitat for species of conservation concern, including migratory birds, mammals, amphibians, reptiles, and invertebrates.			
<i>Floodplain Forest and Swamp, Depressional Forest, and Depressional Shrub Wetlands</i>	Objective 2.1: Maintain the biological integrity of 2,018 acres (817 ha) of native floodplain forest and the 757 acres (306 ha) of depressional forest and shrub with 80 percent closed canopy and less than 10 percent invasive nonnative species along the Patuxent and Little Patuxent Rivers.	Objective 2.1: In addition to alternative A, restore the biological integrity and natural hydrology of approximately 255 additional acres (91 ha) of floodplain or depressional forest along the Patuxent and Little Patuxent Rivers, totaling about 3,030 acres (1,226 ha).	Objective 2.1: In addition to alternative A, restore the biological integrity of 235 acres (95 ha) of native floodplain or depressional forest communities along the Patuxent and Little Patuxent Rivers, totaling 3,010 acres (1,218 ha).
<i>Upland Deciduous, Pine, and Mixed Forest and Associated Wetlands</i>	Objective 2.2: Maintain 8,242 acres (3,335 ha) of native, mature upland forest communities with 80 percent closed canopy and less than 10 percent invasive species containing a diverse age structure and developed understory and midstory to provide breeding, migratory, and winter habitat for whip-poor-will (near forest edge), scarlet tanager, cerulean warbler, eastern wood-pewee, wood thrush, worm-eating	Objective 2.2: In addition to alternative A, restore 191.5 acres (78 ha) of upland forest with an emphasis on large block management (500 acres or larger) and reduced fragmentation to further support area-sensitive, breeding, forest-dwelling species such as scarlet tanager, woodthrush, and box turtle.	Objective 2.2: In addition to alternative B, restore 465 acres (188 ha) of native upland forest habitat, totaling about 8,707 acres (3,524 ha).

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
	warbler, and yellow-throated vireo, and also to benefit other forest-dependent species such as eastern forest bats, eastern spadefoot toad, eastern chorus frog, eastern box turtle, hog-nosed snake, and native insects.		
<i>Oak-Pine Savannah</i>	Objective 2.3: Maintain 50 acres (20 ha) of savannah habitat consisting of an open over-story canopy dominated by native hardwoods (primarily oaks), and an understory dominated by native grasses such as broom sedge, little bluestem, and forbs such as asters and other composites for the benefit of rare darkling and tiger beetle species, upland chorus frog, native bees, Indian skipper and other pollinators, and sandy barren plant communities.	Objective 2.3: In addition to alternative A, increase savannah habitat up to 135 acres (55 ha).	Objective 2.3: Same as alternative B.
Goal 3: Protect, maintain, and restore, where possible, the biological integrity, diversity, and environmental health of refuge aquatic habitats, including the Patuxent, Little Patuxent, and Anacostia River watersheds, and impoundments, to provide habitat for species of conservation concern, including fish, invertebrates, and plants.			
<i>Coastal Plain River and Coastal Plain Stream Habitats</i>	Objective 3.1: Maintain and protect the quality aquatic habitat of the approximately 68 riparian miles (109 km) of Patuxent, Little Patuxent, and Anacostia River watersheds within the refuge, as well as their	Objective 3.1: In addition to alternative A, restore biological integrity and water quality of impaired stream segments.	Objective 3.1: Same as alternative B.

