APPALACHIAN MOUNTAINS JOINT VENTURE

Implementation Plan for the Appalachian Mountains Joint Venture:

A Foundation for All-Bird Conservation in the Region

A fall morning overlooking Dolly Sods Wilderness within the Monongahela National Forest, West Virginia. Photo: Gavin G. Shire

Management Board Endorsement

May 2008

APPALACHIAN MOUNTAINS JOINT VENTURE

We, the Management Board of the Appalachian Mountains Joint Venture, endorse the vision and mission developed by our partnership. Therefore, we are committed to advance the conservation framework articulated in this Implementation Plan and subsequent strategic plans.

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David Whitehurst, Chairman
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Karen Alexy /s/
Karen Alexy
KY Dept. of Fish & Wildlife Resources

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Appalachian Mountains Joint Venture

Vision and Mission Statements

Vision: Partners working together for conservation of native bird species in the Appalachian Mountains region will attain:

- well-managed, fully-functioning ecosystems with sustainable populations of the region's native avifauna, guided by state, regional, national, and international bird plans;
- collaborative and effective delivery of habitat conservation through adaptive management, and guided by an iterative conservation approach consisting of biological planning, conservation design, delivery of conservation actions, evaluation, and research;
- success in capitalizing on funding opportunities relevant to partnership priorities;
- Joint Venture status as described in 721 FW 6 (USFWS policy on Joint Ventures), with associated USFWS financial support for basic program infrastructure; and,
- an engaged Management Board, representative of the diverse landscape and effective partnerships in the Appalachian Mountains.

Mission: To restore and sustain viable populations of native birds and their habitats in the Appalachian Mountains Joint Venture through effective, collaborative partnerships.

Approved by Management Board: 24 October 2007

Last Revised: 24 October 2007

Executive Summary

The Appalachian Mountains Joint Venture (AMJV) is a self-directed partnership of public, private, and non-profit entities, organized to advance the conservation (protection, restoration, and enhancement) of priority bird populations and their habitats throughout the Appalachian Mountains Bird Conservation Region (AMBCR). The over-arching objective of the AMJV is to ensure the sustainability of native bird populations through strategic conservation of habitats (and overall ecosystem functionality) upon which they rely. The AMJV partnership has committed their support to achieve the goals and vision of the North American Bird Conservation Initiative (NABCI), and the conservation objectives established in the North American Waterfowl Management Plan, the Partners in Flight North American Landbird Conservation Plan, the U.S. Shorebird Conservation Plan, the Waterbird Conservation for the Americas plan, the American Woodcock Conservation Plan, the Northern Bobwhite Conservation Initiative, the Ruffed Grouse Conservation Plan, and bird conservation objectives identified in Wildlife Action Plans of partner states. In order to efficiently and effectively support these initiatives, the AMJV will establish its priorities and objectives based on (1) factors that limit native bird populations in the Appalachian Mountains and (2) opportunities to overcome those factors for priority species that represent the suite of habitats in the AMJV. Additionally, the AMJV partnership will align its structure and priorities to best accommodate the specific needs of its partner organizations and the broader regional conservation community.

In 2003, conservation stakeholders in the Appalachian region initiated the AMBCR partnership under the guidance and support of the Atlantic Coast Joint Venture (ACJV) and Region 4 of the U.S. Fish and Wildlife Service (USFWS). Interested parties organized a Steering Committee to help guide the early stages of the partnership. The notion soon emerged that the AMBCR (i.e., BCR 28) partnership should strive to develop its own capacity to effectively deliver scientifically-based bird conservation for native bird species at the landscape scale. Therefore, in 2006, the Steering Committee for the BCR 28 partnership initiated actions that would better position the partnership for recognition as a Joint Venture. The Coordinator, with partner guidance and technical input, began work to fulfill the requirements outlined in 721 FW 6 (USFWS policy on Joint Ventures). In May 2007, the BCR 28 Steering Committee unanimously agreed to pursue Joint Venture status, while continuing to collaborate with the ACJV's staff and Management Board on administrative and technical issues of mutual interest. This Implementation Plan articulates our administrative and organizational framework, and our strategic approach to conservation in the AMBCR, as agreed upon by the AMJV Management Board, Technical Committee, and partner organizations. Additionally, this plan outlines several products that have resulted from our biological planning and conservation design activities to-date. These products include: identification of our priority habitats and avian communities, our approaches to identify focal species and establish population objectives, preliminary analyses of areas of importance outside the AMBCR, and spatially-explicit bird habitat conservation areas (BHCA) based on generalized habitat and population data, as well as expert opinions.

Prairie warbler. Photo: USFWS

The AMJV partnership will conduct conservation planning at the AMBCR scale, an ecologically-based boundary containing similar ecological communities and challenges across the region. Stakeholders in our conservation partnership will focus their collective energies and resources on the AMBCR, an area encompassing approximately 102.9 million acres

Wood thrush. Photo: USFWS

and generally corresponding to BCR 28 boundaries recognized by NABCI. The proposed AMJV administrative boundary encompasses portions of 11 states (Alabama, Georgia, Tennessee, North Carolina, Kentucky, Virginia, Maryland, Pennsylvania, Ohio, New York, and New Jersey) and the entire state of West Virginia. Currently, the Coordinator facilitates the collective efforts of the partnership, but we envision the need for additional staff to fill vital roles pursuant to our mission as our partnership matures. The efforts of the AMJV are guided by an iterative, landscape-level conservation approach consisting of biological planning, conservation design, delivery of conservation actions, evaluation, and research.

The AMJV partnership has focused initially on building a sound biological foundation, which will serve as a basis for subsequent planning, design, and delivery of bird conservation in the region. With a strong foundation in place, AMJV partners will establish spatially-explicit habitat objectives derived from biological planning and conservation design in order to prioritize conservation actions to achieve state, regional, national, and international conservation objectives. The AMJV partnership can then integrate results from planning and design efforts into conservation delivery programs, which also will help partners prioritize delivery of on-the-ground habitat projects. Additionally, AMJV partners (working individually and collectively) can disseminate planning tools and products to a wider audience (e.g., county planning commissions) to influence land-use decisions on private lands. Ideally, our collective and individual efforts will increase the availability of, improve the condition of, and help strategically configure habitats to efficiently and effectively achieve desired population responses. Therefore, we must evaluate our conservation successes by monitoring responses of bird populations, while also monitoring habitat gains and losses (in both habitat quantity and quality).

This plan, developed and endorsed by the AMJV partnership, conveys the AMJV's initial efforts to establish a strategic conservation framework upon which our bird conservation efforts will be based. Adhering to this framework will allow the AMJV partnership to positively influence priority bird populations and assume a prominent role in regional bird conservation efforts. It must be noted that, as our partnership matures and technological abilities improve, our partnership will review (and revise if appropriate) our conservation framework and biological foundation. Although this Implementation Plan is a foundation for organizational and programmatic growth for the AMJV, we must continually be cognizant of our mission and adapt accordingly over time. The AMJV partnership realizes there are numerous challenges to accomplishing our mission; however, our biological foundation, organizational strengths, and collective interests have aligned us to strategically seek opportunities to advance conservation of priority bird populations in the Appalachian Mountains.

Whooping crane. Photo: USFWS

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Note: Please refer to the following citation and its associated supplements for all taxonomic classifications and scientific names of birds mentioned within this document:

American Ornithologists' Union. 1998. Check-list of North American Birds, 7th ed. American Ornithologists' Union, Washington, D.C. *http://www.aou.org/checklist/north/index.php*

Organization and Purpose of the Appalachian Mountains Joint Venture

Figure 1. The Appalachian Mountains Bird Conservation Region (BCR 28) as recognized by the U.S. NABCI Committee.

The Appalachian Mountains Joint Venture and the Implementation Plan

The Appalachian Mountains Joint Venture (AMJV) is a partnership that was founded to coordinate and implement all-bird conservation in the Appalachian Mountains Bird Conservation Region (AMBCR). The AMBCR (or BCR 28), as originally approved by the U.S. North American Bird Conservation Initiative (NABCI) Committee, is an area that stretches from northeastern Alabama to southern New York, covering portions of Tennessee, Kentucky, Ohio, Georgia, the Carolinas, Virginia, Maryland, Pennsylvania, New Jersey, Connecticut, Massachusetts, and all of West Virginia (Fig. 1). The AMJV partnership will take a lead role in all-bird conservation planning and action in a slightly modified BCR 28, guiding partners in an attempt to meet objectives established by national and international bird conservation initiatives. The AMJV partners, in accordance with our shared vision and mission statements, will use an adaptive management framework to guide landscape-level conservation efforts for native birds and their habitats regionally, nationally (i.e., important migration stopover areas), and internationally (i.e., migration and overwintering areas). Our landscape-level conservation framework will resemble other adaptive management frameworks that are used to inform conservation decisions, such as USFWS' recently-adopted 'Strategic Habitat Conservation' framework (SHC; Fig. 2). Operating under this adaptive framework, the AMJV accepts the responsibility of achieving all-bird conservation objectives identified in state, national, and international plans within an eco-regional context that offers unique challenges, opportunities, and threats to bird populations.

This Implementation Plan serves as a foundation for the AMJV's long-term vision for all-bird conservation within the JV planning area (discussed in *Administrative Boundaries of the AMJV*). Within this plan, we summarize the partnership's activities since its inception, identify our proposed administrative boundary and organizational structure, and identify immediate and longer-term priorities to be addressed. To effectively address NABCI's goal of delivering "the full spectrum of bird conservation through regionally-based, biologically-driven, landscape oriented partnerships," the

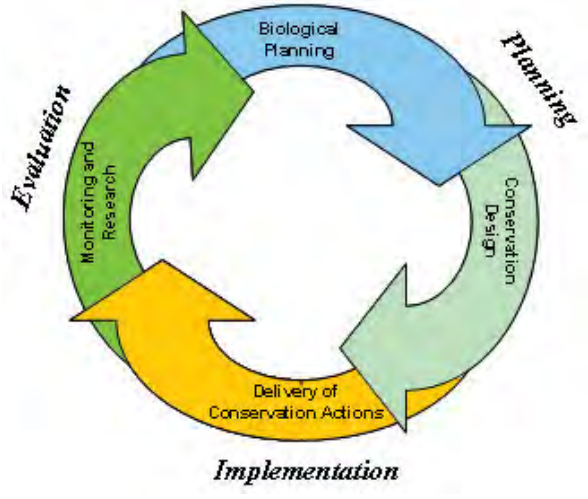

Figure 2. The elements of Strategic Habitat Conservation, an adaptive management framework for landscape-level conservation recently adopted by U.S. Fish & Wildlife Service (from NEAT 2006).

AMJV partnership must be grounded in science. In doing so, it will allow the AMJV to target those landscapes that exhibit the greatest potential for sustaining or enhancing viable bird populations. The AMJV vision and mission can only be accomplished through partnerships that (1) harness the collective energies and expertise of agencies, organizations, industries, and individuals dedicated to bird and habitat conservation, (2) help attain financial support for conservation activities, and (3) facilitate habitat improvement and protection programs. The AMJV Management Board and Technical Committees, through development of this Implementation Plan and subsequent strategic plans, will guide conservation within an eco-regional context and will provide "value-added" benefits that complement our conservation partners' ongoing efforts, and thus start to fulfill the AMJV vision and mission.

Ecology and Conservation in the Appalachian Mountains

The AMBCR's topography consists of tall mountains with long broad ridges, steep slopes, deep ravines, and wide intermountain valleys. The endless combinations of landform, elevation, and soils, along with the area's humid and temperate climate today, make the Appalachians one of the most biologically diverse areas in North America. The region supports a wide array of plant and animal species, including the highest diversity of salamanders in the world, productive forests with a tremendous diversity of tree and herbaceous species, and high densities of a diverse breeding bird assemblage. Repeated glaciation events, coupled with the complex topography, have contributed to the evolution of many species in high elevations (in the Southern Appalachians which were free from glacial ice) and isolated valleys. A third important factor was the role of frequent and often large-scale disturbances, ranging from the grazing of Pleistocene megafauna and more modern large herbivores (e.g., American bison [*Bison bison*] and elk [*Cervus elaphus*]), to natural disturbances (e.g., storms, fire). Collectively, these have helped create the high biological diversity of habitat conditions we see today in the Appalachian Mountains. This last factor also is problematic, in that it is difficult to define the role humans played in promoting disturbances pre-historically and how closely current disturbances mimic events that occurred over many centuries.

Six major forest types and 3 general forest habitat categories have been identified as important bird habitats in the Appalachian Mountains. Forest types include spruce-fir, high-elevation (including northern) hardwoods, hemlock-white pine, cove (mixed mesophytic) hardwoods, Appalachian oak hardwoods, and southern yellow pine forests; the general forest habitat categories include early successional habitats, lowland riparian woodlands, and urban/suburban "backyards"/rural woodlots. The largest expanses of grasslands today occur in agricultural settings or on reclaimed minelands, although remnants of woodland/savanna/glade/barren communities persist throughout the area. Several types of wetlands exist across the region; however, their size and net use by wetland-dependant birds (i.e., waterfowl, waterbirds, and shorebirds) pale in comparison to other BCRs in North America. Nonetheless, wetland systems within the AMBCR are very important components of the ecosystem and provide vital resources to the avian (and plant, wildlife) communities that rely on them.

Through physiographic bird conservation planning efforts organized by Partners in Flight (PIF; PIF Physiographic Plans), bird species that breed in the AMBCR have been scored according to the PIF Species Assessment Process and grouped into broad habitat suites associated with high-elevation forests, habitat conditions associated with frequently disturbed forests, mature forests of all types, grasslands, shrub/early successional communities, and wetlands/lakes. The PIF Species Assessment Process and habitat suites in the physiographic plans, as well as the scoring process used in the PIF North American Landbird Conservation Plan (Rich et al. 2004), served as a starting point for generating the AMJV priority species list. The PIF physiographic plans also described and suggested conservation opportunities and management recommendations for each of these habitat types. Specific landscape habitat recommendations listed in the PIF physiographic plans for the Appalachian Mountains include: (1) protecting and restoring imperiled high-elevation forests (especially spruce-fir) and table mountain/pitch pine forest communities, (2) increasing the amount of late successional northern hardwoods, hemlock-white pine, cove hardwoods, and southern yellow pine forests, (3) improving structural complexity for presently closed canopy, mid-successional stands in all forest types for understory and canopy dependent forest species, (4) protecting, restoring, and recovering sensitive mountain wetlands and bald communities, (5) increasing the amount of early successional, shrub-scrub habitat in high-elevation (again including northern) hardwoods, Appalachian oak, and southern yellow pine forests, and (6) improving the condition and increasing the amount of lowland riparian habitats.

For many species (and entire ecosystems) in the Appalachian Mountains, action must be taken soon to ensure their survival and recovery for future generations. For instance, at least 13 federally listed plants in the Appalachians, plus a growing number of other taxa under consideration for federal listing (including insects, reptiles, plants, and birds), are associated with disturbance-maintained ecosystems in the Appalachians (e.g.,

Carver's Gap on Roan Mountain in Tennessee. Photo: Scott Somershoe

open mountain wetlands, grassy hillsides, and open woodlands). Currently however, small relict populations of these rare organisms persist only in anthropogenic openings such as along roadways, right-of-ways, or trails. Coordinated planning and restoration efforts could benefit many of the listed species above, as well as improve habitat conditions for priority birds that rely on these ecosystems in the Appalachian Mountains.

Limiting Factors and Conservation Challenges

For this plan, a limiting factor is any threat or agent that likely will impede our ability to meet our population objectives for priority species by reversing declines or maintaining populations at current levels (i.e., will have a large effect on future population trends). In some cases, limiting factors may be identical or related to suspected causes for historical population declines. We assume that factors most limiting AMBCR bird populations can generally be placed in 3 over-arching categories that are applicable to breeding and non-breeding grounds: habitat quality, habitat quantity/distribution, and direct mortality. A limiting factor might be linked to multiple categories or to only one. For example, an outbreak of an avian disease may lead to direct mortality and limit populations, but transmission of the disease may not be linked to habitat quantity or quality. On the other hand, human-made structures may limit populations through direct mortality (i.e., collisions), or reduction in habitat quality (e.g., fragmentation of habitat) or quantity/distribution (e.g., removal of forest cover). Keeping these linkages in mind, we briefly discuss several large-scale issues surrounding factors that limit breeding bird populations in the Appalachian Mountains, recognizing that some factors limiting populations may lie outside AMJV boundaries and will require additional partnerships to address.

Several ecosystems within the AMBCR are still extant, and sometimes abundant, across the landscape, but their functionality is greatly reduced (habitat quality and quantity). Many of these ecosystems are disturbance-dependent, flourishing only after large-scale and sometimes frequent disturbances. Among the most important disturbance-dependent ecosystems in need of restoration are native mountain yellow pine, oak woodlands and savannas, serpentine barrens, and mountain bogs and fens that harbor high priority bird species and a great diversity of plants, turtles, and butterflies. Restoration of these ecosystems will require implementation and refinement of numerous

disturbance techniques that mimic natural disturbances, including, but not limited to, thinning of existing densely stocked stands, application of appropriate prescribed fire regimes, reforestation, and management/removal of exotic plants or pests. Human-created habitats (e.g., grasslands/shrublands on reclaimed mines, pasturelands) also are rather abundant throughout the AMBCR and often support priority species. Similar to the ecosystems mentioned above, most of these human-created habitats are in overall poor quality or are not optimally distributed throughout the region. Regardless of the system or habitat, biological planning, design, research, and monitoring must play important roles to target and refine appropriate management practices. This will ensure that AMJV partners incorporate results into future management prescriptions to continually increase our effectiveness.

Forests predominately occurring on north and east facing aspects, and on lower slopes, are at the other extreme in terms of disturbance frequency. These forest types include "High Peak" forests (spruce-fir-northern hardwood mixes of the Southern Blue Ridge and Allegheny Mountains), northern hardwoods, mixed mesophytic (cove) hardwoods, and hemlock-white pine-hardwood mixes. Disturbances in these forest types would be expected to be infrequent and usually very local in effect; however, these forests types support the largest and most commercially attractive trees, leading to severe alteration from pre-settlement conditions (habitat quality). Old-growth forest has been reduced to only a few small and widely scattered stands in the Appalachian Mountains (habitat quantity). However, exotic pests (e.g., Balsam wooly adelgid, *Adelges piceae*) and atmospheric contaminants pose serious threats to maintaining these ecosystems in perpetuity, as dominant tree species within old-growth stands are lost or greatly reduced in number (habitat quality and quantity). These factors and others (e.g., residential development, gas and mineral extraction) increase habitat fragmentation, and as landscapes become more fragmented, any benefits of edge habitat tend to disappear as nest predators and parasites (i.e., Brown-headed Cowbirds) increase in abundance (habitat quality and quantity). This threshold has been quantified in the Ozarks and other forested regions—reproductive success for forest birds is higher when ≥70% of the landscape is forested (as opposed to agricultural or developed lands; Robinson et al. 1995). Within the Appalachian Mountains, the Southern Blue Ridge as a whole has >70% of the land in forested habitat (some smaller-scale areas within the ecoregion have >90% forest cover). However, areas that fall below this threshold occur (e.g., around Asheville, NC and parts of northern GA) in the Southern Blue Ridge, and residential developments (difficult to detect via satellite imagery) also underlie 'contiguous' forest canopy in many areas, thereby influencing the quality of the forested habitat. In contrast, the Ridge and Valley ecoregion is more fragmented and challenged by ever-increasing pressures such as residential and energy development. Therefore, it becomes increasingly important to conserve larger forest blocks, improve overall forest quality, and carefully plan forest/pest management practices in these regions.

Habitat structure is a major consideration in the ecology and conservation of bird species; structure could be influenced by improper disturbance regimes, over-grazing/browsing, disease or pests, harvest strategy, or numerous other possibilities. Many forests currently in the mid-successional (or stem exclusion) stage throughout the Appalachian Mountains may not sustain breeding populations of species dependent on dense understory conditions as stands mature (habitat quality and quantity), or they may not provide adequate habitat for juvenile and molting adults of some migratory birds that nest in midstory or canopy vegetation (habitat quality). Several species associated with mature forests (e.g., Swainson's, Worm-eating, and Black-throated Blue Warblers) often have higher reproductive success along clearcut and road edges in mostly mature-forested areas when compared to forest interiors with sparse understory conditions. Additionally, the canopy-associated Cerulean Warbler also appears to be attracted to forest openings created by some roads, severe storms, and certain forest management practices (e.g., modified shelterwoods) when forest interiors are composed of closed canopies with little or no mid- or understory structure. Consideration of habitat structure is not limited to forested landscapes; vegetative structure of grasslands/shrublands is very important to Henslow's Sparrows, Northern Bobwhite, Golden-winged Warblers, and American Woodcock. Therefore, understanding the influences of vegetative structure at multiple scales is vital for conservation planning regardless of habitat type. Our conservation planning and delivery efforts must ensure that site-scale ecological needs (habitat quality) of priority species are met across all seral stages in order to achieve our objectives, while also ensuring that sufficient habitat exists across the landscape (habitat quantity).

Because much of the AMBCR is remote and relatively rural, many common causes of direct mortality elsewhere are less common here (e.g., building collisions). However, other forms of direct mortality are much more prevalent, and some are poorly understood to-date. For example, collisions with communications towers kill an estimated 308,000 birds annually in the AMBCR (Longcore et al. 2007), and a high percentage of species most commonly involved in collisions are AMJV priority species. In many cases,

even with the most conservative estimates of bird mortality at communications towers, it is evident that the number of birds of certain species killed each year can equal or exceed physiographic conservation goals established by PIF for those species (Longcore et al. 2005, Table 2). Another emerging concern in the region is the potential direct mortality (and habitat loss/fragmentation) from increased wind energy capacity. Potential impacts are poorly understood overall; factors including, but not limited to, location of turbines, weather patterns, and migration strategies (nocturnal vs. diurnal; high vs. low altitude; thermal vs. ridgeline gliding) warrant coordinated investigation among partners and engaged industry representatives. Even less understood are the potential impacts of atmospheric deposition and environmental contaminants (e.g., mercury, selenium, arsenic) on bird populations in the AMBCR's high elevations. An ongoing study in Great Smoky Mountains National Park has found alarming levels of mercury in several species, especially species that breed in the highest elevations (e.g., Canada Warbler) or species closely associated with water (Louisiana Waterthrush; B. Hylton and T. Simons, unpubl. data). Understanding factors that influence potentially large-scale causes of direct mortality is an essential aspect to bird conservation within the AMBCR, and in order to be successful, we must engage a broad spectrum of partners and be transparent in our assumptions, research, and decisions.

