

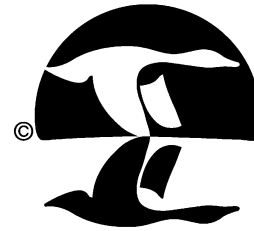
The Piedmont Bird Conservation Region (BCR 29)

Implementation Plan





*North American Waterfowl
Management Plan*



Atlantic Coast
Joint Venture

Version 1.1, July 2014
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Signature Page

The following document, “The Piedmont Bird Conservation Region (BCR 29) Implementation Plan”, is fully endorsed and supported by the Management Board of the Atlantic Coast Joint Venture. This plan represents one of many efforts in North America to integrate the objectives of existing and emerging bird conservation plans under the North American Bird Conservation Initiative into a single plan that land managers, biologists, administrators, and private landowners can use to achieve common goals and objectives for bird conservation across a regional landscape.

Chair: Catherine Sparks, Chief of Wildlife & Forestry, Rhode Island Division of Fish and Wildlife

Vice-Chair: Breck Carmichael, Assistant to the Director, South Carolina Department of Natural Resources

Executive Summary

The goal of the Piedmont Bird Conservation Region (BCR 29) Implementation Plan is to provide an organized and coordinated approach for implementing regional goals for waterfowl, landbird, waterbird, and shorebird conservation in the Piedmont. The plan compiles information from continental and regional bird conservation initiatives and state wildlife action plans, provides an analyses of available data on birds and habitats in the BCR, and highlights consensus among bird conservation partners in the BCR on where and how to implement bird conservation strategies. Over the next 3-5 years the plan recommends that resources first be directed to the following key priorities: 1) Focusing conservation efforts on forest and grassland bird species, particularly on private lands, and protected or sheltered habitat corridors for species utilizing these habitats, and reducing forest fragmentation, 2) Improving Piedmont bird conservation participation in the private land sector, 3) Preserving farmlands and associated habitats in the Piedmont, and 4) Using other partner and NGO suburban/urban growth initiatives and efforts, such as Audubon's [Bird Friendly](#) Community Program, to focus conservation efforts on preserving habitats for breeding and migration for priority species in this rapidly increasing component of the Piedmont landscape and improving education and outreach opportunities.

Additional priorities include 5) Identifying and ranking priority Piedmont bird species, 6) identifying general habitat needs and threats for these species, 7) determining habitat types used by Piedmont birds based on recently developed seamless land cover maps from Southeast Gap Analysis project, 8) presenting population and habitat objectives for priority species, 9) defining and delineating geographic focus areas for priority species where conservation actions can be implemented, 10) identifying the highest priority monitoring and research needs for birds and habitats, 11) presenting objectives and strategies for reducing threats or other limiting factors where habitat is not a limiting factor, 12) identifying additional priority projects (e.g., management, restoration, acquisition, and outreach) that will help meet population and habitat objectives, and 13) creating a communication platform that

encourages dialogue on bird conservation activities among all Piedmont BCR partners. During the development of this plan several goals were identified that will be incorporated into future versions including 1) develop an avicentric habitat classification system based on NatureServe's Ecological Classification System that will better define bird/habitat relationships, 2) use the Designing Sustainable Landscape (DSL) project to refine identification of focus areas and improve planning and implementation, 3) develop geospatial resources for mapping and tracking habitat/land use trends, modeling habitat associations, and refining focus areas, 4) develop evaluation protocols for monitoring progress toward population and habitat objectives for adaptive management purposes, and 5) improve the efficiency of bird conservation efforts in the BCR by linking bird habitat conservation to efforts focused on conserving other species groups (e.g., the Atlantic Coastal Fish Habitat Partnership) and interacting with U.S. Fish and Wildlife Service Landscape Conservation Cooperatives (LCC).

Habitat loss, degradation, fragmentation, and development are the greatest threats to bird populations in the Piedmont. To address threats and effectively manage priority bird species within the BCR partners must:

1. Estimate priority bird populations and set population targets,
2. Assess how much habitat is presently available,
3. Estimate how much habitat is needed to achieve population targets,
4. Select areas on which to focus habitat conservation efforts based on conservation design methodology and decision support tools,
5. Implement best management practices (BMP's) to optimize landscape and habitat conditions for maximum use by priority species,
6. Seek participation by private landowners, and
7. Minimize threats where possible.

The Piedmont provides important resources for migratory birds whose ranges span the western hemisphere. Fifty-seven bird species were identified and placed into four

priority tiers: Highest, High, Moderate, and Management Concern. This list was developed in conjunction with the ACJV, other U.S. Fish and Wildlife Service staff, and Piedmont bird conservation partners. Priority species were grouped by nine general habitat types, most of which are in critical need of conservation. Most priority species are associated with forests, grasslands, early successional shrub-scrubs, forested wetlands, freshwater emergent wetlands, and open water and impoundments. Two additional habitats, agricultural croplands and urban/suburban landscapes and rural woodlots, also provide habitats for some priority species and could be important for their persistence in the Piedmont. Priority conservation actions are given for each habitat and subtype.

Population estimates and objectives for some Piedmont priority species are presented when available. While obtaining population estimates for all Piedmont species remains a desirable goal, lack of this information should not prevent implementation of conservation activities for priority species and habitats. Many Piedmont partners have already recognized and engaged in conservation actions for priority species.

Habitat estimates are available at multiple scales, from finer scales such as ecological system communities to broad habitat types, used in this plan. Habitat objectives for many species remain unknown at this time and this remains a long term goal of this initiative. Adopting a more data driven conservation design approach to conservation planning for Piedmont birds will greatly improve bird conservation in the Piedmont.

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CHAPTER I: INTRODUCTION

Background

Over the past two and a half decades bird conservationists have refined the necessary structure and information base for implementing bird conservation in North America. In 1986 the North American Waterfowl Management Plan ([NAWMP](#)) created a model for implementing coordinated bird habitat conservation by setting population goals and establishing important geographic areas to achieve these population goals. Self-directed regional partnerships called joint ventures (JVs) were established to facilitate planning and implementation of the NAWMP. In the 1990s several other continental and national bird conservation initiatives formed following the NAWMP model, including Partners in Flight ([PIF](#)), the U.S. Shorebird Conservation Plan ([USSCP](#)) and Waterbird Conservation for the Americas ([WCA](#)).

Two remarkable events occurred in 1998 that advanced bird conservation in North America and further unified bird conservation efforts in common objectives. First, the 1998 NAWMP Update recommended that Plan partners broaden their partnerships with other bird conservation initiatives. As a result, JVs and other partnerships began adopting an all-bird approach in their conservation efforts. Second, the North American Bird Conservation Initiative ([NABCI](#)) was established to help facilitate and integrate bird conservation efforts among all four major bird conservation initiatives. NABCI's aim is to ensure that "Populations and habitats of North America's birds are protected, restored, and enhanced through coordinated efforts at international, national, regional, state, and local levels, guided by sound science and effective management." To this end, NABCI developed a common geographic language for integrated bird conservation planning based on physiographic regions known as Bird Conservation Regions (BCRs), and JV staff agreed to coordinate integrated bird conservation planning in these BCRs. The Atlantic Coast Joint Venture ([ACJV](#)) coordinates bird conservation planning among the many partners in the Piedmont Bird Conservation Region (BCR 29).

Efficient and effective delivery of bird conservation objectives requires a broad diversity of interested partners, a shared vision of planning goals, a willingness to employ time, energy, money and staff resources to achieve these goals, a mutual understanding of each partner's strengths and responsibilities, and a commitment to on-going coordination (see South Atlantic Migratory Bird Initiative ([SAMBI](#)) 2008).

Atlantic Coast Joint Venture (ACJV)

The ACJV is a partnership of 16 states and one commonwealth, key federal and regional habitat conservation agencies, and organizations focused on conservation of native bird habitat spanning 7 BCR's within the Atlantic Flyway of the United States from Maine south to Puerto Rico. It utilizes principles of a strong biological foundation, a landscape approach to conservation, and a strong and diverse partnership to facilitate habitat conservation. The ACJV was originally formed as a regional partnership focused on the conservation of waterfowl and wetlands under the NAWMP in 1988 but has since broadened its focus to the conservation of habitats for all birds, consistent with major national and continental bird conservation plans and NABCI. The partners associated with these plans and with NABCI have looked to joint ventures as a major way to deliver habitat conservation outlined under the plans. The ACJV provides a structure and process that attracts partners, leverages and generates funding, and implements projects that support broad goals and objectives within the region. The ACJV also strives to integrate planning and implementation more efficiently and effectively throughout the JV and across BCRs to meet habitat needs that are consistent with major continental, national, and state bird conservation initiatives.

BCR 29 Plan Purpose

Implementation plans specific to species groups and BCRs have been developed by "stepping down" continental bird conservation initiatives for use at smaller geographic scales. Within the Piedmont BCR, partners have identified bird conservation priorities and set population and habitat objectives at many scales (often at the BCR level) when sufficient data is available. Additionally, states have developed State Wildlife Action

Plans ([SWAPs](#)) that identify actions needed to conserve wildlife and the natural lands and waters they use.

The main purpose of the Piedmont BCR Plan is to synthesize the common goals of a multitude of regional and species based plans in a format that can be more easily used by federal and state agencies, non-governmental organizations (NGOs), and other bird conservation interests to coordinate and implement bird conservation activities throughout the Piedmont at all scales to meet established BCR goals. This plan synthesizes material from numerous plans and workshops, including PIF's Mid-Atlantic Piedmont ([2003](#)) and Southern Piedmont (unpublished draft 2000) Bird Conservation Plans, the PIF North American Landbird Conservation Plan (NLCP [2004](#)), the ACJV Waterfowl Implementation Plan ([2004](#)), the Southeastern Coastal Plains-Caribbean Region Shorebird Report ([2002](#)), the United States Shorebird Conservation Plan ([2001](#)), the Southeast Regional Waterbird Plan ([2006](#)), State Wildlife Action Plans ([2005](#)), the American Woodcock Conservation Plan ([2008](#)), the North American Ruffed Grouse Conservation Plan ([2006](#)), the Northern Bobwhite Conservation Initiative ([2011](#)), and the results of the BCR 29 [workshops](#) conducted in October and December of 2012.

BCR 29 Plan Goals

Workshops

During the creation of this plan two workshops were held to bring partners together to develop and refine its structure and content. Elucidating plan goals was also a major topic of discussion. Partners came up with a comprehensive list of short- and long-term goals.

Workshops were held in October and December 2012 at two locations: one in Raleigh, NC and one near Schaefferstown, PA. The purpose of the workshops was to bring partners together to 1) acquire any status updates on any priority species/habitats, 2) agree on bird and habitat priorities, 3) reach consensus on population goals, 4) agree on focus areas, and 5) identify informational gaps in monitoring and research needs.

The four priority goals that were selected for immediate implementation in BCR 29 over the next 3 - 5 years are:

1. Focus conservation efforts on forest and grassland bird species, particularly on private lands, and protected or sheltered habitat corridors for species utilizing these habitats and reducing forest fragmentation,
2. Improve Piedmont bird conservation participation by private landowners,
3. Use Audubon's Bird Friendly Community Program to focus conservation efforts in and around urban/suburban areas to maximize opportunities to preserve habitats for breeding and migration for priority species in this rapidly increasing component of the Piedmont landscape, and
4. Preserve farmlands and associated habitats in the Piedmont.

Additional goals for BCR 29 are to:

5. Identify and rank the priority bird species for the Piedmont,
6. Identify the general habitat needs and threats for these species,
7. Determine habitat types used by Piedmont birds based on recently developed seamless land cover maps from Southeast Gap Analysis Project ([SEGAP](#)),
8. Present population and habitat objectives for priority species when available,
9. Define and delineate geographic focus areas for priority species where conservation actions can be implemented,
10. Identify the highest priority monitoring and research needs for birds and habitats (a dedicated working group is needed to update these needs),
11. Present objectives for reducing threats or other limiting factors where habitat is not a limiting factor,
12. Identify additional priority projects (e.g., management, restoration, acquisition, and outreach) that will help meet population and habitat objectives, and
13. Create a communication platform encouraging dialogue on bird conservation activities among all BCR partners.

The following additional goals were identified for long-term incorporation into future versions of this plan:

1. Develop an avicentric habitat classification system based on SEGAP and Northeast Terrestrial Habitat Mapping Project ([NETHM](#)) that will better define bird/habitat affinities,
2. Incorporate the Designing Sustainable Landscape ([DSL](#)) to refine identification of focus areas and improve planning and implementation,
3. Develop geospatial resources for mapping and tracking habitat/land use trends, modeling habitat associations, and refining focus areas,
4. Develop evaluation protocols for monitoring progress toward population and habitat objectives for adaptive management purposes, and
5. Improve the efficiency of bird conservation efforts in the BCR by linking bird habitat conservation to efforts focused on conserving other species groups (e.g., the Atlantic Coastal Fish Habitat Partnership) and interacting with U.S. Fish and Wildlife Service Landscape Conservation Cooperatives (LCC).

CHAPTER II: DESCRIPTION OF THE PIEDMONT BIRD CONSERVATION REGION

BCR Physical Description

The Piedmont Bird Conservation Region (BCR 29) (Figure 1) is often regarded as a transition area between the mountains and valleys of the Appalachian region and the relatively low lying and flat coastal plain. The Piedmont, which extends from Delaware to Alabama, is a primarily rolling landscape with occasional steep slopes and plateaus. This region encompasses 19,150,363 ha (47,321,579 ac) and is generally divided between northern and southern sub-regions at the Virginia-North Carolina boundary (Piedmont Habitat Analysis Project (PHAP), Jones and Luke 2013). The Piedmont is relatively narrow with a maximum longitudinal width of 200 km (124 miles mi) in the south and only 80km (50mi) in the north.

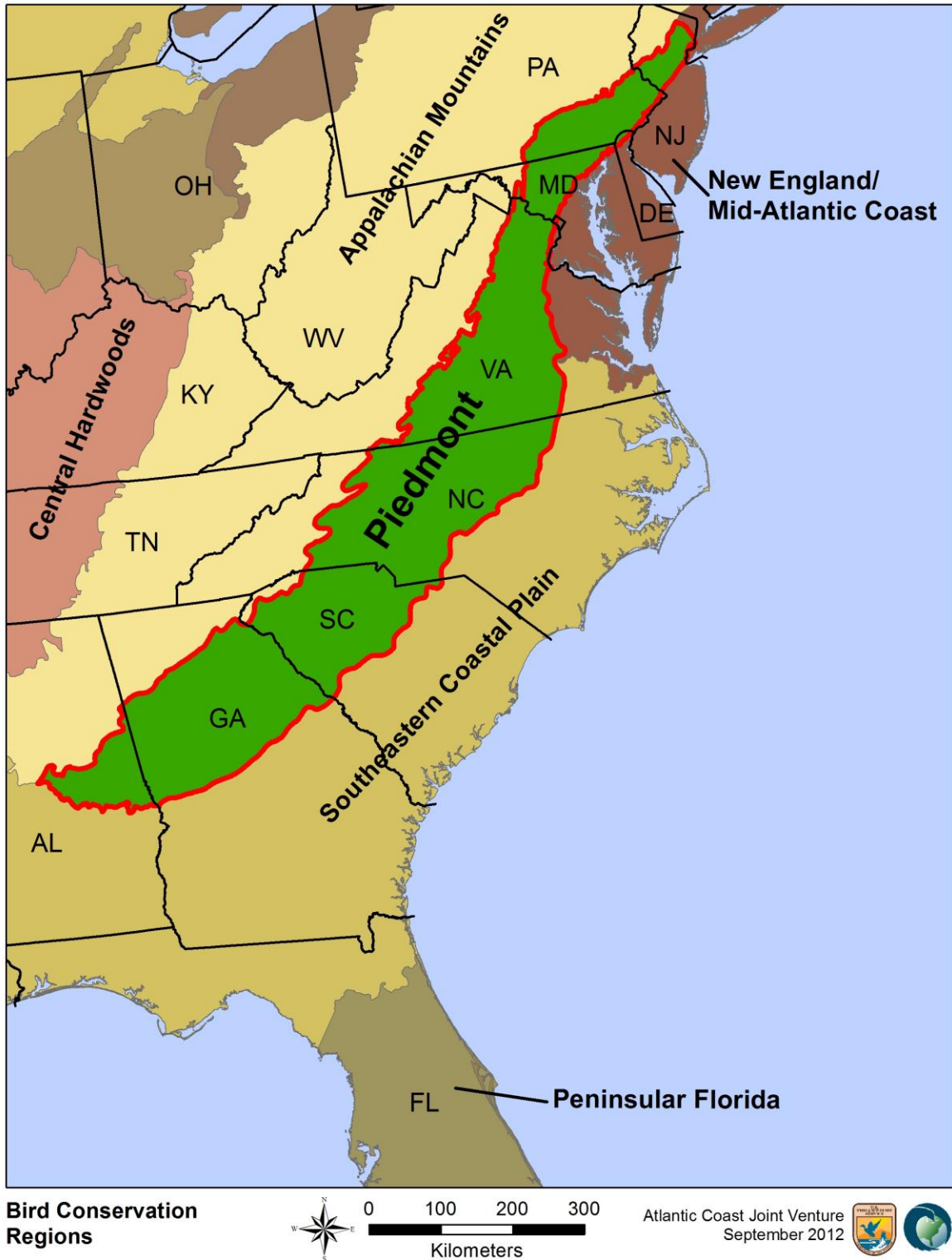


Figure 1. The Piedmont BCR in Relation to Adjacent BCRs in the Eastern United States.

The high and rugged Blue Ridge and Ridge and Valley regions of the Appalachian Mountains form the western border of the Piedmont, while the eastern border is delineated by the Fall Line, an area where erosion-resistant igneous and metamorphic rock give way to softer sands and clays of the Atlantic Coastal Plain. Elevations range primarily from 30-60 m (98-196 ft) in the east to an average of 100-300 m (196-984 ft) in the west, although elevations reach over 400 m (1,312 ft) where the Piedmont meets the Southern Blue Ridge physiographic area. In the North some individual peaks reach 600 m (1968 ft).

Most of the Piedmont rests on metamorphic rock folded by tectonic forces. Weathering and erosion have reduced most surface indications of this folding and have created today's gently rolling topography, characterized by irregular plains and open hills with occasional tablelands. In some locations, particularly in the northern Piedmont, erosion has not yet leveled the most resistant rock, and isolated mountains or [monadnocks](#) remain. These can be quite sizable and often appear as "islands of forest" among the surrounding lowland terrain.

Annual precipitation averages between 840 mm and 1300 mm (33 – 51 inches) in the northern Piedmont and 1000 mm – 1400 mm (40 - 55 inches) in the southern Piedmont with slightly more precipitation during the spring and summer months than at other times of the year. Despite adequate precipitation, few natural lakes and ponds occur in the Piedmont. Most of its original wetlands have been drained to accommodate human agricultural use. Freshwater impoundments have been created to control flooding, generate electrical power, provide drinking water, or support farm operations but have not compensated for the loss of natural wetlands. At least 80 reservoirs and lakes larger than 404 ha (1,000 ac) occur throughout the Piedmont, most being man-made. The most prominent of these are Loch Raven and Pretty Boy Reservoirs and Liberty Lake in Maryland; John H. Kerr Reservoir, Smith Mountain Lake, and Lake Anna in Virginia; Lake Gaston, Falls Lake, Everett Jordan Lake, Shearon Harris Reservoir, Lake Norman, Badin Lake, High Rock Lake, Rhodhiss Lake, and Lake James in North Carolina; Lake Wylie, Lake Murray, Monticello Reservoir, Wateree Lake, Lake Greenwood, Lake Hartwell, Tate Lake, and Strom Thurmond Reservoir in South

Carolina; Lake Sydney Lanier, Allatoona Lake, Lake Oconee, and West Point Lake in Georgia; and Lake Martin and Jordan Lake in Alabama. There are thousands of other smaller lakes and ponds that cover approximately 505,232 ha (1,248,457 ac) in the Piedmont.

Within the Piedmont numerous streams and rivers flow from the Appalachian highlands to the coastal plain. Major rivers include the Delaware, Susquehanna, Potomac, Rappahannock, James, Broad, Chattahoochee, Savanna, Haw, Rocky, and Yadkin. The bottomland forests associated with major rivers form natural corridors that connect otherwise isolated woodlands. In some locations along these rivers frequent flood events sweep away most woody vegetation and create wide, sandy floodplains. Elsewhere, seasonal variations in water flow create sizable pool and riffle complexes.

History and Land Use

The Piedmont's long history of human land use has resulted in a complex composition of habitats that present a challenge for bird conservationists to recover, restore, and/or maintain to support priority bird species. The historic Piedmont forest composition and structure varied along a latitudinal gradient with changing soil and climate conditions. Generally speaking, the northern Piedmont (in Virginia, Maryland, Pennsylvania and New Jersey) was dominated by oaks such as White Oak (*Quercus alba*), Black Oak (*Q. velutina*), Scarlet Oak (*Q. coccinea*) and Chestnut Oak (*Q. prinus*) (Cole and Ware 1997) with hickory (*Carya* spp.), a minor component (Ware 1992). The southern Piedmont (in North and South Carolina, Georgia and Alabama) was mostly an oak-pine forest with oaks such as Post Oak (*Q. stellata*) and Black Oak, and *Pinus* species comprising a majority of the stocking (Cowell 1995). While Shortleaf Pine (*P. echinata*) was predominant, some Loblolly Pine (*P. taeda*) also occurred (Schenck 1904). Longleaf Pine (*P. palustris*) occurred in some parts of Alabama and west-central Georgia and near the Fall Line in South and North Carolina but was not common across the region (Sargent 1884).

Forests within the Piedmont have been subject to human manipulation for over one thousand years. Prior to European settlement the Piedmont was home to numerous Native American communities, some of which likely reached the size of small modern cities (Hamel and Buckner 1998, Denevan 1992). The primary land management tool used by these communities was fire (Cowell 1998). Anthropogenic fire disturbances increased the extent of oak and pine, decreased non-fire tolerant hardwoods and hardwood mid-story, and increased grasses and open areas (Barden 1997, Hamel and Buckner 1998). As early European settlers arrived in the region, they discovered a rich mosaic of meadows, shrublands, and sapling woods interspersed in a larger matrix of old-growth forest (Mayre 1955).

During the 18th and early 19th centuries European settlers dramatically altered this landscape through wide-scale logging and conversion of land to agricultural uses. Piedmont soils, long recognized for their fertility, continued to attract settlers to the region for farming throughout the 19th century. Local deforestation reached its peak around 1860, followed by a trend toward farmland abandonment (Besley 1910). Today, roughly 55% of the area is forested and about 11-15% is in agricultural production (Table 3).

Oaks and other hardwoods mostly grew in the nutrient rich soils, which were selectively converted to agriculture. Cotton farming became prevalent in the southern Piedmont after the Civil War, which eventually led to the depletion of soil fertility necessary for growing hardwoods. Once retired, cotton fields were more suitable for supporting pines, particularly Loblolly and Shortleaf. Today, the heavily degraded soil conditions of the Piedmont cannot easily support historic forest conditions. Furthermore, as a result of active management, commercial pine plantations replaced much of the upland hardwood forest that had not been converted to crops. Additionally, tobacco farming became a prevalent land use in the central region of North Carolina and Virginia, while pastureland and orchards became common in the northern Piedmont.

Sustainable farming practices such as contour plowing and crop rotation were not practiced. As a result, erosion set in, first on the steeper slopes, then throughout the

region as agriculture intensified (Van Lear 2004). The impacts of this erosion were enormous; for example, 47% of the uplands in the Georgia Piedmont lost nearly all of their topsoil (Brender 1974). The average Loblolly Pine site index in the Georgia Piedmont is 73 at 50 years (Cruikshank 1954), which is equal to a white oak site index 60 or a black oak site index 50 (Nelson and Beaufait 1956). An oak site index under 65 is considered a poor site for oaks.

Not all of the Piedmont was forested at the time of early European settlement (Hamel and Buckner 1998). Eastern grasslands and savannas supported bison as late as the late 1700's from Charlotte, North Carolina to Rock Hill, South Carolina. Much of this early settlement era landscape was open woodland interspersed with prairies, some of which were quite extensive and generally believed to be maintained by managed burns set by Native Americans. Therefore, agricultural fields and other large openings were historically a part of a managed Piedmont landscape. Habitats resembling true prairie remnants now occur only along power line Rights-of-Way (ROW) and similarly managed landscapes where frequent disturbances are part of regular management regimes.

Another result of soil degradation is littleleaf disease, which has taken a toll on Shortleaf Pine in the Piedmont. Shortleaf Pine was once the most widespread pine in the Piedmont region, and probably the most ecologically important, providing high habitat value for wildlife and requiring fire to maintain the structure and composition of the plant community (Burns and Honkala 1990). Littleleaf disease, caused by the fungus *Phytophthora cinnamomi*, is associated with poorly drained, eroded soils. It affects Shortleaf Pine in the Piedmont region from Virginia to Alabama. The disease greatly impacts persistence of shortleaf pine stands in the post-settlement, soil degraded Piedmont (Belanger et al. 1986).

At scattered locations throughout the Piedmont the drying effects of thin, sandy soils and frequent ground fires combine to create Pine Barrens. This unusual community is comprised of herbaceous grassland with scattered trees such as Pitch Pine (*P. rigida*), Virginia Pine (*P. virginiana*), Eastern Red Cedar (*Juniperus virginiana*), Blackjack Oak

(*Q. marilandica*), and Post Oak. Each barren's species composition reflects both its history and available seed sources ([NatureServe](#) 2001).

Wetland communities occur throughout the Piedmont, though not to the extent seen in the neighboring Coastal Plain. With few exceptions, these wetlands are comparatively small in size and located near headwaters of the region's rivers and streams. Today, less than 3% of land cover is comprised of emergent and forested wetlands ([PHAP 2013](#)).

Threats

The Piedmont provides nesting habitat for locally breeding birds, and important foraging and resting stops for migrating birds. However, the capacity of the Piedmont to support breeding and migratory bird populations has been greatly reduced, largely due to anthropogenic disturbance. Birds face continued threats from many types of disturbance, particularly habitat destruction, fragmentation, and degradation associated with human development and poor agricultural practices.

Development

The most significant change in land use in the Piedmont over the last 100 years -- and most pressing threat to birds in the region -- is the development and expansion of large metropolitan centers. The rapid growth of cities and adjoining residential areas in and adjacent to the Piedmont, (e.g., Newark, Philadelphia, Baltimore, Washington D.C., Richmond, Raleigh/Durham/Greensboro, Charlotte, Atlanta) has altered a vast amount of bird habitat in and beyond city borders. Urban and suburban sprawl has the most significant impact on agricultural grasslands, wetlands, and other early successional habitats (Vickery and Dunwiddie 1997). In addition, sprawl has fragmented and isolated most of the forests remaining in the region (Bushman and Therres 1988).

Urbanization and suburban and exurban sprawl into rural areas contribute to landscape fragmentation by partitioning, isolating, and degrading habitat patches, either through direct conversion or by increasing associated stressors that can lead to mortality or

reduced productivity (e.g., predation by pets and feral animals and collisions with vehicles, windows, or cell towers). The most effective bird conservation activities should generally focus on landscapes containing a high proportion of a particular habitat. For example, grassland bird projects are most likely to be effective in landscapes dominated by agricultural or natural grasslands, and forest bird conservation is most likely to be effective in forested landscapes or in the largest blocks of forest habitat left in fragmented landscapes (Hartley 2007).

Urbanization is likely to have the most immediate and permanent effects on southern forests (Wear and Greis 2002). The southeastern U.S. is rapidly becoming a major urban growth center. A contiguous belt of development may soon link Atlanta to Charlotte to Greensboro to Richmond to Washington, D.C. to Baltimore. This rapid rate of development in the Piedmont is clearly visible in nighttime satellite imagery (Figure 2).

According to projections made by the National Wildlife Federation, the major metropolitan areas of Atlanta, GA; Charlotte, NC; Richmond, VA; Washington, D.C.; and Baltimore, MD are predicted to grow in population by an average of 40% with Atlanta and Charlotte experiencing the greatest growth. This population growth is expected to reduce the green space by a total of 1,100,744 ha (4,250 square m or 2,720,000 a) by the year 2025, an average loss in each area of 26.4% (Ewing et al. 2005). This figure does not account for the metropolitan areas of Philadelphia, PA, and Newark, NJ, which may experience substantial growth by 2025, nor does this account for growth in smaller cities in the Piedmont.