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
	<p>associated perennial streams, to provide spawning, nursery, foraging, and cover habitat for aquatic resources of conservation concern such as American brook lamprey, American eel, American and hickory shad, alewife, blueback herring, comely shiner, glassy darter, stripeback darter, and the State-endangered triangle floater. Provide quality foraging habitat for eastern forest bats, spotted turtle, and insectivorous birds such as whip-poor-will and prothonotary warbler.</p>		
<i>Impoundments of Open Water, Emergent, Shrub, and Forest</i>	<p>Objective 3.2: Manage the current 553 acres (224 ha) in 61 impoundments of open water, emergent, shrub and forest wetlands, or green tree reservoirs to provide habitat for migratory bird species of conservation concern, including American black duck, solitary sandpiper, green heron, greater and lesser yellowlegs, and also to benefit other species of conservation concern, such as least bittern and elfin skimmer, and aquatic reptiles and amphibians.</p>	<p>Objective 3.2: Of the 342 acres targeted for potential conversion in the structured decision making process, 210 acres (85 ha) would be converted to bottomland or depressional forest resulting in approximately 343 acres (139 ha) of impounded wetlands. Impoundments selected for restoration to natural hydrology are based on maximizing conservation values for species of concern described in alternative A.</p>	<p>Objective 3.2: Of the 342 acres (138 ha) of impoundments targeted for potential conversion in the structured decision-making process, convert an additional 29 acres (97 ha) of impoundments to floodplain bottomland or depressional forest. This would result in approximately 314 acres (127 ha) of impounded wetlands, including those not targeted for restoration.</p>
<i>Emergent Wetlands</i>	<p>Objective 3.3: Maintain the biological integrity of</p>	<p>Objective 3.3: Same as alternative A.</p>	<p>Objective 3.3: Same as alternative B.</p>

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
<i>(freshwater, non-tidal)</i>	44 acres (18 ha) of naturally occurring freshwater emergent wetlands and open bogs in native vegetation such as narrowleaf cattail, sedges, wetland grasses, pipeworts, arrow arum, pickerelweed, bur-reeds, arrowheads, smartweeds, spike-rushes, asters and composites, and more persistent species such as swamp rose, hibiscus to benefit priority wetland bird species of concern, such as American black duck and least bittern.		
Goal 4: Manage refuge non-forested upland communities to provide ecological structure, composition, and function to support native plants and wildlife, including species of conservation concern. Where appropriate, restore the biological integrity and diversity of these habitats.			
<i>Shrub/Early Succession Forest Habitat</i>	Objective 4.1: Continue to provide up to 200 acres (81 ha) of shrub and early succession forest habitat in the 5.5-mile (9-km) BG&E powerline and up to 70 acres (28 ha) in the 3.5-mile (6-km) Pepco powerline right-of-ways in short-stature (less than 10 feet), moderate-density (50 to 75 percent) woody shrub and early succession herbaceous cover comprised of berry, seed, nectar-producing native species for breeding bird species of conservation concern, such as brown thrasher, field sparrow,	Objective 4.1: In addition to alternative A, allow 40 to 50 acres (16 to 20 ha) of grassland in small pockets and border zones (less than 25 acres) next to forest to convert to shrub habitat, totaling approximately 310 to 320 acres (125 to 130 ha).	Objective 4.1: Same as alternative A, with an additional 20 acres (8 ha) of shrub habitat, totaling about 290 acres (117 ha).

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
	prairie warbler, eastern towhee, yellow-breasted chat, and gray catbird; migratory and wintering habitat for blue-winged warbler and American woodcock; and foraging habitat for eastern forest bats, whip-poor-will, native pollinators, and other insects.		
<i>Grasslands/ Old Fields</i>	Objective 4.2: Maintain existing 515 to 535 acres (208 to 217 ha) of grassland dominated by 70 percent native cool and warm season grasses, up to 25 percent forbs, and up to 5 percent shrub cover to provide breeding, migrating, and winter cover and forage for grassland bird species of conservation concern; including eastern meadowlark, eastern kingbird, field sparrow, savannah sparrow, swamp sparrow, and monarch butterfly and grasshopper sparrow and to benefit native pollinating insects. Allow the remaining fields (less than 25 acres) to revert to forest habitat, unless mowing is required for administrative purposes, environmental education, public use, or public viewing.	Objective 4.2: Reduce grasslands by about 150 acres (61 ha), providing approximately 205 acres (83 ha) of priority managed grassland habitat in short- to medium-stature grasslands in large, nonlinear blocks greater than 25 acres (10 ha), dominated by 70 percent native cool and warm season grasses, up to 25 percent native forbs such as milkweeds and asters, and up to five percent shrub cover, for 80 percent use by priority breeding generalist species such as field sparrow, eastern meadowlark, eastern kingbird, and monarch butterfly, and to provide migrating and wintering cover and food for bobolink, savannah and swamp sparrow, overwintering insects, and foraging bats. This results in 385 total acres	Objective 4.2: All priority grassland habitat (205 acres/83 ha), and the many small fields in grass cover (150 acres/61 ha) will be converted to mixed hardwood forest dominated by oaks and other native canopy species. Approximately 180 acres (73 ha) of mowed areas around buildings and facilities will be maintained for administrative purposes in a less-intensive management regime that permits native grasses, forbs, and some shrubs to establish and provide food and cover throughout the year. Maintain 22 acres (9 ha) of grassland/old field habitat in the powerline right-of-way near duck pens (units CT-20 and CT-21).