From the discussion above, it is apparent that both passive and active management strategies are needed to conserve avian (and other) diversity in the Appalachian Mountains. Careful coordination with partners could help restore ecosystem functions, and conserve vulnerable, threatened, and endangered species, while pursuing priority bird conservation objectives established by the AMJV partnership. Therefore, the challenges that lie ahead are many: engage a diversity of partners, adopt and follow a rigorous and adaptive scientific framework, be transparent in every step, seek consensus among groups with different philosophies, and seek efficient and effective delivery of conservation actions. The AMJV partnership must identify where active management strategies for priority species are necessary, and explore the important role that passive

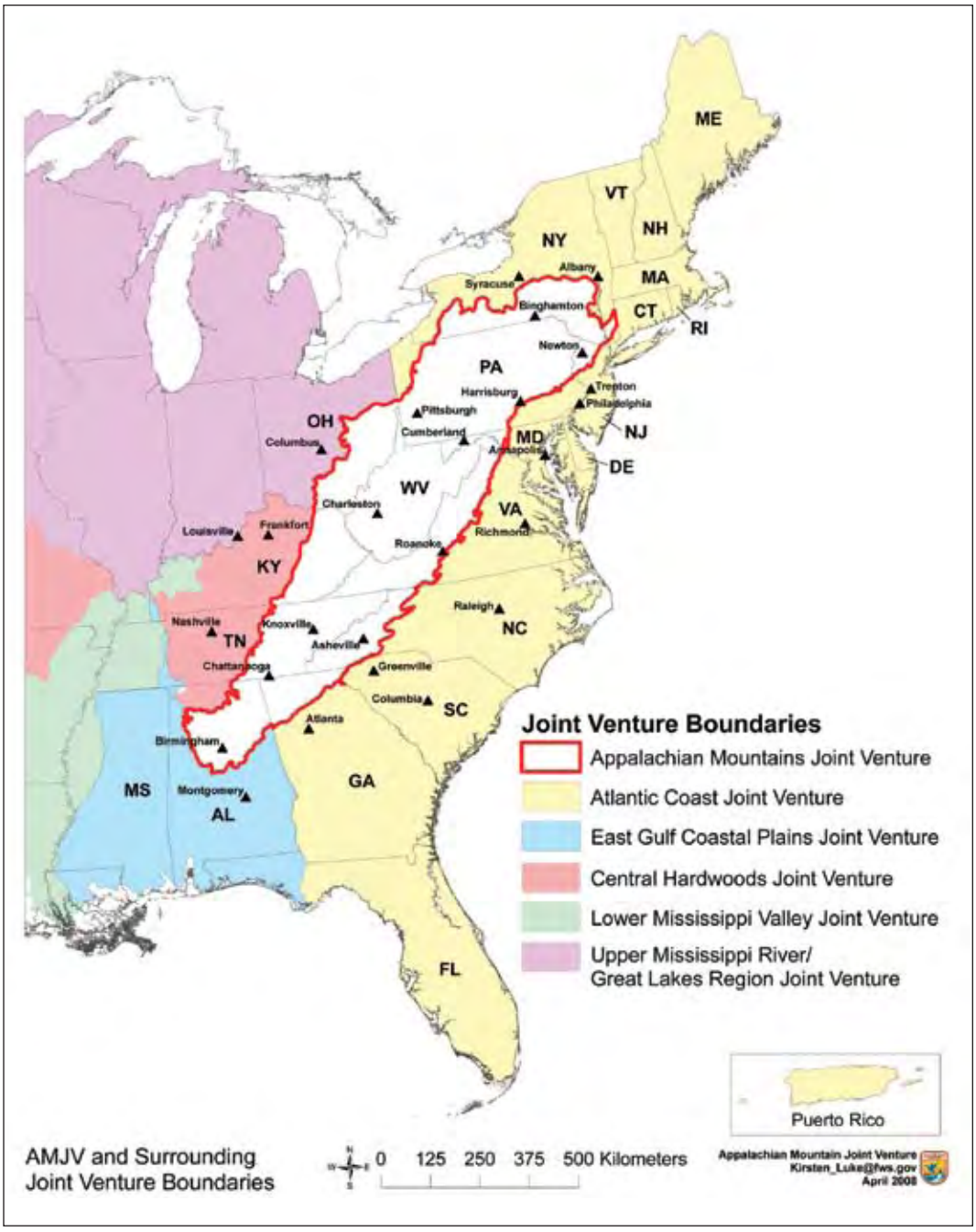

Figure 3. The proposed Appalachian Mountains Joint Venture (AMJV) administrative area covers ~102.9 million acres (41.6 million hectares) in all or portions of 12 states, and shares boundaries with 4 other habitat joint ventures.

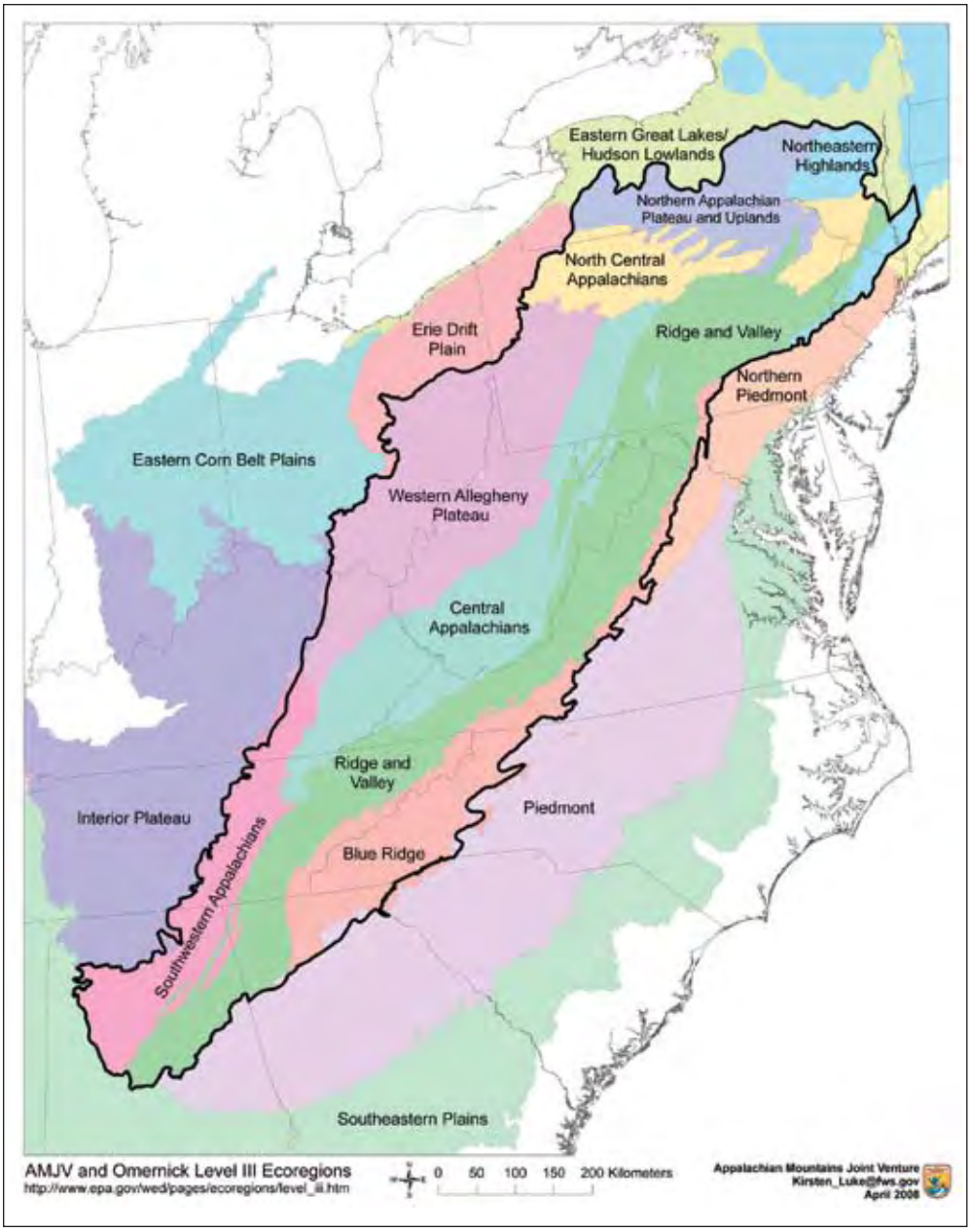

Figure 4. The proposed Appalachian Mountains Joint Venture (AMJV) administrative area as it relates to Omernik's (1987) Level III ecoregion boundaries and subsequent refinements (USEPA 2007).

management approaches play. For example, National Parks and Wilderness Areas on National Forests serve critically important functions for preserving vulnerable ecosystems, protecting water quality, and allowing unique recreational opportunities within the region. However, appropriate and science-driven management prescriptions should be incorporated into area plans in order to benefit priority species and communities in which natural processes have been severely disrupted. Our activities must also include a comprehensive education/outreach component that speaks to the importance of both active and passive management strategies across the landscape.

History of the AMJV Partnership

In 2003, conservation stakeholders in the Appalachian region constituted a partnership to more strategically address bird conservation in BCR 28. This partnership was formed under the guidance and support of the Atlantic Coast Joint Venture (ACJV); Region 4 of the U.S. Fish and Wildlife Service (USFWS) hired a BCR Coordinator to identify key partners, facilitate discussions among partners, and initiate conservation planning for BCR 28. Interested parties organized a Steering Committee to help guide the early stages of the partnership. After several meetings of the Steering Committee, the notion emerged that BCR 28 should strive to develop its own capacity to effectively deliver scientifically-based bird conservation for all species at BCR-scale. Although guidance and support from the ACJV's Management Board and staff still was strong, in 2006, the Steering Committee for the BCR 28 partnership initiated actions that would better position the partnership for recognition as a distinct Joint Venture. Shortly afterwards in 2006, the BCR Coordinator resigned and the position remained vacant until February 2007; at that time, American Bird Conservancy (ABC), under contract with the USFWS, hired a new coordinator. With guidance from an Executive Committee and the Steering Committee, work to begin fulfilling the requirements outlined in 721 FW 6 (USFWS policy on Joint Ventures) resumed, as did discussions between the ACJV Management Board and BCR 28 Steering Committee about the future status of BCR 28's partnership. Ultimately, in May 2007 the BCR 28 Steering Committee unanimously agreed to continue pursuit of Joint Venture status, while continuing to collaborate with the ACJV's staff and Management Board on administrative and technical issues of mutual interest and while also emulating certain aspects of the highly successful structure and function of the ACJV model.

Initially, the BCR 28 Coordinator was an employee of the USFWS with an office in their Asheville (NC)

Migratory Bird Field Office, and AMBCR funding (administration, contributions from partners) was administered by the USFWS. Currently however, the AMJV Coordinator is an employee of ABC and is headquartered within a Kentucky Department of Fish & Wildlife Resources' (KDFWR) office in Frankfort, KY. KDFWR offered to provide office space and technological support for the new coordinator, who had worked for KDFWR during the previous 5 years. AMJV funding is administered through contracts between USFWS and ABC (for support from USFWS and several state partners), or directly between ABC and partners/grantors. Upon approval by the USFWS as an official Joint Venture, the AMJV Management Board and the JV Coordinator will discuss the most effective courses of action with regard to administration of AMJV funds, location of headquarters, and allocation/location of future staff.

Administrative Boundaries of the AMJV

Habitats within the proposed AMJV administrative boundary provide significant and critical habitat for a large number of declining or otherwise sensitive bird populations located in eastern North America. The proposed AMJV administrative area covers ~102.9 million acres (41.6 million hectares) in all or portions of 12 states: Alabama, Georgia, North Carolina, Tennessee, Virginia, Kentucky, West Virginia, Ohio, Maryland, Pennsylvania, New Jersey, and New York (Fig. 3). The proposed AMJV administrative boundary includes BCR 28 (as designated by NABCI) almost in its entirety. Biological planning and conservation design will occur at the BCR scale, with minor modifications to the southern and northeastern boundaries.

The proposed AMJV administrative boundary is described below in terms of shared boundaries with existing/pending Joint Ventures and modifications to the BCR 28 boundary as they relate to Omernik's (1987) Level III ecoregion boundaries and subsequent refinements (USEPA 2007). In short, the proposed AMJV administrative boundary includes these Level III ecoregions in their entirety: Northern Appalachian Plateau and Uplands, North Central Appalachians, Ridge and Valley, Southwestern Appalachians, Central Appalachians, and Western Allegheny Plateau. The AMJV also includes nearly all of the Blue Ridge ecoregion, and small portions of the Northeastern Highlands ecoregion in southern New York, northern New Jersey, and western Pennsylvania (Fig. 4).

The AMJV Administrative Boundary in Relation to Adjacent Habitat Joint Ventures

- ***East Gulf Coastal Plain JV (EGCPJV):*** in Alabama, the AMJV administrative boundary follows Level III ecoregion boundaries for the Southwestern Appalachians and the Ridge and Valley ecoregions. The original BCR 28 boundary included a small portion of the Piedmont ecoregion, but in coordination with the EGCPJV and ACJV, this area will be under EGCPJV's administration.
- ***Central Hardwoods JV (CHJV):*** the western administrative boundary of the AMJV in northern Alabama, eastern Tennessee, and eastern Kentucky shares a boundary with the CHJV, following the shared Level III ecoregional western boundaries for Southwestern Appalachians and Western Allegheny Plateau and eastern boundary of the Interior Plateau ecoregion.
- ***Upper Mississippi River and Great Lakes Region Joint Venture (UMRGLJV):*** in Ohio, the AMJV administrative boundary follows the Western Allegheny Plateau ecoregion boundary, which shares borders with the Eastern Corn Belt Plains ecoregion and the Ohio portion of the Erie Drift Plain ecoregion. This portion of Ohio originally was administered by the UMRGLJV, but responsibility for this area was officially transferred to AMJV at the UMRGLJV Management Board meeting on March 27, 2008.
- ***Atlantic Coast Joint Venture (ACJV):*** the northern terminus of the AMJV administrative boundary lies in southern New York and includes the New York portions of the North Central Appalachians, Northern Appalachian Plateau and Uplands, and Ridge and Valley ecoregions. The 2 southernmost portions of the Northeastern Highlands in New York are also included in the AMJV, with the northeastern boundary for the AMJV being demarcated by the state line in eastern New York. Thus, the Connecticut and Massachusetts portions of BCR 28 (as originally designated by NABCI), as well as the remaining portions of New York, will continue to be administered by the ACJV. The eastern boundary of the AMJV is bounded by the eastern boundaries of the (1) Northeastern Highlands in far southern New York, northern New Jersey, and western Pennsylvania (shared boundary with Northern Piedmont ecoregion), (2) Ridge and Valley ecoregion in Pennsylvania and northwestern Georgia, and the (3) Blue Ridge ecoregion in southern Pennsylvania, Maryland, Virginia, North Carolina, and northeastern Georgia, excluding the minor portion of northwestern South Carolina. Portions of Pennsylvania, New Jersey, Maryland, Virginia, North Carolina, and Georgia that lie outside of the proposed AMJV administrative boundary will be administered by the ACJV.
- ***ACJV and West Virginia:*** the entire state of West Virginia originally was administered by the ACJV, but responsibility for this area was officially transferred to the AMJV in 2007 after coordination with both Management Boards.

Because a large portion of the existing ACJV overlaps the proposed AMJV, the AMJV partnership (Management Board, Staff, and Technical Committee) continues to work with the ACJV's staff and Management Board to transition duties and responsibilities, maintain continuity with partners, and collaborate on projects of mutual interest. The AMJV also is examining the highly successful structure and function of the ACJV in order to incorporate certain aspects into our organizational model.

Finally, the administrative area proposed above is delineated in order for partners and administrators to derive goals and objectives from all the major bird conservation initiatives, State Wildlife Action Plans, and other bird-habitat conservation programs of relevance within the Appalachian Mountains. However, where important limitations to native bird populations in the Appalachian Mountains exist outside of the AMJV area (e.g., wintering areas), the AMJV also will identify steps to address these issues. In fact, preliminary steps to develop 'value-added' international partnerships will be discussed in later sections.

Organizational Structure and Budgets of the AMJV

As in other joint ventures, the AMJV is directed by a broad partnership with a vested interest in developing, administering, and delivering science-based bird conservation in the Appalachian region. The Management Board for this partnership, guided by this Implementation Plan and future strategic plans, determines (1) the organizational structure, (2) conservation priorities, and (3) annual budgets based on allocation of funds from USFWS, partner organizations, and other sources. The following subsections contain brief descriptions of the organizational 'units' of the AMJV as they exist today, discussion about potential organizational units in the near future, and a short-term strategic budget that plans for growth in the AMJV partnership.

AMJV Partners

Any agency or organization that plays a role in furthering the AMJV's mission is welcomed as a volunteer *Partner Organization*; however,

- the number of *Partner Organizations* is unlimited, but *Partner Organizations* are expected to continually aid in promoting and advancing the AMJV mission; and,
- a subset of these *Partner Organizations* are voting partners that serve as the AMJV's *Management Board* (see below); they lead the AMJV with input from all *Partner Organizations*.

AMJV Management Board

The AMJV *Management Board* is the volunteer governing body responsible for accomplishing the mission of the AMJV Implementation Plan. This will be achieved through adherence to bylaws, oversight and direction of the AMJV, review and approval of projects and programs, direction and oversight of the AMJV Coordinator and staff, and direction of Standing Committees and Working Groups. The Management Board includes (Table 1):

- eighteen (18) voting partners, with open seats for additional voting partners to be filled by other agencies or organizations approved by the *Management Board*;
- voting partners committed to actively engaging in the governance of the AMJV and in the development of its organizational and conservation strategy;
- voting partners that regularly attend

Table 1. Eighteen (18) agencies and organizations currently comprise the Appalachian Mountains Joint Venture Management Board (i.e., voting partners).

FEDERAL	STATE
USFWS (Region 4, Region 5)	West Virginia Division of Natural Resources
US Forest Service (Region 8, Region 9)	Pennsylvania Game Commission
National Park Service (Southeast and Northeast Regions)	Maryland Department of Natural Resources
US Geological Survey, Biological Resources Division	Kentucky Department of Fish and Wildlife Resources
	Georgia Department of Natural Resources
NON-GOVERNMENT ORGANIZATIONS	Virginia Department of Game and Inland Fisheries
American Bird Conservancy	Alabama Department of Conservation and Natural Resources
National Audubon Society	Ohio Department of Natural Resources
The Nature Conservancy	Tennessee Wildlife Resources Agency
Wildlife Management Institute	North Carolina Wildlife Resources Commission

* NY and NJ state wildlife agencies currently are not participating on the AMJV Management Board (i.e., voting partners); however, their administrators have allowed staff members to contribute time and technical information for this plan via e-mail, telephone, and participation in workshops.

Management Board meetings and participate in conference calls, working groups, or other such responsibilities;
- voting partners that contribute financially to the AMJV to the best of their abilities; and,
- voting partners that provide oversight and guidance to the AMJV Coordinator and staff through active participation on the *Management Board* and input from all Partner Organizations.

Voting seats on the AMJV *Management Board* are open to conservation organizations, industry representatives, individuals, and other private groups that commit to:
- furthering the vision and mission of the AMJV, and
- sharing the responsibility for bird conservation throughout the Appalachian Mountains.

Executive Committee

The AMJV Management Board elects up to 5 voting partners to serve on the Management Board's Executive Committee, which is guided by the Chairperson of the Management Board. The Executive Committee acts as a liaison among the Management Board, Coordinator, and any Committees or Working Groups in the interim between meetings of the full Management Board.

AMJV Technical Committee

The AMJV Technical Committee is a 'Standing Committee' composed of state and federal agency personnel, university researchers, and technical experts from other entities (e.g., non-governmental organizations, natural science museums) that are interested in bird conservation in the Appalachian Mountains. The Technical Committee provides the scientific foundation for the Joint Venture, ensuring that the partnership develops and further refines our conservation goals and objectives using an adaptive management framework. Meetings and discussions among technical committee members serve as a regional means for cooperation, coordination, and communication on regional, national, and international issues relevant to the AMJV's contribution to population/habitat objectives in state, national, and international plans. Essentially, the AMJV Technical Committee will provide technical expertise and appropriate planning tools to the AMJV Management Board to help identify where on the landscape our efforts should focus for priority species or species suites, how much habitat we need to 'impact' to meet our population objectives, appropriate implementation and monitoring protocols, and results from priority research and implementation projects to inform our adaptive management feedback loop.

Over time, additional Standing Committee(s) may be formed to address longer-term issues that further the mission of the AMJV (e.g., Forest Resources) or facilitate planning and implementation of projects (e.g., Ecoregional/sub-BCR or State Technical Committees). Long-term committee structure is being discussed among technical partners and the Management Board, using organizational models of existing joint ventures and partner's priorities as a basis for our discussions. Upon recommendation by a Partner Organization and approval by the Management Board, the AMJV also may form 'Working Groups' on an *ad hoc* basis in order to develop a specific product or address a current issue of importance to the AMJV. For example, the Technical Committee recommended in August 2007 that we form a Working Group to assimilate data and formulate conservation objectives specific to high elevation coniferous habitats in the AMJV. In October 2007, the Management Board approved funding to host a series of workshops among Working Group members and other experts in order to assimilate relevant data, discuss monitoring needs and objectives, and prioritize conservation strategies to begin addressing threats to high elevation coniferous habitats, thereby strengthening the AMJV's biological foundation.

AMJV Staff and Strategic 5-yr Budget

Currently, the AMJV Coordinator and current projects (e.g., development of this plan, high elevation coniferous habitat) are funded by financial contributions from 15 partner organizations. Additionally, partner funds (USFWS Region 5) are supporting a portion of a contract employee's time to develop GIS products for the AMJV's Technical Committee and this Implementation Plan.

The former BCR 28 Coordinator and current AMJV Coordinator have been supported by partner contributions. A majority of funds to support the Coordinator during the first 3 years were provided by USFWS. In recent years however, as momentum and synergy within the partnership has grown, so too has the financial support from other partner organizations. These funds have been applied towards the Coordinator and AMJV-related activities. The AMJV Management Board has held preliminary discussions about allocation of USFWS 1234 funds, pending approval of this Implementation Plan and an increase in the USFWS' budget for joint venture support. At this time, no official decisions have been made about future budget allocations, but AMJV staff supported by 1234 funds will include a Joint Venture Coordinator, and depending on funding levels, one or more of the following positions within 5 years of funding: Assistant Joint Venture Coordinator(s), Science Coordinator(s), GIS Specialist, and/or Communications/Outreach Specialist (Table 2). Future AMJV partner contributions (i.e., non-1234 funds) will be allocated among priority projects (implementation, research, monitoring, outreach, etc.) as determined by the AMJV Partnership.