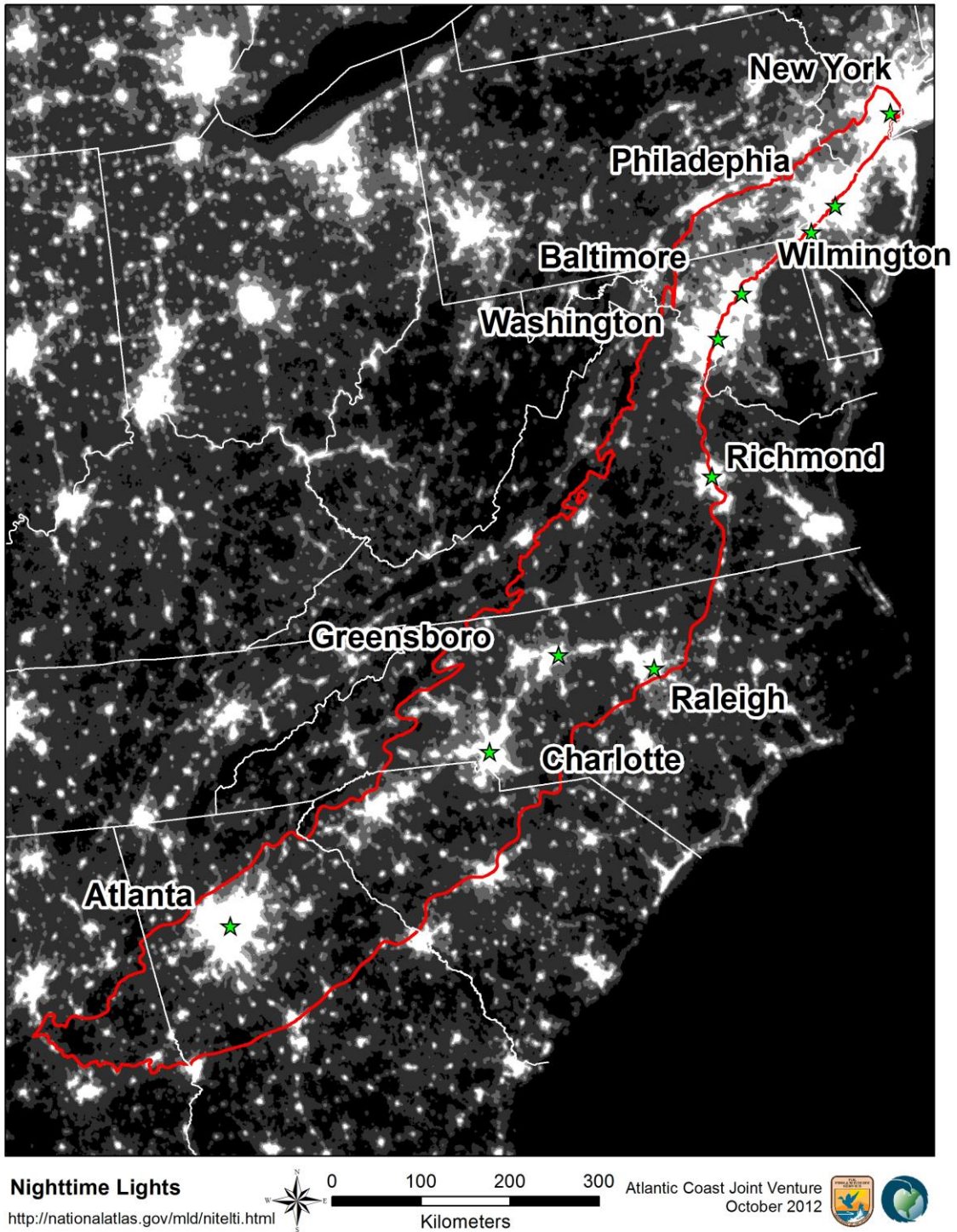


Figure 2. Nighttime Satellite Image of the Eastern United States showing the Piedmont BCR and Major Metropolitan Areas.

Protection and maintenance of bird habitats in the Piedmont will require significant involvement from public land managers, public agencies, and private and industrial land owners. While agricultural lands have the potential to be restored, urbanization yields permanent changes that will ultimately reduce the capacity of the region to support bird populations beyond recoverable levels.

Habitat Loss, Degradation, and Fragmentation

Populations of most priority species are limited by factors related to the quantity, distribution, connectivity, and quality of habitats, including patch size, available to them during the breeding and non-breeding seasons and during migration. When wetlands, forests, or fields are converted for use as human housing, industry, intensive agriculture, or forestry they often lose most of their value as bird habitat, i.e., they become unavailable or unsuitable to the vast majority of bird species. Further, the activities, noise, pets, vehicles, buildings, roads, power lines, and other characteristics of anthropogenic land uses often disrupt and decrease the quality of any potential habitats remaining including lands nearby or adjacent to human developments. The isolation and lack of connectivity of remaining habitat patches (fragmentation) lowers their value to many species (Steinkamp 2008).

As bird populations can be affected by factors across their range, it is often difficult to determine definitively how much habitat is needed within a specific area to sustain or restore populations of priority species. Therefore, it is desirable to both conserve habitat that birds are currently using and increase the quality of available habitat whenever or wherever possible through management action (Steinkamp 2008).

Habitat conservation and restoration in the Piedmont is confounded by the fact that most acreage is held by private landowners. A key task for sustaining and restoring priority bird populations within the Piedmont will be to develop incentives for private landowners to work with conservation partners to manage their lands in ways that are beneficial to bird populations (Steinkamp 2008).

In addition to outright habitat loss, many bird species are negatively affected by fragmentation, changes in landscape composition that decrease average patch size, increase edges between habitat types and the distance between patches. Seriously fragmented landscapes can result in lower habitat occupancy rates, reproductive success, and adult and juvenile survival as well as higher nest predation and parasitism rates, and lower adult and juvenile survival (Doherty and Grubb 2002).

Prior to European settlement much of the eastern United States, including the Piedmont region, was dominated by fire adapted ecosystems such as oak and oak-pine (Abrams 1992, Nowacki and Abrams 2008). These included species such as Shortleaf Pine, Post Oak, Black Oak, and Chestnut Oak. Maturing post-settlement forests are dominated by fire intolerant species such as Tulip Poplar (*Liriodendron tulipifera*), Red Maple (*Acer rubrum*), and Hickory (Cowell 1998). This unprecedented change in ecosystem species, structure, and function will dramatically impact the ability to manage habitat for bird species of concern. Fragmentation is common in the heavily-populated Piedmont, with priority bird habitats spread across a patchy mosaic of different land use types, much to the detriment of priority bird species. Remnant forest patches in the Piedmont tend to be small, isolated, and interspersed with agricultural and/or developed tracts. Many priority birds are thought to be sensitive to such fragmentation, only occupying habitat patches of sufficient size (often one or more orders of magnitude larger than their territory size). Research has shown that sensitivity to fragmentation can vary across different parts of a species' range, depending in part on landscape composition. For example, Cornell's Laboratory of Ornithology Birds in Forested Landscapes research program found that occupancy of a forest patch by Scarlet Tanager and various thrush species was a function of both the size of the forest patch and the amount of forest cover in the surrounding landscape. In landscapes where at least 70% of the area was forested, the birds often occupied forests regardless of patch size, whereas in fragmented landscapes, where less than 70% of the area was forested, the same species was most likely to be found only in patches of 100 to 1000 ha (247-2,471 ac). These findings suggest that conservation efforts should generally be focused on landscapes containing a high proportion of a single contiguous habitat (Steinkamp

2008). This is increasingly a challenge as remnant forest composition has been significantly altered by modern silvicultural practices, which selectively remove high value trees, suppress the development of old-growth conditions, and/or convert historical deciduous forests to plantation pine.

Regeneration cuts in intensively managed pine plantations provide temporary habitat for many early successional species, but faster growing cultivars and the extensive use of herbicides presumably result in less use by those bird species. Pine plantations of intermediate age (10-25 years) support few bird species because of lack of groundcover or other structural diversity (Meyers and Johnson 1978, Darden et al. 1990).

Nevertheless, regeneration to pine is on the decrease and succession to hardwoods is again a common occurrence on many non-industrial private forest lands, which still constitute much of the commercial Piedmont timberland. These practices are resulting in pine-oak mixes today and, if continued, perhaps oak-hickory-tulip poplar forests within the next several decades.

Grassland and early-successional habitats and associated bird communities have declined due to ecological succession to more mature forest conditions, conversion of croplands to development, and the use of more intensive farming techniques. The extreme decline of some high priority species, such as the Northern Bobwhite, is of substantial conservation concern (Brennan 1991). In an attempt to restore such early successional bird species, biologists and conservationists have initiated intensive restoration efforts that appear to be increasing early successional habitat features, such as brushy field borders and hedgerows.

Riparian systems and associated bird communities have been heavily degraded by a number of human activities. For example, hydroelectric power development has adversely affected natural flow regimes of many of large river systems, destroying ephemeral "hatches" of aquatic insects and small fish that birds depend on for food and subsequently lowering quality and quantity of bird habitat. Protected riparian buffer zones are widely viewed as critical to the biological integrity of river ecosystems. While maintenance of vegetated riparian buffer zones does convey numerous advantages to

stream ecosystems, stream biotic integrity may be more strongly influenced by landscape than by local land uses. Further research is needed to determine whether protection of stream margins alone is enough to offset human-induced impacts on bird populations.

Agricultural Practices

Changes in agriculture have impacted bird populations as well. Economies of scale have given larger farms a competitive advantage over smaller ones, leading to the removal of hedgerows, a reduction in fallow land, and more frequent harvests of hay and feed crops to increase production. These more intensive practices reduce habitat available for shrub nesting bird species and increase mortality of grassland nesting birds in the region (Mitchell et al. 2000).

Tilling, mowing, pesticide applications, and other modern conventional agricultural practices can have a direct negative effect on many bird species. Farming is practiced along the banks of many of the Piedmont's major rivers and tributaries. These agricultural activities limit the habitat value of associated riparian areas for most priority bird species throughout much of the year. Conversion of warm season grass pasture to cropland can result in the loss of most grassland bird species. Hayfields support many more grassland bird species than croplands but also may serve as ecological traps. Grassland birds are attracted to these areas for nesting, but subsequent mowing of these areas often destroys the active nests before young are fledged. Abandoning fields (i.e., allowing natural succession to proceed) also causes a loss in grassland habitat availability if not managed but can also provide habitat for early successional species in subsequent seral stages. Agricultural activities cause a great deal of non-point source pollution through increased sedimentation, nutrient input, and pesticide loads in waterways. Pollution lowers water quality, rendering some habitat toxic for birds and, perhaps more importantly, decreasing habitat quality by reducing or altering the plant and animal communities that birds use for food and cover.

Some priority bird species can benefit from agricultural fields. For example, waterfowl, Wild Turkey, and Mourning Dove feed in large numbers on waste grain. Shorebirds often use

wet, low-lying agricultural fields as stopover and feeding sites during migration. While some agricultural areas may be beneficial to birds, they may require conservation agreements with the landowners and associated monitoring to ensure that management practices such as pesticide use do not harm birds using these areas (Hartley 2007).

CHAPTER III: PIEDMONT BCR PRIORITY SPECIES AND HABITATS

Species

Fifty-four (54) species are recognized as conservation priorities for BCR 29 (Table 1). Twenty-two (22) species are strictly breeders and another eighteen (18) have both breeding and non-breeding populations in the Piedmont. Fourteen (14) species are either non-breeders or transient through the Piedmont. These species have been divided into a three-tier framework ranked as Highest, High, and Moderate. A fourth category, Management Concern Species, was added to include three additional species which are of local, state, and regional importance due to their economic importance as game species. Species of management concern will not be discussed as a separate unit and will be included in the Moderate category in the Priority Species and Habitat sections below.

Highest priority species are those requiring immediate action to recover, maintain, or improve existing populations levels or trends. These species are often given preference over lower ranked species when deciding where to focus efforts and allocate resources for management or other conservation actions. **High** priority species are those for which conservation is of immediate attention but actions are not as time-sensitive as highest priority species because continental concerns or observed population declines are not as serious. **Moderate** priority species are those with declining but larger populations, are subject to less serious threats, and/or a smaller proportion of the species continental distribution occurs in the Piedmont (e.g., species of conservation concern at the edge of their range and uncommon in the BCR). This group also includes several common species whose Piedmont population represents a significant portion of the global population for the species. The conservation needs of moderate

priority species should be considered and included in conservation management decisions to positively affect their populations when planning or managing for higher ranked priority species. Status designations B, N, and T denote whether the species is important in the region as a breeder (B), non-breeder (N), or transient (T).

Table 1. Priority Bird Species in the Piedmont Bird Conservation Region (BCR 29).

HIGHEST PRIORITY SPECIES		
Eastern Whip-poor-will (B)	Red-cockaded Woodpecker (B, N)	
Northern Bobwhite (B, N)	Wood Thrush (B)	
HIGH PRIORITY SPECIES		
American Black Duck (B, N)	Chimney Swift (B)	Prairie Warbler (B)
American Woodcock (B, N)	Field Sparrow (B, N)	Ruffed Grouse (B, N)
Black Rail (B)	Grasshopper Sparrow (B)	Rusty Blackbird (T, N)
Brown-headed Nuthatch (B, N)	Kentucky Warbler (B)	Upland Sandpiper (B)
Canada Goose (T, N) (Atlantic Migratory Population)	King Rail (B)	
MODERATE PRIORITY SPECIES		
Acadian Flycatcher (B)	Common Tern (T)	Lesser Yellowlegs (T)
American Bittern (T, N)	Eastern Kingbird (B)	Mallard (B, N)
American Coot (B, N)	Eastern Meadowlark (B, N)	Painted Bunting (B)
Bachman's Sparrow (B, N)	Eastern Towhee (B, N)	Prothonotary Warbler (B)
Black Tern (T)	Eastern Wood-Pewee (B)	Red-headed Woodpecker (B, N)
Blue Grosbeak (B)	Green-winged Teal (T, N)	Short-eared Owl (B, N)
Blue-winged Warbler (B)	Henslow's Sparrow (B)	Swainson's Warbler (B)

Brown Thrasher (B, N)	Hooded Merganser (B, N)	Tundra Swan (T, N)
Buff-breasted Sandpiper (T)	Horned Grebe (N)	Upland Sandpiper (T)
Carolina Chickadee (B, N)	Indigo Bunting (B)	Western Sandpiper (T)
Cerulean Warbler (B)	Least Sandpiper (T, N)	Wood Duck (B, N)
Common Nighthawk (B)	Lesser Scaup (N)	Yellow-billed Cuckoo (B)
MANAGEMENT CONCERN SPECIES		
American Black Duck (B, N)	Mourning Dove (B, N)	Tundra Swan (T, N)
American Woodcock (B, N)	Northern Bobwhite (B, N)	Wild Turkey (B, N)
Lesser Scaup (N)	Ring-necked Duck (N)	Wood Duck (B, N)
Mallard (B, N)	Ruffed Grouse (B, N)	

Priority breeding landbird species were initially identified and ranked using an objective method based on decision rules developed and used for the Atlantic Northern Forest BCR (BCR 14) (Dettmers 2006) planning process (Table 2). This decision matrix is based on scores provided by PIF in the 2012 assessments for breeding landbirds. Non-breeding landbirds, waterbirds, waterfowl, and shorebirds were assessed and ranked based on BCR-specific information derived from the continental and regional plans produced by the bird initiatives, State Wildlife Action Plans, and discussions with bird experts. In general, this list identifies priority bird species based on factors such as global and/or continental conservation concerns, the importance of the BCR to a species' global or continental distribution, and the population trend and threat level within the region. There are a number of native bird species, both common and rare, not specifically mentioned in this plan because they are considered lower priority for conservation as compared to the species addressed by this plan. The exclusion of these species indicates that they are considered to have either robust or acceptable populations or trends not requiring further conservation action at this time in the

Piedmont. Additionally, this list may not reflect current individual State Wildlife Action Plan priorities but should be representative of a larger geographic priority.

Table 2. Priority Bird Ranking Matrix for the Piedmont BCR.

Priority Tier	Continental Concern	BCR Responsibility	BCR Concern	Rule
Highest	HIGH	HIGH or MOD	HIGH	A
Concern columns both High, Responsibility at least Moderate				
High	MODERATE	HIGH or MOD	HIGH	B
	HIGH	HIGH or MOD	MODERATE	C
	MODERATE	HIGH	MODERATE	D
One or Two columns High, the other(s) Moderate, none Low				
Moderate	HIGH or MOD	LOW *	HIGH	E
	LOW	HIGH or MOD	HIGH	F
	HIGH	LOW *	MODERATE	G
	MODERATE	MODERATE	MODERATE	H
	LOW	HIGH	MODERATE	I
	HIGH	HIGH or MOD	LOW	J
	MODERATE	HIGH	LOW	K
Average of three columns at least Moderate, one may be Low				
Continental Concern - HIGH if on PIF Watch List (CCS-max = 14 or 13 and PT-c = 5; else MODERATE if PIF Combined Continental Score of 12 or 13; otherwise LOW				
BCR Responsibility - HIGH if RD=5 and %Pop ≥5% or if RD=4 and %Pop ≥25%; else MODERATE if RD ≥3 and %Pop ≥1%; else LOW if RD ≥2				
* where RD=1, species is only eligible for a Priority Tier if specifically designated as a priority by PIF regional partnership				
BCR Concern - HIGH if TB x 2 + PT > 10; else MODERATE if TB x 2 + PT > 7; else LOW				
RD = Relative Density ; reflects the mean density of a species within a given BCR relative to density in the single BCR in which the species occurs in its highest density; % Pop = reflect the proportion of the global population of a species that is contained within a BCR during the breeding season; TB = Threats to Breeding Populations ; indicates vulnerability due to the effects of current and probable future extrinsic conditions that threaten the ability of populations to survive and successfully reproduce in breeding areas within North America; PT = Population Trend ; indicates vulnerability due to the direction and magnitude of recent changes in population size.				

Habitat Types

Nine aggregate habitats types have been identified as important or potentially important for providing habitat for priority birds in the Piedmont (Table 3). Two of these, Upland Deciduous Hardwoods and Mixed Pine Forests and Pine Forests, are further divided to reflect more refined habitat assessments and accurate bird/habitat relationships. Each major habitat supports one or more of the priority bird species during at least one of

their life stages. Several types are either in need of critical conservation attention or are critical for long-term planning to conserve continentally and regionally important bird populations.

Table 3. Avicentric Habitat Types Developed by the ACJV in the Piedmont BCR.

Habitat Type	Hectares	Acres	Percent (%)
<i>Upland Deciduous Hardwoods and Mixed Pine Forests</i>			
Oak-Pine Forests	4,811,286	11,888,936	25.12
Mesophytic Hardwood Forests	1,637,976	4,047,523	8.55
Oak Forests	843,931	2,085,396	4.41
<i>Pine Forests</i>			
Pine Plantation	2,421,758	5,984,289	12.65
Open Pine	30,945	76,466	0.16
<i>Grasslands</i>	3,238,259	8,001,906	16.91
<i>Forested Wetlands</i>	518,123	1,280,309	2.71
<i>Early Successional Shrub-Scrub</i>	489,352	1,209,214	2.56
<i>Agriculture Croplands</i>	2,116,675	5,230,413	11.05
<i>Open Water and Impoundments</i>	432,527	1,068,797	2.26
<i>Freshwater Emergent Wetlands</i>	32,125	79,383	0.17

<i>Urban/Suburban Landscapes and Rural Woodlots</i>	2,503,537	6,186,368	13.07
Total	19,076,494	47,139,000	99.2%

Currently, developed urban areas are not essential for long term breeding viability of any priority species, with the possible exception of Chimney Swift and Common Nighthawk, but in the future may serve as havens for the most adaptable species and as migration stopover sites. More complete descriptions of the habitat type, its history, and avian associations are described in the habitat unit sections following this table.

Habitat types identified in this version of the Plan represent a unique approach to habitat descriptions, mapping, and conservation planning in the ACJV. With previous ACJV BCR planning efforts, habitat classification systems and mapping efforts were based on data generated from [Landsat](#) satellite imagery and developed into a National Land Cover Database ([NLCD](#)) land cover map by the Multi-Resolution Land Characteristic ([MRLC](#)) Consortium, a partnership of federal agencies led by the U.S. Geological Survey ([USGS](#)). This resulted in often broad classifications, which were then used by ACJV planners to describe habitat management goals for conservation plans in the ACJV. However, ACJV staff recognized the need to further refine habitat classifications and habitat mapping to improve bird conservation planning and implementation. In this plan land cover data from the Southeast Regional Gap Analysis Project ([SEGAP](#)) and the Northeast Terrestrial Habitat Mapping Project ([NETHM](#)) were combined. Both of these land cover mapping efforts used LANDSAT 30 m resolution imagery from 2001 as the base data and mapped to NatureServe's Ecological Classification System (ECS) within the spatial extent of each project. NatureServe developed these classes to represent readily mappable biological communities that share similar physical environments and ecological processes (Comer et al. 2003).

The southern portion of the Piedmont BCR was mapped as part of the SEGAP project and covered 13 map zones from Mississippi to the Atlantic Coast and from Florida to

Maryland ([GAP Land Cover Dataset](#)). The NETHM Project's spatial extent included all of the USFWS's Region 5: from Maine to Virginia and west to West Virginia ([NETHM](#)).

Due to differences in the way ECS land cover classes were mapped by the two projects, the products produced slightly different classifications in areas of overlap (e.g., Virginia). These differences were not able to be resolved in a timely manner for inclusion into this plan; therefore, ACJV staff decided that for the northern Piedmont the NETHM would supersede the SEGAP data. Combining the two sets of land cover data in the Piedmont resulted in a total of 101 unique ECS classes and is referred to in this plan as Piedmont Habitat Analysis Project (PHAP) (Jones and Luke 2013). Recognizing that birds do not respond to land cover at this fine a scale, ACJV staff developed an intermediate classification system, which better describes how the landscape is perceived and used by birds (Figure 3). For the purposes of this document only the first 12 habitat types (e.g., % cover $\geq 0.16\%$), which have been further aggregated into nine habitat types, will be used for bird conservation planning in the Piedmont. Remaining habitats in other categories cover less than 1% of the landscape combined and are not included in this plan (Figure 3).

Priority Species and Habitat Suites

Upland Deciduous Hardwoods and Mixed Pine Forests

Upland deciduous hardwoods and mixed pine forests are the dominant cover type of the Piedmont region, and thus are associated with more priority birds than other habitats (Table 4.) This type has been subdivided into three sub-types, typical of Piedmont hardwood forest systems, but the birds in the habitat type have not been segregated according to sub-type because of much crossover. However, their affinities for these sub-types are described in the discussion below. Nevertheless, more explicit separation can be made if desired due to the tiered nature of the habitat aggregations.

The relative composition of Piedmont hardwood forests shifts with latitude in accordance with prevailing soil types and climate. In the Northern Piedmont upland forests are broadly classified as a Central Appalachian oak type and dominated by

canopy species such as Northern Red Oak, White Oak, Black Oak, and Red Maple. The southern Piedmont is characterized by an “oak-hickory” forest type that is dominated by similar oak species but also includes Shagbark Hickory, Red Hickory, Pignut Hickory, and Tulip Poplar. Mixed oak-pine forests are also widespread throughout the southern Piedmont and include pine species such as Loblolly, Shortleaf, and Pitch Pine.

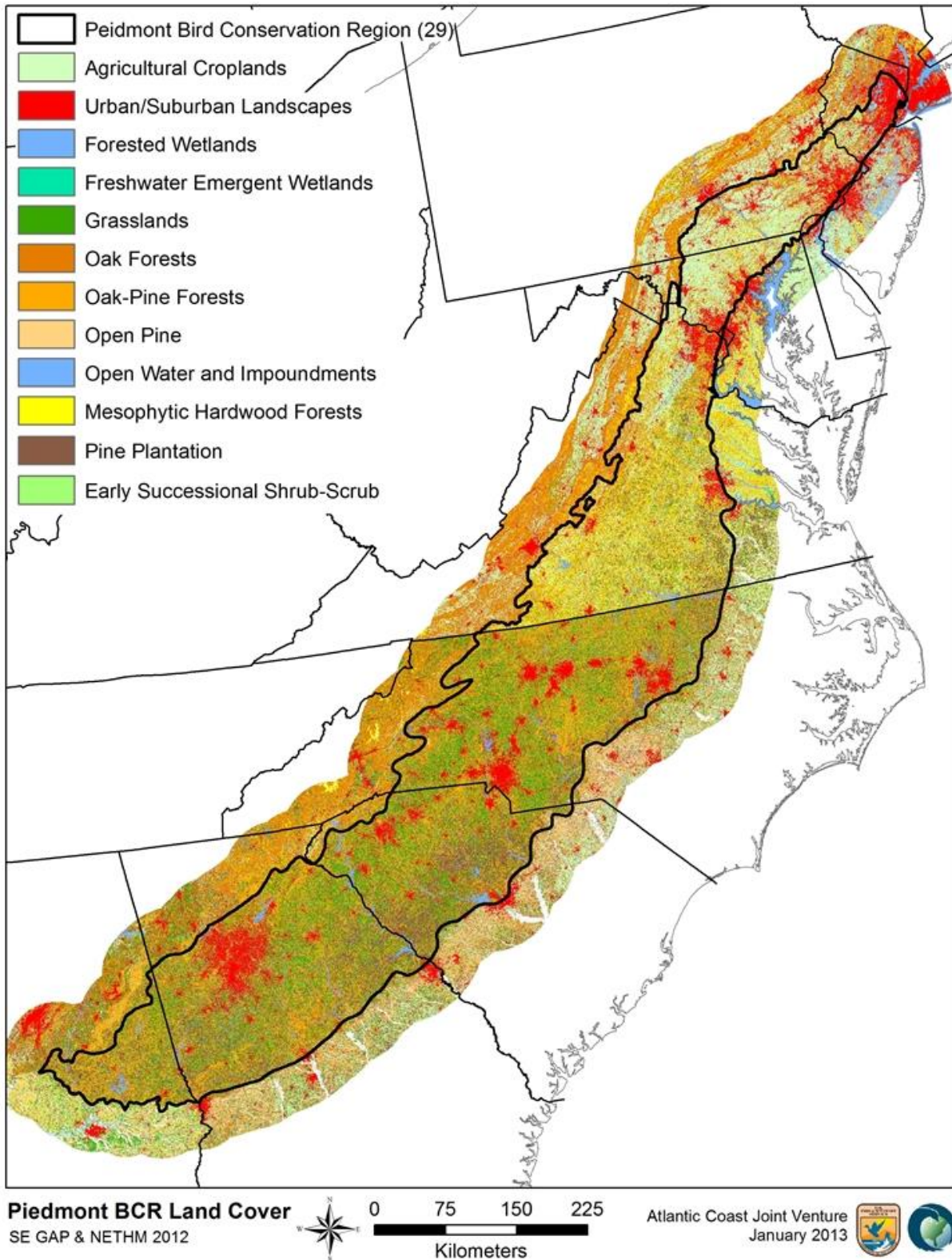


Figure 3. Piedmont Habitat Analysis Project (PHAP) Land Cover and Habitat Types in the Piedmont BCR.

Table 4. Upland Deciduous Hardwoods and Mixed Pine Forests.

Habitat	Species		
	Highest Priority	High Priority	Moderate Priority
Upland Deciduous Hardwoods and Mixed Pine Forests Oak-Pine Forests Mesophytic Hardwood Forests Oak Forests	Eastern Whip-poor-will (B) Wood Thrush (B)	American Woodcock (B, N) Chimney Swift (B) Kentucky Warbler (B) Ruffed Grouse (B, N)	Acadian Flycatcher (B) Carolina Chickadee (B, N) Cerulean Warbler (B) Common Nighthawk (B) Eastern Wood-Pewee (B) Indigo Bunting (B) Mourning Dove (B, N) Painted Bunting (B) Red-headed Woodpecker (B, N) Wild Turkey (B, N) Yellow-billed Cuckoo (B)

The amount and composition of upland hardwood forests have continuously been altered since European settlement. A dramatic and widespread clearing of upland forests began in the 18th century with much deforestation occurring for conversion to agriculture. Most, if not all, forest tracts were cut one time or more since the late 1800s. Currently, upland forest cover comprises 38% of the total land cover and continues to be converted for human uses at high rates. Between 1973 and 2000 nearly 170,000 ha (420,079 ac) of forest was converted to agriculture or human development. This trend is unlikely to abate in the future. Reforested agricultural areas account for nearly 23,000 ha (56,834 ac) but provide minor mitigation to this conversion process. In addition to forest cover loss over the last three centuries, the character of much of the remaining forest landscape has changed. In general, the overall forest landscape is more fragmented compared to pre-European settlement. When habitats become

fragmented not only is there a loss of area but also a reduction in the average size of remaining patches and an increase in their isolation from one another. Bird species with very large area requirements are more susceptible to habitat fragmentation than species with smaller area requirements, and as a result suffer greater population declines, resulting in higher conservation needs in these human dominated landscapes. Another factor that influences forest use by priority species is large scale changes in forest composition from modern forestry practices such as selective logging and hi-grading. These practices remove most of the commercially valuable hardwood species, leaving smaller, less valuable trees behind, thus influencing future forest composition and habitat structure. In the southern Piedmont much of the deforested land has been replanted with monocultures of pine (see [Pine Plantation](#) discussion).

In this plan these upland deciduous hardwood and mixed pine forests have been subdivided into three subtypes that better describe the types of upland forests in the Piedmont and the birds that occupy them. These are Oak-Pine Forests, Mesophytic Hardwood Forests, and Oak Forests.

Oak-Pine Forests

Oak-Pine Forests in the Piedmont are comprised of four ECS classes and their modifiers and cover 25.12% of the Piedmont landscape. These are:

Central Appalachian Dry Oak-Pine Forest
Central Appalachian Pine-Oak Rocky Woodland
North Atlantic Coastal Plain Hardwood Forest
Southern Piedmont Dry Oak-(Pine) Forest - Hardwood Modifier
Southern Piedmont Dry Oak-(Pine) Forest - Mixed Modifier
Southern Piedmont Dry Oak-(Pine) Forest - Loblolly Pine Modifier

These forests are characterized by xerophytic conditions and may either be dominated by deciduous hardwoods, pines (especially farther south), or a mixture of both in varying proportions throughout the landscape and generally occur in lower and middle elevations with nutritionally poor soils and in a variety of slopes and aspects. Sites may be dry to dry-mesic and have either basic or acidic soils. The modifiers used here and in subsequent descriptions are those identified by SEGAP to allow refinement of the

system based on a phenological or structural variation which can be accurately mapped and is considered important to habitat modeling and conservation planning (NatureServe 2012).

Mesophytic Hardwood Forests

Mesophytic hardwood forests in the Piedmont are comprised of seven ECS classes and modifiers and cover 8.55% of the Piedmont upland forests. These are:

Appalachian Hemlock-Hardwood Forest: typic and moist-cool
East Gulf Coastal Plain Southern Mesic Slope Forest
East Gulf Coastal Plain Northern Mesic Hardwood Forest
South-Central Interior Mesophytic Forest
Southern and Central Appalachian Cove Forest: acidic and circumneutral
Southern Atlantic Coastal Plain Mesic Hardwood Forest
Southern Piedmont Mesic Forest

The mesophytic hardwood forests of the Piedmont are generally located in moist but non-wetland sites, often in coves on lower and north facing slopes between xeric uplands and river bottoms. For the most part, these forests are sheltered from frequent fire and are dominated by mesophytic deciduous hardwoods such as beech (*Fagus grandifolia*), maple, and mesic oak (*Quercus spp.*). The forests typically have well developed understories, while the herbaceous layer varies from dense to sparse depending on soil acidity, are often found on deep rich soils, and are associated with abundant spring ephemerals (NatureServe 2012).