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
		(156 ha) of grassland or grassy cover for alternative.	
Goal 5: Provide high-quality recreation, environmental education, and interpretive programs to enhance refuge visitors' understanding and appreciation of fish and wildlife conservation.			
Wildlife Observation and Photography	Objective 5.1: Provide high quality opportunities for wildlife observation and photography on the refuge. Maintain observation towers and areas, trails (25 miles/40 km), wildlife drive, viewing blinds, and wildlife and nature photo gallery.	Objective 5.1: Provide high quality opportunities for wildlife observation and photography on the refuge by expanding facilities and hours of operation. In addition to alternative A: <ul style="list-style-type: none"> • Create two additional trails at North Tract (Telegraph Road 2.5 miles/4 km and Vernal Pool Trail 1.25 miles/2 km). • Create opportunities for photo exhibits with local photo clubs. • Construct new observation tower at the wildlife viewing area on the North Tract and remove existing tower. • Designate and develop an additional outdoor nature exploration area for visitors on the South Tract. 	Objective 5.1: Provide high quality opportunities for wildlife observation and photography on the refuge by expanding facilities and hours of operation. Same as alternative B.
Interpretation	Objective 5.2: Promote a stewardship ethic and instill a sense of wonder and appreciation of natural resources, wildlife,	Objective 5.2: Promote a stewardship ethic and instill a sense of wonder and appreciation of natural resources,	Objective 5.2: Promote a stewardship ethic and instill a sense of wonder and appreciation of natural resources,

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
	<p>and research in visitors by providing engaging interpretive programs and activities for visitors of all abilities, ages, and community groups.</p> <ul style="list-style-type: none"> • Continue to offer a cadre of seasonally related monthly interpretive programs year-round by reservation. These programs are offered free of charge with the exception of tram tours or when otherwise stated. • Continue to offer interpreter-led tram tours from mid-March through mid-November, with increased hours of operation during the summer months. • Continue to use outreach tools to enhance visitation and participation at interpretive programs and special events. • Continue to offer current opportunities for interpretive programs, updating them as demand dictates. • Continue to maintain and utilize outdoor exploration areas, such as schoolyard habitat. • Continue to offer 	<p>wildlife, and research in visitors by providing engaging interpretive programs and activities for visitors of all abilities, ages, and community groups.</p> <p>In addition to alternative A:</p> <ul style="list-style-type: none"> • Increase the quality and diversity of interpretive monthly program opportunities by developing four to six new or revised interpretive programs annually. • Create and offer limited historical/interpretive guided tours on the Central and North Tracts. • Promote more hands-on, physically active outdoor activities. 	<p>wildlife, and research in visitors by providing engaging interpretive programs and activities for visitors of all abilities, ages, and community groups.</p> <p>In addition to alternative A:</p> <ul style="list-style-type: none"> • Explore fee options for refuge entry, programs, and activities. • Reduce the number of interpretive public programs and special events offered at the refuge.

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
	<p>major special events (seven offered in fiscal year 2010).</p> <ul style="list-style-type: none"> • Continue to offer summer series of five to six multi-day youth camps, including one week day camp for underserved youth. • Offer periodic, guided tours to the Central Tract and the Whooping Crane Observatory. 		
Environmental Education	<p>Objective 5.3: Promote a stewardship ethic through environmental education with students, teachers, scout leaders, and organized community groups to understand and appreciate ecological relationships and the role of refuges nationwide and the role of Patuxent Research Refuge.</p> <p>Continue to:</p> <ul style="list-style-type: none"> • Offer naturalist-led and self-guided programs for school and scout groups year round. • Offer teacher workshops year-round, designed to meet Maryland State outcomes and with opportunities for Maryland State Department of Education credits. • Accommodate 	<p>Objective 5.3: Promote a stewardship ethic through environmental education with students, teachers, scout leaders, and organized community groups to understand and appreciate ecological relationships, the role of refuges nationwide, and the role of Patuxent Research Refuge.</p> <ul style="list-style-type: none"> • Offer a schoolyard habitat-related teacher workshop series in accordance with local and State education standards. • Refuge staff/volunteers would increase involvement by 10 percent over 15 years by providing offsite conservation-related programs to local schools with emphasis on Junior 	<p>Objective 5.3: Promote a stewardship ethic through environmental education with students, teachers, and organized community groups to understand and appreciate ecological relationships, the role of refuges nationwide, and understand the role of Patuxent Research Refuge.</p> <p>Offer schoolyard habitat-related teacher workshop series in accordance with local and State education standards.</p> <p>Increase involvement in offsite conservation-related programs to local schools and number of visiting schools by ten percent over fifteen years.</p> <p>Explore grant and</p>