Table 2. A 5-yr strategic budget for the Appalachian Mountains Joint Venture (AMJV), outlining potential allocation of USFWS administrative support (i.e., 1234 funds) as tentatively discussed by the AMJV Management Board.

APPALACHIAN MOUNTAINS JOINT VENTURE STRATEGIC 5-YR BUDGET STARTING FY08*							
GOAL	**NEED(S)**	**PURPOSE**	**FISCAL YEAR AND COSTS**				
	SALARY AND BENEFITS**		**FY08**	**FY09**	**FY10**	**FY11**	**FY12**
Strengthen AMJV partnership and develop capacity to conduct science-based biological planning and conservation design at landscape scales	JV Coordinator (GS13)***	Provide oversight of AMJV finances and programs, facilitate discussions among experts, and develop elements of SHC to convey to partners	$71,253	$108,738	$112,363	$115,989	$119,613
	Science Coordinator (GS12)****		$0	$108,738	$112,363	$115,989	$119,613
	Asst Coord/Outreach/GIS/ Forester (GS11)****		$0	$0	$91,441	$94,490	$97,538
	Asst Coord/Outreach/GIS/ Forester (GS11)****		$0	$0	$0	$91,441	$94,490
		Salary Subtotal	$71,253	$217,476	$316,166	$417,908	$431,255
	OPERATING EXPENSES						
Promote AMJV partnership, encourage professional interaction and development opportunities, develop tools and expertise to conduct science-based biological planning and conservation design, and maintain AMJV office	Computer	Hardware and software needs, conference call and meeting costs, travel support to JV, regional, and national meetings	$0	$5,000	$1,500	$1,500	$1,500
	Software (including GIS)		$1,000	$10,000	$4,000	$2,500	$2,500
	Telephone		$0	$3,000	$3,000	$3,000	$3,000
	Office Setup		$1,000	$5,000	$5,000	$5,000	$2,000
	Travel		$11,000	$22,000	$30,000	$35,000	$35,000
	Overhead ^		$10,000	$20,000	$20,000	$20,000	$20,000
		Operating Expenses Subtotal	$23,000	$65,000	$63,500	$67,000	$64,000
	PRODUCTS/CONTRACTS/ COMMUNICATION						
Create and disseminate AMJV products, promote assumption-driven research by AMJV staff and partners, and communicate our efforts	GIS Services	Develop tools and protocols with partners, support assumption-driven research, and share information with scientific/conservation community and public	$10,000	$10,000	$0	$0	$0
	Research/Implementation Contracts		$0	$0	$50,000	$50,000	$50,000
	Planning		$1,000	$1,000	$1,000	$1,000	$1,000
	Marketing/Outreach		$500	$5,000	$5,000	$5,000	$5,000
	Website		$5,000	$1,000	$1,000	$1,000	$1,000
	Publications		$2,500	$5,000	$10,000	$10,000	$10,000
		Misc. Subtotal	$19,000	$22,000	$67,000	$67,000	$67,000
		TOTAL EXPENSES	**$113,253**	**$304,476**	**$446,666**	**$551,908**	**$562,255**

* Years are based on calendar years to follow ABC's fiscal year; appendix assumes USFWS 1234 funds will be awarded at the start of ABC's FY09 (January 1, 2009).

** All salaries and benefits are based on entry level federal salaries of the appropriate grade for each position listed. The 2008 federal salary schedule for each salary step was used (*http://www.opm.gov/oca/08tables/html/RUS.asp*), and benefits/COL was estimated at approximately 40% of annual salary. Salary schedules may change annually, so these are minimum estimates.

*** JV Coordinator's Salary/Benefits/COL for FY08 is based on ABC's salary scale, but is based on the federal salary/benefits/COL schedule beginning FY09.

**** Position types will be based on priorities set by the AMJV Management Board with guidance from USFWS DBHC; hiring order is yet to be determined.

^ Overhead administration will be taken out by USFWS Region that administers 1234 funds for JV, ranging from 2 - 5% of total. ABC's overhead may change depending on whether new employees are employed by USFWS or ABC.

Landscape-level Approach to Conservation Using an Adaptive Management Framework

Overview

Recent advancements in conservation theory and geospatial technologies, and an increasing emphasis on agency or organization accountability, have influenced conservation science and how it is conducted (NEAT 2006). Many agencies and organizations are transforming from opportunistic conservation to a more strategic approach that relies on scientific principles and establishes measurable conservation objectives based on desired biological outcomes (NEAT 2006). Landscape-level conservation using an adaptive management approach is essentially an iterative approach for planning, implementing, and evaluating multi-scale conservation objectives based on the best available information at the time, and using information gathered from the process to inform future conservation efforts. This adaptive framework is an ideal approach for joint ventures to pursue desired biological outcomes, given the diversity and various strengths of partners, the need for efficient and effective conservation, the transparency afforded by the process, and the ability to adapt conservation strategies based on project-specific feedback. Therefore, the AMJV partnership is committed to using an adaptive conservation framework to achieve desired biological outcomes for priority birds in the region.

Implementation of such a framework requires that partners engage in biological planning, conservation design, conservation delivery, and monitoring and research, with each 'element' within this adaptive management loop having several sub-elements (e.g., Fig. 5, which appeared as Fig. 2 in NEAT 2006). Although listed and diagrammed sequentially, many of the 'sub-elements' occur simultaneously. Our adaptive management framework must be based upon a sound biological foundation, with explicitly-stated bird conservation goals and objectives for the region, species prioritized based on vulnerability and need, and an understanding of bird/habitat relationships (e.g., abundance, viability) at various spatial scales. Understanding these relationships will guide development of conservation design and delivery tools, as well as allow the partnership to assess the amount and types of habitats needed to achieve regional and continental bird population goals. Prioritization and species-habitat relationships require periodic reassessment to incorporate recent information; therefore, using an adaptive management framework to build a strong biological foundation will be paramount to our conservation successes.

In terms of conservation planning, the goal of the AMJV partnership is to strengthen the biological foundation upon which biological planning, conservation design, conservation delivery, and research and monitoring are based. We have established the following objectives to ensure we achieve our goal:

Objective 1: At the BCR level, establish population and habitat objectives for priority species based on the latest assessments by the various bird conservation initiatives (North American Waterfowl Management Plan [NAWMP], PIF, U.S. Shorebird Conservation Plan [USSCP], North American Waterbird Conservation Plan [NAWCP], Northern Bobwhite Conservation Initiative [NBCI], American Woodcock Conservation Plan [AWCP], Ruffed Grouse Conservation Plan [RGCP], etc.), and State Wildlife Action Plans. Appropriate technical teams (e.g., by taxonomic group) will be assembled to achieve this objective, and team leaders will consult with outside experts, other joint ventures (e.g., Black Duck Joint Venture), and staff of the bird conservation initiatives to ensure that the population goals and habitat objectives are agreed upon.

Objective 2: Identify and prioritize research needed to further refine and improve the biological foundation for the AMJV. This also will be addressed by the technical teams referred to in *Objective 1* above.

Objective 3: In cooperation with partner agencies, design population monitoring and habitat evaluation protocols as rec-

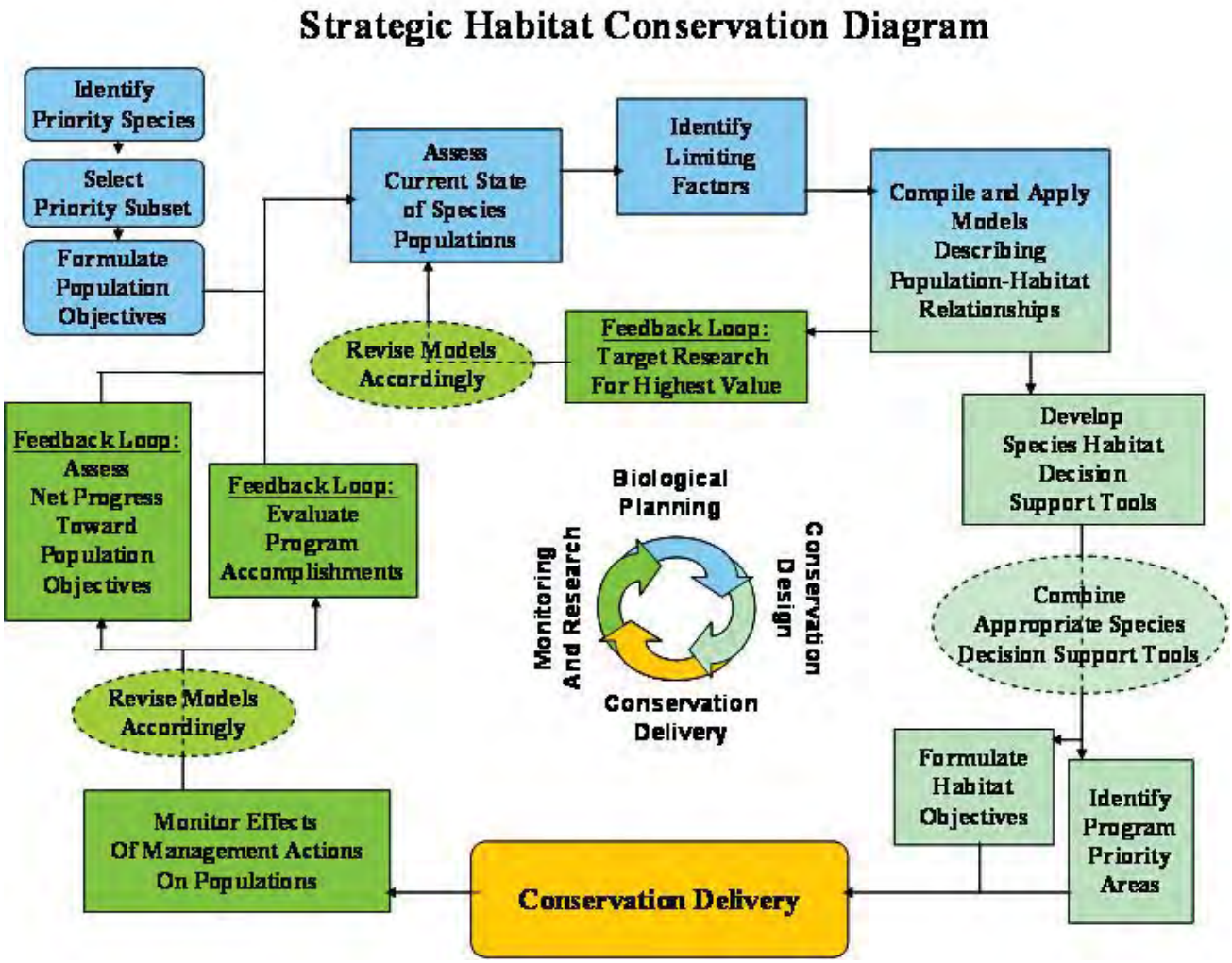

Figure 5. A diagram illustrating the major elements (biological planning, conservation design, conservation delivery, monitoring and research) and sub-elements of Strategic Habitat Conservation (SHC), an adaptive management framework recently adopted by U.S. Fish and Wildlife Service. Some activities within this loop may occur simultaneously (*note:* appeared as fig. 2 in NEAT 2006).

ommended by technical committees.

Objective 4: Develop advanced geographic information system (GIS) and data management capacity that meets the needs of the partnership for planning, implementation, and tracking of accomplishments. Technical teams will identify and prioritize data analyses and planning tools that are needed to guide all-bird planning in the AMBCR, and the AMJV Management Board will facilitate development of these items through administrative and financial oversight.

Biological Planning

The AMJV partnership has taken initial steps to address the objectives listed above. Members of the AMJV Technical Committee convened in August 2007 to develop, refine, and discuss several elements essential to biological planning at the BCR 28 scale. Products from this meeting are considered 'living drafts' instead of 'final drafts' because they will be revisited as new information, techniques, or threats emerge, or when consensus is reached on which technique to employ (e.g., see *Subset of Priority Species*). Other sub-elements of ***Biological Planning*** have been discussed by Technical Committee members and other experts, but processes to further develop (e.g., population objectives), or decisions on the scale at which they are assessed (e.g., limiting factors), are under review.

Habitat Framework

The AMJV Technical Committee has taken initial steps to develop a bird-habitat framework relevant to future conservation planning efforts. Ideally, we will use this framework to assess the current status of bird habitats in the AMBCR, and ultimately to inform and develop conservation design tools to guide delivery of projects that improve quality or increase quantity of priority bird habitats. A bird-habitat framework (Table 3) is under revision by the Technical Committee; given the complexity of habitat types in the Appalachian Mountains (influenced by factors such as underlying geology, slope, aspect, elevation, latitude, and precipitation), we must ensure that we accurately select the

correct scale and level of detail representative of the avian communities in the region.

Our draft habitat framework is derived from a general bird-habitat framework that had been developed for the Eastern/Southeastern U.S. The technical committee has discussed additions or adjustments needed to accommodate habitats in the northern portion of the AMJV. Additionally, states within the Northeast Association of Fish and Wildlife Agencies initiated a project entitled "Regional Habitat Maps - A Foundation For Proactive Conservation Projects" (funded by Doris Duke Foundation/National Fish and Wildlife Foundation) to compile and standardize terrestrial and aquatic habitat classification systems, and provide a basic aquatic habitat dataset and a regional protected areas map to partners. Information from this effort will provide critical tools for state and regional conservation in the Northeast, and it will be linked to similar efforts in the Southeast to create a 'seamless' habitat classification framework for the eastern U.S. and the AMBCR. Once completed, the AMJV framework will easily crosswalk with habitat classes already mapped by Southeast-GAP, as well as those to be mapped in the near future by the Regional/Northeast Gap project. Habitats identified in the final AMJV framework will accurately depict distinct bird communities throughout the AMJV as we currently understand them, and will allow for development of relevant GIS products and conservation tools.

Reclaimed minelands near Hazard, Kentucky. Photo: Dave Baker

In addition to drafting a general habitat framework to operate under, the AMJV Technical Committee discussed which habitats or communities warranted immediate conservation planning and design attention. When discussing prioritization of habitats, we considered the uniqueness of the habitat type and its associated avifauna, availability of spatial and monitoring data, the overall concern for the community type and its avifauna, and the relative importance of the habitat to AMJV partner organizations.

The 3 communities (Table 3) that the Technical Committee recommended as highest priorities were the Upland Hardwood/Pine, Eastern Shrub-Scrub, and Freshwater Wetland communities. Within these communities, the Technical Committee suggested we focus our initial conservation planning and design efforts on the following habitat types (starting with the highest priority) for the reasons stated:

1. ***Spruce-fir:*** power of data regarding bird populations, trends, or densities is low for this habitat type; monitoring coverage (e.g., BBS, USFS avian point counts) is poor at best. Threats to the habitat are high (e.g., climate change, forest pests), habitat and avifauna both reach their southern limits in the AMJV, and studies of habitat/spatial extent are typically done on a site or state scale without coordination region-wide (i.e., spatial data and models of habitat exist but need to be compiled and analyzed regionally). Working through planning and design issues for this relatively discrete habitat type will help partners develop an appropriate framework for future endeavors.
2. ***Early-successional Hardwood/Conifer:*** quantity, and apparently quality, of early-successional habitat in the AMJV has declined over recent decades due to natural succession. Several of our highest priority species rely on early successional forests for portions of their life cycle, so understanding how structure, composition, location, and amount of this habitat influences populations of priority species is critical.
3. ***Manmade/Disturbed (minelands):*** SMCRA-era (i.e., Surface Mine Control and Reclamation Act of 1977) reclamation activities in the Appalachians established mostly non-native grass/shrublands on minelands, thereby replacing diverse hardwood forests with large, unnatural openings. Reclamation to grass/shrublands has increased forest fragmentation, decreased the overall amount of forest cover, and reduced core forest area in many parts of the AMJV, all of which are important habitat features to Cerulean Warblers and other species of priority birds that rely on structurally diverse mature forests. An estimated 741,000 acres of SMCRA-era minelands could be available for reforestation efforts in the Appalachian Coalfield (Zipper 2007). However, some of these grass/shrubland reclaimed areas now support populations of other priority birds such as Golden-winged Warblers, Henslow's Sparrows, and American Woodcock, creating an interesting, yet complex, conservation design project among suites of species with contrasting habitat types (grassland vs. shrubland vs. mature forest). Additionally, the Appalachian Regional Reforestation Initiative (ARRI),

coordinated by the U.S. Department of Interior's Office of Surface Mining Reclamation and Enforcement with a core team of 7 states, was initiated with a goal to reforest abandoned, current, and future minelands in the core coal region of the Appalachian Mountains. The AMJV will work with ARRI and its technical partners to (1) identify 'hotspots' for priority species, (2) communicate population and habitat objectives for grassland, shrubland, and mature forest species, (3) prioritize restoration actions in relation to landscape context and priority bird populations, and (4) develop appropriate restoration and management guidelines for priority species (e.g., species and density of trees/grasses/shrubs to plant, disturbance regime, etc.).

4. ***Freshwater Forested Wetlands (within the 'Freshwater Wetland Community')*:** discussions centered mostly on conservation opportunities/needs of Forested Peatlands in the northern portion of the AMJV. These forested wetlands still occur in relatively large blocks, and generally encompass the headwaters of high quality streams. These peatlands support populations of several priority bird species, which make up only a fraction of a very complex and diverse ecosystem. Threats (mainly wind energy development and climate change) to Forested Peatlands are high, thereby warranting conservation attention from our partnership. The importance of other wetland habitat classes (especially freshwater emergent marshes, scrub swamp, beaver ponds/meadows, and riparian habitats) within the Freshwater Wetland Community were discussed relative to their importance to priority species and the AMJV, indicating the need for thorough planning for wetland-associated birds and habitats.

Table 3. Draft bird-habitat framework developed by the AMJV Technical Committee. The framework includes community type, primary class levels, and, if appropriate, secondary class levels. Due to the complex nature of upland forests in the AMBCR, we are still discussing additional classification levels within the Upland Hardwood/Pine Hardwood Communities that may harbor distinct avifaunal communities (e.g., xeric/mesic forest types).

EASTERN INTERIOR GRASSLAND COMMUNITIES
- Meadows and Prairies
- Agricultural and Cropland
- Pasture
- Rank Herbaceous/Grasses

FRESHWATER WETLAND COMMUNITIES
- Freshwater Non-forested Wetlands
  - Freshwater emergent marsh
  - Bogs/Seepage Slopes/Ephemeral Wetlands
  - Freshwater Shrub-Scrub
  - Mudflats/Sandbars/Shoals
- Freshwater Forested Wetlands
  - Bottomland Hardwoods
  - Scrub Swamp (e.g., Buttonbush/Alder)
  - Beaver Ponds/Meadows
  - Seeps
  - Forested Peatland (Hemlock/Spruce)
- Riparian
  - Riparian Woodland
  - Riparian Scrub/Edge
- Open Water

EASTERN SHRUB-SCRUB COMMUNITIES
- Interior Cedar/Pine/Oak Barrens & Glades
- Appalachian Balds (e.g., Heath Balds)
- Early-successional Hardwood/Conifer
- Cliffs, Domes, & Outcrops
- Manmade/Disturbed (e.g., hedgerows, Right-of-Ways, minelands)

PINE COMMUNITIES
- Shortleaf Pine of the Cumberland Plateau
- Xeric Pine/Heath (e.g., Table Mountain Pine, etc.)

UPLAND HARDWOOD/PINE COMMUNITIES
- Spruce-Fir
- Northern Hardwood
- Mixed Mesophytic/Cove Hardwoods
- Hemlock/White Pine/Hardwoods
- High-elevation Oak/Oak-Pine
- Oak Savanna

CITIES/TOWNS/SUBURBS
- Residential
- Urban/Commercial
- Airfields
- Golf Courses/Parks/Cemeteries/Greenways

Priority Species

Priority species and their conservation needs in the Appalachian Mountains have been identified in PIF landbird conservation plans for physiographic areas within BCR 28 (Hunter et al. 1999, Robertson and Rosenberg 2003, Rosenberg 2003, Rosenberg and Robertson 2003, Rosenberg and Dettmers 2004; Northern Cumberland Plateau and Southern Ridge and Valley plans were never completed, but draft species assessments are available). Additionally, international plans (NAWCP, Kushlan et al. 2002; NAWMP, Plan Committee 2004; PIF, Rich et al. 2004; AWCP, Association of Fish & Wildlife Agencies Woodcock Task Force 2008) or their regional components (Hunter et al. 2006; W. C. Hunter, pers. comm.. 2007 for shorebirds), State Wildlife Action Plans, NBCI (Dimmick et. al. 2002), and the RGCP (Association of Fish & Wildlife Agencies Resident Game Bird Working Group 2006) have identified priority species, and many of these listed population and/or habitat objectives. Given the diversity of methods and

scales used to assimilate priority species lists in each of these plans, AMJV partners and other experts recently compiled data and decided upon a priority species list for the entire AMBCR region. A list of priority species for the AMBCR is presented in Appendix 1.

Subset of Priority Species

The AMJV Technical Committee discussed the selection of a subset from the AMJV priority list above; selecting a smaller representative subset of species (i.e., focal species) will allow us to concentrate our conservation design and limited funding. Each focal species for the AMJV will represent a particular set of habitat characteristics or landscape attributes necessary to support viable populations of all birds across the landscape (Lambeck 1997). Using a focal species approach will reduce the number of conservation design tools (e.g., models) we need to develop and apply on the landscape, while still relating to the full suite of species within their respective habitats (note: assumptions about how other species will respond to derived conservation measures must be evaluated).

As a starting point for discussions, species in the AMBCR region were organized by the 4 major taxonomic groups and then were classified using a set of prioritization formulas developed by various BCR/JV partners in USFWS Region 5 (see Dettmers 2006, Section 3.2 for explanation; also Hartley 2007). This prioritization process reflects priority levels already identified by the various bird conservation plans, but assigns a species to a priority level (Highest, High, Moderate, or Low) based on pre-established rules (Dettmers 2006). Preliminary results from the prioritization process for AMJV species are presented in Appendix 2. Focal species, once finalized, will be used to develop models that examine population-habitat relationships, predicting factors such as habitat suitability or demographic rates in response to external forces (e.g., change in habitat quality or quantity in response to conservation activities).

Population Objectives

To efficiently and effectively conserve bird populations, we need to establish science-based 'targets' to strive for. Two fundamental questions for the AMJV partnership to address are: how many birds are needed to establish/sustain viable populations of our priority species, and how much habitat is needed to support those populations. Global population objectives have been established by the various national and international bird conservation plans, but these must be 'stepped down' to the AMJV level in order to start designing landscapes that will maximize our conservation efforts.