Oak Forests

Oak forests in the Piedmont are comprised of nine ECS classes and modifiers and cover 4.41% of the Piedmont upland forest landscape. They are:

Allegheny-Cumberland Dry Oak Forest and Woodland - Pine Modifier
Allegheny-Cumberland Dry Oak Forest and Woodland – Hardwood Modifier
Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest
Central and Southern Appalachian Montane Oak Forest
Northeastern Interior Dry-Mesic Oak Forest: typic and moist-cool
Northeastern Interior Dry Oak Forest - Mixed Modifier
Southern and Central Appalachian Oak Forest - Xeric

Southern Appalachian Oak Forest: typic and moist-cool
Southern Ridge and Valley / Cumberland Dry Calcareous Forest
Southern Ridge and Valley Dry Calcareous Forest - Pine modifier

These forests are mainly dry hardwood forests on predominately acidic substrates dominated by White, Southern Red (*Quercus falcata*), and Chestnut Oaks along with maples, hickories, and pines. American Chestnut (*Castanea dentata*) sprouts can often be found where the Chestnut was formerly a common tree. These forests are typically closed-canopied and cover large expanses at low to mid elevations where the topography is flat to gently rolling and occasionally steep. Soils are mostly acidic and relatively infertile but not strongly xeric. Today's oak forests are a result of repeated cutting, clearing, and cultivation of the original forests. This system is naturally dominated by stable, uneven-aged forests with canopy dynamics dominated by gap-phase regeneration (NatureServe 2012). Wood Thrush is a priority species that utilizes the sub-canopy in a wide variety of upland forest types and requires well developed mid-story vegetation, preferring moist deciduous forests. Wood Thrush are known to occupy small forest fragments less than 1 ha (2.47 ac) but occur with greater incidence in larger patches.

Eastern Whip-poor-will use relatively open hardwood forests and woodlands with only moderate vegetation cover in the understory and mid-story that also provides access to open habitats where they forage. They seem to avoid dense forests in large uninterrupted blocks (Clink 2002). It is possible that Eastern Whip-poor-will populations could benefit from forest management actions such as prescribed fire or thinning that would reduce the dense understory conditions of many Piedmont uplands forests.

Kentucky Warblers utilize the understory of upland forests and are influenced to a greater degree by groundcover and understory conditions. They require moist deciduous forests with a well-developed understory and dense ground cover (McDonald 1998). Kentucky Warblers were predicted to reach their highest probability of occurrence within patches of 300 ha (741 ac) and 50% occurrence within 17 ha (42 ac) patches (Robbins et al. 1989).

Cerulean Warbler and Eastern Wood-Pewee occupy the upper strata of the forest and are influenced by the condition of the forest canopy. The Cerulean Warbler is primarily associated with the [Appalachian BCR](#) and the Roanoke River basin where its distribution comes in close contact with the Piedmont in northern Virginia, Maryland, and North Carolina. Previous breeding season records in locations like Rock Creek Park, Maryland near Washington, D.C. and the Roanoke River basin provide some probability of this species occupying forests along the Appalachian–Piedmont interface. The Cerulean Warbler appears to have large area requirements. In Maryland maximum Cerulean Warbler occupation of forested stands only reached 50% in patches of 700 ha (1,729 a) (Robbins et al. 1989). Further work is needed to clarify the status and distribution of this sensitive species within the region. The Eastern Wood-Pewee generally prefers open canopy forests to meet foraging requirements but Kendrick et al. (2013) found that nest success increased with decreased forest in the landscape indicating that the Eastern Wood-Pewee may not be significantly influenced by forest fragmentation. However, densities of Eastern Wood-Pewee increased over the range of forest cover at least in the Missouri Ozarks.

Red-headed Woodpeckers prefer open hardwood stands and typically reach their highest densities in open forested wetlands such as beaver ponds or pine savannas. Because of their use of disturbed woodlands Red-headed Woodpeckers have increased in certain portions of their range. Red-headed Woodpeckers excavate cavities, usually in a dead or decaying tree, and so are sensitive to the presence of snags and other appropriate nesting trees.

American Woodcock utilize a greater variety of seral stages than other species and use upland forests in second growth, mid-aged condition as well as riparian mature forests. They are sensitive to the amount of bare ground and leaf litter and respond positively to open understory where these components are accessible. American Woodcock also supplement the use of forested stands with open habitats such as clear-cuts, agricultural areas, grasslands, and shrublands and may be more sensitive to the composition of the broader landscape.

Common Nighthawk requires similar areas for ground nesting, especially where bare ground is exposed from recent logging, fire, and other disturbances. They also nest in areas where naturally occurring exposed substrates such as rock, small gravel, and sand exist. They are common nesters in cities where they utilize flat gravel rooftops. Recent changes in roof design and construction have resulted in reduced rooftop nesting and may have led to the decline experienced by this species (Cornell Lab of Ornithology 2013).

Ruffed Grouse are typically associated with the Appalachian region but may occur in low numbers in the Piedmont. Ruffed Grouse prefer drier deciduous stands in small diameter classes. Compared to most other species that rely on vertical habitat heterogeneity and a mixture of different age trees, management of Ruffed Grouse populations is recommended as even-age forest systems (Dessecker et al. 1996).

Many priority species of upland deciduous and mixed forests also utilize other habitats identified in this plan as well as a variety of forests across the range of this habitat type and will be discussed together. With further refinement of habitat parameters, development of an avicentric habitat classification system, and landscape modeling efforts such as [DSL](#), a more refined discussion can occur for each habitat type and/or species suite.

Priority List of Conservation Actions

1. Identify largest and highest quality forest habitat patches within the Piedmont as targets for coordinated conservation strategy (acquisition, easements, and management, etc.); use USDA Forest Service's ([USFS](#)) Forest Stewardship Program ([FSP](#)) Spatial Analysis Project ([SAP](#)) to identify potential private lands for conservation efforts,
2. Reduce habitat loss and fragmentation due to development and sprawl,
3. Increase and improve active management of forests to improve habitat quality within existing and high priority upland forest (e.g., increase understory layer),

4. Improve outreach and education opportunities for private forest land owners on reforesting habitats and managing forests for priority species (a by-product of this plan will be the production of a guide for managing private lands in the Piedmont),
5. Develop cooperative programs among agencies, NGOs, and local governments to reduce the impacts of deer overabundance on forested communities,
6. Develop regionally species-specific databases of critical demographic parameters that can be used in habitat suitability models,
7. Gather demographic data on forested upland dependent species to identify limiting factors, such as forest fragmentation, that are causing population declines in priority forest birds,
8. Continue to explore and utilize the Forest Legacy Program ([FLP](#)), Forest Stewardship Program, and Forestland Enhancement Programs ([FLEP](#)) of the USFS, USDA-[NRCS](#), and USFWS programs to fund and cost share projects on private forest lands that will improve forest conditions for priority bird species, and
9. Encourage cooperation among various groups engaged in forest work.

Pine Forests

Pine forests in the Piedmont are comprised of five ECS classes and modifiers and cover 12.81% of the Piedmont landscape. For purposes of this plan pine forests are divided into two types, pine plantation and open pine forest. Priority species for Pine Forests are presented in Table 5.

Table 5. Pine Forests.

Habitat	Species		
	Highest Priority	High Priority	Moderate Priority
Pine Forests: a) <i>Pine Plantation (Mature Loblolly and Shortleaf and Short Rotation Pine)</i> b) <i>Open Pine</i>	Eastern Whip-poor-will (B) Red-cockaded Woodpecker (B, N)	American Woodcock (B, N) Brown-headed Nuthatch (B, N) Field Sparrow (B, N) Northern Bobwhite (B, N) Prairie Warbler (B)	Bachman's Sparrow (B, N) Carolina Chickadee (B, N) Common Nighthawk (B) Eastern Kingbird (B) Eastern Towhee (B, N) Eastern Wood-Pewee (B) Henslow's Sparrow (B) Indigo Bunting (B) Mourning Dove (B, N) Painted Bunting (B) Red-headed Woodpecker (B, N) Wild Turkey (B, N)

Pine Plantation

Pine plantations in the Piedmont are comprised of two ECS classes and cover 12.65% of the Piedmont landscape. These are:

Evergreen Plantations or Managed Pine (can include dense successional regrowth) Pine plantation / Horticultural pines

Pine Plantations are by far the most predominant pure pine forest cover type in the Piedmont, represent the greatest potential to establish conditions for mature open pine forests in the future, and are much more valuable for conserving priority pine associated bird species in the Piedmont. Generally they are even-aged, regularly spaced forest stands established by planting and/or seeding in the process of afforestation or reforestation where individual trees are generally greater than 5 m (16.3 ft) in height. Specifically, this class refers to plantations dominated by evergreen species (SEGAP 2010). In the Piedmont pine plantations will include both mature loblolly and shortleaf pine forests and short rotation pine forests.

Mature Loblolly and Shortleaf Pine

Historically, shortleaf pine was probably the most important pine in the Piedmont. Today, the faster growing Loblolly is much more economically important. Loblolly Pine is an excellent natural invader of disturbed sites and today is the most frequent pine found in old field successional stages. Even in areas where longleaf is still a numerically important species disturbance and fire suppression during the last two centuries have led to an increase of Loblolly Pine. Nevertheless, small patches of mature Loblolly Pines prior to European settlement may have played important roles for some species and certainly are important today for many high priority species.

Although the prevailing management for pine savannas is typically suggested for Longleaf Pines, managing Loblolly Pine and Shortleaf Pine similarly to Longleaf Pine should be considered. The priority suite of open pine or pine savanna species will also use Loblolly and Shortleaf stands properly managed for age and appropriate habitat structure. Managing other pine tree species tends to be a greater challenge since Loblolly and Shortleaf pine seedlings are less resistant to fire, and thus it is difficult to maintain juvenile recruitment of pines when using regular intervals of prescribed fire.

Priority List of Conservation Actions

1. Promote open woodland conditions for Shortleaf and Loblolly Pine,
2. Identify and select areas in which to establish new mature pine savanna,
3. Provide suitable landowner incentive programs that deal with the difficult task of managing mature savannas with prescribed fire, and
4. Continue to explore and utilize the various USFS (FLP, FSP, FLEP), USDA-NRCS, and USFWS programs to fund and cost share projects on private forest lands that will improve forest conditions for priority bird species.

Short Rotation Pine Plantation

The development of modern silviculture has led to a dramatic increase in the number of pine plantations in the southeast and southern Piedmont. Managing pines for

commercial harvesting is a relatively recent event that increased in popularity among private and corporate landowners in the 1970s. By 1990, 15% of the remaining forest area in the Southeast was converted to pine plantations. Pine plantations that exist today are derived from other forest types that were clear-cut and replanted in pine or converted from agricultural areas. Planting pines was also used as a landowner incentive to reforest the Southeast, reduce soil erosion, and recover soils that had been depleted of nutrients from long-standing agricultural practices. For instance, 50% of the land enrolled in the USDA Conservation Reserve Program (CRP) in the Southeast has been established in trees with nearly all planted as pine (Osborn et al. 1992). With an ever-growing demand for wood products it seems likely that conversion of forests to pine plantations and the planting of new areas will continue into the future.

Pine plantations managed for pulpwood and saw-timber can supply available habitat for most pine affiliated species except for the Red-cockaded Woodpecker. Management of plantation pines by stocking at low densities to lengthen the time before canopy closure and thinning stands to reduce the time of canopy closure by opening the canopy can provide habitat for a number of priority species. Pine plantations are typically planted at high stocking levels and clear-cut on relatively short rotation schedules of 20-25 years, but recent trends suggest that many landowners are striving for more production of sawtimber through longer rotations and multiple thinnings. This specific method of silviculture retards succession and prevents the development of old growth characteristics required by many bird species. In addition, dense stocking levels promote canopy closure within a relatively short amount of time that shades out and diminishes understory vegetation. Under most management these stands remain in this closed condition for decades unless harvested.

Pine plantations provide habitat for a wide variety of priority bird species, which differ somewhat in their use of pine plantations depending on the seral stage and associated habitat structure. Brown-headed Nuthatches are endemic to southeastern pine savannas and are a priority species of that ecosystem. They typically require open, mature savannas with snags for cavity excavation and nest at low heights (McNair 1984). Because of their nesting height requirements they respond negatively to mid-

story vegetation that can occlude cavities. Brown-headed Nuthatches can use pine plantations 15-20 years after planting but only if thinned or planted with very low pine density. Thinning reduces basal area and opens the stand for Brown-headed Nuthatches. However, because plant regrowth can be rapid their abundance and frequency of plantation use may decline with time since thinning (Wilson and Watts 1999). Brown-headed Nuthatches also respond positively to snag density, and their use of pine plantations is dependent upon the presence of snags. Snag density has been shown to be lower in pine plantations compared to natural stands, and as a result plantations are likely to support comparatively lower densities of Brown-headed Nuthatches.

Prairie Warbler, Indigo Bunting, and Eastern Towhee use early stages of regenerating stands when dense shrub layers begin to develop. The abundance of these species declines during mid-stage closed canopy stands, and they can even be absent when understory vegetation is diminished. All three species respond positively to thinning when the canopy is opened and understory vegetation recovers. Bachman's Sparrows' use of pine plantations is very restricted due to their specific habitat requirements. They may use early grassy stages of 2-5 years only when there are small amounts of woody intrusion. They do not use plantations that are dominated by shrubby vegetation or broad-leafed saplings. They are absent from closed canopy, mid-aged stands but may begin reusing thinned stands if the understory is not dominated by shrubs. Bachman's Sparrows respond positively to prescribed burning of both young and thinned stands (Tucker et al. 1998). Likewise, Northern Bobwhites prefer young pine plantations in grassy stages and respond positively to thinning and other habitat openings (Jones et al. 2010). American Woodcock can use a wide range of plantation conditions when bare ground is accessible for foraging.

The Eastern Wood-Pewee requires tall, open canopies for foraging and only uses mature stands that have been thinned or the edges of plantations. Eastern Whip-poor-will requires mid-aged and mature pine plantations for nesting but also use open habitats such as clear-cuts and roads for foraging.

List of Priority Conservation Actions

1. Lengthen the time of canopy closure by stocking plantations with lower density of pines,
2. Reduce the period of canopy closure by thinning mid-rotation pine stands,
3. Consider the use of prescribed fire in locations where species that benefit from habitats mediated by fire, such as Bachman's Sparrow, may exist,
4. Investigate the role of herbicidal applications of pine plantations on bird abundance and reproduction,
5. Develop a Farm Bill program for priority forest birds (e.g., similar to CRP Practice CP33, for Upland Bird habitat), and encourage Farm Bill funding for private forest management,
6. Use the USFS's SAP to identify privately owned forested areas needed for conservation purposes, and
7. Develop a strong private landowner outreach program in the BCR.

Open Pine

Open pine forests in the Piedmont are comprised of five ECS classes and modifiers and cover 0.16% of the Piedmont landscape. They are:

Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland - Loblolly Modifier
Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland - Open Understory Modifier
Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland - Scrub/Shrub Understory Modifier
Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland - Offsite Hardwood Modifier
Atlantic Coastal Plain Upland Longleaf Pine Woodland
Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods
East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland - Open Understory Modifier
East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland - Loblolly Modifier
East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland - Offsite Hardwood Modifier
Southeastern Interior Longleaf Pine Woodland

Open Pine forests in the Piedmont are distinctly miniscule compared to other established forests. One major goal of this Plan is to increase the amount of open pine

forest in the Piedmont that would function as the old-growth open pine systems that occurred prior to European settlement. This will most likely be accomplished in those forests listed under mature Loblolly and Shortleaf Pine forests.

Most of this forest is comprised of the Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland system, which occurs primarily in the Fall-line Sandhills region of central North Carolina extending into central Georgia. It occurs on upland sites ranging from gently rolling, broad ridge tops to steeper side slopes, as well as locally in mesic swales and terraces. Most soils are well to excessively drained. The vegetation is naturally dominated by Longleaf Pine with an understory of various scrub oaks (*Q. laevis*, *Q. marilandica*, *Q. incana*, and *Q. margarettiae*). The herb layer is generally well-developed and dominated by grasses. Wiregrasses (*Aristida stricta* in the North, *A. beyrichiana* in the South) dominate in most of the range, but other grasses dominate where they are absent. Forbs, including many legumes, are also abundant. Frequent, low-intensity fire is the dominant natural ecological force (NatureServe 2012).

Prior to European settlement of North America the landscape of the southeastern United States was dominated by an estimated 24 million ha (59,305,300 a) of old-growth pine forest (Croker 1979) dominated by Longleaf Pine and maintained by low-intensity ground fires caused by lightning strikes (Komarek 1964, 1974) and indigenous people (Bartram 1791, Ware et al. 1993). Fires occurred over vast areas at approximately 3-5 year intervals (Chapman 1932, Krusac et al. 1995) and maintained forests with an open mid-story and dense ground cover of forbs and grasses. Old-growth Longleaf Pine forests covered most of the coastal plain of the southeastern United States and also extended along the Piedmont fringe and north into the piedmonts of Georgia and Alabama where they typically occurred on high ridge-tops and were referred to as mountain longleaf stands. Very little Longleaf Pine remains in the Piedmont, but some does occur at the periphery near the South Atlantic Coastal Plain.

Since European settlement three centuries of land clearing for the naval stores industry, agriculture, and other uses have reduced the extent of forest cover to 60% of its former range. Conversion rates of some forest types have been extremely high. For instance,

old growth Longleaf Pine forests have been essentially eliminated and currently exist in only 1% of their historic range.

The character of much of the remaining forested land has also been altered. Over the past three to four decades large timber corporations and private landowners have begun to implement intensive management operations to produce a sustained yield of pine plantations. Clear-cutting stands on relatively short rotation schedules of 20-25 years has become the dominant forestry practice. As a result, the southeastern landscape has shifted to contain more mid-successional stands in comparison to the region's prior history.

Bachman's Sparrow, Red-cockaded Woodpecker, and Brown-headed Nuthatch are all priority species in the Piedmont that are associated with the southeast pine ecosystem (Jackson 1988). Each of these species requires one or more specific components found in mature or old growth pine savannas. In general, open understory or mid-story and/or a low basal area of pines that allows an open canopy are common habitat requirements. Other high and moderate priority species use mature pine savannas but are not uniquely endemic to this ecosystem.

The Red-cockaded Woodpecker is a federally endangered species that excavates cavities for roosting and nesting in live, mature pines greater than 80 years old in an open understory condition. A single family group may use 100 ha (247 ac) of old growth forest depending on site quality. The only known populations in the Piedmont exist on public lands at the Oconee National Forest and the Piedmont National Wildlife Refuge in Georgia. The federal properties located in Georgia are recognized as a secondary core population by the Red-cockaded Woodpecker Recovery Plan (USFWS 2003), indicating that they must collectively hold 250 potential breeding pairs to meet recovery goals for the Piedmont region before delisting of the species may occur. In 2012 the combined population on these two properties was 59 potential breeding pairs in 76 clusters (53 in Piedmont National Wildlife Refuge and 23 in the Oconee National Forest).

The remaining pine-associated species, Brown-headed Nuthatch and Bachman's Sparrow, are more sensitive to understory condition than the age of the canopy. Thus, they can be found in other forest types that share open understory conditions (e.g., thinned pine plantations, mixed pine-hardwood forests, regenerating clear-cuts). All respond positively to fire and decline after vegetation recovers following a burn. Brown-headed Nuthatches require snags for cavity excavation and stands with an open mid-story. One possible explanation for the inverse relationship between Brown-headed Nuthatches and the mid-story is that vegetation may obscure potential cavity locations. Brown-headed Nuthatches typically nest in low positions, usually below 3.6 m (11 ft) (McNair 1984), suggesting the potential to increase nesting height is limited. Regrowth of the understory after 5 years limits their distribution (Hirth et al. 1991). Bachman's Sparrows require open understory of grasses with scattered woody vegetation. Their most preferred conditions are within 1-4 years after a burn, suggesting a fire interval of 3-5 years can maintain habitat quality (Dunning and Watts 1990, Gobris 1992). Bachman's Sparrows can also use thinned pine plantations that have been recently burned or regeneration clear-cuts that are dominated by grasses and not hardwoods. However, due to the ephemeral nature of these habitat types, neither may provide the sustained availability of habitat as properly managed pine savannas. Northern Bobwhites respond positively to burning in mature pine forests, and fire has long been considered a primary management tool for this species (Stoddard 1931). Northern Bobwhites prefer habitats that have less than 50% canopy, which allows for growth of understory of grasses and legumes. Like Bachman's Sparrows, Northern Bobwhites' most preferred conditions are within 1-4 years after a burn.

Other priority species are able to use a variety of habitats in the Piedmont, so mature pine savannas only represent a small portion of their overall regional habitat breadth. The Prairie Warbler, Eastern Towhee, Field Sparrow, and Indigo Bunting are typically recognized as shrub nesting species and can utilize the open conditions of pine savannas. Canopy using species such as the Eastern Wood-Pewee and Red-headed Woodpecker also benefit from the open conditions. Red-headed Woodpeckers also require snags for cavity excavation and can reach their highest densities in pine

savannas. Henslow's Sparrow can only be found in pine savannas in winter and are typically associated with wet seepage bogs, which are very rare, and isolated habitats embedded within savannas.

Opportunities to restore mature Longleaf Pine savannas in the Piedmont may be few and spatially limited. Most opportunities only exist on the eastern fringe of the Piedmont where soil types are permissible to allow growth of Longleaf Pine. Moreover, while the best opportunities to restore and maintain pine savannas are typically on public land, the vast majority of land available for potential restoration is on private land in the Piedmont. However, the restoration and management of old growth pine savannas is a difficult proposition for private landowners because of the required regular maintenance costs of using prescribed fire or other means to maintain open understory and mid-story conditions. Conservation incentive programs for private landowners often include options such as easements, tax relief, or habitat enhancement funding. Unlike most habitats where a conservation easement can simply "set-aside" a habitat block in perpetuity, landowners placing an easement on a block of pine savanna could be faced with the monetary costs of having to manage that habitat in an open understory condition to satisfy easement conditions. Special considerations to meet this financial obligation should be made when developing conservation programs to enlist private landowners into pine savanna restoration and management.

The [America's Longleaf Restoration Initiative](#) has developed a systematic conservation and implementation plan to restore longleaf forests in the southeastern United States. Moreover, many U.S. Department of Agriculture (USDA) Natural Resources Conservation Service ([NRCS](#)) state offices have developed a county prioritization scheme within this initiative to allocate funding and assistance for longleaf restoration. Within each state only the eastern most counties in the Piedmont fall into high priority areas.

Priority List of Conservation Actions

1. Protect existing areas of old-growth and mature pine savanna,

2. Identify and select areas in which to establish new mature pine savanna according to priorities designated by the NRCS,
3. Provide suitable landowner incentive programs that deal with the difficult task of managing mature savannas with prescribed fire, and
4. Continue to explore and utilize the USFS (FLP, FSP, FLEP), USDA-NRCS, and USFWS programs to fund and cost share projects on private forest lands that will improve forest conditions for priority bird species.

Grasslands (Agricultural, Managed, and Natural)

Grasslands in the Piedmont are comprised of six ECS classes and cover 16.91% of the Piedmont landscape. The classifications in this type are:

Central Appalachian Alkaline Glade and Woodland
National Land Cover Data Shrubland and Grasslands (NLCD 52 and 71)
Clearcut Grassland/Herbaceous
Herbaceous
Utility Swath and Rights-of-Way (ROW) Herbaceous
Pasture and Hay

Grasslands include agricultural, natural, and managed grassland communities throughout the Piedmont. They are dominated by herbaceous ground cover following a disturbance event such as clear-cutting, utility maintenance (i.e., right of ways), catastrophic fire, etc. They also occur as part of agricultural practices in areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops. These grasslands are generally ephemeral upland areas dominated by grass species with no tree cover and little to no shrub cover, but in some cases Eastern Red Cedar glades are present. They include pastures, hayfields, sod farms, wet pastures, wet prairies, airports, utility swaths, and abandoned old fields or sites maintained purposely in an open, grassy state (SEGAP 2010).

The current status, distribution, and importance of grasslands and their relationship to the conservation of open-habitat populations must be viewed in the appropriate historical context. Prior to European settlement open grasslands were uncommon

within the Piedmont and only existed as relatively small patches embedded within a much larger forested landscape. Open lands likely increased in the years following European settlement, and by the nineteenth century broad-scale clearing of forested lands resulted in a flush of new open habitats. Subsequently, the availability of open lands has declined dramatically throughout the twentieth century following succession of previously open habitats.

Grasslands in the Piedmont are primarily derived from agricultural fields and pasturelands. Other managed grasslands may include airports, golf courses, military training areas, parks, and recreational fields. Without regular management these open habitats will give way to woody vegetation and eventually succeed to shrublands and then forest. The specific form of open habitat is influenced by land history, moisture, soils, and management regime. Old fields, pasturelands, and grain and hay crops may provide breeding habitat for grassland birds where patch size, grassland structure, and harvest intervals are compatible with species' successful breeding requirements.

The suites of species that currently use open habitats within the Piedmont appear to have been present in healthy numbers during pre-European/African settlement. Regional changes that altered the landscape since settlement, such as pandemics, which altered fire and management regimes, forest clearing for agriculture, and changes in agricultural practices following the Civil War and the Depression, have caused fluctuations in the populations of these species, and today they remain in need of conservation (Table 6). Many of these species likely occurred commonly in adjacent geographic regions and were able to colonize the eastern United States during the mid to late 1800s. Other grassland species may have historically been components of Piedmont avifauna but likely increased during this same time period. However, populations of these species began to wane in the twentieth century as the availability of open habitats declined.

The decline in grassland birds is not only a result from a direct loss of habitat but also historical changes in how rural lands are managed. A shift to more mechanized

Table 6. Grasslands (Agricultural, Managed, and Natural).

Habitat	Species		
	Highest Priority	High Priority	Moderate Priority
Grasslands (Agricultural, Managed and Natural)	Northern Bobwhite (B, N)	American Woodcock (B, N) Field Sparrow (B, N) Grasshopper Sparrow (B) Upland Sandpiper (B)	Blue Grosbeak (B) Buff-breasted Sandpiper (T) Common Nighthawk (B) Eastern Kingbird (B) Eastern Meadowlark (B, N) Henslow's Sparrow (B) Mourning Dove (B, N) Short-eared Owl (B, N) Upland Sandpiper (T) Wild Turkey (B, N)

farming, retaining less idle areas, removal of hedgerows and other widespread practices reduced many of the habitat components that once made rural working lands compatible for grassland birds.

Grasshopper Sparrows can be found in areas of agricultural activity, prefer dry grasslands with some bare ground, and respond negatively to small amounts of woody plant intrusion. They breed in old fields, fallow agricultural lands, airports, pasturelands, hay and grain crops, and some row crops. Although they use pasturelands, these patches and similar types that are formed by dense, exotic sod grasses support lower densities compared to areas with bunch grasses and bare ground. Grasshopper Sparrows are known to be area sensitive and are more likely to occur in patches 8 ha (20 ac) or larger. In the mid-Atlantic region Grasshopper Sparrows only reached 50% incidence in patches greater than 10 ha (24.7 ac) and were rarely found in smaller patches. The level of area sensitivity can vary for any species in the Piedmont, and a relatively constant abundance from north to south in the Piedmont suggests minimum area requirements are likely equal across all of these areas. Additional study is needed to derive absolute regional values across the Piedmont. Eastern Meadowlarks also use a wide variety of grassland habitats but are more tolerant of litter cover, dense pasture,

and exotic sod grasses than Grasshopper Sparrows. Eastern Meadowlarks are not very area-sensitive and can be found in patches as small as 1 ha (2.47 ac).

Northern Bobwhites use grasslands and row crop habitats but usually only when in association with adjacent woodlands. Exotic grasses provide poor habitat for Northern Bobwhites due to low vegetative structure and low plant diversity. Henslow's Sparrow is another species that expanded rapidly from the Midwest in the late 1800s. Historically, they were only known to breed regularly in the northern Piedmont, but regular breeding records no longer exist. Henslow's Sparrow is often considered extirpated from the Piedmont region of many states. There are a few breeding populations known from the coastal plain of Virginia and North Carolina and in the Appalachian BCR where they are found at the Radford Arsenal in Virginia and elsewhere on reclaimed surface mines. Most current breeding records in the Piedmont represent scattered pairs with no confirmed breeding status. Henslow's Sparrows may winter throughout the southern Piedmont but are considered rare. They are considered extremely area sensitive and are not found in patches smaller than 50-100 ha (123-247 ac). This pattern is most likely a result of their relatively low regional abundance more than a habitat requirement. Breeding habitat consists of tall dense grass with a well-developed litter layer and standing dead vegetation (Pruitt 1996). They can be found across an array of early successional habitats that share these characteristics including regenerating clear cuts and old fields. They are sometimes associated with moist grasslands in the East. They do not breed in row crop habitats. Winter habitat is very similar but often includes pitcher plant bogs and marshes in the coastal plain regions.

Eastern Kingbirds are not a grassland obligate species and are only typically found in grasslands with scattered trees, shrubs, or the presence of some taller structures for nesting and perching. Short-eared Owls are typically found in the Piedmont only during the non-breeding season, but several breeding records exist for Virginia. They use a variety of open habitats such as grasslands, shrublands, and marshes but are also found in taller grasslands with greater than 30 cm (12 in) vegetation height. They also require large grasslands greater than 100 ha (247 ac) during winter or a large number of moderately sized grassland patches in the landscape to support their area

requirements. American Woodcock use grasslands for night roosting and generally prefer old fields and clear-cuts to pastureland or hayfields (Krementz 2000). Buff-breasted Sandpipers use the Piedmont only during migration and use short-grass areas such as pastures, golf courses, airports, and lawns.