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
	<p>requests from neighboring school communities and other organizations to participate in onsite environmental education program.</p> <ul style="list-style-type: none"> • Offer current environmental education opportunities both onsite and offsite (approximately 10 per year offsite). • Provide workshop opportunities for scouts and scout leaders to meet advancement requirements. • Provide scout program links to scout leaders. • Support Maryland Federal Jr. Duck Stamp Program. 	<p>Duck Stamp curricula.</p> <ul style="list-style-type: none"> • Increase refuge staff/volunteer led scout workshop opportunities by 10 percent over 15 years. • Incorporate additional climate change and research related information into workshops/programs. • Increase number of teacher workshops offered by 20 percent over 15 years. 	<p>sponsorship opportunities for student transportation to public programs.</p> <p>Increase number of teacher workshops.</p>
<i>Non-wildlife-dependent Public Uses</i>	<p>Objective 5.4: Allow non-wildlife-dependent uses when they are appropriate and compatible.</p> <ul style="list-style-type: none"> • Continue to allow horseback riding and bicycling on North Tract. • Continue to allow hiking, cross-country skiing, and jogging on North and South Tracts. • Continue to allow dog walking with current 	<p>Objective 5.4: Support non-wildlife-dependent uses when deemed to be an appropriate use and compatible with the refuge purpose and mission of the Refuge System.</p> <ul style="list-style-type: none"> • Allow horseback riding with cleanup or horse-diaper at the North Tract. • Allow limited virtual and no-impact geocaching along designated trails, if 	<p>Objective 5.4: Reduce or eliminate non-wildlife-dependent public uses of the refuge.</p> <ul style="list-style-type: none"> • Prohibit horseback riding. • Prohibit dogs. • Prohibit search and rescue training. • Implement a fee program for primitive camping opportunities.

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
	<p>stipulations on North and South Tracts.</p> <ul style="list-style-type: none"> Continue to allow search and rescue training via special use permit on the North and South Tracts. Continue to provide primitive camping opportunities for scout and 4H groups on the North Tract. Allow limited dog training in designated areas on the North Tract. 	<p>found compatible at North and South Tracts.</p> <ul style="list-style-type: none"> Allow waterfowl related dog training with hunting permit in designated areas at North Tract (Cattail Pond and New Marsh), while prohibiting all dog training that is not hunting related. 	
<p>Goal 6: Provide high-quality hunting and fishing experiences for hunters and anglers.</p>			
<p><i>Hunting</i></p>	<p>Objective 6.1: Provide safe, high-quality hunting opportunities on the refuge.</p> <ul style="list-style-type: none"> Continue to provide hunting opportunities for upland game, migratory game birds, and white-tailed deer from September through January, and select days in April and May for wild turkey hunt. Assess effectiveness of quality deer management for hunting and maintaining healthy deer populations and revise regulations as needed. Area X on the North Tract is currently open 	<p>Objective 6.1: Provide robust and diverse high quality hunting opportunities to hunters of all ages while promoting hunter and visitor safety, wildlife health, and increasing other public use opportunities. Increase specialty hunts and organized hunts for youth and persons with disabilities.</p> <ul style="list-style-type: none"> Assess effectiveness of quality deer management for hunting and maintaining healthy deer populations and revise regulations as needed. 	<p>Objective 6.1: Provide robust and diverse high quality hunting opportunities to hunters of all ages while promoting hunter and visitor safety, and wildlife health and increasing other public use opportunities.</p> <ul style="list-style-type: none"> Keep Little Patuxent River trail open during waterfowl hunting with 50-yard (150-foot) buffer. Evaluate the need to close some hunt areas seasonally to allow for other permitted uses (e.g., Area N for fishing access at Rieve’s Pond). Eliminate January hunt season