Establishing population objectives can serve several important functions for conservation initiatives, including (1) raising awareness of the need for conservation action, (2) establishing clearly defined goals that provide transparency to conservation efforts and provide targets by which to measure success, (3) informing decisions about the amounts of habitat management and protection activities that are often necessary components of conservation, and (4) helping to prioritize where to direct conservation resources. However, developing conservation targets is often difficult because it ultimately requires consideration of subjective values in addition to objective facts. Science can provide the objective information regarding the range of biological limits and the likely outcomes of various alternatives, but sociopolitical and economic values and realities, in addition to ecological and evolutionary functionality, must be considered during the process. A broad array of people and disciplines need to be involved in setting practical population objectives; each person offers different values and experiences to the process, leading to different approaches to developing such objectives.

Sanderson (2006) provides an informative summary of several different approaches to setting population objectives. He groups them into 3 general categories based on the intended beneficiaries: (1) population-based approaches, in which the animal population itself is the primary entity of concern, (2) population-as-surrogate approaches, in which some non-human aspect of the ecosystem is the primary entity of concern, and (3) human-oriented approaches, in which some aspect of human values becomes the primary entity of concern. For bird conservation initiatives in North America, most objective-setting approaches under Sanderson's (2006) "population-based" category are likely most relevant; people using these approaches are primarily interested in conserving bird populations rather than human values or non-human factors *per se*. Specific population-based approaches include maintaining evolutionary potential, creating demographic sustainability (or minimum viable population approach), restoring/maintaining ecological functions, restoring populations to some historical baseline, and maintaining the status quo. Another possible approach not mentioned by Sanderson (2006), but which is being investigated in other JVs and BCRs, is one of setting population objectives based on projections of future habitat availability for species of interest.

At the continental scale, bird conservation initiatives have used approaches based on restoring bird populations to some historic baseline, as demonstrated through NAWMP and PIF North American Landbird Conservation Plan (Rich et al. 2004). These 2 conservation plans use a historical baseline approach to set population objectives, but they do so in a quantitative manner, either explicitly defining a numeric population size as a target (e.g., NAWMP) or expressing the target in terms of a percentage of the current population size (e.g., PIF). However, for many bird species, the ability to quantitatively determine

population sizes and habitat needs is limited by the information available from, and the level of uncertainty associated with, existing survey data. These limitations affect our current and historical population estimates for bird species, how those species are distributed across space, what their full habitat requirements are, and how they respond to changing conditions in the environment from factors such as habitat management activities, other anthropogenic land use changes, and naturally occurring environmental shifts. These limitations also lead to a high degree of uncertainty regarding any quantitatively defined bird population objectives for conservation purposes. Thus, the use of any bird population size estimates or numerically-based population objectives must be done with a full acknowledgement of the complexities and uncertainties that underlie them, and the assumptions employed to derive them. Such estimates and objectives should be considered preliminary starting points within an adaptive management framework and should be viewed with a sense of reality and skepticism. They will need to be updated and revised as better and more complete information becomes available.

It must also be recognized that for migratory species, population objectives are most meaningful for species whose primary season of occurrence in the BCR is during the breeding season. Estimating populations of migrating and wintering species in a region is complicated by movements of individuals among locations, and interchange of individuals at any specific location during migration and within the wintering season. Also, annual variability in the numbers of birds either migrating through or wintering in a given location is often high. The relationship between local habitat conditions and abundance of birds is less direct during migration and wintering than during breeding because numerous factors external to local conditions determine how many birds will pass through a particular area.

Despite uncertainties currently inherent in setting bird population objectives, there is value in having quantitative targets, as discussed above (e.g., for planning purposes, for justifying the need for further conservation resources, and for assessing how well conservation efforts are succeeding). For these reasons, the AMJV Technical Committee will determine an appropriate approach and method for developing population objectives for the AMBCR. Population objectives at the BCR scale have been suggested through a process of stepping-down the continental population objectives established for landbirds, certain species of waterfowl, and upland gamebirds (e.g., Northern Bobwhite, Ruffed Grouse, and American Woodcock). However, these approaches rarely take into account both the current and future habitat potential for supporting bird populations within the region of interest. Therefore, these approaches sometimes create unrealistic population objectives at the regional scale, potentially leading to numerous efficiency (and maybe even credibility) issues.

Numerous other methods, based on assessments of habitat capacity and observed bird densities in various habitats, currently are being used by joint ventures across the country to establish regional population objectives. Unfortunately, however, no consensus has been reached on which, if any, of these methods are most appropriate for setting regional population objectives. A session held during the PIF Conference in February 2008 reviewed a diversity of objective-setting methods currently being used by several joint ventures and other practitioners. From this session, participants and other experts will undergo a process to develop a guidance document with recommendations for the most appropriate approaches and methods to use under various regional conditions and contexts. The AMJV will await release of this national guidance before it selects a specific approach for developing its regional population objectives. However, for the time being, the AMJV will use population objectives that have been stepped-down by the various bird conservation plans as initial objectives, recognizing the assumptions and shortcomings of the objectives for any project we undertake up front. Regardless of how the AMJV decides to move forward on this issue, setting and using population objectives should be viewed as an ongoing exercise requiring refinement, research into underlying assumptions, and improvement over time. Additionally, establishing and refining methods to set population objectives at regional scales, in cooperation with experts across the country, will only improve the accuracy and value of continental objectives established by the parent plans (e.g., Rich et al. 2004).

International Planning

Prior to the AMJV Technical Committee meeting in Roanoke, AMJV partners worked with Dr. Peter Blancher (Environment Canada) to generate winter linkage 'overlay' maps for priority migratory birds of the AMJV, using the same process found in Blancher et al. (2006). We initiated the process with a list of all migrant birds that breed in BCR 28, excluding priority species that do not leave the BCR entirely during winter. Then, AMJV partners drafted a list of 'priority' and 'highest priority' species (based on suggestions by the AMJV Technical Committee in August 2007) in order to focus winter linkage maps even further. Unweighted maps were created for all species whose proportion of their hemispheric breeding population, minus their proportion of hemispheric winter range, was greater than zero (i.e., all migrants treated equally). In weighted maps however, weights were assigned to priority species according to the proportion of a species population that breeds in the Appalachian region, minus the

proportion of winter range in the Appalachian region. This created winter linkage maps that were as specific to the Appalachian Mountains as possible (i.e., maps for 2 regions with the same list of priority species would be somewhat different if proportions breeding in each region differed), but also gave higher weight to species that rely heavily on the Appalachian region for breeding but migrate out of the region entirely during winter. This resulted in 6 AMJV winter linkage maps: migrants unweighted, priority migrants unweighted, highest priority migrants unweighted, migrants weighted, priority migrants weighted, and highest priority migrants weighted (all presented in Appendix 3).

Initial discussions among AMJV Technical Committee members, Management Board members, and other partner organizations have focused on the map that depicts overlapping ranges of the highest priority migrants with weighted scores. Analysis of this map among partners has led to initial focus on 2 areas: the northern Andes Mountains in Colombia, Venezuela, Peru, and Ecuador; and southern Mexico/Central America (e.g., Chiapas, MX/Guatemala). Several high priority species (Cerulean Warbler, Golden-winged Warbler, Canada Warbler, Olive-sided Flycatcher) overwinter in the Northern Andes, and there is increasing interest in the region by species-specific focus groups (e.g., Cerulean Warbler Technical Group, Golden-winged Warbler Working Group), organizations that comprise them, and regional researchers and conservation groups. Portions of southern Mexico and northern Central America support large proportions of several AMJV priority species, most notably Worm-eating Warblers, Blue-winged Warblers, Louisiana Waterthrush, Acadian Flycatchers, Wood Thrush, Kentucky Warblers, and Golden-winged Warblers. In fact, the Tri-national Committee of NABCI identified a portion of this region, El Triunfo-Chiapas, as 1 of 5 "Continentally Important Areas" for priority bird conservation (NABCI 2008; *http://www.nabci-us.org/aboutnabci/CIP-intro.pdf*). The Tri-national Committee is seeking funding for partners in Canada, the U.S., and Mexico to implement conservation planning and projects in each of these regions. The AMJV is developing a partnership with "Alianza Regional para la Conservación de las Aves y sus hábitat en Chiapas" (a regional alliance similar in structure to our joint ventures), ProNatura-Sur (a member of the regional alliance), and the Pacific Coast JV/Northern Pacific Rainforest BCR 5, another JV/BCR with high proportions of priority species that overwinter in the Chiapas region (NABCI 2008 and *http://www.nabci-us.org/aboutnabci/eltriumfo-chiapas.xls*). Although partnerships in the northern Andes Mountains of South America and with the Regional Alliance in Chiapas are possibilities, the AMJV Management Board needs to further discuss international conservation priorities, evaluate funding potential, and critically examine our role in such projects. Until such time, our preliminary discussions with AMJV partners, outside experts, and international conservation groups are helping to narrow our focus on important wintering areas for priority birds that breed in the AMJV.

Conservation Design

Conservation planning for birds has been occurring at continental, national, regional, and state levels at varying degrees for many years. However, for the most part, tools that inform managers about how much, what, and where specific habitats are needed on the landscape to sustain priority bird populations have not been developed consistently and are not widely available. Additionally, with the completion of State Wildlife Action Plans and regional, national, and international bird conservation plans, there is an immediate need for such planning tools at various scales. Developing these tools will allow policy-makers, administrators, and land managers to make scientifically-based decisions about habitat conservation activities, and evaluate progress relative to objectives identified within this suite of bird conservation plans.

Conservation design refers to identification of specific areas with landscape or habitat characteristics that will sustain viable populations at target levels, in this case, for priority bird species. The conservation design process is a series of steps that builds upon information gathered during the biological planning steps and ultimately provides tools to efficiently and effectively guide management decisions, i.e., where and how much habitat needs to be protected, managed, restored, or enhanced to improve or sustain priority bird populations. A robust conservation design process also explicitly evaluates "trade-offs" among species with conflicting habitat requirements instead of considering each species independently. Conservation design in the AMJV will involve assessments of habitat-related limiting factors upon bird populations by modeling known and/or hypothesized relationships between species and habitats, assessing current and potential future status of habitats and their capacity to support populations, and development of decision support tools to guide conservation actions.

An example of a large-scale migratory bird conservation design project recently was initiated by North Carolina State University (NCSU). Researchers at NCSU, in partnership with ACJV and numerous others, were awarded a grant through the Association of Fish and Wildlife Agencies' Multistate Conservation Grant Program, for their proposal entitled "Designing Sustainable Landscapes for Bird Populations in the Eastern U.S." The project will use Ecological Systems classification and Regional Gap

Analysis mapping to develop a consistent approach to habitat modeling and conservation design throughout the eastern United States, including the AMJV. This process will produce tools that may range from identifying focus areas for priority species to complex habitat suitability maps that address competing habitat needs (e.g., early successional forest vs. mature forest, grassland vs. forest), and will be used to support other conservation design tools the AMJV partnership creates.

Within the AMJV partnership, we have identified the following overarching goal and corresponding objectives for conservation design:

Goal: Based on our current understanding of landscape conditions and bird population/habitat relationships, the AMJV will develop a landscape design that will sustain populations of priority birds at prescribed levels.

Objective 1: Establish geographic- or habitat-based working groups that can collectively contribute to conservation design at multiple spatial scales (e.g., international, BCR, ecoregion, landscape, project/site).

Objective 2: Through working groups, describe bird-habitat relationships for focal species, determine current estimated population based on available habitat, and then develop habitat goals based on the difference between prescribed levels and current population estimates.

Objective 3: Develop a spatially-explicit conservation blueprint of future desired conditions for priority habitats that will sustain priority bird populations at prescribed levels within the AMJV.

Below we discuss various aspects of and challenges to conservation design that our partnership has initiated or discussed.

Bird Habitat Conservation Areas

Currently within the AMJV, we lack large-scale empirical models of species-habitat relationships, although several longer-term and recently initiated projects by AMJV partners are generating valuable data that will create very useful models (e.g., regional Cerulean Warbler silvicultural project, regional Golden-winged Warbler patch occupancy and productivity assessment). In lieu of empirical models initially, which we are striving towards, we have delineated geographically explicit Bird Habitat Conservation Areas (BHCA) for the entire AMBCR, within which future conservation planning activities generally will be based. At our August 2007 meeting, Technical Committee members indicated the relative importance of geographic areas based on 'hotspots' for priority species or species suites (e.g., National Audubon Society's Important Bird Areas [IBAs], protected lands with monitoring data), and/or distribution of habitat (e.g., large forest blocks, grassland or wetland complexes). Once digitized into a GIS, the Technical Committee was able to view how these BHCAs aligned with known protected areas (e.g., state, federal, or private conservation ownership), IBAs, and various habitats or habitat metrics (i.e., forest patch size). Maps depicting BHCAs were then reviewed by a wider audience (e.g., technical experts that did not attend the August 2007 meeting, state IBA coordinators, and several agency administrators) and adjustments and additions were incorporated into our AMJV Bird Habitat Conservation Areas (see Appendix 4). Data layers (i.e., forest patch size, NLCD 2001, NLCD rare classes) used to inform experts, and associated metadata, are shown by state in Appendix 5. For consistency, we used *proclamation boundaries* in Appendix 5 to depict all federal lands; we continue to gather current GIS data layers that depict federal ownership of lands within the AMJV and will update maps in Appendix 5 once layers for all federal lands are gathered.

We recognize that our BHCAs are coarse assessments of geographically important areas and other areas within the AMBCR do (or could, if managed properly) provide high quality bird habitat. However, based on expert opinion, our BHCAs have the highest conservation and restoration potential in the AMBCR. Many of these areas contain large blocks of contiguous habitat and/or public ownership, high concentrations of priority birds, discrete patches of rare or important habitat types, or ongoing/potential partnerships with private landowners (including industry). Many of these BHCAs also were identified in other conservation plans (e.g., State Wildlife Action Plans) because of their high biodiversity or unique ecological functions. Therefore, identifying areas of known 'high potential' for conservation will allow us to examine factors within those BHCAs that influence avian populations, and apply that knowledge to other appropriate areas in order to achieve our objectives.

Additionally, we have taken initial steps with ACJV staff and partners to incorporate waterfowl focus areas that now lie within the proposed AMJV administrative boundary. The ACJV Waterfowl Technical Committee developed waterfowl focus areas by state for the entire ACJV area (ACJV 2005). Overall, there are 12 ACJV Waterfowl Focus Areas that fall entirely or partially within AMJV boundaries (Fig. 6). Only minor portions of Finger Lakes (New York), Roanoke River (Virginia), and Savannah River (Georgia) waterfowl focus areas fall within the proposed AMJV administrative boundary. Also, the Finger Lakes, Susquehanna River (Pennsylvania), Ohio River (Pennsylvania section only), Meadow River (West Virginia), and Roanoke River have little to no overlap with any of the BHCAs the AMJV Technical Committee has drafted. Waterfowl have been added as a 'priority suite' to all BHCAs that overlap with the Waterfowl Focus Areas in

Fig. 6. Waterfowl-specific focus areas are not identified for Ohio, Kentucky, Tennessee, or Alabama in Fig. 6 because those states were not involved in the ACJV's process (i.e., they are not within the ACJV boundary). However, the AMJV Technical Committee and subsequent reviewers considered all bird groups when drafting BHCAs for the AMJV, so waterfowl are identified as a focal suite in several BHCAs.

Characterizing the Landscape—Past, Present, and Future

The Appalachian Mountains region is well-known for its rugged terrain, abundance and diversity of flora and fauna, and expanses of contiguous forest that are increasingly rare in the eastern U.S. In fact, based on National Land Cover Data 2001 (NLCD 2001) for the AMBCR, the ratio of percent forest cover (deciduous, evergreen, and mixed) to 'developed' area (open space and low, medium, and high intensity) was >8:1 (Table 4) at the time those data were compiled. Given the abundance of forested habitat remaining in the AMJV, it is likely the region functions (or could function, depending on habitat quality) as 'source' populations for numerous forest-dependent bird species (Donovan et al. 1995). Reproductive success of forest birds in landscapes with <70% forest cover within a 10 km radius often is too low to sustain local populations (Donovan et al. 1995, Robinson et al. 1995); nest parasitism and predation tend to increase as forest fragmentation increases. Based on NLCD 2001, the AMBCR stands at the 70% threshold as a region, although there are many smaller-scale areas within the region that greatly exceed that threshold (see state forest patch maps in Appendix 5). Maintaining forest cover at a ≥70% threshold regionally is critical to sustaining or increasing forest bird populations within the AMBCR, as well as sustaining forest bird communities in adjacent joint ventures. AMJV Technical Committee members and other partners, in their drafting of BHCAs, identified numerous contiguous blocks of forested habitat; within those areas, the goal is to maintain ≥70% forest cover or restore forest cover to that threshold or beyond.

Although the AMJV is predominantly forested, ample opportunities for grassland and shrubland habitat conservation occur throughout the AMJV. Historically, much of the region supported disturbance-dependent habitats such as open oak woodlands, barrens, shrublands, and savannas with diverse grass/forb communities. Remnants of these habitats have persisted in certain areas, and much of the habitat surrounding these areas can be restored. Additionally, extensive opportunities to conserve grassland and shrubland birds exist on lands currently in agricultural pasture/haylands and on minelands that were reclaimed to grasslands. Although many of these pasture/hayland or mineland areas are embedded within a forested matrix (i.e., should be reforested or managed to 'soften' edges), numerous broad agricultural valleys or mine "complexes" often support breeding populations of priority grassland birds. Strategic conservation planning for both natural (e.g., oak woodlands,

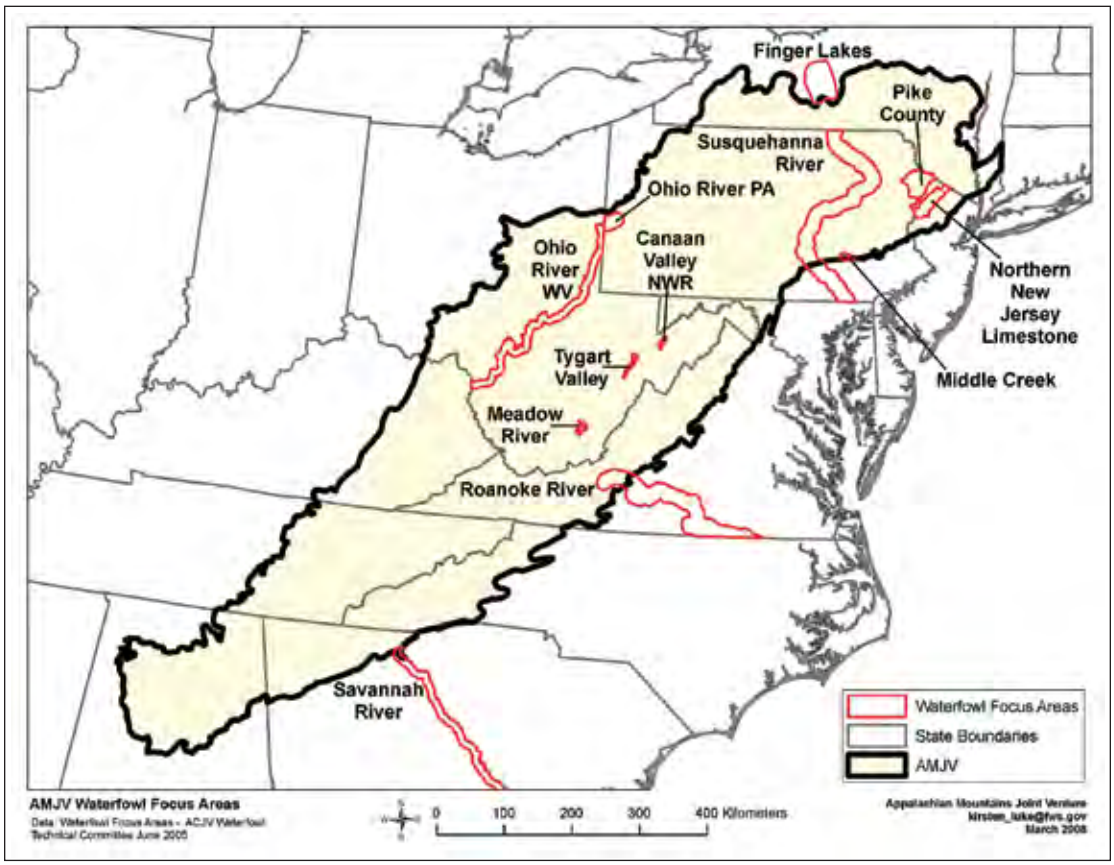

Figure 6. Twelve (12) Waterfowl Focus Areas (WFAs), previously created by the Atlantic Coast Joint Venture Waterfowl Technical Committee (see ACJV 2005 for all WFAs in ACJV states), that now fall entirely or partially within the Appalachian Mountains Joint Venture (AMJV) administrative area. The Finger Lakes, Susquehanna River, Ohio River (Pennsylvania section only), Meadow River, and Roanoke River have little to no overlap with Bird Habitat Conservation Areas drafted by the AMJV Technical Committee; the portions of these WFAs within the AMJV have been incorporated as focus areas.

Table 4. Habitat classes, descriptions, area estimates (hectares and acres), and an estimate of percent coverage within the Appalachian Mountains Joint Venture, based on National Land Cover Data 2001 (NLCD 2001). NLCD 2001 is a Landsat based landcover database with 30 m resolution and 21 classes of land-cover data derived from imagery, ancillary data, and derivatives using a Decision tree.

NLCD 2001 Habitat Class	General Habitat Description	Area (ha)	Area (ac)	% of AMJV
Open Water	All areas of open water, generally with less than 25% cover or vegetation or soil.	498,793	1,232,538	1.2
Developed, Open Space	Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.	2,285,815	5,648,348	5.5
Developed, Low Intensity	Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49% of total cover. These areas most commonly include single-family housing units.	753,623	1,862,236	1.8
Developed, Medium Intensity	Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79% of the total cover. These areas most commonly include single-family housing units.	253,203	625,676	0.6
Developed, High Intensity	Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80-100% of the total cover.	79,417	196,243	0.2
Barren Land (Rock/Sand/ Clay)	Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.	158,453	391,544	0.4
Deciduous Forest	Areas dominated by trees generally greater than 5 m tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.	24,165,809	59,714,778	58.0
Evergreen Forest	Areas dominated by trees generally greater than 5 m tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.	2,110,792	5,215,860	5.1
Mixed Forest	Areas dominated by trees generally greater than 5 m tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.	2,348,887	5,804,202	5.6
Shrub/Scrub	Areas dominated by shrubs; less than 5 m tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.	515,911	1,274,838	1.2
Grassland/ Herbaceous	Areas dominated by grammanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.	897,895	2,218,738	2.2
Pasture/Hay	Areas of grasses, legumes, or grass/legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.	5,573,941	13,773,455	13.4
Cultivated Crops	Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation.	1,681,758	4,155,699	4.0
Woody Wetlands	Areas where forest or shrub land vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.	309,378	764,487	0.7
Emergent Herbaceous Wetlands	Areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.	31,212	77,127	0.1
	Total Area in AMJV =	**41,664,887**	**102,955,770**	

barrens) and human-altered grassland systems in the AMJV will help us attain our grassland and shrubland bird population objectives. Areas within the AMJV that either historically supported disturbance-dependent grassland and shrubland habitats, or currently support these habitats through anthropogenic land-uses (e.g., mining, agriculture) have been targeted (e.g., BHCAs, mineland Decision Support Tool) for grass-shrubland bird conservation efforts.