Upland Sandpipers are important in the Piedmont as both a breeder, primarily in the northern Piedmont, and as a transient. They nest in the open countryside where vegetation like timothy (*Phleum* spp.), bluegrass (*Poa* spp.), needlegrass (*Stipa* spp.), bluestem (*Andropogon* spp.), and quackgrass (*Argopyron* spp.) comprise grasslands, meadows, and fallows fields where this vegetation is from 8-40 cm (3 to 16 in) tall. Airports often provide habitat for grassland birds such as the Upland Sandpiper, particularly if the habitat is managed to benefit these birds. Traditional nesting sites are often used in successive years provided that suitable habitat remains. Migrants can be found in hayfields, pastures, airports, grasslands, sod farms, fallow fields, and vegetated landfills (New Jersey Dept. of Environmental Protection 2013).

Priority List for Conservation Actions

1. Improve habitat conditions of current grassland and early successional habitats rather than conversion of forest land or other priority habitats,
2. Schedule harvesting of native warm season pasturelands and hayfields to eliminate disruption of breeding by grassland birds,
3. Manage small patches only as shrublands and large patches as either grasslands or shrublands depending on availability of these habitats in the immediate or local landscape,
4. Promote native warm season grass conversion of pasturelands and implement in patches large enough to support priority grassland birds such as the Grasshopper Sparrow, and manage by haying, burning, or grazing.
5. Provide habitat enhancement funding for warm season grass conversion to landowners willing to provide large patches for grassland birds, and instruct landowners how to best manage grasses for expected results,

6. Conduct outreach to private landowners to increase awareness of the USDA Grassland Reserve Program ([GRP](#)), and
7. Forge and expand partnerships and programs to promote grassland management on agriculture and forestry lands.

Forested Wetlands (Riparian Mesic Hardwoods)

Forested Wetlands in the Piedmont are comprised of 17 ECS classes and modifiers and cover 2.71% of the Piedmont landscape. The systems in the type are:

Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest - Taxodium/Nyssa Modifier
Atlantic Coastal Plain Peatland Pocosin and Canebrake
Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall
Central Appalachian River Floodplain
Central Appalachian Stream and Riparian
Central Interior Highlands and Appalachian Sinkhole and Depression Pond
Southern Coastal Plain Non-riverine Cypress Dome
South Atlantic Coastal Plain Non-riverine Swamp and Wet Hardwood Forest-- oak-dominated
South Atlantic Coastal Plain Non-riverine Swamp and Wet Hardwood Forest-- conifer-dominated
Southern Piedmont Large Floodplain Forest
Southern Piedmont/Ridge and Valley Upland Depression Swamp
Southern Piedmont Small Floodplain and Riparian Forest
North Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest
North Atlantic Coastal Plain Tidal Swamp
North-Central Appalachian Acidic Swamp
North-Central Interior and Appalachian Rich Swamp
North-Central Interior Wet Flatwoods
Piedmont Upland Depression Swamp-- bedrock not mafic
Piedmont Upland Depression Swamp-- mafic bedrock

They include a wide diversity of forests dominated by woody plant species 6 m (20 ft) or taller that can tolerate inundation for various periods during the growing season (Cowardin et al. 1979). This can include a variety of forest wetlands commonly known as swamps, cypress swamps, riverine swamps, floodplain forests, levee forests, and bottomland hardwood forest. Forested wetlands are differentiated by their underlying soil and hydrology. Other forested wetland types exist across a gradient of hydro-periods.

Across the United States forested wetlands are experiencing dramatic declines in area and changes in plant composition. Between the 1950s and 1970s nearly 2.5 million ha (6,177,634 ac) of forested wetland were lost. Much of this loss was due to harvest of wetland forests and conversion to agriculture or urban development. Forested wetlands are not as prevalent or as extensive in the Piedmont as compared to the coastal plain. Nonetheless, forested wetlands in the Piedmont may account for 10-20% of each individual state's total wetland area (Tiner 1987). More recently within the Piedmont forested wetland loss has ranged between 0-9% per watershed in a ten year span between 1980 and 1990 (USDA Southern Forest Resource Assessment 2003).

The Wood Thrush utilizes a diversity of forest types, occupies several habitat categories, and can often reach some of its highest densities in forested wetlands. It utilizes drier portions of floodplain forests with well-developed deciduous canopies and mid-story vegetation and is not found in cypress swamps.

The Swainson's Warbler and Prothonotary Warbler are species that are primarily associated with forested wetlands (Table 7). They are the only priority species in the Piedmont that are forest wetland obligates. The Swainson's Warbler uses bottomland hardwood forests in the southern Piedmont that have dense understory vegetation typically composed of switch cane (*Arundinaria* spp.) or sweet pepperbush (*Clethra alnifolia*). There are only small remnants of canebrake communities existing in the Piedmont. The Prothonotary Warbler inhabits mature deciduous floodplains and alluvial and swamp forests. Although they can use the drier portion of the forest wetland gradient, flooded habitats often contain higher densities of Prothonotary Warblers, presumably because of greater site quality (Petit and Petit 1996, Lyons 2005). Prothonotary Warblers are secondary cavity nesters, so their relative abundance may be influenced by both the availability of nest sites and prey density. Chimney Swifts use a wide diversity of habitats in a landscape and are usually identified utilizing areas of human settlement. Within urbanized and suburban areas they often nest within a variety of artificial substrates such as chimneys and buildings. Historically this species nested in natural situations such as hollow trees as secondary cavity users.

Table 7. Forested Wetlands (Riparian Mesic Hardwoods).

Habitat	Species		
	Highest Priority	High Priority	Moderate Priority
Forested Wetlands (Riparian Mesic Hardwoods)	Wood Thrush (B)	American Black Duck (B, N) American Woodcock (B, N) Chimney Swift (B) Kentucky Warbler (B) Rusty Blackbird (T, N)	Acadian Flycatcher (B) Carolina Chickadee (B, N) Cerulean Warbler (B) Eastern Wood-Pewee (B) Hooded Merganser (B, N) Mallard (B, N) Prothonotary Warbler (B) Red-headed Woodpecker (B, N) Swainson's Warbler (B) Wood Duck (B, N) Yellow-billed Cuckoo (B)

They can be found across the hydrological gradient of forested wetlands and forage over tree canopies and along river corridors. Red-headed Woodpeckers also use a variety of forested wetland habitats and are included within priority species suites for pine savannas, upland forests, and forested wetlands. Within forested wetlands Red-headed Woodpeckers prefer an open canopy structure with available snags for nesting. These areas share characteristics with habitats such as beaver ponds that have low deciduous tree density, little to no mid-story, and many dying or dead trees. Forested wetlands also serve as important winter habitats for Red-headed Woodpeckers that migrate out of pine savannas after the breeding season.

Hooded Mergansers can be found in forested wetlands such as beaver ponds, swamps, and forested creeks and rivers. They are generally found in low abundance in the southern Piedmont during the breeding season. In winter they are more numerous and can be found in a wider variety of habitats including open water ponds and lakes. Hooded Mergansers and Wood Ducks are cavity nesters and thus can be influenced by the presence of snags or other secondary cavity sites.

The Piedmont is emerging as one of the most significant regions to support Rusty Blackbirds in the non-breeding season. Rusty Blackbirds breed in the boreal zone but winter in the southern United States. Forested wetlands appear to be an essential component of their migratory and winter habitat use. They utilize a wide range of forested wetland types and often venture into the surrounding landscape matrix to forage in upland fields, agricultural areas, or orchards.

List of Priority Conservation Actions

1. Determine buffer sizes needed to protect forested wetlands and their bird communities,
2. Establish appropriate buffers adjacent to riparian woodlands and forest corridors, and
3. Identify important wintering sites for Rusty Blackbirds.

Early Successional Shrub-Scrub

In the Piedmont early successional shrub-scrub is comprised of three ECS classes and covers 2.56% of the Piedmont landscape. These are:

Successional Shrub/Scrub (Clear Cut)
Successional Shrub/Scrub (Utility Swath)
Successional Shrub/Scrub (Other)

This broad habitat type includes a variety of habitats and includes ephemeral upland areas dominated by low woody vegetation generally less than 5 m tall with varying amounts of herbaceous vegetation, sparse tree cover, and shrubs covering at least 20% of the total vegetation. It includes regenerating forests, abandoned field sites, barrens, utility swaths (ROW) and old field hedge rows. Barrens are simply early successional habitats primarily comprised of herbaceous or shrub ground cover with small interspersed trees throughout the area (SEGAP 2010).

Prior to European settlement early successional habitats and shrublands existed as narrow margins along edges of forest or areas in early to mid-stages of regeneration

resulting from natural disturbances such as fire or tree blow downs and anthropogenic fire used by Native Americans. Shrublands in the Piedmont likely only existed as small pockets of habitat within a much larger forested landscape, and large patches were uncommon. Open lands likely increased in the years following European settlement, and by the nineteenth century broad-scale clearing of forested lands resulted in a flush of new open habitats. Subsequently, the availability of open lands has declined dramatically throughout the 20th century following succession of previous open habitats. Additionally, clean agricultural practices have often led to an absence of hedgerows, eliminating valuable shrub habitats.

Shrublands in the Piedmont are primarily derived from human cleared areas that have gone idle and have not been disturbed for more than five years or open areas created from natural forest disturbance. Without repeated disturbance or management, shrublands will succeed to closed canopy forest within 12-20 years. Beginning in the 1970s, landowners began to manage pine plantations on relatively short rotation schedules. Based on the total land area involved with this method of forestry practice regenerating forest stands likely represent the most commonly supplied shrublands in the Piedmont. However, other shrubland habitats still exist along forest edges, agricultural field borders ROW's, and wetlands created by beaver.

The suite of priority species that use shrublands require the later successional stages of old field succession or forest clear-cut regeneration that have moderate to substantial intrusion by woody shrubs and sapling trees (Table 8). These species show positive responses to the density of shrub cover but may differ somewhat in the specific successional state preferred. Some species will utilize a wide variety of alternative habitats including hedgerows, tree-fall gaps, regeneration forest clear-cuts, and forest edges. Moreover, certain species can utilize dense understory vegetation of forests. Because of their ability to use thin shrubby habitats along forest edges it is apparent that most shrubland birds are not highly area sensitive and can readily occupy small patches, perhaps as small as 1 ha (2.47 ac).

Table 8. Early Successional Shrub-Scrub.

Habitat	Species		
	Highest Priority	High Priority	Moderate Priority
Early Successional Shrub-Scrub	Eastern Whip-poor-will (B) Northern Bobwhite (B, N)	American Woodcock (B, N) Field Sparrow (B, N) Prairie Warbler (B) Ruffed Grouse (B, N)	Bachman's Sparrow (B, N) Blue Grosbeak (B) Blue-winged Warbler (B) Brown Thrasher (B, N) Carolina Chickadee (B, N) Common Nighthawk (B) Eastern Kingbird (B) Eastern Towhee (B, N) Eastern Wood-Pewee (B) Henslow's Sparrow (B) Indigo Bunting (B) Mourning Dove (B, N) Painted Bunting (B) Short-eared Owl (B, N) Wild Turkey (B, N)

By comparison many grassland birds, such as the Grasshopper Sparrow and Henslow's Sparrow, are only found in patches larger than 10 ha (24.7 ac). The relative difference in area sensitivity between grassland birds and shrubland birds reflects an important management tradeoff when deciding how to manage small patches. Small patches may be best managed as shrublands since they are used by most shrubland birds and are not used by most grassland birds.

Prairie Warblers and Field Sparrows use old fields or regenerating clear-cuts with moderate shrub cover to successional stages with scattered trees. Field Sparrows do not use dense shrubby stands that have no open grassy or herb layers. Patches with the appropriate habitat structure for Field Sparrows are fleeting and only occur in a relatively narrow period across the successional development of old fields or regenerating clear-cuts. Neither Field Sparrows nor Prairie Warblers will use later

successional stages of shrublands where shrub layers are continuous or tree canopies begin to close over. However, both species will utilize pine savanna habitats with open canopies, dense understory grasses, and moderate shrub cover. Indigo Buntings use areas with dense shrubs and grasses as well as forested edges.

The Northern Bobwhite and Eastern Kingbird are included here as well as in the priority grassland bird suite. Eastern Kingbirds also use pastures and orchards and prefer shrublands with open grassy patches. Northern Bobwhites use grasslands and shrublands but typically only when associated with open forest stands.

Blue-winged Warblers are more common in lower elevation areas of the Appalachians but at one time occurred more frequently in the Piedmont than currently. They are now found more frequently in the northern reaches of the Piedmont as compared to the southern region. Blue-winged Warblers nest in a variety of early to mid-successional stands that are formed from old fields, overgrown pastures, regenerating clear-cuts, ROW's, and wetter areas such as shrubby swamps. They require dense shrubs and are often found in patches with sapling trees. Brown Thrashers use areas with dense shrub areas and forests with dense understory vegetation and are often found in urban settings. By comparison, the other high priority shrubland birds only utilize habitats away from urbanization.

Blue Grosbeaks prefer forest edges, fields, power-line cuts, riparian areas, hedgerows, and other areas with medium-sized trees and low shrub density (Cornell Lab of Ornithology 2013) where they nest from 1–3 m above ground in a low tree or bush or a tangle of vegetation often at the edge of an open area. In North Carolina, they thrive in disturbed sites and can often even be found singing in small brushy woodlots in urbanized areas (Johns 2013).

Priority List for Conservation Actions

1. Enhance existing shrubland habitats rather than convert forest,
2. Encourage addition or enhancement of shrub buffers to existing forests,

3. Conduct shrub management activities to delay succession in a rotational schedule within a local landscape to maintain constant availability of shrubland habitat,
4. Extend the open conditions of pine plantations by using lower stocking levels and thinning of small diameter trees,
5. Manage field borders by planting or allowing shrubby plant growth consistent with CP33 (Habitat Buffers for Upland Birds) programs,
6. Manage shrubland patches by removal of less desirable species to prevent succession to forest,
7. Consider the development of BMP's for shrublands, shrub borders, etc. on private lands in the Piedmont,
8. Determine the presence of Bewick's Wren in the Piedmont.

Agricultural Croplands

Agricultural croplands in the Piedmont are comprised of two ECS classes and cover 11.05% of the Piedmont landscape. The classes are:

NLCD Agricultural (81 and 82) Row Crop

These areas are used for the production of annual crops such as corn, soybeans, vegetables, tobacco, and cotton and perennial woody crops such as orchards and vineyards. Crop vegetation accounts for more than 20% of total vegetation. This class also includes all land being actively tilled. This type of habitat is listed because of its value primarily during autumn and winter after crops have been harvested, particularly grain crops, and waste grain is available in harvested fields or when croplands are subject to intentional or periodic natural flooding. These areas will sometimes attract large numbers of waterfowl including Canada Goose, Mallard, Tundra Swan and migratory shorebirds such as Least and Western Sandpipers and Lesser Yellowlegs, especially if the fields are flooded. Wild Turkey and Mourning Dove also use post-harvest fields for foraging (Table 9). Even though modern agricultural machinery

harvests about 95% of ripened grain, most fields still contain 50-310 lb./ac. of residual grain (USDA NRCS 2001).

Table 9. Agricultural Croplands.

Habitat	Species		
	Highest Priority	High Priority	Moderate Priority
Agricultural Croplands	Northern Bobwhite (B, N)	American Black Duck (B, N) Canada Goose (T, N) (Atlantic Migratory Population) Rusty Blackbird (T, N)	Blue Grosbeak (B) Eastern Meadowlark (B, N) Least Sandpiper (T, N) Lesser Yellowlegs (T) Mallard (B, N) Mourning Dove (B, N) Tundra Swan (T, N) Western Sandpiper (T) Wild Turkey (B, N)

When these and other fields become flooded shorebirds are often attracted to these areas. Agricultural fields under irrigation also attract shorebirds in the spring. Species such as Blue Grosbeak, Northern Bobwhite, and Eastern Meadowlark may find suitable nesting and foraging areas adjacent to croplands, especially where there are sufficient hedgerows, brush tangles, and other types of vegetation borders.

List of Priority Conservation Actions

1. Utilize practices that allow crop seed to become available to foraging waterfowl; for example, leave low growing varieties of barley and wheat standing to allow access to seed heads (USDA NRCS 2001),
2. Flood agricultural fields where appropriate for shorebird use,
3. Where feasible and conducive to flooding, construction of dikes and water control structures can create fall/winter wetland habitat for waterfowl and other species,
4. Intensify field borders and other fallow habitats,
5. Implement no-till practices as long as practical, and

6. Utilize Wetland Reserve Programs ([WRP](#)) to facilitate open wet landscapes in the spring prior to planting or as an alternative to planting.

Open Water and Impoundments

Open water habitats in the Piedmont are comprised of four ECS classes and cover 2.26% of the Piedmont landscape. They are:

*NLCD- National Hydrography Dataset (NHD) Open Water
North Atlantic Coastal Plain Stream and River
Open Water (Fresh)
South-Central Interior Small Stream and Riparian*

These areas include lakes, ponds, rivers, reservoirs, streams, and human created impoundments. They usually lack emergent vegetation and include any islands, mudflats, or banks associated with the water. Open water primarily provides habitat for priority species during the non-breeding season, particularly for waterfowl and migrating shorebirds (Table 10).

Least Sandpipers and Lesser Yellowlegs use shallow areas on the edges of open water, farm ponds, and wet meadows and often require exposed mud for foraging. A significant portion of the known population of Lesser Yellowlegs migrates inland between breeding grounds in the boreal zone and wintering grounds along the southern coast of the U.S. and into Central America. Numbers at any one site during migration are typically low, but because migration is widespread almost any place in the Piedmont with appropriate habitat is important for this species. Peak migration times in the spring begin in late February and can last until May. Least Sandpipers also migrate across a wide front that includes the Piedmont. They are typically seen in small to large flocks during spring migration in May and in fall from late August through September.

Habitat use of waterfowl that migrate or winter through the Piedmont includes a variety of open water types and emergent wetlands. Mallards, Horned Grebes, and American Coots generally prefer open water with shallow areas that are associated with emergent vegetation. The Canada Goose is a prominent species throughout the Piedmont but

only the migratory Atlantic population is recognized as a conservation priority. Both Common and Black Terns migrate through the region and use open water as foraging areas and migration corridors.

Table 10. Open Water and Impoundments.

Habitat	Species		
	Highest Priority	High Priority	Moderate Priority
Open Water and Impoundments		American Black Duck (B, N) Canada Goose (T, N) (Atlantic Migratory Population)	American Coot (B, N) Green-winged Teal (T, N) Black Tern (T) Common Tern (T) Hooded Merganser (B, N) Horned Grebe (N) Least Sandpiper (T, N) Lesser Scaup (N) Lesser Yellowlegs (T) Mallard (B, N) Ring-necked Duck (N) Tundra Swan (T, N) Western Sandpiper (T)

List of Priority Conservation Actions

1. Identify and implement Program for Regional and International Shorebird Monitoring ([PRISM](#)) surveys at appropriate sites,
2. Control water levels at man-made impoundments to provide mudflats during shorebird migration and water during waterfowl migration,
3. Work with agencies and other landowners to install/replace/repair water control structures that will facilitate water level management at man-made structures,
4. Improve water quality at impaired impoundments,
5. Retain large trees adjacent to impoundments for eagle and heron nesting,
6. Initiate dialogue with managers of public lakes and reservoirs regarding costs/benefits of hydrilla management, and/or
7. Promote establishment of native submerged aquatic vegetation (SAV) where hydrilla removal is taking place.

Freshwater Emergent Wetlands

Freshwater emergent wetlands in the Piedmont are comprised of two ECS classes and cover 0.17% of the Piedmont landscape. These systems are:

Laurentian-Acadian Freshwater Marsh
Piedmont-Coastal Plain Freshwater Marsh

Marshes dominated by herbaceous vegetation in closed or open basins that are generally flat and shallow are typical of these areas. They are associated with lakes, ponds, slow-moving streams, and/or impoundments or ditches. The herbaceous vegetation does not persist through the winter. Scattered shrubs are often present and usually total less than 25% cover. Trees are generally absent and, if present, are scattered. The substrate is typically muck over mineral soil (NatureServe 2012).

The most common freshwater emergent wetlands in the Piedmont consist of wet meadows in low lying areas or along streams, ponds, lakes, and bogs that are dominated by herbaceous plants such as cattails (*Typha spp.*), rushes (*Juncus spp.*), sedges (*Carex spp.*), or arrow arum (*Peltandra virginicum*). Many freshwater wetlands can be maintained or created as watering areas for grazing animals or for other wildlife value. Some areas may have once been forested wetlands that were cleared for agriculture or other purposes. The resurgence of beaver has also resulted in the creation of freshwater emergent wetlands in the Piedmont. Freshwater emergent wetlands in the Piedmont mostly occur as small, isolated patches and are flooded on a seasonal, temporary, or semi-temporary basis (Cowardin et al. 1979) and occupy less than 1% of the land cover (NLCD 2006). Although the combined area of emergent wetlands in the Piedmont is a small portion of the entire landscape, these wetlands can collectively account for 5% of an individual's state entire wetland cover (Tiner 1997).

Freshwater emergent wetlands have been declining for several decades. The major causes of this loss are conversion of wetlands to agriculture and urban areas and increased flooding to create ponds or small lakes. Legislative protection of wetlands

has slowed the rate of loss, but controversy between states and agencies over the jurisdictional definition of wetlands can lead to inconsistent safeguards.

Very little is known about the habitat requirement of high priority emergent wetland species in the Piedmont (Table 11). This is due in part to their low abundance, which makes them difficult to study. King Rails can occur in freshwater marshes across the Piedmont, but their overall distribution is poorly known (USFWS 2008). They use wetland habitats that include denser emergent vegetation and shallow water less than 24 cm (9.4 in) deep interspersed or bordered by drier high patches for nesting and brood rearing. They may be negatively associated with wetlands surrounded by trees and seem to prefer an open landscape. King Rails can also be found in impoundment canals bordered by dense wetland vegetation. Comparatively, Black Rails are among the highest priority species in the Mid-Atlantic and Southeastern coastal plain BCRs because of populations that have reached dangerously low levels and are at risk of extirpation. The inclusion of the Black Rail in the Piedmont is in part due to historical breeding and transient records. However, most of these records occurred when Black Rails were more abundant. Historically they may have nested in wet meadows and along the edges of farm ponds with wetland vegetation in the Piedmont.

The American Bittern is a freshwater wetland obligate breeder and requires tall marshes such as those covered by cattails. They can only be found in the northern Piedmont during the breeding season but can occur in appropriate habitat throughout the Piedmont during migration and the non-breeding season. American Coots' presence within the Piedmont occurs primarily in the non-breeding season, though small numbers do breed in the Piedmont. In winter they use areas with standing emergent vegetation on the shoreline and deeper water typical of ponds and lakes. They can also be found in agricultural areas, golf courses, and recreational parks with appropriate habitat.

Henslow's Sparrow uses a variety of early successional habitats but also nests in wetter areas such as wet meadows. They are rarely found in the Piedmont during the breeding season and are more likely to occur during migration or in winter.

Table 11. Freshwater Emergent Wetlands.

Habitat	Species		
	Highest Priority	High Priority	Moderate Priority
Freshwater Emergent Wetlands		American Black Duck (B, N) Black Rail (B) King Rail (B)	American Bittern (T, N) American Coot (B, N) Green-winged Teal (T, N) Henslow's Sparrow (B) Hooded Merganser (B, N) Mallard (B, N) Short-eared Owl (B, N) Wood Duck (B, N)

List of Priority Conservation Actions

1. Restore and maintain the natural hydrology of existing wetlands,
2. Promote the development of emergent vegetation in appropriate wetlands that can provide priority species with usable habitat,
3. Investigate the potential of retention ponds created to mediate water runoff in human developments for emergent vegetation and priority bird species, and
4. Identify and conserve as many remaining wetlands as possible on private lands through federal assistance and incentive programs.

Urban/Suburban Landscapes, Rural Woodlots (Developed Areas)

These areas are comprised of five ECS classes and cover 13.07% of the Piedmont landscape. They are:

- Developed, Open Space*
- Developed, Low Intensity*
- Developed, Medium Intensity*
- Developed, High Intensity*
- Barren*

These landscapes are represented by those areas that are characterized by various amounts of impervious materials such as asphalt, concrete, buildings, and vegetation. The amount of impervious surface increases from open space to high intensity developed areas while the amount of vegetation decreases. Developed open spaces generally include large-lot, single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. At the other extreme, high intensity developed areas have little vegetation and often have large areas of apartment complexes, row houses, and commercial and industrial development where large numbers of people live and work (SEGAP 2010). This area class also includes areas of barren lands, such as rock quarries.

As urban centers continue to expand, valuable habitats are often lost due to new developments and associated human disturbances and infrastructure construction. The bird communities tend to become less rich and dominated by more urban/human tolerant species and are often composed of non-native species (Melles et al. 2003). They do provide some remedial habitat for some adaptive species that can tolerate a wide range of disturbed habitats. Even when small patches of mature pine are allowed to remain standing, Brown-headed Nuthatches will utilize small pine stands embedded in an urban environment. Rural woodlots also attract and hold a wide range of species including Blue Grosbeak, Brown Thrasher, Carolina Chickadee, Eastern Towhee, and Eastern Wood Pewee (Table 12). Numbers of breeding individuals may be lower than preferred habitats, but they do breed under these conditions. Chimney Swift populations have recently experienced global population declines on the order of 20-29% in the last 20 years (J. Sauer *in lit.* 2010 in Birdlife International 2013). If this trend continues, it may soon be listed by the International Union for Conservation of Nature (IUCN) as Vulnerable. Several large metropolitan areas in the Piedmont -- Raleigh, Washington D.C., Baltimore, and Philadelphia -- have been identified as globally important migratory stopover sites by Audubon. It is important that these sites be preserved in the future.

Table 12. Urban/Suburban Landscapes, Rural Woodlots (Developed Areas).

Habitat	Species		
	Highest Priority	High Priority	Moderate Priority
Urban/Suburban Landscapes, Rural Woodlots (Developed Areas)	Wood Thrush (B)	Brown-headed Nuthatch (B, N) Chimney Swift (B) Rusty Blackbird (T, N)	Blue Grosbeak (B) Brown Thrasher (B, N) Carolina Chickadee (B, N) Common Nighthawk (B) Eastern Kingbird (B) Eastern Towhee (B, N) Eastern Wood-Pewee (B) Indigo Bunting (B) Mourning Dove (B, N) Painted Bunting (B)

Urban threats such as tall windowed buildings, communication towers, feral animals, invasive species, and air and water pollution have great mitigation potential when large numbers of people are concentrated and concerned about protecting these habitats for birds. Urban and suburban landscapes do provide a great potential to engage large numbers of people for bird conservation outreach and education.

List of Priority Conservation Actions

1. Encourage the retention of forest blocks and greenspace in new urban development,
2. Encourage retention of a habitat corridor to link woodlots and other important rural habitats,
3. Improve management of early successional areas, especially those near forests (for nesting Eastern Towhee and Indigo Bunting and post-breeding dispersal of woodland nesters),
4. Improve outreach and education on Chimney Swift benefits and habitat needs for nesting,
5. Promote Cat Indoors programs and discourage feral cat colonies, and

6. Promote [Lights Out](#) programs in large urban centers.

CHAPTER IV: POPULATION AND HABITAT OBJECTIVES

An important component of any bird conservation plan is to set quantitative population objectives and estimate the required habitat necessary to achieve desired population objectives. However, for many species the ability to quantitatively assess factors that are used to establish population estimates and set populations objectives and habitat needs is severely lacking, as it is limited by the precision, bias, and error associated with existing survey, monitoring, habitat data, and narrow research framework. These limitations affect our understanding of how species respond to different habitat management actions, changing landscape patterns, and the dynamic ecosystems that they use for breeding, migration, and wintering. For example, we know that many Piedmont landscapes are important to Neotropical migrants. However, we have limited information on how many migrants use the Piedmont as stopover habitat or how the different land cover types available are used. Thus, it is hard to estimate how much of each land cover type and what the distribution of those types should be on the landscape. Even though we lack a great deal of the information needed, we should not let this deter us from making estimates based on current information and striving to improve them over time.

Despite these difficulties there is value in having quantitative goals for planning purposes, fund raising, and assessing the performance of resources devoted to bird conservation. Therefore, where possible, bird conservation initiatives have developed species' population and breeding habitat goals (Table 13). For some species directional population goals have been developed (increase, maintain, decrease populations, double populations, etc.). For other species, specifically those with sufficient survey data, quantitative targets for both species populations and habitat have been developed. For those species without qualitative or quantitative targets one of the ongoing tasks for this Partnership will be to develop population and habitat goals. Regardless of how population and habitat goals are derived, they must be used with an

awareness of the complexity associated with them and assumptions upon which they are based.

Population Objectives

For most Piedmont landbirds, the PIF [Populations Estimates Database](#) (PIF 2013) has identified continental population estimates, which have been stepped down to the BCR level. These estimates represent the total number of individuals for non-game (songbirds) and some game species and provide a basis for developing population and habitat objectives at the BCR level. PIF has established directional or quantitative population goals for all Species of Continental Concern (NLCP 2004) at the continental or biome level; however, they may be based on previous population estimates, not the most recent estimates. Nonetheless, in the absence of newer and associated objectives, the 2004 NLCP goals are used for this plan. Values presented in Table 13 represent quantitative or directional goals for the Eastern Biome, which includes the Piedmont in its entirety. For species not on the PIF Species of Continental Concern or for non-breeding populations there are no established population estimates or goals.

For other species not covered by PIF population estimates and objectives may exist. For example, waterfowl populations under the NAWMP have a general goal of restoring their populations to the levels of the 1970's (NAWMP 2004), but specific BCR level estimates and goals are not available. However, state level estimates are available for the ACJV. Waterbird population estimates and objectives were derived from the Southeast (2006) and Northeast (MANEM 2006) Waterbird Conservation Plans and represent numbers of breeding pairs. Shorebird population estimates are not generally available, but transient population sizes for Upland Sandpiper and Buff-breasted Sandpiper were estimated by Hunter et al. (2001) for the Southeastern U.S. and Caribbean not including the southern Piedmont. Where given, shorebird population objectives were derived from U.S. Shorebird Conservation Plan (2001). Generally, population objectives for shorebirds are to return their population levels to that of the 1970s and 1980s (Brown et. al. 2001).