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
	with a 50-yard (150-foot) buffer and the wildlife viewing area is currently open except during firearms season. Close Area W on the North Tract every other week to allow hiking on Forest Trail.		refugewide with the exception of January deer firearms season.
<i>Fishing</i>	<p>Objective 6.3: Provide high quality fishing opportunities at established sites and according to State regulations.</p> <ul style="list-style-type: none"> • Continue to provide year-round fishing opportunities at North Tract, which includes Lake Allen, New Marsh, Cattail Pond, Rieve’s Pond, Bailey Bridge Marsh, and the Little Patuxent River areas. • Continue to provide fishing opportunities seasonally on the South Tract at Cash Lake (June to October). • Continue to improve quality of fishing through vegetation management, which may include temporary impoundment draw-downs and herbicide treatments. 	<p>Objective 6.3: Provide additional fishing opportunities to anglers of all ages while promoting angler and visitor safety, and wildlife health.</p> <ul style="list-style-type: none"> • Open Blue Heron Pond to fishing access via hiking and biking. Allow vehicular access to Blue Heron Pond for visitors with impaired mobility. • Expand calendar days for fishing on the South Tract at Cash Lake to start in mid-March (contingent on harvest population surveys). • Expand fishing hours at North Tract (contingent on operating hours changing). • Evaluate potential new fishing areas at North Tract (upstream of Bailey Bridge and Wood Duck Pond). 	<p>Objective 6.3: Provide additional fishing opportunities to anglers of all ages while promoting angler and visitor safety and wildlife health.</p> <p>Same as alternative B.</p>

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
		<ul style="list-style-type: none"> ● Assess fish populations refugewide to ensure biological integrity and health in accordance with providing a quality fishing experience. ● Expand North Tract events to include youth fishing activities. 	
<p>Goal 7: Enhance partnerships with local communities and various organizations to garner support and promote refuge programs and resources.</p>			
<p><i>Volunteer Opportunities</i></p>	<p>Objective 7.1: Provide a wide variety of volunteer opportunities to support the refuge and to encourage community involvement and support of refuges and natural resources.</p> <ul style="list-style-type: none"> ● Continue current volunteer program to assist the refuge in all aspects of day-to-day operations. ● Continue to maintain quality internship program. ● Continue to promote organized group participation (ex. Scout groups) for one-time volunteer projects. ● Continue coordination between PWRC, MNHA, and the refuge. ● Continue to provide 	<p>Objective 7.1: Provide a wide variety of high-quality volunteer opportunities to support Patuxent Research Refuge and to encourage community involvement and support of refuges and natural resources.</p> <ul style="list-style-type: none"> ● Increase participation with youth volunteers and youth community service organizations by 10 percent over 15 years. ● Accommodate two to four service related organizations per year for work projects. ● Organize/implement a refugewide project database outlining possible volunteer projects (identify seasonality of work, age appropriateness, etc.). 	<p>Objective 7.1: Provide a wide variety of high-quality volunteer opportunities to support the refuge and to encourage community involvement and support of refuges and natural resources.</p> <p>Same as alternative B.</p>

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
	<p>volunteer award and recognition programs/events.</p>	<ul style="list-style-type: none"> • Better integrate volunteer opportunities with PWRC, MNHA, and Friends of Patuxent. • Encourage/recruit diverse volunteer workforce. • Increase volunteer recognition, award, social, and interactive opportunities. 	
Outreach	<p>Objective 7.2: Foster community relations and recruit visitors through outreach and community involvement. Send notices and press releases to local media and partners about upcoming events and programs.</p> <ul style="list-style-type: none"> • Participate with an information table and/or activities at community events such as Bowiefest, Montpelier festivals, and others. • Participate in events/programs of neighboring county conference and visitors' bureaus. • Participate in tourism and educational events of the MD Tourism Council. • Allow partners to use meeting space for events/meetings. 	<p>Objective 7.2: Continue to foster community relations and recruit visitors through outreach and community involvement.</p> <ul style="list-style-type: none"> • Increase outreach referenced above by at least ten percent per category. • Reactivate speakers' bureau. • Investigate highway radio announcement opportunities (on special frequency). • Reorganize refuge Web site to make site more user-friendly and be in accordance with Service guidelines. • Increase media partner mailings and communications for events and develop target mailing lists for events. • Actively participate 	<p>Objective 7.2: Continue to foster community relations and recruit visitors through outreach and community involvement.</p> <p>Same as alternative B.</p>