Few priority wetland-dependent (e.g., waterfowl, waterbirds, shorebirds) species breed in the AMJV, and for those that do, they occur at relatively low densities. Additionally, no research to date within the AMJV indicates that landscape context influences density or survival of transient or wintering wetland-dependent birds. However, wetland, riparian/riverine, and 'open water' habitats are very important (ecologically and to our partners) within the Appalachian Mountains; therefore, our partnership will design appropriate landscapes for wetland-dependent species. Our initial BHCAs for wetland-dependent birds were delineated around existing wetlands or historical wetlands with conservation potential (including those originally developed by the ACJV Waterfowl Technical Committee; Fig. 6).

To accurately and realistically characterize past, current, and future AMJV landscapes, we must continue to develop and maintain strong partnerships with GIS experts, ecologists, researchers, and on-the-ground partners. Existing GIS data will be compiled and organized for the joint venture area, ensuring these data are made available at various scales so partners can assess local and large-scale status, distribution, and trends of bird habitats. Opportunities to examine land use change (e.g., 1970 to 2000) throughout the AMJV exist with such datasets as the USFS's Forest Inventory and Analysis (FIA). In fact, Fearer (2006) examined bird population-habitat relationships of forest-dwelling birds at several spatial and temporal scales using FIA and U.S. Geological Survey's Breeding Bird Survey (BBS) data. This research highlighted the strengths and weaknesses of FIA data to describe forest habitats for birds, providing valuable insight about data needed to improve our abilities to characterize bird habitats using FIA data. Research such as this, coupled with ever-improving modeling techniques for forest birds (e.g., models developed jointly by the Central Hardwoods and Lower Mississippi Valley Joint Ventures; see *http://www.lmvjv.org/hsi_model/*), is vastly improving our (i.e., the conservation community's) abilities to examine bird population-habitat relationships at multiple scales. Tying information gathered from such bird population models into landscape-level simulation models (e.g., LANDIS-II *http://www.landis-ii.org*) to evaluate future land cover composition will provide powerful predictions about effects of large-scale changes to forested habitat on populations of priority species. The AMJV partnership will need to evaluate the usefulness of these bird-habitat models and landscape simulation tools.

Additionally, our ability to model ecological systems (i.e., native vegetation patterns based on landform, moisture, etc.) will provide insight into the management potential of different areas, assuming it is inherently easier to restore areas to habitats that naturally occurred there (e.g., reforest areas that were historically forest). One exception to the notion of restoring natural systems wherever possible is the treatment of post-SMCRA minelands that were reclaimed to grasslands/shrublands instead of hardwood forests. These grasslands/shrublands support populations of several high priority species and provide some of the only early successional habitat in some areas. Management of these minelands must be considered at multiple scales, examining bird populations and habitats within a local and landscape context to ensure we maximize forest, shrubland, and grassland bird-habitat potential throughout the region.

With a vast portfolio of bird-habitat models and habitat characterizations for major habitat types, we will be able to generate estimates of carrying capacity for a wide-range of species within the AMJV. In turn, we should then be able to estimate the amount of habitat necessary to increase or maintain populations of priority species at our established population targets.

Decision Support Tools

Decision-support tools (DSTs) are developed to target specific conservation actions (reforestation, land acquisition, etc.) that reduce effects of a limiting factor(s) for priority species' populations. DSTs must (1) be based on a strong biological foundation, (2) accurately predict response patterns by priority species, and (3) depict results in easily understood and easy-to-use products. Creating a robust portfolio of powerful DSTs will increase our ability to respond to information needs of partners, policy-makers, city planners, and/or program delivery agencies (e.g., NRCS, USFS).

Thus, as the AMJV partnership continues to develop its biological foundation, it should result in the development of spatially-explicit DSTs that will allow habitat managers and policy-makers to:

- delineate and prioritize landscape- and site-scale priority conservation areas for priority species,
- prioritize where conservation dollars should be spent,
- assess the capability of current landscapes to support populations of priority species,
- resolve conflicts among "competing" habitat types that support priority species (e.g., minelands as grasslands, shrublands, or forests), and
- predict effects of land cover changes due to management actions or other causes (e.g., succession, climate

change, urbanization) on populations of priority species.

Near-term development of 2 DSTs has generated great interest among AMJV partners. First, AMJV partners are beginning to assimilate population, habitat, and other pertinent spatial data for high elevation spruce-fir habitats and associated priority species. Analyzing the information available will allow us to assess population status and habitat quality, and determine what conservation actions we need to initiate, and where those actions should be targeted. The second DST of immediate interest to partners will guide habitat management or restoration decisions for minelands previously reclaimed to grasslands/shrublands. Many of these open areas are large (or occur in "complexes") and support populations of priority grassland/shrubland birds (e.g., Golden-winged Warbler, Henslow's Sparrow, Northern Bobwhite) and/or other wildlife populations of interest to partner agencies. However, many of these open areas occur within large blocks of contiguous forested habitat (i.e., causing fragmentation) or within known 'hotspots' of priority birds that require large blocks of intact forest (e.g., Cerulean Warblers). Creating a DST to target reforestation or grassland/shrubland management based on habitat needs of priority grassland, shrubland, or interior forest birds, as well as incorporating other social or economic interests of AMJV partners (e.g., elk management areas), will strategically and efficiently guide our conservation efforts on minelands in the AMJV.

Climate Change

The exact magnitude of predicted effects of climate change is uncertain, but nearly all global climate change models agree that global temperatures and sea levels will continue to rise unnaturally fast, and precipitation patterns will change. The AMJV must consider climate change during our planning and design efforts, or we increasingly will fail to reach our population objectives for priority species (Inkley et al. 2004). It is imperative that the potential impacts of climate be understood, to the extent possible, so appropriate actions can be taken to ensure adequate habitat is available to sustain bird populations. For instance, it is generally believed that terrestrial ecosystems and forest types in the Southeast will generally "migrate" northward and to higher elevations (Smith 2004). Also, the AMJV could suffer a complete loss of sub-boreal forest types found in higher elevations (Prasad and Iverson 1999). Changes to the composition and abundance of oak/hickory and oak/pine forests are also predicted (Prasad and Iverson 1999), which in turn, will have profound influences on the distribution and abundance of priority bird species and their populations. Matthews et al. (2004) compiled models of bird distributions in the eastern U.S. that show likely consequences of such ecosystem shifts in response to climate change. Species' ranges may retract entirely out of the AMJV (e.g., Black-billed Cuckoo, Yellow-bellied Sapsucker), shift northward within the AMJV (e.g., Chuck-Will's Widow, Kentucky Warbler), or expand into the AMJV (e.g., Scissor-tailed Flycatcher), making it very important that AMJV partners, and the bird conservation community as a whole, be aware of how current conservation actions may be impacted by future system changes, and how we must adapt to accommodate these changes.

Potential questions related to climate change that the AMJV will evaluate/incorporate in its conservation planning efforts include:

- Which species are inherently more susceptible/vulnerable to extinction/extirpation because of climate change (e.g., Foden et al. 2008)?
- Where do habitat conservation efforts 'overlap' with carbon sequestration projects or other means of mitigating/sequestering emissions (i.e., additional habitat conservation opportunities)?
- How will climate change impact water resources and critical lowland riparian habitats?
- What data must we gather about bird distribution and abundance to accurately assess effects on priority bird populations?
- How might climate change impact migratory and wintering habitats of priority birds outside of the AMJV?

Currently, the bird conservation community has a limited understanding of the potential implications of climate change on birds. However, working together to better predict changes in habitat, hydrology, precipitation patterns, etc., will allow us to more accurately assess and design landscape conservation efforts related to climate change and bird populations.

Conservation Delivery

The AMJV partnership will help partners achieve their bird conservation objectives by coordinating the programmatic strengths and capabilities of all partners, and subsequently implementing projects efficiently and effectively to affect landscape change. The action of restoring, managing, enhancing, or protecting habitat, collectively known as conservation delivery, will be paramount to our success as a bird conservation initiative. The AMJV will serve as a forum that fosters cooperative and collaborative efforts among partners with regard to conservation delivery efforts that address high priority needs for bird populations and their habitats. The AMJV partnership has identified the following over-arching goal and associated objectives for conservation delivery:

Goal: Engage, facilitate, and coordinate partners' collective capabilities and expertise to maximize the potential to positively affect landscape change and population status of priority species.

Objective 1: Facilitate the development, funding, and implementation of

conservation delivery efforts of AMJV partners, ensuring projects strive to fulfill the JV's mission of achieving all-bird conservation across the region.

Objective 2: Develop a conservation delivery communication strategy and appropriate tools to help integrate AMJV population and habitat conservation objectives into delivery programs or plans, develop outreach strategies and conservation messages, and develop new partners and partnerships.

Objective 3: Develop and coordinate conservation delivery efforts of mutual interest across jurisdictional boundaries within the AMJV, among adjacent JVs/BCRs, or on wintering grounds that support priority species.

Objective 4: Use conservation planning products to leverage additional funding for high priority conservation projects within BHCAs or other appropriate areas (e.g., IBAs).

Objective 5: With partners, develop the technical capacity to track partner accomplishments and progress towards delivering habitat objectives at multiple scales.

Objective 6: Evaluate current and developing policies that directly affect conservation delivery efforts, using science-based analyses to examine potential impacts to priority bird populations under various scenarios and to discuss among AMJV partners.

Communication and coordination are key factors in fully engaging and realizing the potential of our partnership. Among AMJV partners, we must understand the importance of biological planning and conservation design; it will focus our collective efforts on the actions or locations within the region that maximize our conservation efforts for priority species. Identifying an effective organizational structure (which includes additional AMJV staff) will greatly enhance our ability to (1) prioritize and develop useful planning tools; (2) communicate between the Management Board and Technical Committee(s); (3) effectively communicate outside of our immediate partnership; and, (4) coordinate activities that advance our conservation efforts (e.g., task-oriented workshops to develop products, delivery programs). Communication and coordination among our core partnership will build a strong foundation for reaching out to policy-makers, industries, and other stakeholders that influence land-use in the Appalachian Mountains. External to our partnership, we also must effectively communicate and coordinate with coordinators/committees of the various bird conservation plans, the Atlantic and Mississippi Flyway Councils, adjoining joint ventures, and other habitat partnerships or conservation organizations that may help us meet our conservation goals. Communication and coordination, both internal and external, are vital to the success of our partnership; we will develop and implement effective communication and coordination strategies, refining our efforts as our partnership matures.

Identifying new partners that are either active in conservation delivery (e.g., local land trusts) or influence land-use policy (e.g., municipalities) in areas important to priority bird populations will be important. The AMJV partnership must engage new partners in biological planning and conservation design efforts if we expect to affect change on the landscape. To be successful, conservation strategies and tools must incorporate AMJV objectives and societal attitudes to the degree possible. If successful, our conservation design efforts and habitat objectives will be incorporated into the appropriate delivery programs or land-use planning efforts.

The AMJV will assist partners with coordination of projects involving conservation delivery that span state boundaries, the jurisdiction of an individual partner, and where appropriate, among adjacent joint ventures or countries that overwinter large proportions of AMJV priority species. These might include projects that qualify for funding from the Northeast Association of Regional Wildlife Agencies' Regional Conservation Needs program, the Association of Fish and Wildlife Agencies' Multistate Conservation grant programs, Neotropical Migratory Bird Conservation Act (NMBCA), or the North American Wetlands Conservation Act (NAWCA). As our partnership matures, we will develop streamlined processes to solicit and review grant applications for federal programs (NMBCA, NAWCA), particularly emphasizing projects that address AMJV priorities, and to facilitate coordination and delivery of conservation projects for in conjunction with partners. Our partnership has initiated discussions about how we will organize at various scales (e.g., ecoregion/sub-BCR, state, BHCA) to facilitate conservation delivery projects, but those discussions are ongoing. Additionally, the AMJV will assist with leveraging of funds for high priority projects by effectively using conservation design products in grant applications, presentations to potential funding sources, etc.

The AMJV Management Board recognizes that the majority of the projects will be developed and implemented by local and/or subregional partnerships, but cumulative effects eventually must be tracked in a spatial framework (i.e., GIS) and associated databases. Example databases are being constructed and used by other JVs and partners; collaboration to develop a tracking framework for the AMJV will greatly expedite development of this product. Ultimately, AMJV partners must be able to track conservation gains vs. losses, which will provide an assessment of our collective efforts in the region.

Finally, situations may arise when policy/legislation (current or emerg-

ing) is directly affecting the ability of the AMJV partnership to efficiently deliver on-the-ground conservation projects. In such cases, the AMJV office will examine potential impacts to priority bird populations under various policy scenarios, ensuring we use the best available science to inform our analyses. Such analyses of policy issues will be thoroughly discussed among AMJV Management Board members to ensure partners are aware of, and understand, potential effects on our efficiency and effectiveness as a partnership.

Habitat-specific Conservation Delivery

In the AMJV, most of our priority species are forest-dependent landbirds. Habitat needs for this suite of species must include management to enhance forest structure in mature forests, adequate distribution of various age-classes across the landscape, addressing threats from forests pests and diseases, perpetuating native ecosystems (e.g., Table Mountain pine), and the long-term maintenance of the region's "source" forest areas. The National Forests within the AMJV represent the largest public land base where forest and woodland management efforts are being applied, although state forests also cover a great extent throughout the region. Management efforts on public lands in the AMJV often are hampered by internal (e.g., personnel or funding shortages) or external (e.g., lawsuits from the private sector) forces. Therefore, outreach and funding are essential if we hope to educate the public about the role that management and disturbance plays in maintaining the health of the Appalachian Mountains' forested ecosystems and the bird populations that rely on them. Prescribed fire, thinning, even-aged (e.g., regeneration) harvest, and uneven-aged (e.g., individual tree and group selection) harvest are all important management tools and must be applied appropriately based on species' needs. As a partnership, we must clearly articulate species' needs to ensure that a balance among stands of various age classes is achieved across forested landscapes. Through careful planning and design, we will ensure that the needs of all the AMJV's priority forest- (and woodland-) dependent bird species are met.

In areas where forests are fragmented, we will encourage reforestation with native species or through natural succession. Opportunities to deliver reforestation efforts on public and private lands through carbon sequestration and/or mineland reforestation projects abound in the AMJV, as do projects through USDA Farm Bill programs, USFWS' Partners For Wildlife program, or grants to AMJV partners through various other entities (e.g., The Hardwood Forestry Fund; *http://www.hardwoodforestryfund.org/Grants.htm*). Private lands incentive programs and reforestation projects on public lands are being implemented across the AMJV; targeting these efforts also will improve the condition of surrounding forest stands. Additionally, we can provide outreach to promote best management practices that will sustain the health and economic benefits of privately-owned forests well into the future.

The conversion of forest for urban areas, energy (wind, coal, and natural gas), and infrastructure (roads, transmission lines, pipelines) often eliminates or degrades forested habitat and increases fragmentation. Nest predators and parasites also increase in numbers and are more successful at permeating into the fragmented forest, resulting in lower nesting success of forest birds. The AMJV partnership must work with appropriate development initiatives and industry if we are to successfully reduce the impacts of urbanization and energy development in our largely forested landscape. However, we must remain sensitive to the economic needs of rural communities, working to educate them about wildlife populations and to identify creative solutions to our collective challenges.

In terms of grasslands and grass-shrublands, many of the AMJV's partner agencies are actively restoring and enhancing these habitats on lands they own or manage, or on private lands through programs they administer. State agencies and the National Forests possess the greatest ability to restore significant acreages of extant but degraded natural communities such as glades, barrens and woodland-savannas. Prescribed fire is crucial to the restoration and long-term viability of these ecosystems (and some forested ecosystems discussed above), which will require extensive outreach to ensure that the public is aware of the need for periodic management to sustain these systems. Integrating our efforts with experts in ecology and prescribed fire (e.g., Landscape Fire & Resource Management Planning Tools Project, a.k.a., LANDFIRE, *http://www.landfire.gov/*; U.S. Fire Learning Network, *http://www.tncfire.org/training_usfln.htm*) will be essential to delivering the AMJV's message to a wider audience, engaging new partners, and strategically applying prescribed fire to benefit habitat for bird populations. Potential for management of grasslands and grass-shrublands exists through private lands incentives programs, targeting non-native pastures and marginal croplands. However, the greatest opportunity for grassland and grass-shrubland management in the region (as well as reforestation, depending on location, compaction, etc.) may exist on previously mined lands that were reclaimed to non-native grasslands. Many of the larger mineland complexes in grasses/shrubs already support breeding populations of priority species, but we must design our conservation efforts appropriately to target grass/shrubland management without comprising habitat for priority forest-dwelling species. Finally, partnerships to promote grassland and grass-shrubland conservation

efforts have recently formed and initiated work. For example, a "Shrubland Bird Initiative" coordinated by Wildlife Management Institute recently received funding from various sources. The AMJV partnership is coordinating efforts with this initiative to guide placement of demonstration areas, deliver habitat management efforts, develop practices that will benefit priority species in the region (e.g., Golden-winged Warbler, American Woodcock), and engage partners to design and assist with monitoring efforts.

AMJV partners, especially state fish and wildlife agencies, USFWS, and USFS, have played a major role in wetland restoration and protection in the Appalachian Mountains. Although wetlands are not as common or expansive as in other regions of the country, they offer important habitats for priority birds and other wildlife species in the region, and their unique ecological functions have far-reaching benefits. As a partnership, we will facilitate and coordinate public-private partnerships to conserve wetland habitat in order to meet the AMBCR's responsibility as identified by the North American Waterfowl Management Plan, and conserve other wetland-dependent species (e.g., shorebirds, wading birds, marsh birds, and a variety landbirds). Establishing population goals and habitat objectives will provide guidance for wetland habitat work within the AMJV.

Monitoring, Research, and Evaluation

Although monitoring and research are separate concepts in conservation science, they are interrelated, and are thus discussed concurrently in this section. Monitoring and research both contribute to the evaluation necessary for maintenance of a healthy and effective conservation process. The AMJV partnership supports recommendations in the U.S. NABCI Monitoring Subcommittee report (2007) and the draft Framework for Coordinated Bird Monitoring in the Northeast (Northeast Coordinated Bird Monitoring Partnership 2007). These efforts recommend that bird monitoring should move beyond 'surveillance type monitoring' typical of most monitoring programs, instead shifting to a paradigm that stresses evaluation of conservation actions in a coordinated, statistically rigorous fashion.

Monitoring is the process of assessing the status of populations, habitats, and other variables, and tracking changes in those variables over time. Data from properly designed monitoring programs can be used to examine causes of observed trends or alteration of ecological processes. Monitoring can lead to evaluation of the effectiveness of implementation of planned conservation efforts, thereby providing knowledge about current projects but also informing future conservation decisions. Monitoring, therefore, promotes improved efficiency and effectiveness of conservation actions (Nichols and Williams 2006). Integrating this evaluation process into biological planning and on-the-ground decisions for management or conservation is central to the AMJV attaining their regional, national, and international bird conservation goals.

Assumption-driven research involves measuring parameters of interest through research that investigates testable hypotheses related to critical assumptions in decision making processes. As with monitoring, results from assumption-driven research contribute to program evaluation and influencing decisions upon which future conservation programs are based (i.e., in a feedback loop). Targeted research can address uncertainties or assumptions related to any stage of the AMJV's adaptive SHC framework (e.g., Biological Planning, Conservation Design, Conservation Delivery, and Monitoring). Uncertainties and assumptions that strongly influence decisions about how, where, how much, and what types of habitat to conserve, restore, and manage should be the principal research emphases for the AMJV and its partners.

Establishing and attaining broad, clearly defined monitoring goals has been recognized as an important element to effectively advance bird conservation efforts (Dunn et al. 2005, U.S. NABCI Monitoring Subcommittee 2007). Therefore, the AMJV has discussed goals of our monitoring programs in relation to the NABCI Monitoring Subcommittee report (2007). Our monitoring programs fall within several broad categories:

1) tracking long-term population trends to assess conservation status;
2) examining possible causes of population changes for priority species;
3) measuring responses of priority bird populations to specific conservation actions;
4) assessing particular vital rates indicative of reproductive success and survivorship; and,
5) determining status and changes in habitat quantity and quality.

Information from our monitoring programs will be used to inform decision-makers on management issues, improve our conservation design, evaluate our population and habitat objectives, and reassess our priorities. AMJV partners also recognize the importance of monitoring human dimensions within the region, but developing a monitoring program for human dimensions will require additional time and expertise. Additional 'key thoughts' about AMJV monitoring programs are discussed in the sections below.

Monitoring of Bird Populations

Improving effectiveness of bird monitoring in the AMJV will involve analysis of, coordination among, and improvements to existing efforts, as well as initiation of new projects where critical gaps or other information needs have been identified that are central to the partnership's conservation activities. Anticipated roles of the AMJV are consistent with the findings of the U.S.

NABCI Monitoring Subcommittee (2007), which recognized that the structure and function of Joint Ventures are well-suited to meet the growing challenge of improving upon the numerous avian monitoring programs that typically exist within any given landscape. The JV seeks to build upon the contributions of existing monitoring programs by encouraging their improved design and careful establishment of objectives. Another role of the partnership will be to lead in the coordination among these efforts in order to increase efficiency and reduce redundancy. A third objective to which the JV will eventually help contribute toward is improved data management and analysis.

As a first step, the AMJV Technical Committee will coordinate with the Northeast Coordinated Bird Monitoring Partnership to review or compile planned or ongoing monitoring programs relevant to the AMJV. Many AMJV Technical Committee members have been involved with this partnership since its inception; however other members, especially those from the southern portion of the AMJV, have only peripheral knowledge of this partnership. The Northeast Coordinated Bird Monitoring Partnership has coordinated efforts among 13 northeastern states (6 relevant to the AMJV: VA, WV, MD, PA, NJ, and NY) to assess and clarify the purpose and contributions of specific monitoring efforts, identify opportunities to improve or integrate programs, encourage reallocation or redistribution of efforts where appropriate, share information, and minimize redundancy. Emphasis will be placed on identifying monitoring programs (1) relevant to the entire AMJV, (2) relevant to the portion of the AMJV not covered by the Northeast Coordinated Bird Monitoring Partnership, and (3) increasing the applicability of these monitoring programs to the AMJV's conservation planning and management decisions. As this knowledge develops, the AMJV will develop a monitoring needs assessment that articulates and prioritizes activities by partner organizations, as well as the regional coordination roles that the JV can play.