Habitat Objectives

Once species-habitat models and habitat characterizations are available we will be able to estimate the carrying capacity of the Piedmont for a wide-range of focal species. By focusing on demographic parameters instead of just population estimates we should be able to estimate whether populations (i.e., breeding, migratory or wintering) are sustainable. Additionally, once we reach this stage we will be able to estimate how many hectares of habitat are necessary to support a species' population target within a region (i.e., what is the population-based habitat objective). If we develop spatially-explicit models we should be able to target conservation to the best areas in order to maintain or increase our biological capacity most efficiently.

BCR Goals

Despite the difficulties and inherent error associated with establishing species population and habitat objectives, there is value to having quantifiable targets for planning purposes, fundraising, and assessing how well resources devoted to bird conservation are performing. But it is absolutely necessary to clearly state methodologies used and associated assumptions. Where possible, bird conservation initiatives have developed species' population and breeding habitat goals (Table 13). Two types of population objectives have been recognized: directional (increase, maintain, decrease populations, double populations, etc.) and quantitative.

For many species without sufficient data to estimate population size directional objectives are based on reversing a perceived population trend. For other species, specifically those with sufficient data from Breeding Bird Survey (BBS) routes or other sources, preliminary quantitative population objectives have been developed based on indices of abundance and/or density. For a smaller subset of those species preliminary habitat goals have been developed using those density estimates. It is important to remember that these preliminary habitat goals must be used with caution since most assume all habitat patches are of equal quality (i.e., density is constant over space),

and thus probably underestimate the actual amount of habitat necessary to meet the objective.

Table 13. Preliminary Population Estimates, Population Objectives, and Habitat Estimates for Priority Species in the Piedmont BCR.

Species	Current BCR Population Estimate¹	BCR Prelim. Population Objective²	Habitat Type³	Habitat Objectives (acres)⁴
Eastern Whip-poor-will (B)	300,000	Increase	UF, P	
Northern Bobwhite (B, N)	230,000	2,136,168**	P, G, ES, A	34,025,300***
Red-cockaded Woodpecker (B, N)	60	250	P	
Wood Thrush (B)	1,100,000	Increase 50%	UF, FW, U	
American Black Duck (B, N)		!!!	FW, A, O, FE,	
American Woodcock (B, N)	10,155*	22,745*	UF, P, G, FW, ES	3,178,118*
Black Rail (B)	60 (50-100)	1,000-5,000	FE	
Brown-headed Nuthatch (B, N)	300,000	Increase 50%	P, U	
Canada Goose (T, N) Atlantic Migratory Population			A, O	
Chimney Swift (B)	850,000		UF, FW, U	
Field Sparrow (B, N)	550,000		P, G, ES	
Grasshopper Sparrow (B)	600,000	Maintain	G	
Kentucky Warbler (B)	80,000	Increase 50%	UF, FW	
King Rail (B)	79 (50-100)	400-600	FE	
Prairie Warbler (B)	680,000	Increase 50%	P, ES	
Ruffed Grouse (B, N)	11,200	11,500	UF, ES	650,600
Rusty Blackbird (T, N)	Unknown	Increase 100%	FW, A, U	
Upland Sandpiper (B)	NA	Increase 35%	G	

Acadian Flycatcher (B)	360,000	Maintain	UF, FW	
American Bittern (T, N)	Unknown	20,750+	FE	
American Coot (B, N)	300 (100-500)	2,000-3,000	O, FE	
Bachman's Sparrow (B, N)	1,200	Increase 100%	P, ES	
Black Tern (T)	Unknown	Maintain	O	
Blue Grosbeak (B)	1,300,000		G, ES, A, U	
Blue-winged Warbler (B)	5,000	Increase 50%	ES	
Brown Thrasher (B, N)	290,000	Maintain	ES, U	
Buff-breasted Sandpiper (T)	1,500	Increase 1000%	G	
Carolina Chickadee (B, N)	1,300,00		UF, P, FW, ES, U	
Cerulean Warbler (B)	3,000	Increase 100%	UF, FW	
Common Nighthawk (B)	800		UF, P, G, ES, U	
Common Tern (T)	Unknown	Maintain	O	
Eastern Kingbird (B)	550,000		P, G, ES, U	
Eastern Meadowlark (B, N)	650,000		G, A	
Eastern Towhee (B, N)	3,000,000	Maintain	P, ES, U	
Eastern Wood-Pewee (B)	410,000		UF, P, FW, ES, U	
Green-winged Teal (T, N)		!!!	O, FE	
Henslow's Sparrow (B)	Unknown	Increase 100%	P, G, ES, FE	
Hooded Merganser (B, N)		!!!	FW, O, FE	
Horned Grebe (N)	Unknown		O	
Indigo Bunting (B)	5,800,000	Maintain	UF, P, ES, U	
Least Sandpiper (T, N)	Unknown	Increase 17%	A, O	
Lesser Scaup (N)		!!!	O	
Lesser Yellowlegs (T)	Unknown	Increase 480%	A, O	
Mallard (B, N)		!!!	FW, A, O, FE,	
Painted Bunting (B)	Unknown	Increase 100%	UF, P, ES, U	

Prothonotary Warbler (B)	12,000	Increase 50%	FW	
Red-headed Woodpecker (B, N)	17,000	Increase 100%	UF, P, FW	
Short-eared Owl (B, N)	Unknown	Increase 100%!	G, ES, FE	
Swainson's Warbler (B)	1,400	Maintain	FW	
Tundra Swan (T, N)	1,000-2,000 (N) 25,000 (T)	Maintain	A, O	
Upland Sandpiper* (T)	10,500	Increase 35%	G	
Western Sandpiper (T)	Unknown	Maintain	A, O	
Wood Duck (B, N)		!!!	FW, FE	
Yellow-billed Cuckoo (B)	290,000		UF, FW	
American Woodcock (B, N)!!	10,155*	22,745*	UF, P, G, FW, ES	3,178,118*
Mallard (B, N)!!		!!!	FW, A, O, FE,	
Mourning Dove (B, N)	2,300,000		UF, P, G, ES, A, U	
Northern Bobwhite (B, N)!!	230,000	2,136,168**	P, G, ES, A, U	34,025,300***
Ring-necked Duck (N)		!!!	O	
Ruffed Grouse (B, N)!!	11,200	11,500	UF	650,600
Tundra Swan (T, N)!!	25,000 (T) 1,000-2,000 (N)	Maintain	A, O	
Wild Turkey (B, N)	22,000		UF, P, G, ES, A	
Wood Duck (B, N)!!		!!!	FW, FE	

^{1,2} From PIF NLCP or 2013 Population Estimates Database; **for Red-Cockaded Woodpecker** the estimate and objective are number of breeding pairs; all Highest Priority Species are assumed to need population improvement and were assigned at least an Increase in objective (if not otherwise stated in NLCP); **American Woodcock, Northern Bobwhite, and Ruffed Grouse** estimates were obtained from species specific conservation plans and represent number of singing males for American Woodcock, number of coveys for Northern Bobwhite, and number of drumming males for Ruffed Grouse; BCR based waterfowl populations estimates and objectives are not available.

³ Habitat Types: UF = Upland Deciduous Hardwoods and Mixed Pine Forests; P = Pine Forests; G = Grasslands; ES = Early Successional Shrub-Scrub; FW = Forested Wetlands; A = Agricultural Croplands; O = Open Water and Impoundments; FE = Freshwater Emergent Wetlands; U = Urban.

⁴ From respective species specific conservation plans.

*Data for American Woodcock does not include Alabama, Georgia, South Carolina, and North Carolina

**178,014 coveys with 12 birds per covey in autumn

*** Represents number of acres to be managed to achieve population goal (see [NBCI](#))

! Represents NLCP (2004) Continental Population Objective

!! Denotes Conservation Concern as well as Management Concern

!!! Represents general objective of restoring population to the 1970's level, minimally.

A major long-term goal of the Piedmont BCR implementation is to develop indices and/or numbers for population and habitat goals. Setting and using population or habitat objectives should be viewed as an ongoing exercise requiring refinement, research into underlying assumptions, and improvement over time (Steinkamp 2008). Currently, some shorebirds, rails, bitterns, landbirds, and waterbirds have no population estimate and, therefore, no population objective. However, many of these species have trend estimates, and thus directional objectives can be established.

Species' population and habitat goals developed for the Piedmont need to represent the rolling up of goals developed at smaller scales or stepped down from larger scales. Partners should strive to agree on multiple scale objectives. For example, goals developed for the Piedmont should be developed in a manner consistent with the goals for other BCRs and should reflect continental goals. At the same time, goals developed at smaller scales than the BCR, such as within States, need to reflect that planning unit's contribution to BCR goals. The long-term goal for conservation scientists working within the Piedmont is to assess and validate existing population and habitat objectives and develop, where practical, population and habitat goals for priority species presently lacking them. Priority research and monitoring activities needed to set quantitative objectives will be identified, and factors limiting bird populations will be incorporated into short and long-term conservation planning and implementation. An assessment of the Piedmont's capacity to provide habitat for priority species at present and in the future also needs to be conducted, compared to the population objectives that are stepped down from the continental level, and used to define these goals as necessary (Steinkamp 2008).

State Goals and Objectives

At this time, states have not stepped down continental and regional population or habitat objectives to state level objectives based on Piedmont objectives but at some point in the future may desire to do so. Generally, this is difficult to do, yet existing population and habitat objectives for some species allow for such a step down, particularly where objectives of high priority species often share objectives of other species in similar habitats. Existing regional objectives for the various bird conservation plans are not entirely explicit about where to place quantifiable habitat conservation objectives. Therefore, State Working Groups should evaluate such objectives in their state relative to stated goals and identify where best to target such conservation. States not wishing to step down objectives will rely upon objectives outlined in the various national and regional bird conservation plans. Finally, several species specific plans-- The Northern Bobwhite Conservation Initiative, The American Woodcock Conservation Plan, and the Ruffed Grouse Conservation Plan--each have quantifiable objectives for the restoration of habitat at state and BCR levels and often habitat type.

CHAPTER V: CONSERVATION DESIGN AND IMPLEMENTATION

PIF defined a process for developing regional habitat targets based on continental objectives that was summarized in a technical document entitled “The Five Element Process: Designing Optimal Landscapes to Meet Bird Conservation Objectives” (Will et al. 2005). This process has since been coarsely applied to landbirds and other bird groups and serves as a basis with which partnerships can develop biologically-based, spatially-explicit, landscape scale habitat objectives to sustain bird populations at goals set by any of the bird initiatives. The “Five Elements” represent a conceptual approach, through which conservation partners work together to assess current landscape conditions, evaluate species’ distributions through the use of bird-habitat relationships, and determine where on the landscape sufficient habitat can support bird population objectives through the use of conservation strategies. The “Five Elements” include the following:

1. Landscape characterization and assessment,
2. Bird population response modeling,
3. Conservation opportunities assessment,
4. Optimal landscape design, and
5. Monitoring and evaluation.

The U.S. Fish and Wildlife Service adopted a very similar approach to landscape scale conservation called Strategic Habitat Conservation (USGS 2006). Thus, conservation design in the Piedmont should ideally follow a similar process in a coordinated, collaborative approach that builds upon existing efforts and applies the most appropriate tools and processes for the Piedmont. Conservation design in the Piedmont should attempt to answer these questions:

1. How much of each habitat is present?
2. How will this habitat landscape change over time due to threats such as climate change, urban growth, etc?
3. How much of each habitat type is needed to sustain priority species at their target levels for the BCR?
4. How much is already in the conservation estate?
5. How much more is needed to meet conservation goals?
6. Are the population and habitat goals realistic?
7. Where within the BCR should the conservation community implement priority conservation actions to most effectively achieve bird conservation objectives?
8. How should lands be managed to most efficiently achieve the goals for multiple bird species and other elements of biodiversity (Steinkamp 2008, Atlantic Coast Joint Venture 2008)?

To answer the most basic questions listed above we need to assess existing habitat conditions in the Piedmont and set habitat objectives to support BCR-level population objectives.

Landscape Characterization and Assessment

ACJV staff have recently adopted and utilized the PHAP habitat mapping results previously explained in the [Habitats](#) section. By using these data habitat and patch analysis can be readily conducted for all habitat types in the Piedmont, either at the aggregate scale for the nine major habitat and their subtypes or at the ECS level (101 ECS classes in the Piedmont). The ACJV is currently using GUIDOS (Graphical User Interface for the Description of image Objects and their Shapes, Vogt, 2010) software to map and analyze spatial patterns, landscape corridors, functional connectivity, scale analysis, riparian corridors, and other habitat parameters. GUIDOS classifies each habitat into seven classes: Core, Islet, Perforation, Edge, Loop, Bridge, and Branch. ACJV staff used GUIDOS to identify core, bridge (habitat that joins cores), and branch (small areas of habitat attached to core but not large enough to be core) areas of grassland and forest habitat and used the spatial results to identify focal areas to guide where partners should target conservation strategies. For example, we were able to identify areas where core patches could be expanded by management actions.

Habitat Objectives

Once species-habitat models and habitat characterizations are available we will be able to estimate the Piedmont's carrying capacity for a wide-range of focal species. By focusing on demographic parameters instead of just population estimates we should be able to estimate whether populations are sustainable. In the short term we will probably be limited in our ability to make such estimates and will have to rely on evaluating estimates of population trends under the various management scenarios. However, once we reach this stage we will be able to estimate how many hectares of habitat are necessary to support a species' population target within a region (i.e., what is the population-based habitat objective). Given that all the tools developed to this stage are spatially-explicit we should be able to target conservation to the best areas in order to maintain or increase our biological capacity most efficiently.

By linking regional population objectives to habitat use models the ACJV hopes to develop spatially-explicit habitat objectives over the next one to two years. JV staff and partners will be working with the North Atlantic and South Atlantic LCCs to build on work being done through the two designing sustainable landscape projects. The ACJV technical committees have selected a preliminary set of species to work with and these efforts should provide the conceptual framework for all priority species in the Piedmont. In the meantime, we will be using existing goals where available or relying on expert elicitation to inform our partners' conservation actions.

Conservation Design

Conservation design answers the interrelated questions of how much of which habitat conservation (protection, restoration, enhancement, management) is necessary and where it should be targeted. The development of maps predicting patterns in the ecosystem is particularly useful because these maps are a means of summarizing the predictions from complex, multi-dimensional models in a much more easily understandable two-dimensional format.

The most critical step in conservation design is the development of decision support tools that guide the partnership in where to target specific habitat conservation and management actions to most effectively restore and sustain bird populations. Within the ACJV conservation design for BCRs has been traditionally based on expert elicitation where maps are reviewed and areas for conservation are selected based on current knowledge and expertise of persons reviewing the maps. These "focus areas" provide only a coarse assessment of where partners should focus conservation for some species (see Focus Areas below). Intensive follow-up that includes research, monitoring, and evaluation is required to assess the validity of focus area selection.

In order to better evaluate species-habitat relationships, more precisely target conservation actions to priority sites, and evaluate placement of conservation sites model-based approaches also will be needed. Such models can be used to assess the capacity of present day landscapes or the future capacity based modeled predictions of

future landscape condition. With these models we will be able to determine how to most efficiently conserve lands for multiple species with similar habitat requirements and evaluate trade-offs of implementing various management regimes for priority species with conflicting habitat needs. The process of determining how to most efficiently meet multiple species' goals across the landscape is referred to as an optimal landscape design process. Throughout their development, models' assumptions should be clearly stated and tested through research, and monitoring programs should be developed and used to validate models and assess effectiveness of conservation planning and implementation (Steinkamp 2008).

A number of conservation design related efforts are available across the wide range of conservation agencies and planning units, including the ACJV. However, the most promising advancement in conservation design in the ACJV is the development of a modeling approach called Designing Sustainable Landscapes ([DSL](#)) (see Designing Sustainable Landscapes below) that is being applied to the SAMBI planning area. This approach seeks to develop a consistent methodology and enhance the capacity of states, joint ventures, and other partners to formulate conservation design schemes at landscape levels to sustain bird populations and other wildlife in the eastern United States (Williams 2013). This project was expanded to the Piedmont in 2012, and preliminary models should be available in 2014 and be incorporated into future editions of this plan.

Until such time that the Piedmont DSL is available for inclusion in the plan, the following tasks should be considered of prime importance to achieve implementation of a successful conservation design in the Piedmont:

1. Continue to develop and incorporate DSL models for priority species;
2. Continue to support compilation, acquisition of, and mapping of basic demographic information on the distribution of existing species, habitats, and protected and managed lands in the BCR, using NatureServe ecological classification system as the standard to which habitats are identified for implementation of conservation actions;

3. Develop a strategy to conduct additional surveys that will allow for validation of models and for the development of long-term database for future modeling efforts; work with partners to develop and implement additional surveys for poorly surveyed species, priority species, and priority geographic areas; and collaborate with partners involved in coordinated bird monitoring projects.

Landscape/Regional Conservation

Focus Areas

One of the tools being used to foster implementation in BCRs is the concept of focus areas, which are geographically explicit areas supporting general habitat characteristics preferred by priority birds. Focus areas are not the only areas within a BCR that provide basic habitat needs for priority species but are geographic areas that have been identified by the bird conservation community as areas of high conservation potential because of their biological attributes at the landscape scale. The Piedmont bird focus areas were defined by staff of partner agencies and organizations during the Piedmont workshops held in October and December 2012. Criteria developed for designating waterfowl focus areas have been adopted for use in defining other bird focus areas within the Piedmont. These are:

1. Focus areas are regionally important to one or more life history stages or seasonal- use periods,
2. Focus areas are developed within the context of landscape-level conservation and biodiversity,
3. Focus areas are made up of discrete and distinguishable habitats or habitat complexes demonstrating clear ornithological importance. The boundaries are defined using ecological factors such as wetlands and wetland buffers, etc., and
4. Focus areas are large enough to supply all the necessary requirements for survival during the season for which it is important, except where small, disjunct areas are critical to survival and a biological connection is made, such as areas used by migrating shorebirds (Steinkamp 2008).

The focus areas depicted in this plan should be considered an initial draft set for the Piedmont and will need to be periodically revised as new tools become available to aid in conservation site selection (see DSL below). The process used to generate focus areas has important limitations that should be understood by anyone using the maps or lists in this plan. The determination of focus areas is biased in terms of taxonomic groups, habitats, jurisdictions, existing knowledge, and the people reviewing and selecting focus areas. Not all bird experts in the region attended the workshops where lines were drawn on maps, and some geographic areas and species groups were better represented than others. No attempt was made to verify the importance of each focus area identified or to rank them or quantify their relative contributions to different bird species or groups.

Over the long-term model-based approaches should be used for widely distributed species to determine the most suitable habitats across the landscape to focus conservation efforts. For this plan Forest Bird, Grassland Bird, Waterfowl, and Potential Waterbird and Shorebird Focus Area maps are presented. All of these maps and associated data can be obtained from the ACJV website.

Forest Bird Focus Areas

Forest bird focus areas were identified by workshop participants for both the northern and the southern Piedmont (Figures 4, 5). These forest bird focus areas do not distinguish between the different forest types in this plan, rather they represent large forest blocks where workshop participants desired to focus broad conservation efforts based on the desired short-term goal of concentrating efforts on forest bird conservation. However, because these forest types are tiered to SEGAP/NETHM ECS any level of forest block analysis from the ECS to aggregate habitat types can be conducted. Each numbered polygon has associated attribute data, which can be queried from the underlying land cover data.

Grassland Bird Focus Areas

An identical process was used by workshop participants to identify grassland bird focus areas in the northern and the southern Piedmont (Figures 6, 7). Similar to forests, there is no distinction made between different types of grassland habitats. This level of analysis can be achieved at much smaller scales (ECS) if needed. These blocks, like forest bird focus areas, represent a partner based desire to identify and concentrate on grassland bird conservation in the Piedmont as an immediate short-term goal. Each numbered polygon has associated attribute data, which can be queried from the underlying land cover data.

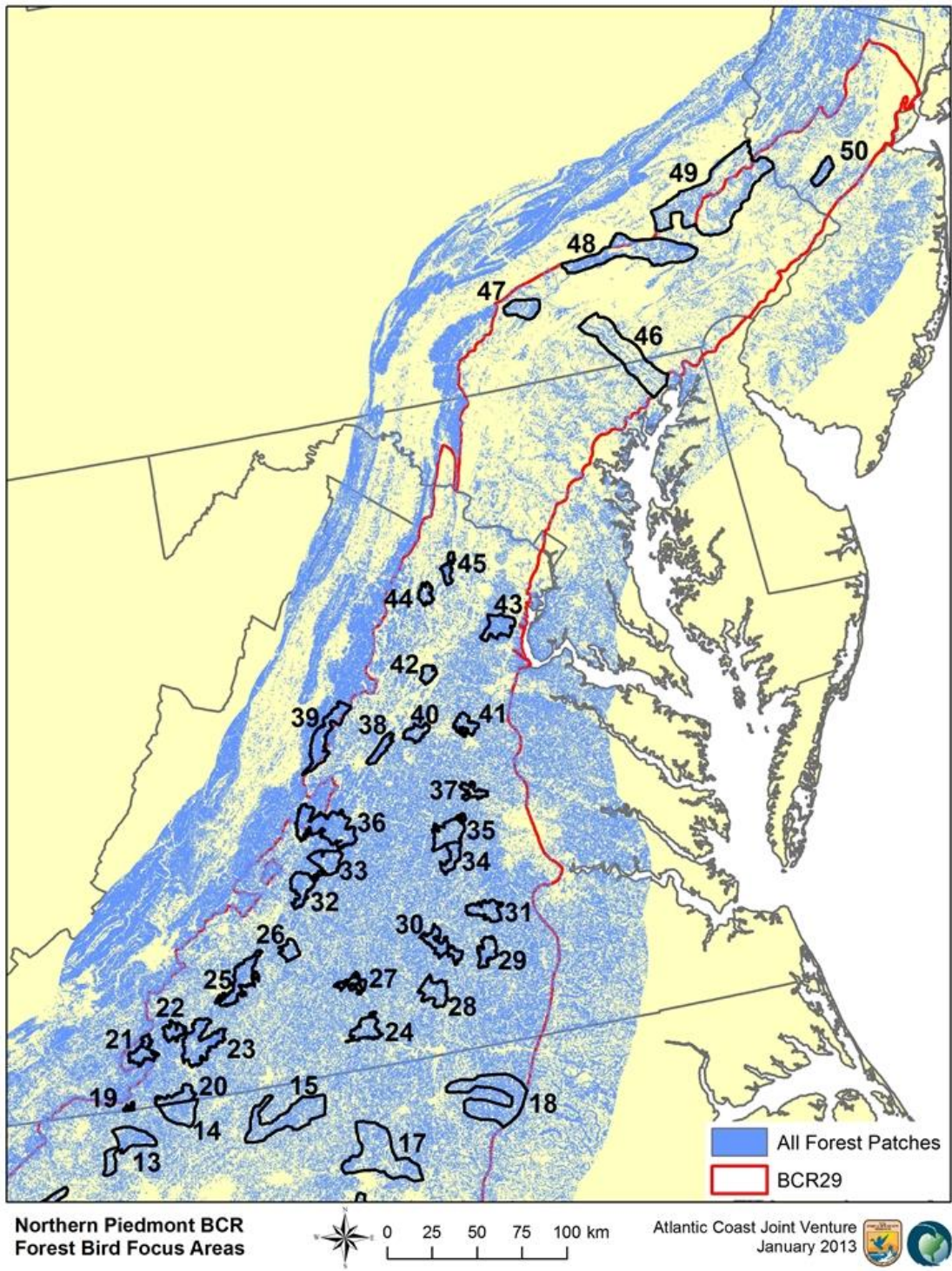


Figure 4. Forest Bird Focus Areas in the Northern Piedmont BCR.

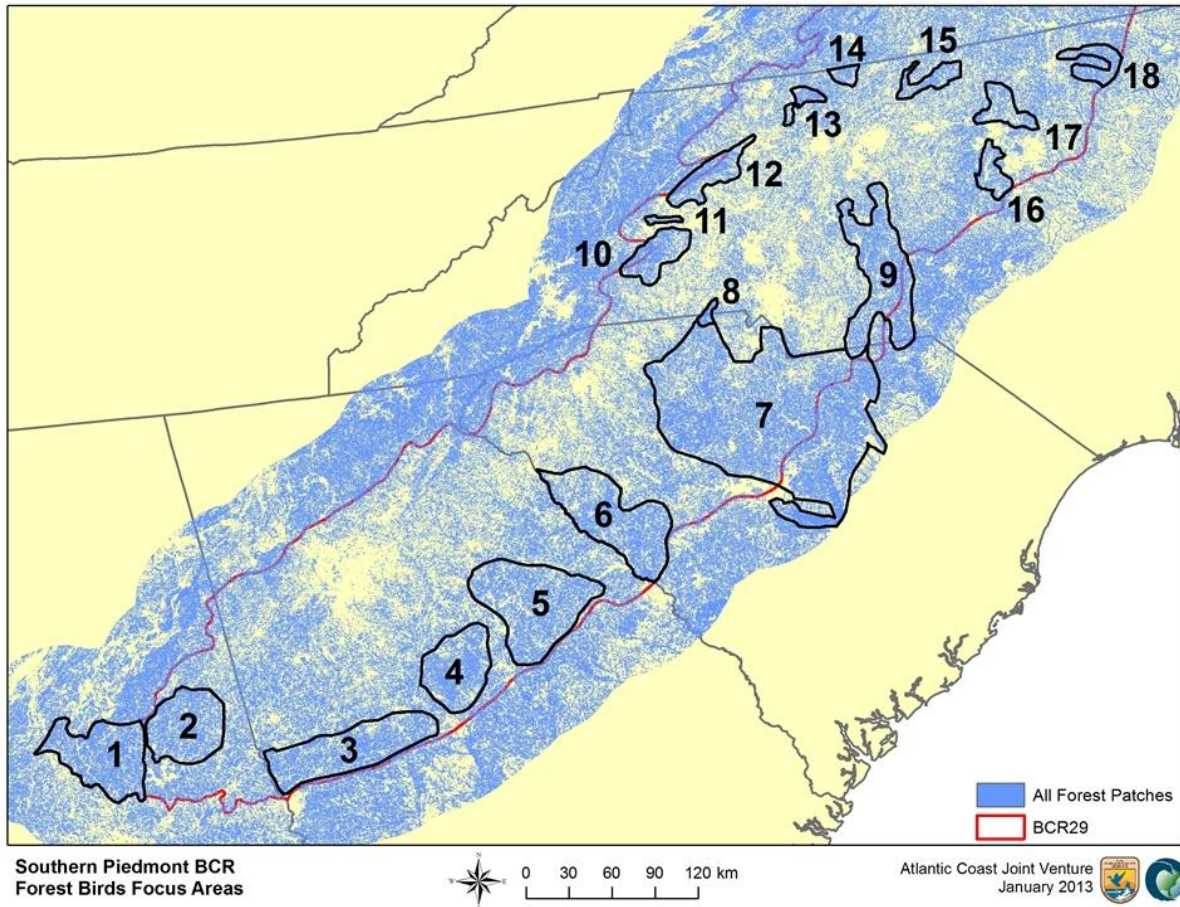


Figure 5. Forest Bird Focus Areas in the Southern Piedmont BCR.

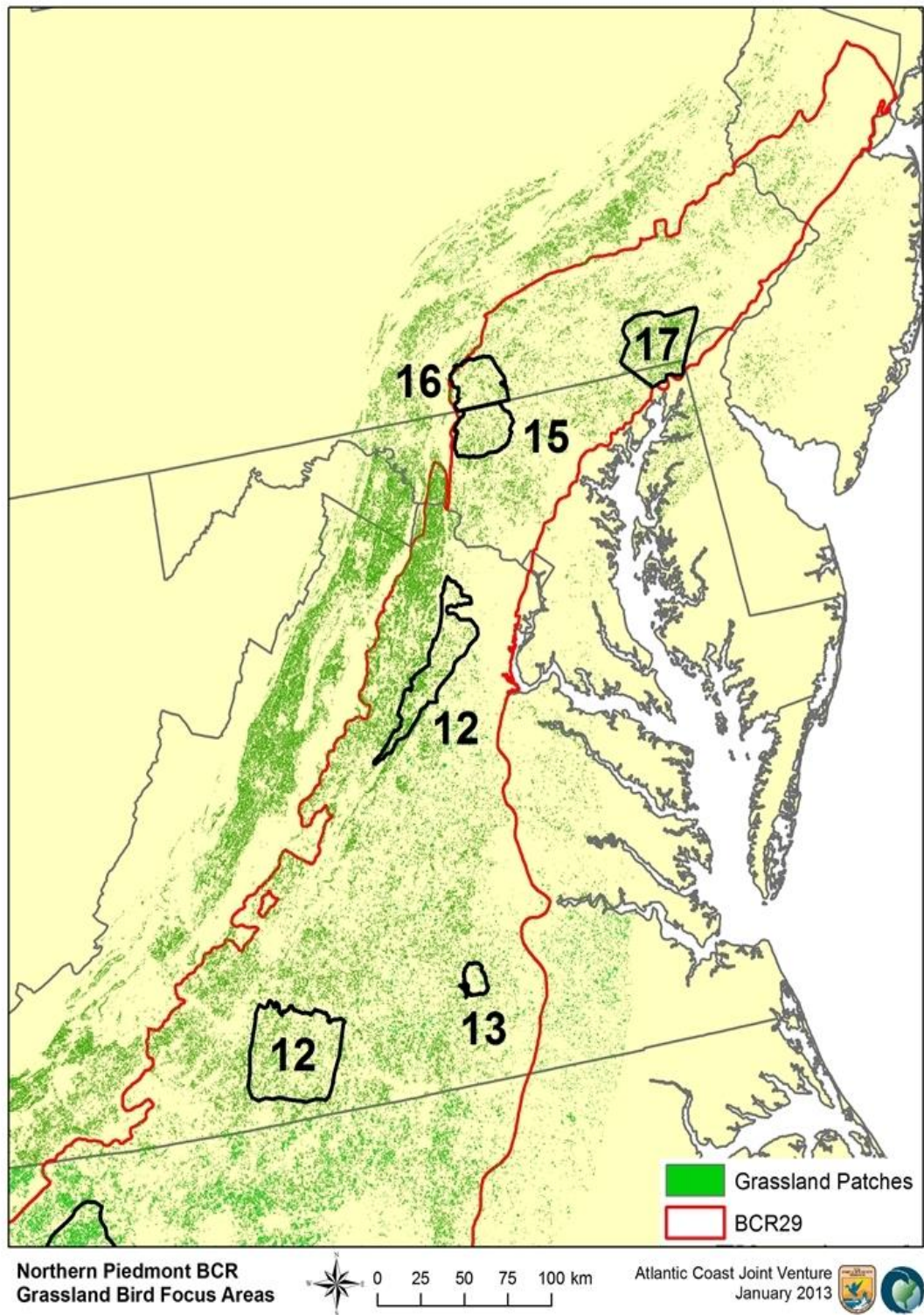


Figure 6. Grassland Bird Focus Areas in the Northern Piedmont BCR.