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
	<ul style="list-style-type: none"> • Continue to fund attraction signs on nearby highways (through the State Highway Administration). • Continue to maintain and update Web site. • Encourage Friends and staff to utilize social media to publicize refuge events and programs. • Continue to maintain email listserv. 	<p>in social media.</p>	
<p><i>Refuge Staffing, Facilities, and Grounds</i></p>	<ul style="list-style-type: none"> • Maintain current staff. • Continue to work with youth and student employment programs. • Maintain existing buildings and facilities. • Central Tract facility usage and maintenance will be guided by the facilities management program. • Continue NWVC hours of operation from 9 a.m. to 4:30 p.m. daily (except Federal holidays) for building and sunrise to 4:30 p.m. daily (except Federal holidays) for trails and grounds. • Continue VCS hours of operation from 8 a.m. to 4 p.m. daily (except Federal holidays). • Continue to provide 	<ul style="list-style-type: none"> • In addition to 2010 staffing org chart, the following positions were identified in 2009 Refuge System staffing model as a need for the refuge: <ul style="list-style-type: none"> ○ WG-09 Maintenance Worker – Grounds (FEM) ○ WG-09 Maintenance Worker – Buildings (FEM) ○ GS-12 Contracting Officer (BMA) ○ LE-11 Law Enforcement Officer (RLE) ○ GS-11 Visitor Services (VCS) • Continue NWVC hours of operation from 9 a.m. to 4:30 p.m. daily, including 	<ul style="list-style-type: none"> • In addition to 2010 staffing org chart, the following positions were identified in 2009 Refuge System staffing model as a need for the refuge: <ul style="list-style-type: none"> ○ WG-09 Maintenance Worker – Grounds (FEM) ○ WG-09 Maintenance Worker – Buildings (FEM) ○ GS-12 Contracting Officer (BMA) ○ LE-11 Law Enforcement Officer (RLE) ○ GS-11 Visitor Services (VCS) • In addition to the positions listed above, a Forester position (GS-09) would be

Refuge Resource or Program	Alternative A Current Management	Alternative B Preferred Alternative	Alternative C Maximize Forest Interior
	<p>conference facilities for scientific, educational, agency, and partner-related information exchange.</p> <ul style="list-style-type: none"> • Collaborate with Fort Meade and other stakeholders on the design of an alternative firing range design. 	<p>most Federal holidays (except Thanksgiving, Christmas, and New Year's Day).</p> <ul style="list-style-type: none"> • Expand hours of operation for South Tract trails and grounds from dawn to dusk. • Utilize green technology to update NWVC and modify building structure and grounds to be more wildlife friendly. • Update and modify the Wisdom of Wilderness exhibits. • Construct additional space for environmental education and interpretation classes and storage. • Collaborate with Fort Meade and other stakeholders on the design of an alternative firing range design. • Obtain funding from the DOD for all needed remediation (such as soil sifting, phyto-remediation, phosphate immobilization) excavation of hot spots, and disposal of accumulated lead-based ammunition in soils and streams in 	<p>needed to address the increased role of forest management.</p> <ul style="list-style-type: none"> • Increase weekend seasonal hours of operation for NWVC and North Tract VCS, including most Federal holidays (except Thanksgiving, Christmas, and New Year's Day).

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		<p>areas D, E, F, G, H, I, and J.</p> <ul style="list-style-type: none"> • Assess the cause of poor revegetation in former firing range Area NT-7 (e.g., result of soil type/soil contamination). • Continue to provide conference facilities for scientific, educational, agency, and partner-related information exchange. 	
<i>Conference Facilities</i>	Continue to provide conference facilities for scientific, educational, agency and partner related information exchange.	Same as alternative A.	Allow use of conference facilities to non-wildlife and scientific opportunities.