The AMJV will work alongside other conservation entities in the southeastern U.S., particularly the CHJV and ACJV, to identify and address broader regional priorities for improved collaboration and efficiency. An overarching priority for the AMJV in all monitoring-related work will be the integration of monitoring efforts and results to address management and conservation questions across multiple spatial scales.

Monitoring Habitat Change

To track AMJV efforts to improve the overall sustainability of bird populations in the region, we must develop the capacity to assess net changes in both availability and condition of bird habitats, and how accomplishments of our partners relate to our established objectives. Land use in the region is dynamic in the mostly forested AMJV—demands for timber products fluctuate widely, energy extraction (e.g., coal, natural gas) and development (e.g., wind) have (and will continue to) altered the landscape, invasive/exotic species are affecting habitat quality, and urban/exurban development pressures are increasing in several areas. Therefore, habitat conservation successes within the AMJV must be considered in the context of region-wide land use changes. Assessing gains in bird habitat attributable to conservation delivery efforts of AMJV partners will require site, program, and landscape-level tracking. Several template geo-databases exist and are being used by existing JVs currently; the AMJV will develop similar tools specific to our needs, or will integrate with geo-databases in use by neighboring JVs where/when appropriate. The AMJV's collaboration with the ACJV, CHJV, EGCPJV, and Southeast Gap Analysis Project (SEGAP) will create an opportunity to develop a working understanding of net changes in land cover regionally, and the significance of these changes to our bird conservation activities. Finally, we must be able to accurately account for improvements in *habitat quality* that are not necessarily evident from tracking changes in *habitat quantity*. We must develop metrics to track improvements of existing habitats' quality on the landscape as it relates to AMJV management and restoration efforts, which are rooted in the core principles of conservation biology (e.g. increased connectivity, decreased edge, and improved ecosystem function).

Addressing Assumptions and Uncertainties Through Research

Partners in the AMJV recognize the critical nature of continually refining the information on which conservation and management decisions are based. We recognize that our biological planning and conservation design efforts will be limited by the availability of sufficient scientific information. Likewise, conservation delivery and monitoring efforts may be limited, for example, by our understanding of how habitats respond to management, or how species' detectability rates can bias survey data. Gaps in our knowledge will require us to explicitly state assumptions that describe the relationships, processes, or responses of interest. These uncertainties in our understanding can be used to frame testable hypotheses that relate directly to elements of the AMJV's adaptive conservation framework. These assumptions and hypotheses will form the context within which the AMJV will develop, promote, and coordinate research programs that help refine its planning, design, delivery, and evaluation activities.

Specifically, the AMJV has initiated development of a prioritized list of research topics, and will follow up with a list of *a priori* hypotheses generated from the development of decision support tools that focus on

priority habitats in the region. The AMJV office will assist partners in identifying and securing funding and other resources needed to conduct this research. Additionally, the AMJV will sponsor research assistantships for graduate students or research institutes to address research topics guided by our priorities. Similar to monitoring activities, the AMJV can help coordinate and pool efforts in the design and implementation of research projects that would otherwise be infeasible because of their resource demands, logistical complexity, or broad geographic scope. Similarly, the AMJV can serve as a continuing forum in which scientists, biologists, and managers can discuss and prioritize research to best meet mutual needs and interests.

Programmatic and Organizational Performance

As partners in the AMJV, we must challenge ourselves to objectively assess our progress towards 3 measures of success: delivering superior performance, making a distinctive impact, and achieving lasting endurance. In the business sector, money is both an input and an output, and performance can be measured by comparing profits vs. losses. However, in bird conservation joint ventures such as ours, money is an input and performance should be assessed relative to our mission. Therefore, we must track accomplishments of the AMJV with our mission in mind, and self-evaluate our effectiveness in delivering conservation to the region.

Several aspects of the AMJV mission (e.g., restoration of habitat, increases in avian populations) can be tracked quantitatively, yet many aspects can only be tracked through qualitative data. As we articulate our work plan's objectives, we must decide upon the information we need to objectively, consistently, and intelligently assess our performance. Several examples of attributes the AMJV partnership intends to develop and monitor are listed below. As our partnership and programmatic complexity evolve, we will modify our measures of success to accurately monitor our impacts and effectiveness.

Attribute 1: *Delivering Superior Performance*

- Avian diversity and population levels of priority species achieve the goals of state, regional, national, and international bird initiatives,
- Well-managed, fully-functioning habitats at target quality and quantity,
- Efficient and effective coordination and communication among partners, and,
- Biologically and ecologically-based shared vision for AMJV habitat conservation and management.

Attribute 2: *Making a Distinctive Impact*

- Innovative and relevant conservation design tools used by partners,
- Consistent ability to secure state, federal, and private grants,
- Ability to engage regional industries, communities, and others in conservation-related activities,
- Conservation delivery executed as part of regional, landscape-scale strategies, and,
- Regional collaboration among partners to maximize effective conservation delivery.

Attribute 3: *Achieving Endurance*

- Strength and breadth of partnership,
- Diversity of funding sources sufficient to achieve JV goals, and,
- Regional visibility and leadership.

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Appendices to Appalachian Mountains Joint Venture Implementation Plan

Appendix 1: Priority Species of the Appalachian Mountains Joint Venture

Appendix 1: Priority birds of conservation concern in the Appalachian Mountains Bird Conservation Region (AMBCR), based on comments received from AMJV partners via e-mail and at a meeting of the AMJV Technical Committee in August 2007. Also listed for each species is its status from various national, regional, and state plans, as well as the USFWS Birds of Management Concern (BMC) list and "WatchList 2007" co-authored by National Audubon Society and American Bird Conservancy (G. Butcher and D. Pashley 2007).

Common Name	International Plans [1, 2]	Regional PIF Plans [3, 4]	USFWS BMC List [5]	WatchList 2007 [6]	Listed in Wildlife Action Plans in the AMJV? [7]												
					AL	GA	SC	NC[8]	TN[8]	KY	VA[8]	WV	MD	OH	PA	NJ	NY
LANDBIRDS																	
Acadian Flycatcher	S; PR	IB; 5					X		X			X	X	X	X	X	
Alder Flycatcher	S; PR	IV; 2						X	X			X	X		X		
Bachman's Sparrow	WL,S; IM	2	BCC/N	Red	X	X	X		X	X		X	X				
Bald Eagle	S; PR	III; 1	BCC/N			X	X		X	X	X	X	X		X	X	X
Bay-breasted Warbler	WL,S; MA		BCC/R (R5)	Yellow													
Bewick's Wren		IA; 5	BCC/N		X		X		X	X	X	X	X				
Bicknell's Thrush	WL,S; IM	IB; 1	BCC/N	Red		X							X				X
Black-and-white Warbler		IB; 1									X		X	X		X	
Black-billed Cuckoo		IB; 3	BCC/N					X				X	X	X	X	X	X
Black-capped Chickadee		IA; 1	BCC/BCR					X	X								
Blackburnian Warbler	S; PR	IB; 2								X		X	X		X	X	
Blackpoll Warbler															X		
Blue-winged Warbler	WL,S; MA	IA; 7		Yellow				X	X	X		X	X	X	X	X	X
Broad-winged Hawk		IV; 1											X		X	X	
Brown Thrasher	S; MA	IIA; 2									X		X	X	X	X	X
Brown-headed Nuthatch	WL,S; MA	IB; 2	BCC/N				X	X	X				X				
Canada Warbler	WL,S; MA	IA; 4	BCC/N	Yellow				X		X	X		X	X	X	X	X
Cerulean Warbler	WL,S; MA	IA; 7	BCC/N	Yellow	X	X		X	X	X	X	X	X	X	X	X	X
Chimney Swift		IIB; 2									X			X	X	X	
Chuck-will's-widow	S; MA	III; 1	BCC/N						X		X	X	X	X			
Eastern Meadowlark		IV; 1					X	X			X		X	X	X	X	X
Eastern Towhee	S; MA	IB; 4									X		X	X		X	
Eastern Wood-Pewee		IB; 3					X	X	X		X	X		X		X	
Field Sparrow		IB; 5					X	X			X	X	X	X		X	
Golden Eagle									X				X		X		
Golden-winged Warbler	WL; IM	IA; 6	BCC/N	Red		X		X	X	X	X	X	X		X	X	X
Grasshopper Sparrow	S; MA	IIC; 4	BCC/N			X	X	X	X	X	X	X	X	X	X	X	X
Henslow's Sparrow	WL,S; IM	IA; 5	BCC/N	Red	X		X		X	X	X	X	X	X	X	X	X
Hooded Warbler	S; PR	IB; 3						X	X				X	X		X	
Indigo Bunting	S; PR	IIA; 3												X		X	
Kentucky Warbler	WL,S; MA	IA; 7	BCC/N	Yellow	X		X	X	X	X	X	X	X	X	X	X	X
Lark Sparrow		IV; 1							X			X		X			
Loggerhead Shrike		IIC; 2	BCC/N			X	X		X	X	X	X	X	X	X		
Long-eared Owl										X		X	X		X	X	
Louisiana Waterthrush	S; PR	IB; 7	BCC/N				X		X	X	X	X	X	X	X	X	X
Marsh Wren		IV; 1										X	X	X	X	X	
Northern Bobwhite		IIB; 2				X	X	X	X	X	X	X	X	X	X	X	
Northern Flicker								X						X		X	
Northern Goshawk		IV; 3										X	X		X	X	

Common Name	International Plans [1, 2]	Regional PIF Plans [3, 4]	USFWS BMC List [5]	WatchList 2007 [6]	Listed in Wildlife Action Plans in the AMJV? [7]												
					AL	GA	SC	NC[8]	TN[8]	KY	VA[8]	WV	MD	OH	PA	NJ	NY
LANDBIRDS																	
Northern Harrier		IV; 3	BCC/N		X				X	X	X	X	X	X	X	X	X
Northern Parula		IIA; 2							X		X		X			X	
Northern Saw-whet Owl		IA; 3	BCC/BCR					X	X		X	X	X	X			
Olive-sided Flycatcher	WL; MA	IB; 3	BCC/N	Yellow					X			X	X		X		X
Peregrine Falcon	S; PR	IIA; 4	BCC/N				X	X	X	X	X	X	X	X	X	X	X
Prairie Warbler	WL,S; MA	IA; 7	BCC/N	Yellow			X	X	X	X	X	X	X	X	X	X	X
Prothonotary Warbler	WL,S; MA	IB; 3	BCC/N	Yellow					X	X	X	X	X	X	X		
Purple Martin		IV; 1												X			
Red Crossbill		IA; 2	BCC/BCR				X	X			X				X		
Red-cockaded Woodpecker	WL,S; IM	2	T/E	Red	X		X			X			X				
Red-headed Woodpecker	WL; MA	IB; 5	BCC/N	Yellow				X	X	X		X	X	X	X	X	X
Ruffed Grouse		IB; 1					X	X						X		X	X
Scarlet Tanager		IB; 4					X				X		X	X	X	X	
Sedge Wren		IIC; 4	BCC/N						X	X		X	X	X	X	X	X
Sharp-shinned Hawk								X	X	X		X	X		X	X	
Short-eared Owl	WL; MA	IA; 2	BCC/N	Yellow	X				X	X		X	X	X	X	X	X
Summer Tanager													X		X		
Swainson's Warbler	WL,S; PR	IA; 4	BCC/N	Yellow	X	X	X	X	X	X	X	X	X				
Whip-poor-will		IIA; 3	BCC/N					X	X		X	X	X	X	X	X	X
White-throated Sparrow	S; PR																
Wild Turkey																	
Willow Flycatcher	WL; MA	IA; 4						X		X	X		X	X	X	X	
Wood Thrush	WL,S; MA	IA; 7	BCC/N	Yellow	X		X	X	X	X	X	X	X	X	X	X	X
Worm-eating Warbler	WL,S; MA	IA; 7	BCC/N		X		X	X	X	X	X	X	X	X	X	X	
Yellow-bellied Flycatcher	S; PR	IV; 2										X			X		
Yellow-bellied Sapsucker	S; PR	IA; 3	BCC/BCR			X		X	X		X	X	X			X	
Yellow-breasted Chat		IIA; 5									X			X	X	X	X
Yellow-throated Vireo	S; PR	IB; 3							X		X		X	X	X	X	
Yellow-throated Warbler	S; PR	IB; 3							X							X	
WATERFOWL																	
American Black Duck	H; H	IB; 4	BDC		X					X	X		X	X	X	X	
Blue-winged Teal	MH													X			
Bufflehead	M; ML																
Canada Goose - Atlantic	H; H															X	
Canvasback	MH; ML		BDC										X	X			
Common Goldeneye	MH; ML													X			
Gadwall	M; ML																
Hooded Merganser	ML									X				X		X	
Lesser Scaup	H		BDC											X			
Mallard	H; M		BDC											X			
Redhead	MH		BDC														
Ring-necked Duck	M		BDC											X			
Wood Duck	M; ML; ML	IIB; 1	BDC				X	X						X		X	

Common Name	International Plans [1, 2]	Regional PIF Plans [3, 4]	USFWS BMC List [5]	WatchList 2007 [6]	Listed in Wildlife Action Plans in the AMJV? [7]												
					AL	GA	SC	NC[8]	TN[8]	KY	VA[8]	WV	MD	OH	PA	NJ	NY
WATERBIRDS																	
American Bittern	I; MA	IV; 4							X	X		X	X	X	X	X	X
American Coot	I; MA											X			X	X	
Black Tern	I; MA	IV; 1								X			X	X	X		
Black-crowned Night-Heron		IV; 1								X	X	X	X	X	X	X	
Common Moorhen		IV; 1								X		X	X	X	X		
Common Tern	I; MA	IV; 1								X			X	X	X		
King Rail	I; MA	IB; 3	BDC	Yellow			X		X	X		X	X	X	X	X	
Least Bittern		IV; 2			X	X			X	X	X	X	X	X	X	X	X
Sandhill Crane	II; PR																
Sora												X		X	X	X	
Virginia Rail		IV; 1									X	X		X	X	X	
Whooping Crane	I; CR		T/E	Red					X	X							
Yellow Rail			BCC/N	Red	X					X							
SHOREBIRDS																	
American Woodcock	MA (b)	IA; 4	BDC		X		X	X	X	X	X	X	X	X	X	X	X
Buff-breasted Sandpiper	IM (t)		BCC/N	Red					X	X				X			
Dunlin	MA (t)									X			X	X			
Greater Yellowlegs	MA (t)												X	X			
Least Sandpiper	MA (t)													X			
Lesser Yellowlegs	MA (t)									X							
Semipalmated Plover	MA (t)																
Semipalmated Sandpiper	MA (t)			Yellow						X			X	X			
Solitary Sandpiper	MA (t)		BCC/N							X			X	X	X		
Spotted Sandpiper	MA (b)	IV; 1										X				X	
Stilt Sandpiper	MA (t)		BCC/N	Yellow					X	X							
Upland Sandpiper	CR (b); MA (t)	IB; 3	BCC/N				X		X	X	X	X	X	X	X	X	X
Western Sandpiper	MA (t)			Yellow					X	X				X			

[1] Citations for international plans:

Landbirds: Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Inigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, T.C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY.

Waterfowl: North American Waterfowl Management Plan, Plan Committee. 2004. North American Waterfowl Management Plan 2004. Implementation Framework: Strengthening the Biological Foundation.

Waterbirds: Hunter, W.C., W. Golder, S. Melvin, and J. Wheeler. 2006. Southeast United States Regional Waterbird Conservation Plan.

Shorebirds: Based on suggestions from Chuck Hunter (USFWS), May 2007, and the AMJV Technical Committee, August 2007. Chuck Hunter currently is revising shorebird scores and shorebird priorities will reflect these scores and partner input once completed.

[2] Abbreviations from each international plan:

Landbirds: Abbreviations for "status" listed first, and "management action" are listed after the semi-colon. Status Codes: WL = PIF Watchlist species; S = PIF Stewardship species. Action Codes: IM = Immediate Management needed; MA = Management needed; PR = Long-term Planning & Responsibility

Waterfowl: If only 1 abbreviation occurs, it indicates continental priority only (i.e., the Appalachian Waterfowl Conservation Region was not listed as vital for the species). If 2 abbreviations occur, it indicates continental priority and nonbreeding need for each species. If 3 abbreviations occur, it indicates continental priority, breeding need, and nonbreeding need for each species. Codes: H = High; MH = Moderate High; M = Moderate; ML = Moderate Low.

Waterbirds: Tiers (listed first): I = Concern including all species meeting at the regional scale both continental and regional concern criteria, regional concern criteria only, and continental concern only; II = Additional Stewardship including all species meeting stewardship criteria not otherwise already identified in Tier I. Action Codes: CR = Critical Recovery actions needed to prevent likely extirpation or to reintroduce a species that has been extirpated; MA = Management Attention indicates that management or other on-the-ground conservation actions needed to reverse or stabilize significant, long-term population declines in species that are still relatively abundant; PR = Planning and Responsibility indicates that long-term plan-

ning and responsibility are needed for species to ensure that sustainable populations are maintained for species for which a region has high responsibility for that species, but not otherwise considered to be of regional concern.
Shorebirds: Action Codes (season of interest): CR (b) = Critical Recovery actions needed for breeding populations; IM (t) = Immediate Management actions needed for transient populations; MA (b) or (t)= Management Attention indicates that management or other on-the-ground conservation actions needed for breeding or transient populations.

[3] Citations for regional PIF plans:
Robertson, B., and K.V. Rosenberg. 2003. Partners In Flight Landbird Conservation Plan: Physiographic Area 24 Allegheny Plateau. Cornell Lab of Ornithology, Ithaca, NY.
Rosenberg, K.V., and B. Robertson. 2003. Partners In Flight Landbird Conservation Plan: Physiographic Area 17 Northern Ridge and Valley. Cornell Lab of Ornithology, Ithaca, NY.
Rosenberg, K.V., and R. Dettmers. 2004. Partners In Flight Landbird Conservation Plan: Physiographic Area 22 Ohio Hills. Cornell Lab of Ornithology, Ithaca, NY.
Rosenberg, K.V. 2003. Partners In Flight Landbird Conservation Plan: Physiographic Area 12 Mid-Atlantic Ridge and Valley. Cornell Lab of Ornithology, Ithaca, NY.
Hunter, W.C., R. Katz, D. Pashley, and R. Ford. 1999. Partners In Flight Landbird Conservation Plan: Physiographic Area 23 Southern Blue Ridge. USFWS, Atlanta, GA.
A physiographic plan was never completed for Northern Cumberland Plateau (Phys. Area 21), but 13 priority species were listed in the Executive Summary on PIF's website and were incorporated here.
A physiographic plan was never completed for Southern Ridge and Valley (Phys. Area 13), but 16 priority species were listed in the Executive Summary on PIF's website and 15 were incorporated here.

[4] Abbreviations from each regional PIF plan:
This column lists the highest tier listed in any plan for each species, followed by the number of PIF plans the species occurred in for the AMJV region. Definitions for each tier follow.
Tier I. High Continental Priority: Species on the PIF Continental Watch List (as published in the PIF North American Landbird Conservation Plan [Rich et al. 2004]), or species of equivalent watch list ranking from other taxonomic groups, which are typically of conservation concern throughout their range. These are species showing high vulnerability in a number of factors, expressed as any combination of high global parameter scores, with AI ≥ 2 (so that species without manageable populations in the region are omitted). High level of conservation attention warranted.
Tier IA. High Continental Concern + High Regional Responsibility: Species for which this region shares in major conservation responsibility; i.e., conservation in this region is critical to the overall health of this species. These species are on the PIF Continental Watch List with Area Importance of 3 – 5 for this region, or a high percent population (above threshold in IIB).
Tier IB. High Continental Concern + Low Regional Responsibility: Species for which this region can contribute to rangewide conservation objectives where the species occurs. Species on the PIF Continental Watch List with Area Importance of 2 for this region.
Tier II. High Regional Priority: Species that are of moderate continental priority (not on Continental Watch List), but are important to consider for conservation within a region because of various combinations of high parameter scores, as defined below; total of 7 parameter scores = ≥ 19.
Tier IIA. High Regional Concern: Species that are experiencing declines in the core of their range and that require immediate conservation action to reverse or stabilize trends. These are species with a combination of high area importance and declining (or unknown) population trend; total of 7 parameters ≥ 19, with Area Importance + Population Trend ≥ 8.
Tier IIB. High Regional Responsibility: Species for which this region shares in the responsibility for long-term conservation, even if they are not currently declining or threatened. These are species of moderate overall priority with a disproportionately high percentage of their total population in the region; total of 7 parameters ≥ 19, with Area Importance = 5 or % population > threshold.
Tier IIC. High Regional Threats: Species of moderate overall priority that are uncommon in a region and whose remaining populations are threatened, usually because of extreme threats to sensitive habitats. These are species with high breeding threats scores within the region (or in combination with high nonbreeding threats outside the region); total of 7 parameters ≥ 19 with Threats Breeding + Threats Nonbreeding > 6, or local Threats Breeding or Threats Nonbreeding = 5.
Tier III. Additional Federally Listed: Species protected under federal endangered species laws receive conservation attention wherever they occur.
Tier IV. Additional State Listed: Species on state or provincial endangered, threatened, or special concern lists that did not meet any of above criteria. These often represent locally rare or peripheral populations.
Tier V. Additional Stewardship Responsibility: Representative or characteristic species for which the region supports a disproportionately high percentage of the world population (see Appendix), but which did not meet any of the above criteria. Includes moderate- and low-scoring species for which the region has long-term stewardship responsibility, even if these species are not of immediate conservation concern. These species are not included in the table below, but they can be found by reviewing the "% of population" numbers available at <http://www.rmbo.org/pif/pifdb.html>.
Tier VI. Local concern: species of justifiable local concern or interest. May represent a geographically variable population or be representative of a specific habitat or conservation concern.

[5] Abbreviations for USFWS Birds of Management Concern
Birds with blank cells are considered common throughout their entire range by USFWS. Abbreviations for all others are as follows: federally Threatened or Endangered (T/E); Birds of Conservation Concern at National (BCC/N), Regional (BCC/R), or Bird Conservation Region (BCC/BCR) scales; game/falconry birds Above Desired Condition (ADC) or Below Desired Condition (BDC) across their entire range (but not necessarily true in BCR 28).

[6] WatchList 2007 (Greg Butcher of National Audubon Society and David Pashley of American Bird Conservancy) was released 28 November 2007.
Red = species of greatest conservation concern. Yellow = species of conservation concern, but not to the extreme level of those on the Red List.

[7] State Wildlife Action Plans in the AMJV

Each state used different methods to assign a status to a species; therefore, this table simply indicates whether or not a species was identified as a "species of greatest conservation need" by the state planning team, regardless of its overall status relative to other species. Citations for each state plan follows.