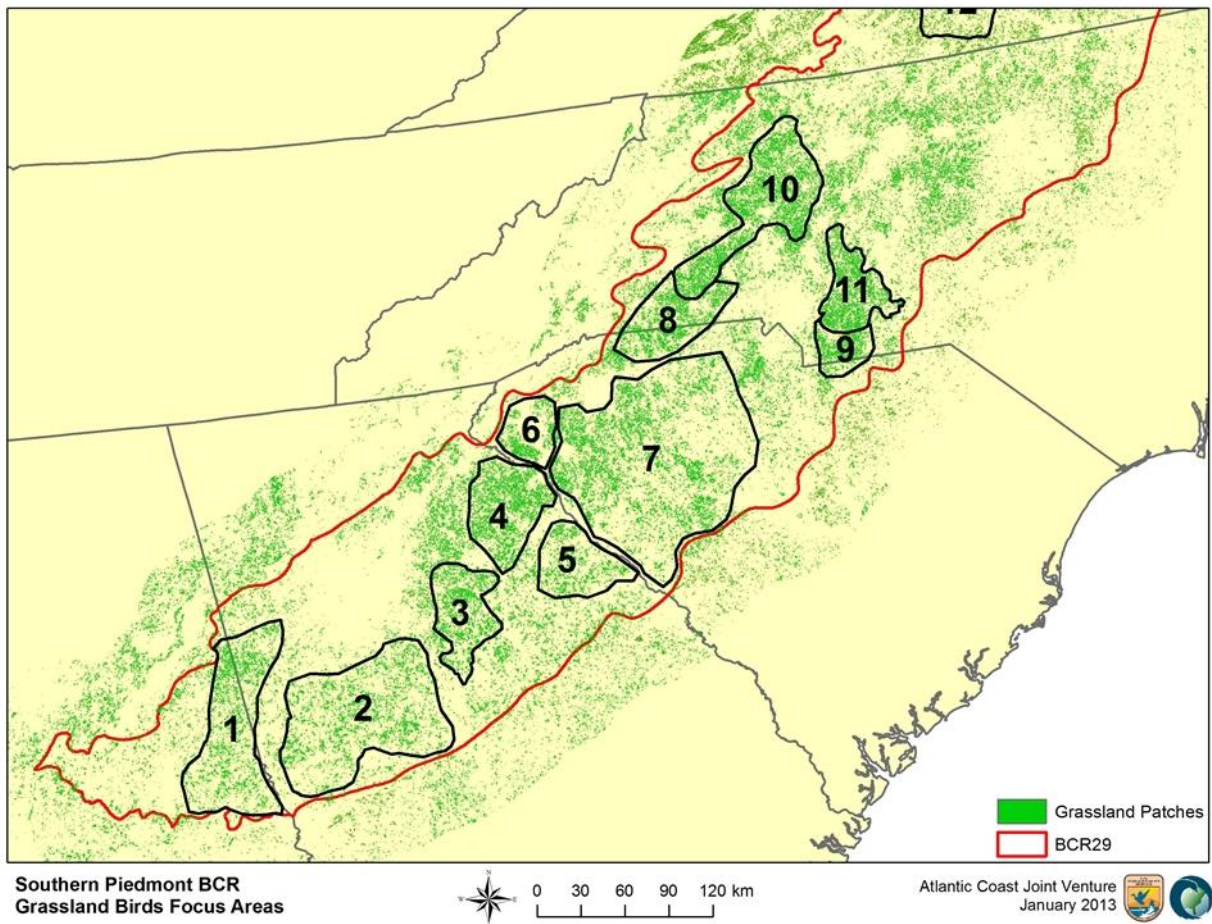


Figure 7. Grassland Bird Focus Areas in the Southern Piedmont BCR.

Waterfowl Focus Areas

These focus areas were established by the ACJV Technical Committee state representatives during planning for the revision to the ACJV Waterfowl Implementation Plan in 2004. Presented here are the northern and southern Piedmont waterfowl focus areas as originally developed (Figures 8, 9). Each numbered polygon has associated attribute data, which can be queried from the underlying land cover data.

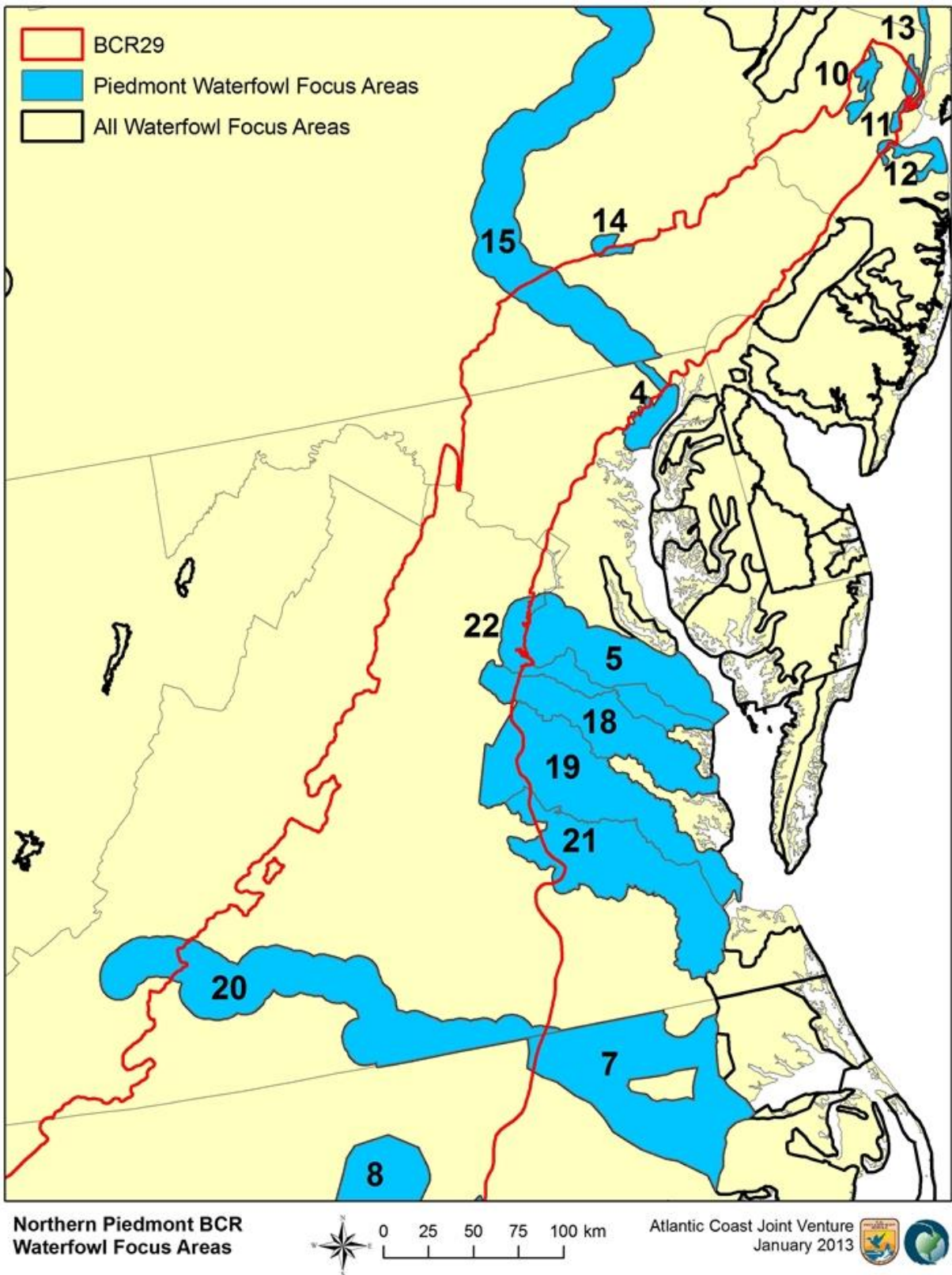


Figure 8. Waterfowl Focus Areas in the Northern Piedmont BCR.

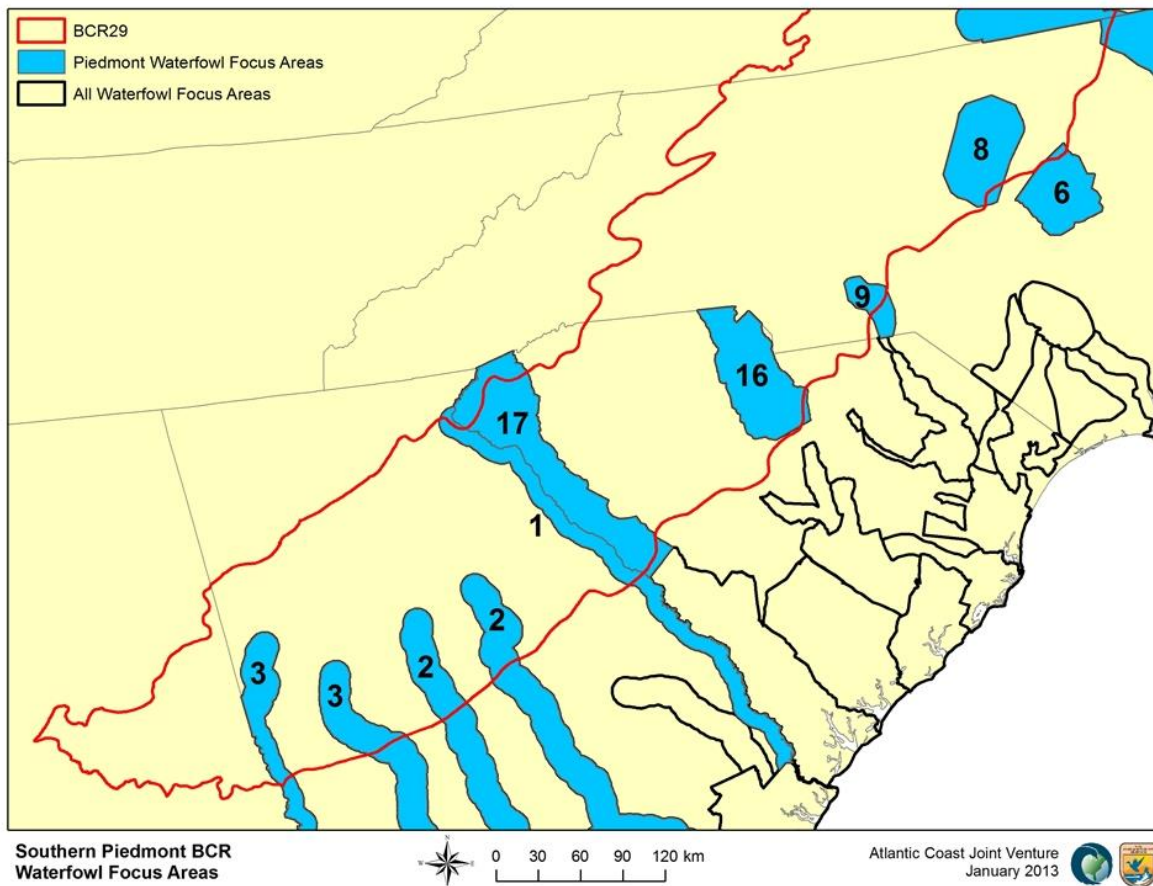


Figure 9. Waterfowl Focus Areas of the Southern Piedmont BCR.

Potential Waterbird and Shorebird Focus Areas

Waterbird and shorebird focus areas were not specifically identified by Piedmont workshop participants, but they did indicate that waterbirds and shorebirds typically occur in waterfowl focus areas, forested wetlands, water and sewage treatment plants, and open water and impoundment areas. Staff at [Manomet](#) Center for Conservation Sciences conducted a database search for shorebirds sites in the Piedmont that might suggest an Important Bird Area (IBA see below) or Western Hemisphere Shorebird Reserve Network ([WHSRN](#)) site, but none could be located. Therefore, a map depicting the National Hydrography Dataset ([NHD](#)) is presented here that represents potential areas for the conservation of Waterbirds and Shorebirds in the Piedmont

(Figure 10) based on water bodies greater than 5 acres in size. Additionally, the waterfowl focus areas serve to act as focus areas for these bird groups.



Figure 10. Potential Waterbird and Shorebird Focus Areas in the Piedmont BCR.

[Designing Sustainable Landscapes](#): In 2007 ACJV staff and scientists with the USGS Cooperative Fish and Wildlife Research Unit at North Carolina State University and Auburn University recognized the need for advanced bird conservation design. Together they proposed and received funding for a multi-year, multi-state project entitled “Designing Sustainable Landscapes for Bird Populations in the Eastern United States.” The overall objective of this proposal is to develop a consistent methodology and enhance the capacity of states, joint ventures, and other partners to assess, design, and manage sustainable landscapes for birds and other wildlife in the eastern United States (Williams 2013). Specifically, this project would develop and implement a framework and tools to 1) assess the current capability of habitats in ecoregions in the eastern United States to support sustainable bird populations, 2) predict the impacts of landscape-level changes (e.g., from urban growth, conservation programs, climate change) on the future capability of these habitats to support bird populations, 3) target conservation programs to effectively and efficiently achieve objectives in State Wildlife Action Plans and bird conservation plans and evaluate progress under these plans, and 4) enhance coordination among partners during the planning, implementation, and evaluation of habitat conservation through conservation design (Williams 2013). Currently, the models being developed for designing sustainable landscapes under this project are being applied to the SAMBI planning area. Recent funding has permitted the extension of this project into the Piedmont BCR south of the James River in Virginia.

The expansion of this project, and the standard methodology developed as a part of this project, both geographically into the Piedmont region and taxonomically into additional priority wildlife species is a high priority for the ACJV. Expanding this project includes the development of core landscape projection datasets for the Piedmont Region including projections of climate change, urbanization, ecosystem disturbance processes, and land cover (habitat) dynamics through the year 2100. It will also include expanding the stakeholder driven process to identify priority species of all taxa and evaluating available science to create species-habitat relationship models.

This project will build on several regional efforts that are currently developing or have recently completed spatial data. Most notable is the SEGAP/NETHM Project, which has

developed a regional land cover map based on NatureServe's Ecological Systems. Some inconsistencies remain between the SEGAP and NETHM products, which are being resolved by ACJV staff. This is the most detailed land cover map to date at this resolution and will provide the data for the Piedmont habitat assessment. The importance of this consistent approach cannot be overstated given the myriad of habitat classification systems and descriptions across multiple states, NGO's, and federal agencies. In addition to land cover, GAP products include terrestrial vertebrate species predicted habitat models. While these models are limited in that they only predict presence/absence, they do provide a solid foundation for further refinement and development of abundance/population models through the supporting ancillary data sets and extensive habitat relationship database used in their development. Furthermore, North Carolina Cooperative Fish and Wildlife Research Unit is supporting research into extending species-habitat models beyond presence/absence to include habitat suitability indices as well as predictions of population densities.

CHAPTER VI: RESEARCH AND MONITORING NEEDS FOR PRIORITY SPECIES IN THE PIEDMONT

Research and monitoring needs have not been adequately identified for the Piedmont. A dedicated working group is needed to undertake this task and incorporate their findings into the future versions of this plan.

The Southern Piedmont PIF Plan (Cooper unpublished 2000) listed several research questions for the Southern Piedmont physiographic area pertaining to assumptions used in the conservation plan. These suggest priority questions for research involving birds in the Southern Piedmont can easily be applied to Piedmont BCR-wide needs. Priority research topics and questions include, but are not limited to, the following:

1. What size do forest patches need to be in order to support viable populations of priority species? Or, more specifically, do patches less than 8,093 ha (20,000 ac) commonly support viable populations of forest dwelling species?

2. Refine knowledge of habitat requirements of Wood Thrush and Cerulean Warbler within the upland hardwood forest.
3. Do pine forests contribute to hardwood forest patch size or should they be ignored in calculating the size of such patches?
4. Determine size of large forest blocks and percentage of forested landscape for species such as Red-headed Woodpecker and Kentucky Warbler.
5. In intensive forest management what are the economic and ecological tradeoffs between using more or less intensive options (e.g., spacing, herbicides, site preparation)?
6. What size do early successional habitat blocks need to be to support viable populations of priority species?
7. How does composition of blocks of early successional habitat affect population viability?
8. How wide do brushy field margins need be to provide habitat for priority species, and what are the economic and ecological tradeoffs in using them?
9. How wide do riparian zones need to be to allow priority species to successfully fledge young? How does this width vary with stream size and surrounding habitat?
10. What types of land use and disturbance are compatible with the conservation objectives for priority species, regardless of habitat type?
11. What influence does habitat restoration have on the colonization and breeding success of Bachman's Sparrow and Brown-headed Nuthatch?
12. What is the optimal block size of pine forests (with pine barrens) for conservation action for Bachman's Sparrow and Brown-headed Nuthatch?
13. What are the BMP's available to create appropriate habitat in rights-of-way (ROW) for the suite of early successional bird species?
14. How can ROWs be evaluated to assess how management history, size, and dimension of ROW, vegetation composition, and landscape context affect current abundance, diversity, and productivity of the early successional priority bird species?

15. How can models be developed that predict abundance and productivity as a function of patch size, vegetative composition, landscape context, land use history, and water level and quality (if applicable)?
16. How can precise habitat and area needs of Henslow's Sparrow in this region be determined?
17. How can the success or failure of this conservation plan be monitored and assessed when implemented?
18. What are the BMPs for management of early successional habitat for priority species, especially in more developed areas?
19. What is the distribution and density of priority species in fragmented habitats such as early successional shrub-scrub, agricultural croplands, and urban/suburban areas?
20. Determine the feasibility of reintroduction of Bewick's Wren.

Additional research topics can be found at the PIF Continental (U.S. & Canada) Watch List Species [Research & Monitoring Needs Database](#) (2008). This list contains both research and monitoring needs for Continental Watch species, several of which occur in the Piedmont.

Monitoring programs are an important component of bird conservation. For many species information on species distribution, abundance, and population trends are needed to assess species status and results of conservation implementation programs or management actions that promote conservation. For other species detailed information on demography, population structure, and other life history parameters are needed to run population and habitat models and to make management decisions. This information is often best obtained through long-term, coordinated monitoring efforts. The utility of information coming out of well designed, targeted monitoring programs is highly valuable. One of the highest bird conservation priorities within the Piedmont is to design coordinated, standardized monitoring programs focused on answering specific questions. Furthermore, monitoring efforts to assess the effectiveness of bird conservation activities within the BCR need to be developed and implemented as part of

every project. Within an adaptive management framework partners will be able to evaluate whether implementation actions are successful in meeting desired outcomes.

It is important to be able to assess the effectiveness of this plan and its component parts. Monitoring at several scales can address some of these issues (Ralph et al. 1993). Assessing the effectiveness of the overall plan will entail a combination of intensive demographic approaches (nest success, survivorship) at individual sites and point counts used over a larger area. For example, research on the effects of alternative land management options on birds should be designed so that the sites are at least periodically monitored using appropriate methods. Although point counts can help answer such questions, it is recognized that demographic monitoring, while much more expensive and involved, is more informative and may be more appropriate at this scale of investigation.

In the northeastern U.S. the Northeast Coordinated Bird Monitoring Partnership (NECBM) was established to support development and implementation of regional bird monitoring programs and assist bird conservation partners in improving the coordination and effectiveness of their monitoring efforts. This effort included a large portion of the Piedmont from New Jersey south through Virginia. The NECBM program catalogued existing bird surveys, developed consensus on monitoring priorities, and identified key management issues that could be addressed through monitoring programs. Annual workshops fostered opportunities to coordinate existing surveys and support statistical survey design and analyses. By providing new tools and collaborative opportunities the NECBM helped build the fundamental basis for science-based bird conservation in the Northeast. The ACJV should encourage development of a similar coordinated bird monitoring effort throughout the Piedmont BCR. There are a number of existing [southeastern bird monitoring programs](#) with protocols that cover multiple species in a variety of habitats in the southeast U.S., but they have not been standardized or adopted across multi-agency/organizational boundaries in the Piedmont (Laurent et. al. 2012).

The following preliminary goals have been identified based on general research and monitoring needs for the priority species from other adjacent BCRs and the PIF physiographic area plans (Cooper unpublished 2000, Kearney 2003). In some sections more specific monitoring needs are presented and taken from PIF's Research and Monitoring Needs for [Continental \(U.S. and Canada\) Watch List](#) Species.

General Research/Monitoring Goals

1. Encourage participation in coordinated bird monitoring efforts throughout the Piedmont and adjacent BCRs within the ACJV.
2. Improve the BBS for most landbird species.
3. Design coordinated, standardized monitoring programs focused on answering specific management questions such as the effectiveness of conservation activities implemented within the Piedmont.
4. Implement stopover or migration monitoring for priority passerines and shorebirds.
5. Coordinate with existing monitoring and bird documentation programs such as [eBird](#), Christmas Bird Counts ([CBC](#)), the Great Backyard Bird Count ([GBBC](#)), [Project Feeder Watch](#), etc. to assemble more data on the distribution and abundance of Piedmont priority species. Many more bird monitoring programs exist, and these should all be explored to determine if valuable data on Piedmont priority species can be obtained.

Species/Group Monitoring Goals

Forest Birds

1. Evaluate the effectiveness of conservation and management actions on the status of priority forest species.
2. Improve BBS coverage for priority forest birds in under-represented habitats such as forested riparian wetlands.

3. Develop supplemental inventory and monitoring programs to determine population levels and identify important sites for raptors and other bird species not well monitored by BBS.
4. Determine presence/absence of Bachman's Sparrow in the northern Piedmont, and improve BBS and winter monitoring of known populations to determine more precise trends (additional Bachman's Sparrows needs identified at <http://www.partnersinflight.org/WatchListNeeds/BACS.htm>).
5. Develop supplemental monitoring programs to determine regional population levels and trends for Brown-headed Nuthatch.

Upland Game Birds

Currently, most monitoring programs are designed to estimate changes in relative abundance and provide information to guide harvest regulations. There is an opportunity to develop coordinated designs that would more clearly demonstrate population responses to regulatory and habitat management actions, particularly for non-game species that utilize early successional habitats. Some important monitoring considerations are to:

1. Continue existing singing ground, wing collection, and demonstration site survey efforts for American Woodcock,
2. Conduct nocturnal surveys for American Woodcock,
3. Increase existing Ruffed Grouse drumming surveys, and
4. Integrate priority forest, grassland, and early successional songbird surveys into game bird surveys where appropriate.

Grassland Birds

1. Develop an inventory and monitoring program to assess status, trends, and distributions of the priority species, impacts of development, succession, and changing agricultural practices, and the effects of conservation efforts on these species.

Early Successional Shrub-Scrub Birds

1. Determine presence/absence of Henslow's Sparrow in the northern Piedmont.
2. Develop supplemental inventory and monitoring programs to determine population levels and identify important sites for Henslow's Sparrow and other uncommon, patchily distributed grassland species not well monitored by BBS.
3. Inventory existing early successional shrub-scrub habitat to identify important sites for Prairie Warbler, Blue-winged Warbler, and Field Sparrow.
4. Conduct outreach and educational programs to implement best management practices in farmlands where hay/straw and pasture operations exist.

Night Birds

1. Increase and implement [Nightjar surveys](#) throughout the Piedmont, especially for Eastern Whip-poor-will and Common Nighthawk.
2. Conduct winter surveys for Short-eared Owl.

Marsh Birds

1. Implement monitoring programs to determine the distribution, occupancy, and abundance of breeding secretive marsh birds (especially those that are state-listed and/or designated as species of greatest conservation need in state wildlife action plans).
2. Determine presence/absence and abundance of Black Rail in the Piedmont.

Waterfowl

1. Estimate the population size of widely-distributed species during breeding and non-breeding periods.
2. Estimate the number of migratory waterfowl harvested in order to make sound decisions concerning hunting seasons, bag limits, and population management.
3. Obtain annual waterfowl abundance indices in winter concentration areas.

Shorebirds

1. Implement targeted monitoring programs for high priority shorebird species, and where appropriate determine presence and abundance of Upland Sandpiper in the Piedmont.
2. Determine use of various grassland types (natural and managed) by Upland Sandpiper and area requirements in these types.

Urban Birds

- 1) Implement a monitoring program to assess the status of Chimney Swift.
- 2) Provide outreach programs to urban residents to implement [Audubon's Bird Friendly Community](#) and [Audubon at Home](#) Programs.
- 3) Outreach to urban and suburban residents to engage in monitoring programs such as CBC, IMBD, GBBC, Project Feeder Watch, etc.

CHAPTER VII: CONSERVATION STRATEGIES AND IMPLEMENTATION

There are various tools that managers can use to assist in determining where the best and most efficient conservation should take place. These were discussed in the Conservation Design section. However, there are additional tools that provide the basis or anchor for many conservation actions and where these actions should occur. These tools are outlined below.

Important Bird Areas:

The Important Bird Areas ([IBA](#)) Program began in Europe in 1985 with Birdlife International. The IBA program has been implemented in the U.S. by two groups, the National Audubon Society ([NAS](#)) and the American Bird Conservancy ([ABC](#)). The programs differ by organization and within each organization are implemented at the state level. These IBA programs are designed to identify sites of high importance for bird life.

An IBA can be defined as a site that has been documented as supporting significant populations of a particular species or a significant diversity of species. Being designated as an IBA usually signifies that an area is managed and maintained for the benefit of ecological health and diversity. Although this is frequently the case, it is not always the standard, and birds may frequent places that are not protected or managed for conservation purposes. Often the public confuses the IBA program as an instrument for choosing good birding sites. The sites are not chosen for their worthiness as public birding places but rather for their species conservation value, which may result in many places being designated that are not available to the average birder. The NAS and ABC each have distinct qualities they are looking for in a potential IBA site. Within each state some sites may be on both IBA lists, while some states may have radically different IBA site listings.

Within the context of the Piedmont IBAs can be seen as a useful tool for identifying potential target sites for protection and habitat management. The IBA designation has a certain public value that may aid in the mobilization of resources for the conservation of bird species. It can also signify areas, particularly state or federal lands, where land managers have achieved conservation success. The Piedmont currently has 77 NAS and 32 ABC IBA sites (Table 14, Figure 11). Digital coverage of IBA's for each state within the Piedmont is available.

Table 14. Important Bird Areas of the National Audubon Society (NAS) and the American Bird Conservancy (ABC) in the Piedmont BCR.