Wildlife and Freshwater Fisheries Division, Alabama Department of Conservation and Natural Resources. 2005. Conserving Alabama's wildlife: a comprehensive strategy. Alabama Department of Conservation and Natural Resources, Montgomery, AL.

Wildlife Resources Division, Georgia Department of Natural Resources. 2005. A Comprehensive Wildlife Conservation Strategy. Georgia Department of Natural Resources, Social Circle, GA.

South Carolina Department of Natural Resources. 2005. South Carolina Comprehensive Wildlife Conservation Strategy 2005-2010. South Carolina Department of Natural Resources, Columbia, SC.

North Carolina Wildlife Resources Commission. 2005. North Carolina Wildlife Action Plan. North Carolina Wildlife Resources Commission, Raleigh, NC

Tennessee Wildlife Resources Agency. 2005. Tennessee's Comprehensive Wildlife Conservation Strategy. Tennessee Wildlife Resources Agency, Nashville, TN.

Kentucky Department of Fish and Wildlife Resources. 2005. Kentucky's Comprehensive Wildlife Conservation Strategy. Kentucky Department of Fish and Wildlife Resources, #1 Sportsman's Lane, Frankfort, KY.

Virginia Department of Game and Inland Fisheries. 2005. Virginia's Comprehensive Wildlife Conservation Strategy. Virginia Department of Game and Inland Fisheries, Richmond, VA.

Wildlife Resources Section, West Virginia Division of Natural Resources. 2005. It's About Habitat: West Virginia Wildlife Conservation Action Plan. West Virginia Division of Natural Resources, Charleston, WV.

Maryland Department of Natural Resources. 2005. Maryland wildlife diversity conservation plan. Maryland Department of Natural Resources, Annapolis, MD.

Division of Wildlife, Ohio Department of Natural Resources. 2005. Ohio Comprehensive Wildlife Conservation Strategy. Ohio Department of Natural Resources, Columbus, OH; and **Ohio Bird Conservation Initiative.** 2008. Ohio All-bird Conservation Plan. Unpublished report to the Ohio Department of Natural Resources-Division of Wildlife.

Pennsylvania Game Commission and Pennsylvania Fish and Boat Commission. 2005. Pennsylvania Comprehensive Wildlife Conservation Strategy.

Division of Fish & Wildlife, Endangered & Nongame Species Program, New Jersey Department of Environmental Protection. 2007 (FEB; Originally published SEP 2004). New Jersey Wildlife Action Plan. New Jersey Department of Environmental Protection, Trenton, NJ.

New York State Department of Environmental Conservation. 2005. A Strategy for Conserving New York's Fish and Wildlife Resources. New York State Department of Environmental Conservation, Albany, NY.

[8] Ruffed Grouse and Wood Duck were not listed in NC's Wildlife Action Plan for the Appalachian region, but they were suggested for inclusion for this table (M. Johns, NCWRC, pers. comm.). Northern Bobwhite was not listed in TN's Wildlife Action Plan for the Appalachian region, but was suggested for inclusion for this table (S. Somershoe, R. Applegate, TWRA, pers. comm.). Brown-headed Nuthatch and King Rail (VA) were listed for the region in VA's Wildlife Action Plan, however, further analysis indicates these species are very localized (BHNH) or non-existent (KIRA; S. Harding, VA DGIF, pers. comm.).

Appendix 2:
Ranking the Priority Species of the Appalachian Mountains Joint Venture

Appendix 2. Draft results of a tiered priority species list for the Appalachian Mountains Bird Conservation Region, applying a set of objection decision rules adapted from Dettmers (2006) and Hartley (2007). The rules are based on BCR-specific information provided for each species in regional and continental plans from the major bird initiatives. The outcome is a 3-tiered framework with species falling into Highest, High, or Moderate categories to ideally guide decisions on management, funding, or conservation actions. Twenty (20) additional species appear on the AMJV priority species list but have not yet been assigned to a tier below. Pages 2-9 of App. 2 show input information, applicaiton of rules, and comments.

HIGHEST PRIORITY	HIGH PRIORITY	MODERATE PRIORITY	
Canada Goose - Atlantic	Northern Goshawk*	American Bittern	Marsh Wren*
American Black Duck	Golden Eagle*	Wood Duck*	Sedge Wren*
American Woodcock	Whooping Crane	Mallard	Brown Thrasher
Bewick's Wren*	Upland Sandpiper*	Hooded Merganser*	Northern Parula*
Wood Thrush	Black-billed Cuckoo	Sharp-shinned Hawk*	Blackburnian Warbler
Golden-winged Warbler	Whip-poor-will	Northern Harrier*	Blackpoll Warbler*
Cerulean Warbler	Chimney Swift	Broad-winged Hawk	Bay-breasted Warbler*
Kentucky Warbler	Yellow-bellied Sapsucker*	Bald Eagle*	Yellow-throated Warbler
Prairie Warbler	Yellow-bellied Flycatcher*	Peregrine Falcon*	Black-and-white Warbler
Blue-winged Warbler	Acadian Flycatcher	Wild Turkey*	Prothonotary Warbler
Worm-eating Warbler	Brown-headed Nuthatch	Ruffed Grouse	Yellow-breasted Chat
Henslow's Sparrow	Bicknell's Thrush*	Northern Bobwhite	Scarlet Tanager
	Canada Warbler	King Rail	Summer Tanager
	Swainson's Warbler	Virginia Rail*	Indigo Bunting
	Hooded Warbler	Sandhill Crane	Eastern Towhee
	Louisiana Waterthrush	Semipalmated Plover*	Bachman's Sparrow
	Field Sparrow	Lesser Yellowlegs*	Lark Sparrow
	Red Crossbill*	Solitary Sandpiper	Grasshopper Sparrow
		Spotted Sandpiper*	White-throated Sparrow*
		Buff-breasted Sandpiper	Eastern Meadowlark
		Western Sandpiper	Olive-sided Flycatcher
		Least Sandpiper*	Eastern Wood-Pewee
		Long-eared Owl*	Willow Flycatcher
		Short-eared Owl	Alder Flycatcher*
		Northern Saw-whet Owl	Loggerhead Shrike
		Chuck-will's-widow	Yellow-throated Vireo
		Red-headed Woodpecker	Purple Martin
		Red-cockaded Woodpecker	Black-capped Chickadee (SBR pop)*
		Northern Flicker	

* Species whose tier was suggested by AMJV partners after viewing rule outcome; additional data may warrant change in tier assignment.

Literature Cited

Dettmers, R. 2006. A blueprint for the design and delivery of bird conservation in the Atlantic Northern Forest. Atlantic Coast Joint Venture planning document for BCR 14.

Hartley, M. 2007. Bird conservation plan for the Lower Great Lakes/St. Lawrence Plain Bird Conservation Region (BCR 13). Atlantic Coast Joint Venture planning document for BCR 13.

Proposed Priority Tiers – LANDBIRDS

Priority Tier	Continental Concern	BCR Responsibility	BCR Concern	Rule
Highest	High	High or Mod	High	a
High	Mod	High or Mod	High	b
	High	High or Mod	Mod	c
	Mod	High	Mod	d
Medium	High or Mod	Low	High	e
	Low	High or Mod	High	f
	High	Low	Mod	g
	Mod	Mod	Mod	h
	Low	High	Mod	i
	High	High or Mod	Low	j
	Mod	High	Low	k
	Low	High	Low	l
Partnership review needed*				m
Does not meet any Priority Tier criteria				n
T or NB season only or breeding scores needed				u

Note: The list for landbirds includes all bird species that are known to breed in the region, not just the species included on the AMJV priority species list in Appendix 1. Also, a few transient or over-wintering species were included on this list, although their priority tier remains under review.

* Partners suggested species be included as priority species or it is PIF Continental Stewardship species, but formula excluded it from any of the 3 tiers.

Species	Cont. Score	Cont. Concern	Cont. Steward sp?	BCR Resp.	BCR Concern	Priority Tier	Rule	Comments
Henslow's Sparrow	18	High		Mod	High	Highest	a	
Golden-winged Warbler	17	High		Mod	High	Highest	a	
Cerulean Warbler	16	High		High	High	Highest	a	
Kentucky Warbler	14	High		High	High	Highest	a	
Prairie Warbler	14	High		Mod	High	Highest	a	
American Woodcock**		High		Mod	High	Highest	a	
Blue-winged Warbler	15	High		High	Mod	Highest	a	
Wood Thrush	14	High		High	Mod	Highest	a	
Worm-eating Warbler	14	High		High	Mod	Highest	a	
Whip-poor-will	13	Mod		Mod	High	High	b	
Black-billed Cuckoo	12	Mod		Mod	High	High	b	
Field Sparrow	12	Mod		Mod	High	High	b	
Brown-headed Nuthatch	14	High		Mod	Mod	High	c	
Canada Warbler	14	High		Mod	Mod	High	c	
Swainson's Warbler	14	High		Mod	Mod	High	c	
Hooded Warbler	13	Mod	Yes	High	Mod	High	d	
Louisiana Waterthrush	13	Mod	Yes	High	Mod	High	d	
Acadian Flycatcher	12	Mod	Yes	High	Mod	High	d	
Chimney Swift	12	Mod		High	Mod	High	d	
Red-cockaded Woodpecker	18	High		Low	High	Moderate	e	
Bachman's Sparrow	17	High		Low	High	Moderate	e	
Dickcissel	14	High		Low	High	Moderate	e	not included on AMJV priority species list
Olive-sided Flycatcher	14	High		Low	High	Moderate	e	
Red-headed Woodpecker	13	High		Low	High	Moderate	e	
Short-eared Owl	13	High		Low	High	Moderate	e	

Species	Cont. Score	Cont. Concern	Cont. Steward sp?	BCR Resp.	BCR Concern	Priority Tier	Rule	Comments
Chuck-will's-widow	12	Mod	Yes	Low	High	Moderate	e	
Grasshopper Sparrow	12	Mod	Yes	Low	High	Moderate	e	
Lark Sparrow	12	Mod		Low	High	Moderate	e	
Loggerhead Shrike	12	Mod		Low	High	Moderate	e	
Northern Bobwhite	12	Mod		Low	High	Moderate	e	
Eastern Towhee	11	Low	Yes	High	High	Moderate	f	
Eastern Meadowlark	11	Low		Mod	High	Moderate	f	
Blackburnian Warbler	10	Low	Yes	Mod	High	Moderate	f	
Eastern Wood-Pewee	10	Low		Mod	High	Moderate	f	
Ruffed Grouse	10	Low		Mod	High	Moderate	f	
Summer Tanager	10	Low		Mod	High	Moderate	f	
Yellow-breasted Chat	10	Low		Mod	High	Moderate	f	
Black-and-white Warbler	9	Low		Mod	High	Moderate	f	
Northern Flicker	9	Low		Mod	High	Moderate	f	
Northern Saw-whet Owl	9	Low		Mod	High	Moderate	f	
Purple Martin	8	Low		Mod	High	Moderate	f	
Prothonotary Warbler	15	High		Low	Mod	Moderate	g	
Chestnut-sided Warbler	13	Mod	Yes	Mod	Mod	Moderate	h	not included on AMJV priority species list
Brown Thrasher	12	Mod	Yes	Mod	Mod	Moderate	h	
Orchard Oriole	12	Mod		Mod	Mod	Moderate	h	not included on AMJV priority species list
Indigo Bunting	11	Low	Yes	High	Mod	Moderate	i	
Yellow-throated Vireo	11	Low	Yes	High	Mod	Moderate	i	
Yellow-throated Warbler	11	Low	Yes	High	Mod	Moderate	i	
Belted Kingfisher	10	Low		High	Mod	Moderate	i	not included on AMJV priority species list
Broad-winged Hawk	9	Low		High	Mod	Moderate	i	
Song Sparrow	8	Low		High	Mod	Moderate	i	not included on AMJV priority species list
Blue-gray Gnatcatcher	7	Low		High	Mod	Moderate	i	not included on AMJV priority species list
Downy Woodpecker	7	Low		High	Mod	Moderate	i	not included on AMJV priority species list
Willow Flycatcher	14	High		Mod	Low	Moderate	j	
Scarlet Tanager	12	Mod		High	Low	Moderate	k	
Carolina Chickadee	11	Low		High	Low	Moderate	l	not included on AMJV priority species list
Gray Catbird	9	Low		High	Low	Moderate	l	not included on AMJV priority species list
Common Yellowthroat	8	Low		High	Low	Moderate	l	not included on AMJV priority species list
Cooper's Hawk	8	Low		High	Low	Moderate	l	not included on AMJV priority species list
Eastern Phoebe	8	Low		High	Low	Moderate	l	not included on AMJV priority species list
Ruby-throated Hummingbird	8	Low		High	Low	Moderate	l	not included on AMJV priority species list
Tufted Titmouse	8	Low		High	Low	Moderate	l	not included on AMJV priority species list
Chipping Sparrow	7	Low		High	Low	Moderate	l	not included on AMJV priority species list
Pileated Woodpecker	7	Low		High	Low	Moderate	l	not included on AMJV priority species list
Red-eyed Vireo	7	Low		High	Low	Moderate	l	not included on AMJV priority species list
American Crow	6	Low		High	Low	Moderate	l	not included on AMJV priority species list
White-breasted Nuthatch	6	Low		High	Low	Moderate	l	not included on AMJV priority species list
Northern Harrier	11	Low		Low	High	Review	m	* on AMJV list; suggested 'Moderate'
Vesper Sparrow	11	Low		Low	High	Review	m	
Bewick's Wren	10	Low		Low	High	Review	m	* Appalachian population/ssp, suggested 'Highest'
Common Nighthawk	10	Low		Low	High	Review	m	
Nashville Warbler	9	Low	Yes	Low	High	Review	m	

Species	Cont. Score	Cont. Concern	Cont. Steward sp?	BCR Resp.	BCR Concern	Priority Tier	Rule	Comments
Red Crossbill	9	Low		Low	High	Review	m	* Appalachian population, suggested at least 'High'
Savannah Sparrow	9	Low		Low	High	Review	m	
Sedge Wren	9	Low		Low	High	Review	m	* on AMJV list; suggested 'Moderate'
Horned Lark	8	Low		Low	High	Review	m	
Peregrine Falcon	8	Low	Yes	Low	High	Review	m	* on AMJV list; suggested 'Moderate'
Black-throated Green Warbler	11	Low	Yes	Mod	Low	Review	m	
Red-bellied Woodpecker	9	Low	Yes	Mod	Low	Review	m	
Alder Flycatcher	9	Low	Yes	Low	Low	Review	m	* on AMJV list; suggested 'Moderate'
Pine Warbler	9	Low	Yes	Low	Low	Review	m	
White-throated Sparrow	9	Low	Yes	Low	Low	Review	m	* NB season, on AMJV list; suggested 'Moderate'
Yellow-bellied Sapsucker	9	Low	Yes	Low	Low	Review	m	* Appalachian population, suggested at least 'High'
Blue-headed Vireo	8	Low	Yes	Mod	Low	Review	m	
Carolina Wren	8	Low	Yes	Mod	Low	Review	m	
Magnolia Warbler	8	Low	Yes	Low	Low	Review	m	
Red-shouldered Hawk	8	Low	Yes	Low	Low	Review	m	
Swamp Sparrow	7	Low	Yes	Low	Low	Review	m	
Winter Wren	7	Low	Yes	Low	Low	Review	m	
Red-breasted Nuthatch	6	Low		Low	Low	Review	m	
Long-eared Owl	12	Mod		Low	Mod	Review	m	* on AMJV list; suggested 'Moderate'
Yellow-billed Cuckoo	11	Low		Mod	Mod	Review	m	
Least Flycatcher	11	Low		Mod	Mod	Review	m	
Mourning Warbler	11	Mod	Yes	Low	Mod	Review	m	
Northern Goshawk	11	Low		Low	Mod	Review	m	* Appalachian population, suggested at least 'High'
Northern Parula	10	Low		Mod	Mod	Review	m	* on AMJV list; suggested 'Moderate'
White-eyed Vireo	10	Low	Yes	Mod	Mod	Review	m	
Bald Eagle	10	Low	Yes	Low	Mod	Review	m	* on AMJV list; suggested 'Moderate'
Yellow-bellied Flycatcher	10	Low	Yes	Low	Mod	Review	m	* on AMJV list; suggested at least 'High'
Barn Owl	9	Low		Low	Mod	Review	m	
Brown Creeper	9	Low		Low	Mod	Review	m	
Golden-crowned Kinglet	9	Low		Low	Mod	Review	m	
Pine Siskin	9	Low		Low	Mod	Review	m	
Sharp-shinned Hawk	8	Low		Mod	Mod	Review	m	* on AMJV list; suggested 'Moderate'
Marsh Wren	8	Low		Low	Mod	Review	m	* on AMJV list; suggested 'Moderate'
American Kestrel	7	Low		Mod	Mod	Review	m	
Bicknell's Thrush	18	High					u	* Low density B;T; no BCR scores yet; on AMJV list; suggested 'High'
Bay-breasted Warbler	14	High					u	* Low density B;T; no BCR scores yet; on AMJV list; suggested 'Moderate'
Rusty Blackbird	13	High					u	NB season; no BCR scores
Connecticut Warbler	13	Mod	Yes				u	Low density B;T; no BCR scores yet
Mississippi Kite	13	Mod	Yes				u	Low density B; no BCR scores yet
Blackpoll Warbler	12	Mod					u	* Low density B;T; no BCR scores yet; on AMJV list; suggested 'Moderate'
Cape May Warbler	12	Mod	Yes				u	Low density B;T; no BCR scores yet
Golden Eagle	11	Low					u	* NB season; no BCR scores; on AMJV list; suggested 'High'
Rough-legged Hawk	8	Low	Yes				u	NB season; no BCR scores
Merlin	7	Low					u	Low density B;NB; no BCR scores yet
Black-throated Blue Warbler	12	Mod		Mod	Low	None	n	

Species	Cont. Score	Cont. Concern	Cont. Steward sp?	BCR Resp.	BCR Concern	Priority Tier	Rule	Comments
Rose-breasted Grosbeak	12	Mod		Mod	Low	None	n	
Baltimore Oriole	11	Low		Mod	Low	None	n	
Clay-colored Sparrow	11	Low		Low	Low	None	n	
Warbling Vireo	11	Low		Low	Low	None	n	
Veery	11	Low		Mod	Mod	None	n	
Bobolink	11	Low		Low	Mod	None	n	
Purple Finch	11	Low		Low	Mod	None	n	
Eastern Screech-Owl	10	Low		Mod	Low	None	n	
Northern Rough-winged Swallow	10	Low		Mod	Low	None	n	
Ovenbird	10	Low		Mod	Low	None	n	
Eastern Kingbird	10	Low		Mod	Mod	None	n	
Swainson's Thrush	10	Low		Low	Mod	None	n	
Blue Jay	9	Low		Mod	Low	None	n	
Fish Crow	9	Low		Low	Low	None	n	
Blue Grosbeak	9	Low		Mod	Mod	None	n	
Great Crested Flycatcher	9	Low		Mod	Mod	None	n	
Northern Waterthrush	9	Low		Low	Mod	None	n	
American Redstart	8	Low		Mod	Low	None	n	
Common Grackle	8	Low		Mod	Low	None	n	
Northern Mockingbird	8	Low		Mod	Low	None	n	
Tree Swallow	8	Low		Mod	Low	None	n	
Wild Turkey	8	Low		Mod	Low	None	n	* on AMJV list; suggested 'Moderate'
Dark-eyed Junco	8	Low		Low	Low	None	n	
Barn Swallow	8	Low		Mod	Mod	None	n	
Red-winged Blackbird	8	Low		Mod	Mod	None	n	
Bank Swallow	8	Low		Low	Mod	None	n	
Osprey	8	Low		Low	Mod	None	n	
White-winged Crossbill	8	Low	Yes	Low	Mod	None	n	
Barred Owl	7	Low		Mod	Low	None	n	
Brown-headed Cowbird	7	Low		Mod	Low	None	n	
Cedar Waxwing	7	Low		Mod	Low	None	n	
Eastern Bluebird	7	Low		Mod	Low	None	n	
Yellow Warbler	7	Low		Mod	Low	None	n	
Great Horned Owl	7	Low		Low	Low	None	n	
Hairy Woodpecker	6	Low		Mod	Low	None	n	
House Finch	6	Low		Mod	Low	None	n	
House Wren	6	Low		Mod	Low	None	n	
Red-tailed Hawk	6	Low		Mod	Low	None	n	
Black-capped Chickadee	6	Low		Low	Low	None	n	* Southern Blue Ridge Pop only; on AMJV list; suggested 'Moderate'
Cliff Swallow	6	Low		Low	Low	None	n	
Common Raven	6	Low		Low	Low	None	n	
Hermit Thrush	6	Low		Low	Low	None	n	
Turkey Vulture	6	Low		Low	Low	None	n	
Yellow-rumped Warbler	6	Low		Low	Low	None	n	
American Goldfinch	6	Low		Mod	Mod	None	n	
American Robin	5	Low		Mod	Low	None	n	
Mourning Dove	5	Low		Mod	Low	None	n	

Species	Cont. Score	Cont. Concern	Cont. Steward sp?	BCR Resp.	BCR Concern	Priority Tier	Rule	Comments
Northern Cardinal	5	Low		Mod	Low	None	n	
Black Vulture	5	Low		Low	Low	None	n	
European Starling				Mod	Low	None	n	
Rock Pigeon				Mod	Low	None	n	
Eurasian Collared-Dove				Low	Low	None	n	
House Sparrow				Low	Low	None	n	
Ring-necked Pheasant				Low	Mod	None	n	

PIF did not calculate a score for this species; concern and responsibility levels converted from USSCP. Considered of 'high concern' continentally in USSCP 2004 list (*http://www.fws.gov/shorebirdplan/USShorebird/downloads/ShorebirdPriorityPopulationsAug04.pdf*). BCR responsibility based on Area Importance (AI) score for BCR28 in USSCP and status (i.e., occurrence) in BCR 28, according to rules: AI score 5 and occurrence "M**, **B**, M, or B" then Responsibility = High; AI Score 4 and occurrence "**M** or **B**" then Responsibility = High; AI Score 4 and occurrence "M or B" then Responsibility = Moderate (this rule was applied); AI Score 4 and occurrence "m or b" OR AI Score 3 (with any occurrence value) then Responsibility = Low. BCR Concern reflects BCR priority scores in *http://www.fws.gov/shorebirdplan/USShorebird/downloads/BCRSCORES3.xls* unless modified by expert input.