Name	NAS	ABC	Digital Coverage
New Jersey			
Amwell Valley Grasslands	✓		✓
Arthur Kill Complex and Tributaries	✓		✓
Baldpate Mountain	✓		✓
Clinton Wildlife Management Area	✓		✓
Delaware and Raritan Canal State Park	✓		✓
Delaware Valley Raptor Migration Corridor		✓	✓
Duke Farms	✓		✓
Everittstown Grasslands	✓		✓
Garret Mountain	✓		✓
Great Swamp National Wildlife Refuge	✓		✓
Hatfield Swamp	✓		✓
Hoffman County Park	✓		✓
Meadowlands District Macrosite	✓		✓
Musconetcong Gorge	✓		✓
Northern Musconetcong Mountain Region Macrosite	✓		✓
Pequannock Watershed Macrosite	✓		✓
Pole Farm	✓		✓
Raritan Bay and Southern Shore Macrosite	✓		✓
Round Valley Recreation Area	✓		✓
Sourland Mountain Region Macrosite	✓		✓
Wildcat Ridge Wildlife Management Area/ Splitrock Reservoir	✓		✓
Delaware			
Red Clay Valley	✓		✓

White Clay Creek State Park	✓		✓
Pennsylvania			
Codorus State Park	✓		✓
Conejohela Flats	✓		✓
Creek Road Area	✓		✓
Delaware Valley Raptor Migration Corridor		✓	✓
Fairmount Park and Benjamin Rush State Park	✓		✓
Glen Morgan Lake	✓		✓
Great Marsh	✓		✓
Green Lane Reservoir	✓		✓
Hay Creek – French Creek Forest Block	✓		✓
Kiwanis Lake Rookery	✓		✓
Laurels, King Ranch and Stroud	✓		✓
Lower Susquehanna River Gorge – Conowingo/Muddy Run	✓		✓
Middle Creek Wildlife Management Area	✓		✓
Octoraro Reservoir	✓		✓
Peace Valley Park	✓		✓
Quakertown Swamp SGL 139	✓		✓
Red Clay Valley	✓		✓
South Mountain – Caledonia State Park & Michaux State Forest	✓		✓
Southern Adams County Grasslands	✓		✓
State Line Barrens	✓		✓
Unami Creek Valley	✓		✓
Upper Ridley/Crum	✓		✓
Maryland			
Appalachian Raptor Migration Corridor		✓	✓
Bald Eagle Key Habitat Area		✓	✓
Blackwater National Wildlife Refuge		✓	✓
Conowingo Dam		✓	✓
Lower C&O Canal	✓		✓

Maryland Blue Ridge	✓		✓
Monocacy Grasslands	✓		✓
Patapsco Valley	✓		✓
Prettyboy	✓		✓
Susquehanna River	✓		✓
Virginia			
Appalachian Raptor Migration Corridor		✓	✓
Bald Eagle Key Habitat Area		✓	✓
Blue Ridge Parkway		✓	✓
Central Piedmont	✓		✓
Culpeper Basin	✓		✓
George Washington National Forest		✓	✓
Jefferson National Forest		✓	✓
Lower James River	✓		✓
Lower Potomac River	✓		✓
Shenandoah National Park		✓	✓
Upper Blue Ridge Mountains	✓		✓
North Carolina			
Appalachian Raptor Migration Corridor		✓	✓
Blue Ridge Parkway		✓	✓
Caswell Game Lands	✓	✓	✓
Catawba River – Mountain Island Lake	✓	✓	✓
Eno River Bottomlands	✓	✓	✓
Falls Lake	✓	✓	✓
Jordan Lake	✓	✓	✓
Northern Escarpment	✓	✓	✓
Pee Dee National Wildlife Refuge	✓	✓	✓
Pilot Mountain	✓	✓	✓
Pisgah National Forest		✓	✓
South Mountains	✓	✓	✓
Stone Mountain – Doughton Park	✓	✓	✓

South Carolina			
Bomb (Lunch) Island	✓		✓
Clemson Experimental Forest	✓		✓
Croft State Natural Area	✓		✓
Hilton Pond Center (Important Bird Research Area)	✓		✓
Hogback Mountain	✓		✓
Sumter National Forest: Andrew Pickens, Long Cane Ranger Districts	✓	✓	✓?
Georgia			
Charlie Elliot Management Area	✓		✓
Chattahoochee National Forest		✓	✓
Dawson Forest	✓		✓
Fernbank Forest	✓		✓
Hitchiti Experimental Forest		✓	✓
Kennesaw Mountain National Battlefield Park	✓	✓	✓
Oconee National Forest	✓	✓	✓
Piedmont National Wildlife Refuge	✓	✓	✓
State Botanical Garden of Georgia/Whitehall Forest	✓		✓
Alabama			
Talladega National Forest		✓	✓

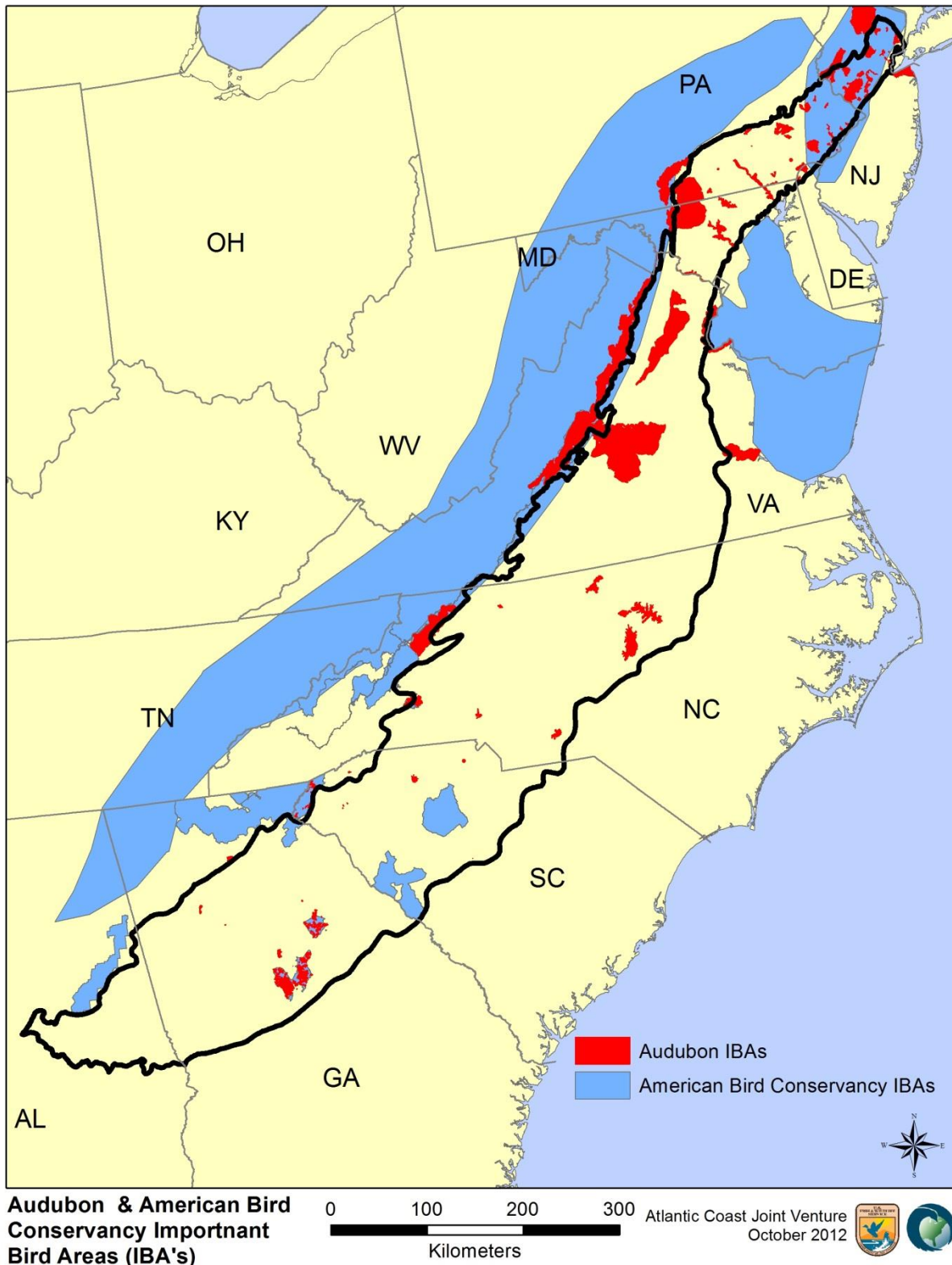


Figure 11. Important Bird Areas in the Piedmont BCR.

Audubon's Forest Focus Areas

As part of their Atlantic Eastern Forest Project, Audubon has mapped the largest, most intact forested areas in the U.S. portion of the Atlantic Flyway (Maine to Florida). Forest blocks identified through this process will be proposed for consideration as global and/or continental level Important Bird Areas under BirdLife International's Biome-restricted Species Assemblages criterion and will also serve as the focal areas for Audubon's forest stewardship and protection efforts.

Four criteria were chosen to evaluate forest block quality: size (total amount of forest cover within each polygon), intactness (percentage of forest cover within each polygon), richness of target birds (number of species of the suite of birds being targeted in each biome or BCR), and relative abundance of target birds (relative measure of the number of individuals of the suite of birds being targeted within each biome or BCR) (Smalling and Burger 2012).

The overall goal was to identify a network of forest blocks that collectively include the best 10-25% of forested areas (from the criteria above) in the Atlantic Flyway and when protected and properly managed would support long-term core, viable populations of birds of regional conservation responsibility, a shared goal of this plan (Fig 12). For additional information on this program contact Jim Shallow, Vermont Audubon Conservation and Policy Director in Huntington, Vermont.

Priority Forest Blocks in the Atlantic Flyway

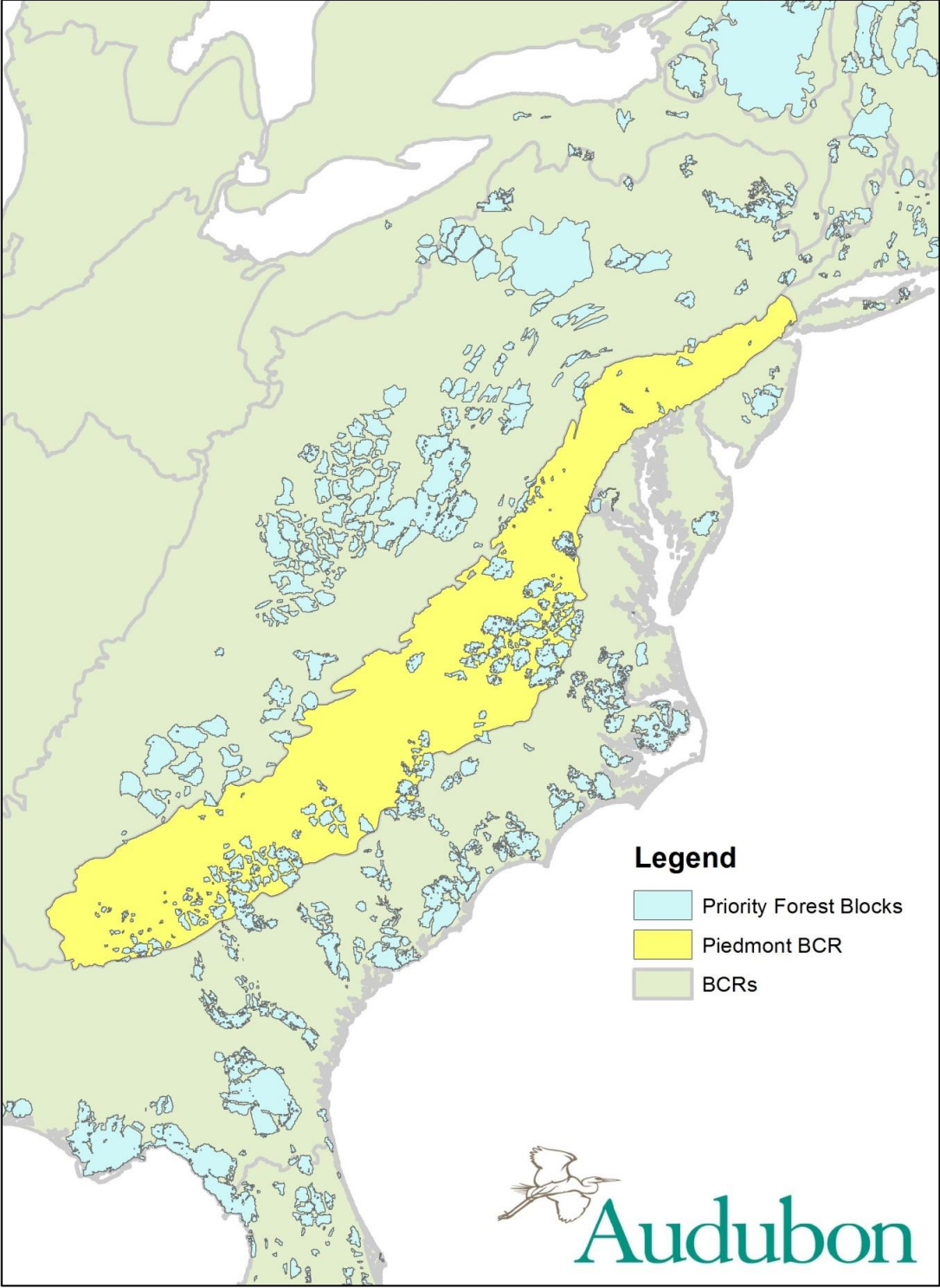


Figure 12. Audubon’s Priority Forest Blocks in the Atlantic Flyway.

Protected Lands

Public lands (primarily federal and state), lands protected through non-governmental agencies, and private lands protected through conservation easements have been mapped in the Piedmont (Table 15, Figure 13). This coverage can be separated and used by State Working Groups to help direct conservation efforts at the state level. Availability of digital coverage for protected lands within each state varies. Generally, coverage for public lands is readily available; however, digital coverage for some privately protected lands may require special permission to use.

Table 15. Protected Lands Ownership and Acreage in the Piedmont BCR.

Ownership	Units	Acres
Federal Land	500	670,689.27
Local Government Land	443	516,810.37
Private Conservation Land	28	15,529.88
Regional Agency Land	2880	177,718.14
State Land	585	226,666.58

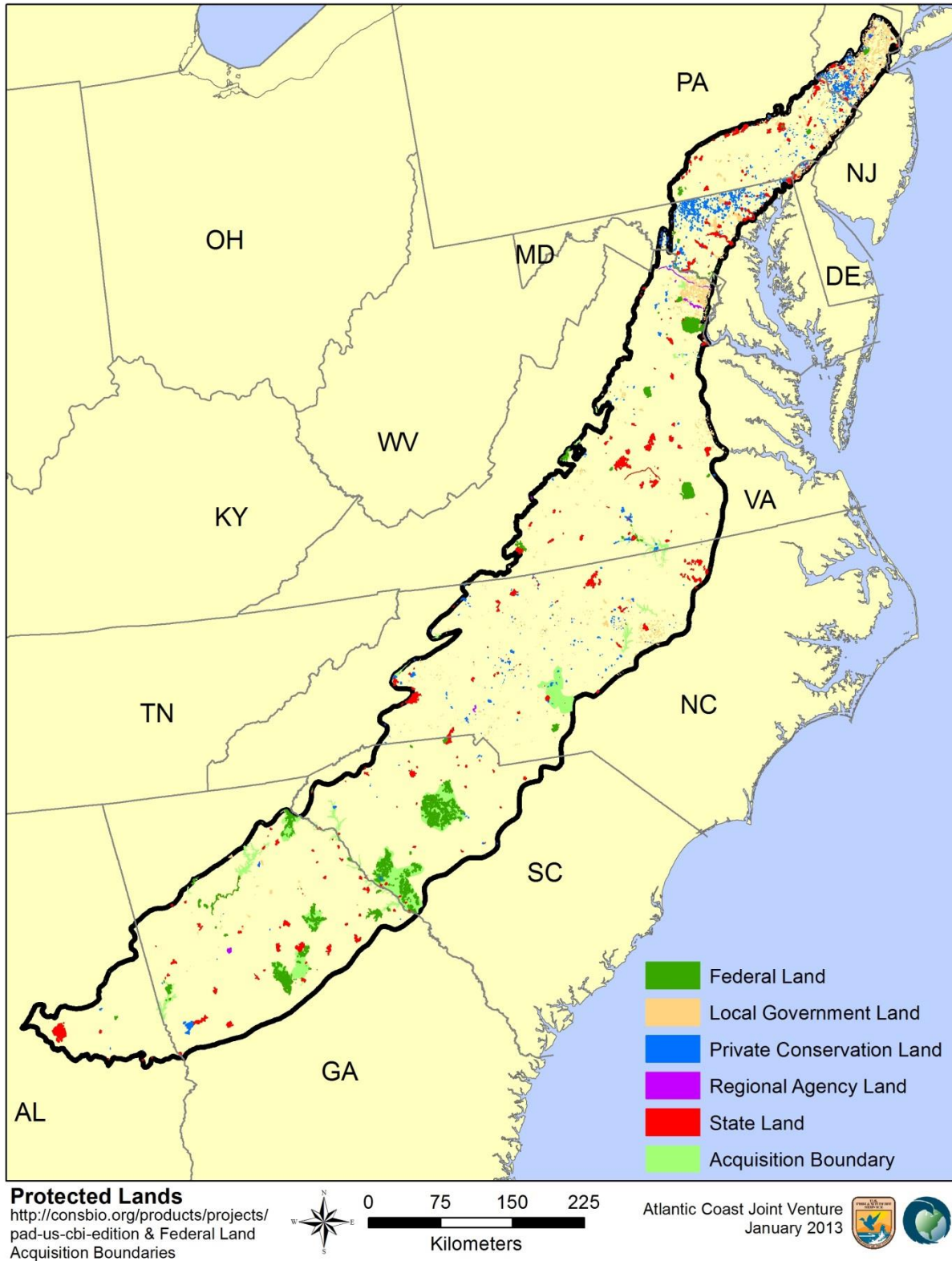


Figure 13. Protected Lands Coverage in the Piedmont BCR.

USDA Forest Service's Forest Stewardship Spatial Analysis Project

The Spatial Analysis Project ([SAP](#)) is a Geographic Information System (GIS) based strategic management tool that allows participating State forestry agencies to identify and spatially display important forest lands rich in natural resources and vulnerable to threat currently under Forest Stewardship Plans as well as areas of opportunity to focus future Forest Stewardship Program efforts (USFS 2009).

The Forest Stewardship Program, administered by the U.S. Forest Service and implemented by State forestry agencies, encourages private forest landowners to manage their lands using professionally prepared Forest Stewardship Plans. These plans consider all associated forest-related resources to meet landowner objectives including, but not limited to, timber, wildlife, fish, water, and aesthetics. Each state has developed a methodology used to identify these lands that could potentially be used to identify important lands in the Piedmont not identified by other means where forest

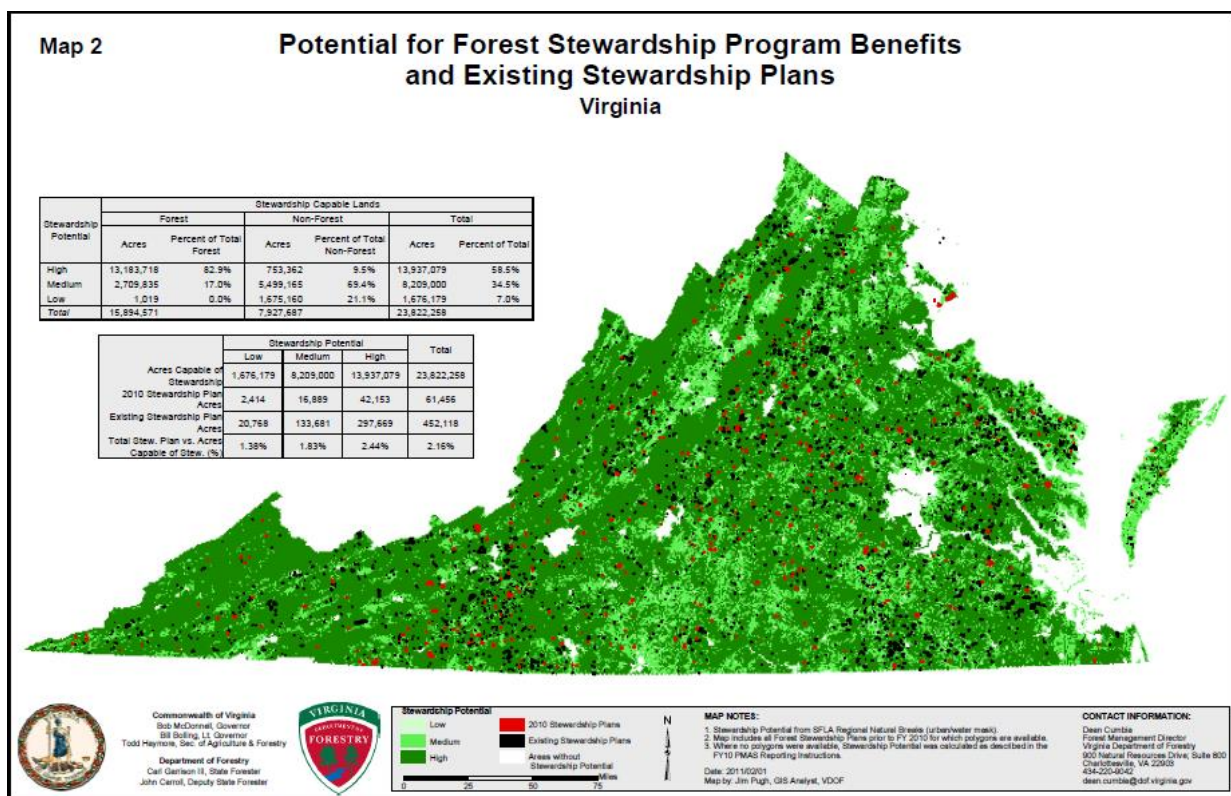


Figure 14. Existing and Potential Forest Stewardship Plans in Virginia.

management actions can be initiated that will benefit priority forest birds of the Piedmont (USFS 2009). For example, Figure 14 (above) depicts the location of existing and potential Forest Stewardship Plans on private lands in Virginia. If any of these areas were shown to contain priority bird habitat, the landowners could be made aware of, or invited to participate in, the Forest Stewardship Program that could provide incentive to manage the lands in a manner that would benefit our bird conservation goals.

Private Lands Assessment

Most land in the Piedmont is privately owned. Successful bird conservation in the Piedmont will depend on the cooperation and participation of significant private landowners in the region. An assessment will be made of private lands meeting a certain patch size that will contribute to habitat goals established through this plan. Outreach and education to private landowners will be conducted at the state and agency level through established channels and existing private landowner cooperative and incentive programs. Additionally, as a by-product of this plan a Guide to Managing Land in the Piedmont BCR for the Benefit of Birds and Other Wildlife will be produced and made available.

The following conservation strategies can be used in conjunction with other conservation design activities undertaken by partners to enhance bird conservation programs and achieve goals established in the Piedmont bird conservation region plan. Implementing these strategies will help ensure that population goals are met for priority birds and associated ecological functioning is maintained. The strategies have been taken primarily from the SAMBI plan (2008) and modified accordingly for the Piedmont. It should be noted that the strategies listed here are not exhaustive. Additional strategies may be available to enhance bird conservation in the Piedmont. As the Piedmont Plan is implemented, the list of strategies will likely grow.

Habitat Protection

1. Increase Fee Title Acquisitions: Direct acquisition of lands to be owned by a conservation agency or organization and managed for wildlife conservation in

perpetuity. Priority acquisitions include BCR focus areas and areas where acquisition builds upon networks of contiguous existing protected lands. Major partners include state fish and wildlife and land conservation agencies, National Wildlife Refuges, National Forests, The Nature Conservancy ([TNC](#)), land trusts, and state Audubon chapters.

2. Increase Conservation Easements: Establishment of conservation easements on land owned by private landowners and local governments. With easements conservation groups acquire legal interests to conserve and manage important wetlands and associated upland, grassland, and forest habitat and limit development, while allowing some use by the landowner consistent with the easement conditions.
3. Increase Cooperative Agreements: Development of collaborative projects with corporations, government agencies, private landowners, and other organizations that protect important bird habitats and/or integrate land use practices that benefit bird habitats.
4. Increase Leases: Establishment of long-term property leases with private landowners, corporations, and other private entities where habitat protection and management activities can be implemented.
5. Increase Financial Incentives: Development of state and local legislation that provides financial benefits to individual landowners for protecting and conserving valuable habitats on their land.
6. Increase Urban/Suburban Habitat Protection Initiatives: Provide urban and suburban residents with outreach and training (through Audubon chapters, green space committees, green building committees, etc.) to implement habitat and bird protection initiatives such as Audubon Bird Friendly Community and Audubon at Home programs.

Habitat Restoration

7. Restore Longleaf Pine Flatwoods and Savannas along the Piedmont-Coastal Plain interface where historical Longleaf Pine occurred.
8. Restore native grasslands where feasible, and implement BMP's on all grasslands.
9. Target priority, unprotected areas around existing reservoirs and wetlands for easements/acquisition with the goal to restore or maintain high freshwater quality.
10. Restore drained and ditched freshwater wetlands by eliminating drains and ditches to restore hydrology and planting/seeding native wetland plants.
11. Restore the natural flow of streams and floodplain wetlands.
12. Protect and restore forested wetlands (bottomland hardwoods, riparian mesic hardwoods) large enough to support populations of Cerulean Warbler, Swainson's Warbler, and other priority species.

Habitat Enhancement and Management

13. Improve water level management on managed wetlands: Upgrade existing managed wetlands by providing adequate water control structures (dikes, etc.) to improve habitat quality for breeding, wintering, and migrating waterfowl, waterbirds, and shorebirds.
14. Provide high quality managed shorebird habitat (e.g., "contaminant free" foraging resources and roosting areas) to support migrating and overwintering shorebirds.
15. Establish and restore riparian buffers through planting, stream bank fencing, and other techniques.
16. Establish shrublands on small, isolated grassland patches: Stop intensive management of small grassland patches (e.g., less than 6 ha), which have low value for priority grassland birds, to encourage establishment of higher quality shrubland habitat.

17. Identify and implement BMP's that benefit grassland bird species: Should include development of best management practices for utility right of ways.
18. Promote forest management on private lands.
19. Encourage, develop, and support state beaver management policies and programs:
These programs improve habitat for Black Ducks and other emergent wetland species by manipulating beaver populations and installing devices that allow for beaver-enhanced wetlands without flooding roads.
20. Control exotic and invasive vegetation: Eliminate and suppress the spread of invasive and exotic plants in wetlands and uplands using physical, biological, and/or chemical control methods.
21. Prescribed burning: Use prescribed fire to restore natural fire-dependent ecological communities such as Longleaf Pine Flatwoods and Savannas and Open Oak Savannas, and increase open understory in dense upland hardwood forests.

Landowner Outreach, Education, and Incentives

22. Coordinate implementation of federal, state, and local assistance programs with priorities and needs of Piedmont BCR focus areas: Biologists that have a role in implementing Farm Bill programs (e.g., NRCS Wetlands Reserve Program; <http://www.nrcs.usda.gov/wps/portal/nrcs/main/nj/programs/easements/wetlands/>) should strive to initiate these projects in designated Piedmont BCR focus areas that benefit priority bird species and associated habitats.
23. Establish community based habitat protection programs: Local communities plan and coordinate preservation and management of habitat that benefit birds. Grassland-focused programs can be particularly important. The [Bobolink Project](#) in Rhode Island is an example of one such successful local community program.
24. Ensure ACJV coordination with NRCS on Piedmont priorities (NRCS is now a member of the ACJV management board). Work with NRCS at all levels to

coordinate implementation of various programs for habitat enhancements, restoration, and protection.

25. Implement NRCS Farm Bill and encourage participation in USFS forest habitat programs: Work with NRCS to implement Farm Bill conservation programs to enhance wetlands and buffers in agricultural areas of the Piedmont including Conservation Reserve Program, Conservation Reserve Enhancement Program ([CREP](#)), Wetland Reserve Program ([WRP](#)), Wildlife Habitat Incentive Program ([WHIP](#)), Grassland Reserve Program ([GRP](#)), and Healthy Forests Reserve Program ([HFRP](#)). Encourage private forest landowners to utilize the USFS's Forest Legacy Program ([FLP](#)), Forest Stewardship Program ([FSP](#)), and Forestland Enhancement Program ([FLEP](#)).
26. Enhance habitat on Federal lands: Work with federal agencies such as the USFWS, USFS, and the Department of Defense (DOD) to develop and help implement programs to better manage and enhance bird and other wildlife habitats on federal lands.
27. Work with federal and state regulatory agencies to ensure that mitigation measures conserve bird habitat: Mitigation actions resulting from development projects and policies driving those actions should be coordinated with BCR conservation priorities to ensure that bird habitat benefits through protection and management.
28. Develop outreach materials for the general public. Develop informational-educational leaflets/brochures, audiovisual programs, and other techniques to generate public interest and support for Piedmont priority birds.
29. Promote information to landowners about conserving bird habitat: Develop a guide to habitat conservation for private landowners, and circulate it to a network of potential collaborators. Develop and implement an extension education program to encourage private individuals to conserve and manage habitats, utilize BMP's, and participate in federal and state assistance programs.

30. Assist watershed protection and management planning efforts to benefit birds: Help develop and provide input on watershed management and estuary plans/guidelines aimed at preventing degradation of wetland health and productivity from municipal waste, agricultural runoff, sedimentation, and industrial contaminants. Work with all interested parties to improve freshwater quality.
31. Predator management: Take steps to control predators where intervention is necessary to protect high priority species and ensure and sustain the viability of the population. Provide outreach to landowners on the impact of feral cat populations on bird predation and conservation.
32. Work with agencies and private groups to eliminate deliberate releases of domestic game species: e.g., Mallard, Northern Bobwhite, Wild Turkey.

CHAPTER VIII. CONSERVATION FUNDING

Table 16. Conservation Funding Sources Relevant to Conservation Implementation in the Piedmont BCR.

Conservation funding opportunities are available through a wide variety of sources. Eligible partners are encouraged to compete for funding sources that advance Piedmont BCR priorities. Funding proposals are generally most competitive when they involve diverse partnerships. Partnerships leverage more funds and matching dollars to assist in project implementation, and the following are working programs that partners can use to fund bird conservation projects.

The Table below describes several different grant opportunities for BCR 29 partners. Funding levels for Fiscal Year (FY) 2014 and beyond are not yet available. Thus, amounts shown are theoretical, based on funding levels for FY 2006, and not necessarily indicative of funding levels that may be available in the future.

POTENTIAL FUNDING SOURCES IN BCR 29					
Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
Conservation Reserve Enhancement Program (CREP)	USDA Farm Service Agency	CREP aims to improve water quality and wildlife habitat by offering rental payments to farmers who voluntarily restore riparian buffers, filter strips and wetlands using approved conservation practices. Another CREP goal is to establish 8,000 acres of perpetual conservation or open space easements statewide. State cost-share payments are administered through local Soil and Water Conservation District (SWCD) offices. May include permanent easements.	not specified	3:1 from State; 1:1 from Farm Service Agency (expenses for implementing best management practices, such as fencing or alternative watering systems).	private landowners
Conservation Reserve Program (CRP)	Farm Service Agency	Voluntary program to help agricultural producers safeguard environmentally sensitive land. Producers enrolled in CRP plant long-term, resource-conserving covers to improve water quality, control soil erosion, and enhance wildlife habitat.	Farmers receive an annual rental payment for the term of the multi-year contract. Cost sharing is provided.	10-15 year rental programs with 1:1 cost-share in establishing approved conservation practices.	private landowners

POTENTIAL FUNDING SOURCES IN BCR 29

Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
Grassland Reserve Program (GRP)	Natural Resources Conservation Service (NRCS)	Voluntary program offering landowners the opportunity to protect, restore, and enhance grasslands, rangeland, pastureland, and shrubland on their property while maintaining the areas as grazing lands. The program emphasizes support for working grazing operations; enhancement of plant and animal biodiversity; and protection of grassland and land containing shrubs and forbs under threat of conversion to cropping, urban development, and other activities that threaten grassland resources.	\$254 million in program funding for fiscal years 2002 through 2007, with 2-million-acre statutory enrollment cap.	variable cost-sharing for restoration, or 10-30 yr rental contract, or 30-yr or permanent easement	private landowners (with at least 40 contiguous acres)
Environmental Quality Incentives Program (EQIP)	NRCS	Voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land. Includes promotion of <i>at-risk species</i> habitat conservation.	not specified	1-10 yr incentive payment and cost-share (75-90%) contracts	private landowners
Wetlands Reserve Program (WRP) and Wetland Reserve Enhancement Program (WREP)	NRCS	WRP - Voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. Enrolled lands are mostly agricultural lands located in high-risk flood prone areas and restored to wetlands. The type of wetlands being restored varies from floodplain forest, to prairie potholes, to coastal marshes. WREP - allows NRCS to form partnerships to improve or expand the delivery of WRP, including, but not limited to, <i>easement acquisition</i> and activities associated with wetland restoration, creation, or enhancement. WREP projects should address wetland	WRP - funding for total of 2,275,000 acres (250,000 acres annually) WREP - \$9.5 mil available in FY06	WRP - 10-yr cost-share (1:1), 30-yr easement, permanent easement WREP - partner contribution to tech assistance costs	private landowners

POTENTIAL FUNDING SOURCES IN BCR 29

Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
		creation and enhancement efforts on easements enrolled in prior years; partners should contribute significantly to WRP technical assistance costs; and provide assistance with managing easement projects.			
Wildlife Habitat Incentives Program (WHIP)	NRCS	Voluntary program for people who want to develop and improve <i>wildlife habitat</i> primarily on private land. Includes upland, wetland, riparian, and aquatic habitat areas.	not specified	5-10 yr cost-share (1:3) agreements, greater cost-share for 15+ yr agreements	private landowners, Federal land when the primary benefit is on private or Tribal land; State and local government land on a limited basis; and Tribal land
Farm and Ranch Lands Protection Program (FRLP)	NRCS	Voluntary program that helps farmers and ranchers keep their land in agriculture. State, Tribal, and local governments and non-governmental organizations with farm/ranch protection programs acquire <i>conservation easements</i> from landowners. Participating landowners agree not to convert their land to non-agricultural uses and to develop and implement a conservation plan for any highly erodible land.	not specified	1:1	private landowners, through State, Tribal, or local government or nongovernmental organizations
Healthy Forests Reserve Program (HFRP)	NRCS	Voluntary program to restore and enhance forest ecosystems to: 1) promote the recovery of threatened and endangered species, 2) improve biodiversity; and 3) enhance carbon sequestration.	not specified	10-yr cost-share (1:1), 30-yr easement, 99-yr easement	private landowners
Forest Legacy Program (FLP)	USFS	Federal program in partnership with state forestry agencies designed to encourage the protection of privately owned forest lands through property acquisition and conservation easements. Funding based on Assessment of Need (AON) developed by the States. The AON is an implementation plan that demonstrates that the FLP will conserve important forest areas, evaluates characteristics, uses, and threats, describes specific forest legacy areas where the FLP will	In FY 2007, \$2.1mil for New River Corridor Project	1:3 (grantee match may come from private, state or local sources)	state agencies, local governments, land trusts, local organizations, and interested landowners

POTENTIAL FUNDING SOURCES IN BCR 29

Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
		be focused, and lays outlines program goals and eligibility criteria that guide the selection of forest tracts for conservation.			
Forest Stewardship Program (FSP)	USFS	Forest Stewardship Program (FSP) provides technical assistance, through State forestry agency partners, to nonindustrial private forest (NIPF) owners to encourage and enable active long-term forest management. A primary focus of the Program is the development of comprehensive, multi-resource management plans that provide landowners with the information they need to manage their forests for a variety of products and services.	Not specified but works in conjunction with EQIP		Must develop a Forest Stewardship Plan
Forestland Enhancement Program (FLEP)	USFS	Federal program in partnership with state forestry agencies for implementation of state-approved forestry practices, including forest stewardship plan implementation, hardwood mgmt, invasive species control, wildlife habitat mgmt.. (pine mgmt. not included)	\$135k in 2005	1:3	private, non-industrial landowners
Migratory Bird Conservancy	The Migratory Bird Conservancy	The Migratory Bird Conservancy (MBC) is the only habitat conservation fund created and supported by birding businesses and their customers, and contributes to the goals and objectives of Partners in Flight. NFWF makes awards primarily of federal funds in support of bird habitat conservation projects that directly address conservation of priority bird habitats in the Western Hemisphere. Acquisition, restoration, and improved management of habitats are program priorities. Education, research, and monitoring will be considered only as components of actual habitat conservation projects.	Approximately \$100,000 is available each grant cycle. The average award to date has been about \$40,000, with a range of \$20,000 to \$70,000. Competition is stiff. In 2003, about 10% of pre-proposals that were submitted were ultimately funded.	minimum 1:1 with cash or tangible in-kind contributions	not specified, but past grantees have included USFWS and state natural resource agencies
Natural	National	Supports high quality projects that engage private landowners, primarily farmers and	grants range from \$10,000-\$150,000	2:1 (includes cash and in-kind)	state and local governments, education institutions, and

POTENTIAL FUNDING SOURCES IN BCR 29

Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
Resources Conservation Service: Private Landowner Assistance Program	Fish and Wildlife Foundation and NRCS	ranchers, in the conservation and enhancement of fish and wildlife and natural resources on their lands. A new focus added for this year's program is on grassland nesting birds, particularly sage grouse, and their associated habitats.			nonprofit organizations
State Wildlife Grants (SWG)	USFWS	The SWG program is designed to assist States by providing federal funds for the development and implementation of programs that benefit wildlife and their habitat, including species that are not hunted or fished. Both planning and implementation of programs are permitted.	The bill directs the apportionment of funds on a formula basis based on land area (1/3) and population (2/3). No State may receive more than 5 percent or less than 1 percent of the available funds.	For planning-related grant activities, the States must provide a minimum 25 percent match and a 50 percent minimum match for all other types of eligible activities.	state fish and wildlife agencies
Landowner Incentive Program (LIP)	USFWS	LIP (nontribal portion) is designed to assist States by providing grants to establish or supplement landowner incentive programs that protect, restore or manage habitats on private lands, to benefit Federally listed, proposed or candidate species or other species determined to be at-risk, and provide technical and financial assistance to private landowners for habitat protection and restoration.	FY 06 est \$34,920,000 - average for Tier 2 grants is \$1,170,000 (\$165,000 to \$1,750,000); average for Tier 1 grants is \$180,000. No State may receive more than 5% of the total amount available to the States.	1:3	For the nontribal portion, only State agencies with primary responsibility for fish and wildlife may submit proposals. Other agencies, organizations or individuals may partner with or serve as a subgrantee of that fish and wildlife agency.
Neotropical Migratory Bird Conservation Fund	USFWS	Since FY02, funds projects in the US, Latin America, and the Caribbean that promote the conservation of Neotropical migrant birds. The Act's purposes are to: perpetuate healthy populations of Neotropical migratory birds, assist in the conservation of these birds by supporting conservation initiatives, and provide financial resources and foster international cooperation for those initiatives. Projects run	The Act authorizes \$5 million, and Congress appropriated \$4 million in Fiscal Year 2005. At a minimum, 75 percent of this money will be available for projects	3:1 (re-authorization in 2006 may reduce match burden on grantee - targeting 1:1 match)	Any U.S., Latin American, or Caribbean individual, corporation, government agency, trust, association, or other private entity can apply for funding.

POTENTIAL FUNDING SOURCES IN BCR 29

Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
		the gamut from research, monitoring, land acquisition, law enforcement, education and outreach.	in Latin America and The Caribbean.		
Partners for Fish and Wildlife (PFW)	USFWS	Provides technical and financial assistance to private landowners who want to restore or improve habitat on their property through cooperative agreements - does not fund planning and research.	FY 05 est \$25.5 mil - avg = \$5400 (\$200 to \$25,000)	1:1 (including cash/in-kind match)	private landowners, tribes, local governments
Private Stewardship Grants	USFWS	Provides grants and other assistance on a competitive basis to individuals and groups engaged in local, private, and voluntary conservation efforts that benefit federally listed, proposed, or candidate species, or other at-risk species. Eligible projects include those by landowners and their partners who need technical and financial assistance to improve habitat or implement other activities on private lands. The PSGP supports on-the-ground conservation actions as opposed to, for example, education and outreach, planning, or research activities, and we will not fund the acquisition of real property either through fee title or easements.	FY 06 est \$6,500,000	10% match of cash or through in-kind contributions is required.	Private landowners and their partners (ex. land conservancies, community organizations, or conservation organizations working with private landowners on conservation efforts are also encouraged to submit project proposals provided they identify specific private landowners who have confirmed their intent to participate on the project or provide other evidence in the project proposal to demonstrate landowner participation will occur).
The North American Wetlands Conservation Act (NAWCA) Small Grants	USFWS	All wetland conservation proposals that meet the requirements of the Act will be accepted. However, funding priority will be given to projects from new grant applicants (individuals or organizations who have never received a NAWCA grant) with new partners, where the project ensures long-term conservation benefits. This does not preclude former NAWCA grant recipients from receiving Small Grants funding.	FY 06 est \$2,000,000 - to be considered for funding in 2006, proposals must have a grant request no greater than \$50,000.	1:1	Available to private or public organizations or to individuals who have developed partnerships to carry out wetlands conservation projects in the U.S., Canada, and Mexico.
National Coastal Wetlands	USFWS	Provides funds for wetlands conservation projects in North America. Funds may be used for acquisition, restoration, enhancement,	FY 13 est Approximately \$13M to \$17M is available	Usually 25% by applicant	States must be the applicant, however, funds can be provided to subgrantees, ie.

POTENTIAL FUNDING SOURCES IN BCR 29

Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
Grants		management, and preservation of coastal wetlands. Most applicable to New Jersey, Delaware, Maryland, and Pennsylvania.	annually		NGOs, federal agencies.
Urban Treaty for Migratory Bird Conservation	USFWS	To support a partnership agreement between the Service and a U.S. city to help conserve birds. The focus areas are Habitat Creation, Protection, and Restoration; Education and Outreach; Hazard(s) Reduction; and Non-native, Invasive, or Nuisance Animal and Plant Species Management. Each city will work with the Service to develop a customized action plan that specifies goals and objectives in the four focus areas.	currently unavailable; grants from \$10,000 to \$150,000	1:1	municipalities; The Treaty cities are selected based on the intent of their proposal and for their commitment to provide habitat for wildlife, particularly migratory birds. Other criteria are a city's location along a major migratory flyway, and its proximity to Service personnel who are able to provide technical assistance and guidance in achieving the Treaty activities.
General Matching Grants Program	National Fish and Wildlife Foundation	Matching grants are awarded to projects that: address priority actions promoting fish and wildlife conservation and the habitats on which they depend; work proactively to involve other conservation and community interests; leverage available funding; and evaluate project outcomes. Does not include basic research.	Grants typically range from \$25,000-\$250,000, based upon need.	minimum 2:1	federal, tribal, state, and local governments, educational institutions, and non-profit conservation organizations
State Comprehensive Wildlife Conservation Support Program	National Fish and Wildlife Foundation and Doris Duke Charitable Foundation	Funding for projects that involve collaboration and strategic coordination for the development and implementation of regional (multi-state) and national conservation approaches based on State Comprehensive Wildlife Conservation Strategies (SCWCs). The State Comprehensive Wildlife Conservation Support Program is a three-year grant program that was developed to support: 1) Enhancement of the SCWCs, through strategic regional and national coordination and implementation; 2) A national communication strategy via the development of a comprehensive National Report of SCWCs; and 3) collaborative implementation of conservation actions as	Not to exceed \$100,000. Projects may not to exceed 18 months in duration, with preference given to projects that do not exceed 12 months (note – project time span is initiated at execution of grant agreement).	not required, but recipients encouraged to voluntarily provide and identify in-kind matching support	Any state fish and wildlife agency (in partnership with at least one other state fish and wildlife agency), IAFWA, SAFWA, NAFWA, etc.

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Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
		<p>identified by the state strategies and national report, via coordinated and collaborative multi-state data management and synchronization, action plan development, execution of conservation activities, and monitoring of outcomes. Projects must involve the coordination of conservation objectives/actions among at least two states, and should address priorities identified by at least two SCWCSs.</p>			
<p align="center">Five-Star Restoration Grants</p>	<p align="center">National Fish and Wildlife Foundation and others</p>	<p>The Five-Star Restoration Program provides modest financial assistance on a competitive basis to support community-based wetland, riparian, and coastal habitat restoration projects that build diverse partnerships and foster local natural resource stewardship through education, outreach and training activities. Projects must include a strong on-the-ground wetland, riparian, or coastal habitat restoration component and should also include training, education, outreach, monitoring, and community stewardship components. Projects involving only research, monitoring, or planning are not eligible for funding.</p>	<p>Awards are between \$5,000 and \$20,000; the average grant is \$10,000</p>	<p align="center">yes, but ratio not specified</p>	<p>Must involve diverse partnerships of ideally 5 organizations that contribute funding, land, technical assistance, workforce support, and/or other in-kind services. Partners may include: schools or youth organizations; local or tribal governments; universities and local cooperative extension districts; local businesses or corporations; conservation organizations or local citizens groups; state and federal resource management agencies; and foundations or other funders. State and federal partnerships are encouraged, but they are not eligible to serve as the grantee.</p>
<p align="center">Species Recovery Fund Grants</p>	<p align="center">National Wildlife Federation</p>		<p align="center">between \$3,000 and \$7,000</p>	<p align="center">not specified</p>	<p align="center">presumably non-profits</p>

POTENTIAL FUNDING SOURCES IN BCR 29

Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
		Each spring, the National Wildlife Federation awards grants to local organizations using innovative, community-based means to directly improve on-the-ground conditions for imperiled species.			
National Park Service Challenge Cost Share	NPS	Increase participation by qualified partners in the preservation and improvement of National Park Service natural, cultural, and recreational resources; in all authorized Service programs and activities; and on national trails. NPS and partners should work together on projects with mutually beneficial, shared outcomes.	\$30,000 max award	1:1 (including non-federal in-kind match)	State and local agencies, non-profit organizations, communities, educational institutions, corporations, and individuals.
Wildlife Grants Program	Sierra Club Foundation	The mission of The Sierra Club Foundation is to advance the preservation and protection of the natural environment by empowering the citizenry, especially democratically based grassroots organizations, with charitable resources to further the cause of environmental protection. Funds for the Wildlife Grants Program are supported by the following two funds at The Foundation: Avery Wildlife Fund - Grants for local projects to preserve, protect, and educate about wildlife; and Schroeder Wildlife Fund: Grants to support wildlife efforts that represent "grassroots" endeavors. Special consideration given to projects that focus on birds.	In the 2004 grant cycle, awards ranged from \$500 to \$5,000.	n/a	presumably non-profits
Endangered Species Grants - Habitat Conservation Planning (HCP) Assistance Grants	USFWS	Provides financial assistance to States and Territories to support the development of HCPs that provide for the conservation of imperiled species while allowing economic activities to proceed. Can include animal, plant, and habitat surveys; research; planning; monitoring; habitat protection, restoration, management, and acquisition; and public education. National competition.	collectively, Endangered Species Grants FY 06 est \$80 mil; range \$1,000 to \$14,362,500	75% for single State or Territory; 90% for 2 or more States or Territories implementing a joint project	restricted to those State fish and wildlife agencies with which the USFWS has a current cooperative agreement for the species involved.

POTENTIAL FUNDING SOURCES IN BCR 29

Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
Endangered Species Grants - Implementation of Conservation Project Grants	USFWS	Provides financial assistance to States and Territories to assist in the development of programs for the conservation of endangered and threatened species. Can include animal, plant, and habitat surveys; research; planning; monitoring; habitat protection, restoration, management, and acquisition; and public education. Formula.	collectively, Endangered Species Grants FY 06 est \$80 mil; range \$1,000 to \$14,362,500	75% for single State or Territory; 90% for 2 or more States or Territories implementing a joint project	restricted to those State fish and wildlife agencies with which the USFWS has a current cooperative agreement for the species involved.
Endangered Species Grants - Recovery Land Acquisition	USFWS	Provides financial assistance to States and Territories to acquire habitat for endangered and threatened species. Acquisition of habitat to secure long term protection is often an essential element of a comprehensive recovery effort for a listed species. Can include animal, plant, and habitat surveys; research; planning; monitoring; habitat protection, restoration, management, and acquisition; and public education. Regional competition.	collectively, Endangered Species Grants FY 06 est \$80 mil; range \$1,000 to \$14,362,500	75% for single State or Territory; 90% for 2 or more States or Territories implementing a joint project	restricted to those State fish and wildlife agencies with which the USFWS has a current cooperative agreement for the species involved.
Multistate Conservation Grants	USFWS	To support sport fish and wildlife restoration projects identified by the International Association of Fish and Wildlife Agencies (IAFWA). Sport Fish and Wildlife Restoration funds may be used for sport fisheries and wildlife research projects, boating access development, hunter safety, aquatic education, habitat improvements, and other projects consistent with the purposes of the enabling legislation. Projects must benefit at least 26 States, or a majority of the States in a region of the USFWS, or a regional association of State fish and game departments. Beginning in 2005, IAFWA identifies National Conservation Needs (NCN) annually and solicits grant proposals that address all, or a portion of, a NCN.	FY 06 est \$6,000,000 - average \$140,000 (\$25,000 to \$500,000)	no match required	States, groups of States, USFWS (for National Survey of Fishing, Hunting, and Wildlife- Associated Recreation only), non-governmental organizations.
National Wildlife Refuge	USFWS	Encourage partnerships between USFWS and nonfederal entities through projects which	FY 05 est \$12,000,000 -	1:1 (including non-federal in-kind match)	individuals, public and quasi-public

POTENTIAL FUNDING SOURCES IN BCR 29

Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
<p>System's Challenge Cost Share</p>		<p>conserve, protect, and enhance fish, wildlife, and plants. Funds may be used for approved Challenge Cost Share projects. Encourages the use of Challenge Cost Share agreements to complete projects on and off Service lands.</p>	<p>average \$7,800 (\$300 to \$25,000).</p>		<p>institutions/organizations, specialized group, small business, profit organization, native American, Federal, Interstate, Intrastate, State, Local, Sponsored organization, U.S. territory, or any organization with interests which support the mission of the Service.</p>
<p>Wildlife Without Borders - Latin America And The Caribbean</p>	<p align="center">USFWS</p>	<p>To address the management of fish, plant, and wildlife resources in the Western Hemisphere. Of particular interest are projects that strengthen the capacity of Latin American and Caribbean countries to conserve and use sustainably their biological resources, contribute to the integration of environmental concerns with sustained development processes, and result in specific and measurable on-the-ground management actions in agreement with the Western Hemisphere Convention, 1940. Project work should be conducted in Latin America and must address one or more of the following: academic and technical training in the conservation and management of biological resources; training in management of nature reserves and other protected areas; applied research and monitoring in support of natural resource management activities; community-level conservation education; technology transfer and information exchange; and the promotion of networks, partnerships and coalitions that assist in the implementation of conventions, treaties, protocols and other international activities for the conservation and management of biological resources. If project work is to be conducted in the US the proposal should show a clear international component to be eligible for funding.</p>	<p>FY 05 est \$472,000 - FY 03 average = \$27,000 (\$5,000 to 50,000)</p>	<p>Applicants and/or other project partners must contribute funds to the project, which may include cash or in-kind contributions.</p>	<p>Federal, State and local governments, nonprofit, non-governmental organizations; and public and private institutions of higher education</p>

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Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
Wilderness Stewardship Challenge	National Forest Foundation	In celebration of the 40th anniversary of The Wilderness Act, the USDA Forest Service issued a Wilderness Stewardship Challenge, calling for all Wilderness Areas in the National Forest System to be managed to standard within the next decade. The NFF, as the official nonprofit partner of the Forest Service, will increase the resources available to meet this challenge by providing grants to implement projects that implement on-the-ground ecosystem restoration-related work in Forest Service Wilderness Areas.	up to \$50,000	minimum 1:1	Non-governmental, nonprofit organizations only. Applications cannot be accepted from federal agencies, regional, state or local governmental entities.
Matching Awards Program (MAP)	National Forest Foundation	A common thread connecting NFF's four program areas – community-based forestry, watershed health & restoration, wildlife habitat improvement, and recreation – is an interest in action-oriented projects that enhance the viability of natural resources while considering benefits to, and the involvement of, surrounding communities. During the 2006 MAP, the NFF will concentrate its efforts in five geographic focus areas: Southern Appalachians (TN, NC, SC, GA), Oregon Coast and Central Cascades, the Selway-Bitterroot (MT, ID), Central Colorado Rockies, and Central Sierra (CA). For the 2006 MAP, approximately 80 percent of available funds will be allocated to projects within the five current geographic priority areas, and the remaining 20 percent is available for projects outside these areas.	Over \$2.6 million in matching funds is available in 2006, with past awards ranging from \$500 to over \$100,000 (most awards in the \$20,000-\$40,000 range)	minimum 1:1 non-federal cash match. In-kind contributions may be noted to show leverage for a project, but cannot be matched by NFF funds. Projects must be completed within a year from project award date.	The NFF will accept applications from non-governmental, nonprofit 501(c)(3) organizations working on or adjacent to National Forests and Grasslands.
Conservation Security Program (CSP)	NRCS	Voluntary conservation program that supports ongoing stewardship of private agricultural lands by providing payments for maintaining and enhancing natural resources. CSP identifies and rewards those farmers and ranchers who are already meeting the highest standards of conservation and environmental management on their operations. <i>Wildlife habitat</i> needs are addressed through the enhancement provisions of the program.	For FY-2005, congress has provided \$202 million; over the next seven years the administration is committing \$13.4 billion in funding	5-10 year contracts, maximum \$20,000-45,000 annually	private landowners in annually specified watersheds; for 2006, Great Wicomico-Piankatank watershed in eastern Virginia, and the North Fork Shenandoah watershed in north-western Virginia

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Grant	Granting Entity	Description	Funding	Match (grantee/ grantor)	Applicant Eligibility
National Wildlife Refuge Friends Group Grant Program	National Fish and Wildlife Foundation	Include Start-up Grants to provide formative and/or initial operational support, Capacity Building Grants to strengthen the capacity of existing refuge Friends organizations to enable them to be more effective, and Project Specific Grants, which may include developing outreach and conservation education programs for private landowners, habitat restoration projects, watchable wildlife programs, etc.	grants range from \$1,500 - \$5,000	none required	non-profit organizations interested in assisting a National Wildlife Refuge or group of refuges
Acres for America	National Fish and Wildlife Foundation	Acres for America is a partnership between Wal-Mart Stores, Inc. and NFWF to provide funding for projects that conserve important habitat for fish, wildlife, and plants through acquisition of interest in real property. The goal of the Acres for America program is to offset the footprint of Wal-Mart's domestic facilities on at least an acre by acre basis through these acquisitions. Preference will be given to acquisitions that are part of published conservation plans (North American Waterfowl Management Plan, Partners in Flight, etc.), draft State Conservation Strategies, or ESA Recovery Plans.	Approximately \$3.1 million will be available annually for 10 years for conservation investments.	All grant awards require a minimum 1:1 match of cash or contributed goods and services. Federal funds may be considered as match. Higher ratios of matching funds will at times aid in making applications more competitive.	not specified

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APPENDIX A

PIEDMONT WORKSHOP SUMMARIES OCTOBER AND DECEMBER 2012

Workshop 1: Southern Piedmont, Raleigh, NC, October 26, 2012

Objectives: A workshop to discuss the status, development, and future of Piedmont Bird Conservation Region (BCR 29) planning was conducted on October 26, 2012 at the North Carolina Museum of Natural Sciences in Raleigh, NC. The purposes of the workshop were to 1) discuss the status and assessment of the draft plan, 2) identify, clarify, and discuss any objections or additions to the plan, 3) discuss any changes needed in the priority bird list, 4) identify any informational gaps in the plan and how to resolve these gaps, 5) discuss the priority habitat assessment, 6) discuss populations and habitat objectives, 6) identify high priority focus areas on maps, and 7) identify and discuss high priority implementation actions and obtain agency/organizational commitments from partners.

Results: The meeting place and logistical necessities were coordinated with and provided by John Gerwin of the North Carolina Museum of Natural Sciences. Meeting notes were taken by Brian O'Shea, assistant to John Gerwin.

A total of 20 persons attended the workshop (including this contractor and two Atlantic Coast Joint Venture (ACJV) staff). Present were representatives from the natural resource departments from the states of Georgia, South Carolina, North Carolina, and Virginia, various offices of the US Fish and Wildlife Service, Audubon North Carolina, Wildlife Management Institute, American Bird Conservancy, North Carolina Museum of Natural Sciences, Catawba College, and the National Wild Turkey Federation.

A brief update of the Piedmont Bird Conservation planning effort was provided by several key partners followed by a presentation by Craig Watson (ACJV) regarding Piedmont Bird Conservation planning history, status, and future.

The group then discussed some general ideas and concepts that are in the draft plan and how to better address needs of both birds and the managers who will effectively be responsible for making changes to address long-term conservation needs of Piedmont birds. Emphasis was placed on who the audience of the "plan" was and how to best distribute the information to the audience. In general, the audience of the "plan" is us, the managers, but the implementation interface between the managers and the primary

landowners, private landowners, was soon seen as a large but necessary gap to close. There were many ideas discussed during this time, but no one seemed to have any real issue with omissions or additions to the plan per se.

Following these discussions, a lengthy exercise followed that many felt was necessary: the revision of the draft priority bird list. This activity took some time, but most felt it was a worthwhile exercise and now reflects more accurate priority bird list, at least in the southern Piedmont.

This discussion ended, lunch ensued, and after break a discussion on habitat classifications was conducted. The primary reason this occurred is that the approach taken in this plan in regards to habitat classification will be different from previous classifications. This current effort will use aggregate NatureServe's ecological community data to establish a more refined habitat classification and better on the ground mapping product. Kirsten Luke (American Bird Conservancy, ACJV) described the many different types of ecological communities in the Piedmont and how they have been aggregated into a classification scheme with which planners can identify bird species. The group did not have much discussion on this concept and agreed this would be a good approach. The maps produced by Kirsten for the map exercise were based on these ecological community aggregates.

The group then spent the next hour or more actually drawing polygons on maps where priority conservation areas need to be targeted for birds in the Piedmont. This resulted in some excellent but incomplete maps. Kirsten Luke will be digitizing the workshop maps and resending them to state representatives for completion. This exercise also resulted in a revised map exercise process for the northern Piedmont.

Following this exercise was a discussion on what kind of commitment each partner or her/his agency would make in this Piedmont implementation process. There was a lot of discussion on this matter and several commitments were made.

Workshop 2: Northern Piedmont, Middle Creek Wildlife Management Area Visitor Center, Steven, PA, December 13, 2012

This workshop was scheduled for Thursday November 1, 2012 but was postponed due to the passage of Hurricane/Superstorm Sandy.

An attempt was made to reschedule the workshop for Wednesday November 14, 2012 but only 8 participants could be attracted to this workshop. ACJV staff decided to

postpone this workshop in hopes of attracting a larger participation. The workshop was rescheduled for December 13, 2012.

Objectives: A workshop to discuss the status, development, and future of Piedmont Bird Conservation Region (BCR 29) planning was conducted on December 13, 2012 at the Middle Creek Wildlife Management Area Visitor Center near Steven, Pennsylvania. The purposes of the workshop were to 1) discuss the status and assessment of the draft plan, 2) identify, clarify, and discuss any objections or additions to the plan, 3) discuss any changes needed in the priority bird list, 4) identify any informational gaps in the plan and how to resolve these gaps, 5) discuss the priority habitat assessment, 6) discuss populations and habitat objectives, 6) identify high priority focus areas on maps, and 7) identify and discuss high priority implementation actions and obtain agency/organizational commitments from partners.

Results: The meeting place and logistical necessities were coordinated with and provided by James Binder and Daniel Brauning of the Pennsylvania Game Commission. Meeting notes were taken Cathy Haffner and Daniel Brauning of the Pennsylvania Game Commission.

A total of 14 persons attended the workshop (including this contractor and the Science Coordinator of the Atlantic Coast Joint Venture (ACJV)). Present were representatives from the natural resource departments from the states of Pennsylvania and Maryland, Wildlife Management Institute, Ducks Unlimited, US Fish and Wildlife Service, and Pennsylvania Audubon.

A brief update of the Piedmont Bird Conservation planning effort was provided by several key partners followed by a presentation by Tim Jones (ACJV) regarding Piedmont Bird Conservation planning history, status, and future.

The group then discussed some general ideas and concepts that are in the draft plan and how to better address needs of both birds and the managers who will effectively be responsible for making changes to address long-term conservation needs of Piedmont birds. The group felt that there needed to be a more defined temporal framework for this plan, particularly since DSL will be incorporated when available and may modify objectives. The group also wanted short-term goals to work on. Additionally, the group suggested and expanded discussion on threats and a refined structure for goals. The groups suggested a framework that would identify and measure 1) Goals: Objectives: Strategies.

Following these discussions a review and revision of the draft priority bird list occurred and resulted in many suggested changes to the list. Tim Jones stated that the ACJV

did not want to arbitrarily change the priority of birds or remove or add birds to the list without adequate justification. Tim stated he would obtain the latest PIF Assessments to determine if any of the suggested changes are appropriate. Until that time, a draft priority bird list is available and reflects changes suggested by both southern and northern partners.

This discussion ended, lunch ensued, and after break a discussion on habitat classifications was conducted by Tim Jones. The primary reason this occurred is that the approach taken in this plan in regards to habitat classification will be different from previous classifications. This current effort will use aggregate NatureServe's ecological community data to establish a more refined habitat classification and better on the ground mapping product. The group did not have much discussion on this concept but agreed this would be a good approach and were excited to be advancing conservation on improved habitat mapping. The maps produced by Kirsten Luke (ACJV/ABC GIS Specialist) for the map exercise were based on these ecological community aggregates.

The group then spent the next hour or more actually drawing polygons on maps where priority conservation areas need to be targeted for birds in the Piedmont. This resulted in some excellent maps. Kirsten Luke will be digitizing the workshop maps for inclusion into the final Piedmont BCR Implementation Plan.

Following this exercise was a discussion on what kind of commitment each partner or her/his agency would make in this Piedmont implementation process. There was a lot of discussion on this matter and several commitments were made.

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