Proposed Priority Tiers – WATERFOWL

Priority Tier	Continental Priority	BCR Responsibility	BCR Concern	Rule
Highest	High	High or Mod	High	a
High	Mod	High or Mod	High	b
	High	High or Mod	Mod	c
	Mod	High	Mod	d
Medium	High or Mod	Low	High	e
	Low	High or Mod	High	f
	High	Low	Mod	g
	Mod	Mod	Mod	h
	Low	High	Mod	i
	High	High or Mod	Low	j
	Mod	High	Low	k
	Low	High	Low	l
Partnership review needed*				m
Does not meet any Priority Tier criteria				n
T or NB season only or breeding scores needed				u

Note: The list for waterfowl includes only those species that (1) were listed for Waterfowl Conservation Region 28 in NAWMP Plan Committee (2004), (2) were included in PIF Physiographic Plans, or (3) were suggested for inclusion on the AMJV priority species list by partners. Priority, responsibility, and concern categories (e.g., high, mod low) were provided in NAWMP Plan Committee (2004), except for Hooded Merganser.

* Partners suggested species be included as priority species or it is PIF Continental Stewardship species, but formula excluded it from any of the 3 tiers.

Common Name	Cont. Priority	BCR Resp. Breeding	BCR Resp. NB Season	BCR Concern Breeding	BCR Concern NB	Priority Tier	Rule	Comments
Canada Goose - Atlantic	High		Mod High		High	Highest	a	
American Black Duck	High		Mod High		High	Highest	a	
Mallard	High		Mod Low		Mod	Moderate	g	
Lesser Scaup	High					Review	m	
Ring-necked Duck	Mod					Review	m	
Bufflehead	Mod		Mod Low		Mod Low	Review	m	
Blue-winged Teal	Mod High					Review	m	
Canvasback	Mod High		Mod Low		Mod Low	Review	m	
Redhead	Mod High					Review	m	
Common Goldeneye	Mod High		Mod Low		Mod Low	Review	m	
Hooded Merganser[1]	Mod Low	Mod Low	Mod Low	Mod Low	Mod Low	Review	m	suggested 'Moderate'
Wood Duck	Mod	Mod Low	Mod Low	Mod Low	Mod Low	None	n	suggested 'Moderate'
Gadwall	Mod		Mod Low		Mod Low	None	n	

[1]Partners in KY and OH asked to include species as a breeder in Appalachian Plateau; scores in green were not provided in NAWMP Implementation Framework (NAWMP Plan Committee 2004) but were approximated by B. W. Smith for this exercise.

Proposed Priority Tiers – WATERBIRDS

Priority Tier	Continental Concern	BCR Responsibility	BCR Concern	Rule
Highest	High	High or Mod	High	a
High	Mod	High or Mod	High	b
	High	High or Mod	Mod	c
	Mod	High	Mod	d
Medium	High or Mod	Low	High	e
	Low	High or Mod	High	f
	High	Low	Mod	g
	Mod	Mod	Mod	h
	Low	High	Mod	i
	High	High or Mod	Low	j
	Mod	High	Low	k
	Low	High	Low	l
Partnership review needed*				m
Does not meet any Priority Tier criteria				n
T or NB season only or breeding scores needed				u

Note: The list for waterbirds includes only those species (1) suggested by AMJV partners or (2) for BCR 28 in Hunter et al. (2006).

* Partners suggested species be included as priority species or it is PIF Continental Stewardship species, but formula excluded it from any of the 3 tiers.

Common Name	NAWCP Priority	BCR Responsibility	BCR Concern	Priority Tier	Rule	Comments
Whooping Crane	High*	Mod	Mod High	High	c	
American Bittern	High*	Low	Mod High	Moderate	g	
King Rail	High*	Low	Mod High	Moderate	g	
Sandhill Crane	Low*	High	Mod	Moderate	i	
Least Bittern	High*	Low	Low	Review	m	
Sora	High*	Low	Low	Review	m	
Yellow Rail	High*	Low	Low	Review	m	
Virginia Rail	Mod*	Mod	Low	Review	m	suggested 'Moderate'
Common Moorhen	Mod*	Low	Low	Review	m	
Black-crowned Night Heron	Mod**	Low	Low	Review	m	
Black Tern	Mod**	Low	Mod High	Review	m	Tier I Mgmt Action in Hunter et al. (2006) but low rank with formula
American Coot	Low*	Low	Mod	Review	m	Tier I Mgmt Action in Hunter et al. (2006) but low rank with formula
Common Tern	Low**	Low	Mod High	Review	m	Tier I Mgmt Action in Hunter et al. (2006) but low rank with formula

* From *http://www.waterbirdconservation.org/pdfs/status_assessment/FinalStatusandDistributionMarshbirdsTable.pdf*
** From Kushlan et al. (2002) at *http://www.waterbirdconservation.org/pdfs/plan_files/complete.pdf*
BCR Responsibility based on occurrence information in Southeast U.S. Waterbird plan for BCR 28 and Area Importance (AI) scores.
BCR Concern based on Priority in Southeast U.S. Waterbird Plan for BCR 28.

Proposed Priority Tiers – SHOREBIRDS

Priority Tier	Continental Concern	BCR Responsibility	BCR Concern	Rule
Highest	High	High or Mod	High	a
High	Mod	High or Mod	High	b
	High	High or Mod	Mod	c
	Mod	High	Mod	d
Medium	High or Mod	Low	High	e
	Low	High or Mod	High	f
	High	Low	Mod	g
	Mod	Mod	Mod	h
	Low	High	Mod	i
	High	High or Mod	Low	j
	Mod	High	Low	k
	Low	High	Low	l
Partnership review needed*				m
Does not meet any Priority Tier criteria				n
T or NB season only or breeding scores needed				u

Note: The list for shorebirds includes only those species (1) suggested by AMJV partners or (2) suggested by C. Hunter (pers. comm. 2007) because shorebird scores for BCRs are under revision.

* Partners suggested species be included as priority species or it is PIF Continental Stewardship species, but formula excluded it from any of the 3 tiers.

Common Name	Continental Priority	BCR Responsibility	BCR Concern	Priority Tier	Rule	Comments
Buff-breasted Sandpiper	5	Low	High	Moderate	e	
Solitary Sandpiper	4	Low	High	Moderate	e	
Western Sandpiper	4	Low	Mod	Moderate	g	
Upland Sandpiper	4	Low	Low	Review	m	suggested at least 'High'
Greater Yellowlegs	3	Low	Mod	Review	m	
Lesser Yellowlegs	3	Low	Low	Review	m	suggested 'Moderate'
Dunlin	3	Low	Mod	Review	m	
Semipalmated Sandpiper	3	Low	Mod	Review	m	
Least Sandpiper	3	Low	Mod	Review	m	suggested 'Moderate'
Stilt Sandpiper	3	Low	Mod	Review	n	
Semipalmated Plover	2	Low	Low	Review	n	suggested 'Moderate'
Spotted Sandpiper	2	Low	Low	Review	n	suggested 'Moderate'

Continental concern category: 5 = "highly imperiled," 4 = "species of high concern," 3 = "species of moderate concern," 2 = "species of low concern," 1 = "not at risk."
BCR Responsibility: based on Area Importance (AI) score for BCR28 in USSCP and status (i.e., occurrence) in BCR 28, according to rules: AI score 5 and occurrence "M, B, M, or B" then Responsibility = High; AI Score 4 and occurrence "M or B" then Responsibility = High; AI Score 4 and occurrence "M or B" then Responsibility = Moderate (this rule was applied); AI Score 4 and occurrence "m or b" OR AI Score 3 (with any occurrence value) then Responsibility = Low.
BCR Concern: reflects BCR priority scores in http://www.fws.gov/shorebirdplan/USShorebird/downloads/BCRSCORES3.xls unless modified by expert input.

Appendix 3: International Conservation Planning: Data and Products

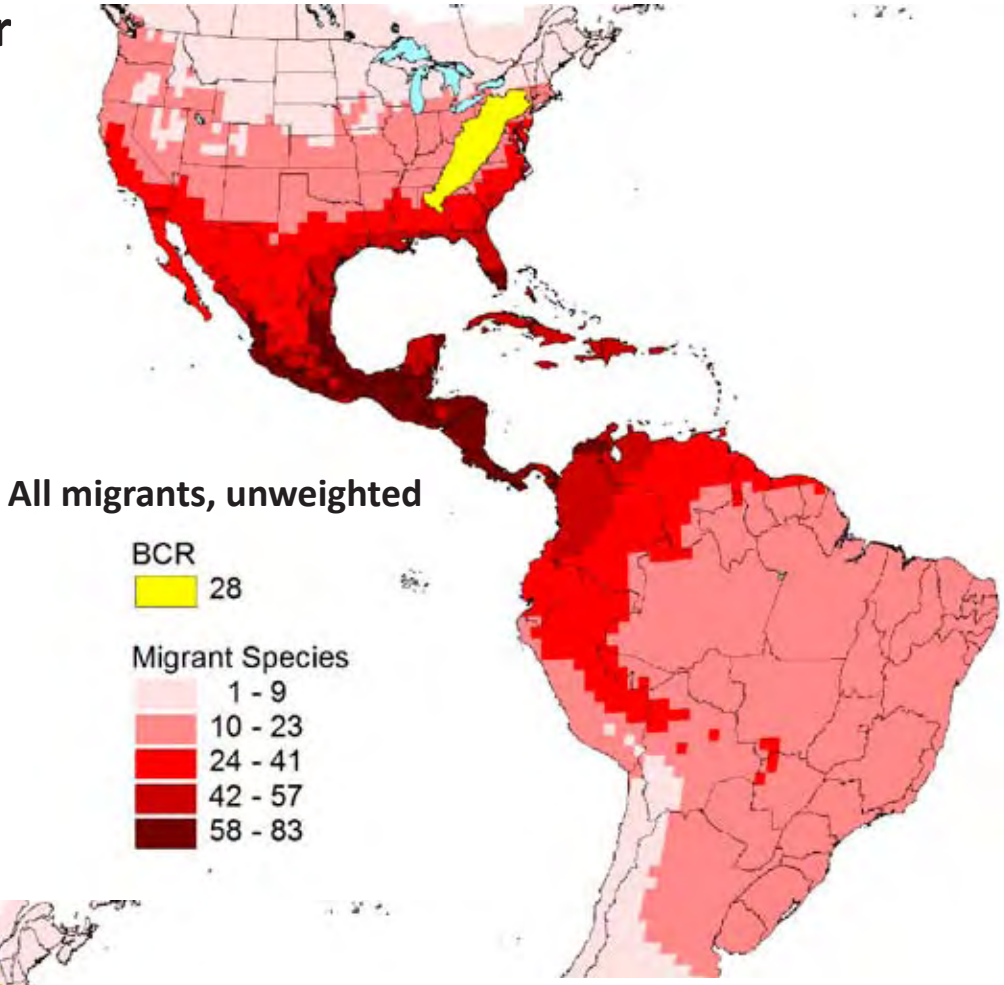
The table below lists migratory bird species used to produce unweighted and weighted maps of over-wintering areas for species that breed in the Appalachian Mountains Bird Conservation Region and migrate completely (or almost entirely) out of the BCR. See the Partners In Flight website (*http://www.partnersinflight.org/pubs/ts/04-Connections*) for a complete description of the general process used. On the maps below, darker shades of red indicate areas of "overlap" in wintering range by an increasing number of species.

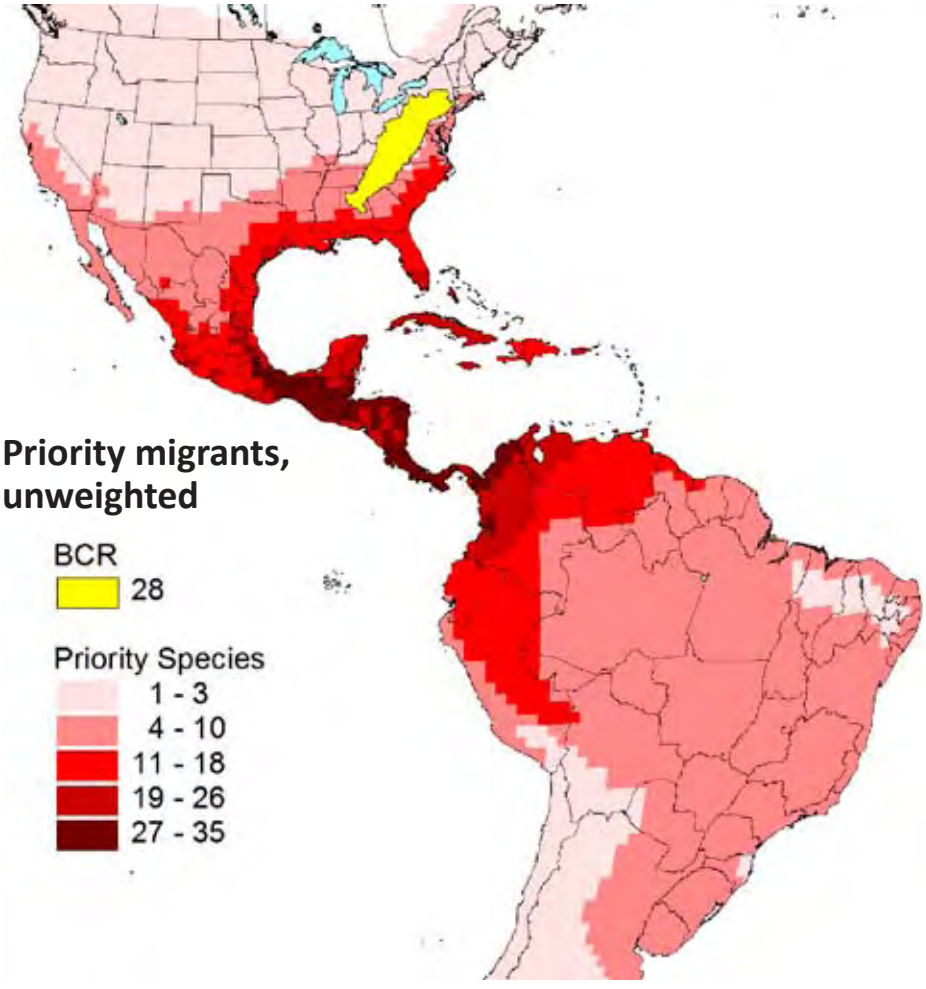
	Unweighted			Weighted		
Species	Migrant	Priority	Highest	Wt Migrants	Wt Priority	Wt Highest
Cerulean Warbler	1	1	1	10.00	5.00	3.45
Worm-eating Warbler	1	1	1	6.89	3.29	2.27
Blue-winged Warbler	1	1	1	6.56	3.14	2.16
Louisiana Waterthrush	1	1	1	5.84	2.79	1.92
Acadian Flycatcher	1	1	1	4.51	2.16	1.49
Wood Thrush	1	1	1	4.28	2.05	1.41
Hooded Warbler	1	1	1	3.89	1.86	1.28
Yellow-throated Vireo	1	1	1	3.09	1.47	1.02
Kentucky Warbler	1	1	1	3.08	1.47	1.01
Prairie Warbler	1	1	1	2.41	1.15	0.79
Swainson's Warbler	1	1	1	1.48	0.71	0.49
Golden-winged Warbler	1	1	1	1.22	0.59	0.40
Henslow's Sparrow	1	1	1	1.06	0.51	0.35
Black-billed Cuckoo	1	1	1	0.91	0.43	0.30
King Rail	1	1	1	0.88	0.42	0.29
Whip-poor-will	1	1	1	0.85	0.41	0.28
Canada Warbler	1	1	1	0.27	0.13	0.09
Yellow-bellied Flycatcher	1	1	1	0.00	0.00	0.00
Upland Sandpiper	1	1	1	0.00	0.00	0.00
Buff-breasted Sandpiper	1	1	1			
Olive-sided Flycatcher	1	1	1			
Scarlet Tanager	1	1		6.24	2.98	
Yellow-throated Warbler	1	1		5.51	2.63	
Gray Catbird	1	1		3.01	1.44	
Indigo Bunting	1	1		2.63	1.26	
Chimney Swift	1	1		1.94	0.93	
Ruby-throated Hummingbird	1	1		1.82	0.87	
Eastern Wood-Pewee	1	1		1.64	0.78	
Broad-winged Hawk	1	1		1.56	0.74	
Yellow-breasted Chat	1	1		1.47	0.70	
Black-throated Blue Warbler	1	1		1.30	0.62	
Red-eyed Vireo	1	1		1.20	0.58	
Eastern Towhee	1	1		1.04	0.50	
Eastern Phoebe	1	1		0.90	0.43	
Common Yellowthroat	1	1		0.90	0.43	
Great Crested Flycatcher	1	1		0.86	0.41	
Black-and-white Warbler	1	1		0.70	0.34	
Willow Flycatcher	1	1		0.69	0.33	
Brown Thrasher	1	1		0.68	0.32	
Summer Tanager	1	1		0.56	0.27	
Chestnut-sided Warbler	1	1		0.49	0.24	
Blackburnian Warbler	1	1		0.46	0.22	
Purple Martin	1	1		0.45	0.21	
Chuck-will's-widow	1	1		0.35	0.17	
Prothonotary Warbler	1	1		0.07	0.03	
Grasshopper Sparrow	1	1		0.03	0.01	
Dickcissel	1	1		0.00	0.00	
Blue-gray Gnatcatcher	1			1.44		
White-eyed Vireo	1			1.09		
Northern Parula	1			1.02		
Baltimore Oriole	1			0.96		
Black-throated Green Warbler	1			0.92		
Ovenbird	1			0.89		
Blue-headed Vireo	1			0.79		
Orchard Oriole	1			0.72		

	Unweighted			Weighted		
Species	Migrant	Priority	Highest	Wt Migrants	Wt Priority	Wt Highest
Barn Swallow	1			0.70		
Yellow-billed Cuckoo	1			0.66		
Chipping Sparrow	1			0.61		
Rose-breasted Grosbeak	1			0.59		
American Redstart	1			0.58		
House Wren	1			0.58		
Song Sparrow	1			0.55		
Bobolink	1			0.53		
Cedar Waxwing	1			0.47		
Veery	1			0.46		
Green Heron	1			0.43		
American Goldfinch	1			0.42		
Blue Grosbeak	1			0.40		
Yellow Warbler	1			0.40		
Eastern Kingbird	1			0.38		
Cooper's Hawk	1			0.34		
Northern Rough-winged Swallow	1			0.30		
Blue Jay	1			0.29		
Tree Swallow	1			0.26		
Field Sparrow	1			0.24		
Wood Duck	1			0.23		
Eastern Bluebird	1			0.19		
Least Flycatcher	1			0.19		
Yellow-crowned Night-Heron	1			0.18		
American Crow	1			0.16		
Belted Kingfisher	1			0.14		
American Woodcock	1			0.09		
Bank Swallow	1			0.09		
Warbling Vireo	1			0.08		
Yellow-bellied Sapsucker	1			0.08		
Turkey Vulture	1			0.05		
Sharp-shinned Hawk	1			0.05		
Magnolia Warbler	1			0.05		
Cliff Swallow	1			0.04		
Black-crowned Night-Heron	1			0.03		
Mourning Warbler	1			0.03		
Least Bittern	1			0.03		
Osprey	1			0.01		
Spotted Sandpiper	1			0.01		
Alder Flycatcher	1			0.01		
Common Nighthawk	1			0.01		
Virginia Rail	1			0.01		
Mississippi Kite	1			0.01		
Northern Waterthrush	1			0.00		
Great Egret	1			0.00		
Marsh Wren	1			0.00		
Nashville Warbler	1			0.00		
Common Moorhen	1			0.00		
Cape May Warbler	1			0.00		
American Bittern	1			0.00		
Connecticut Warbler	1			0.00		
Bewick's Wren	1			0.00		
Sora	1			0.00		
Swainson's Thrush	1			0.00		
Common Loon	1			0.00		

Unweighted Winter Linkage Maps

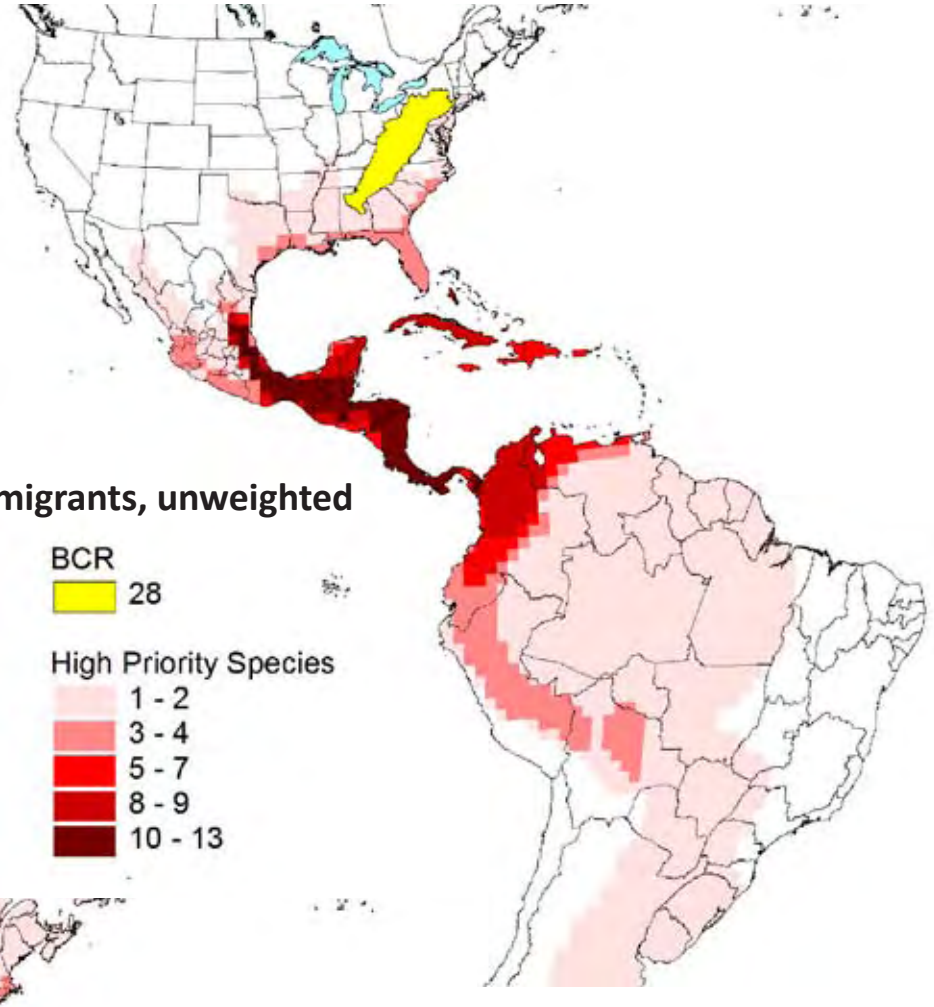
credit: Dr. Peter Blancher, Environment Canada





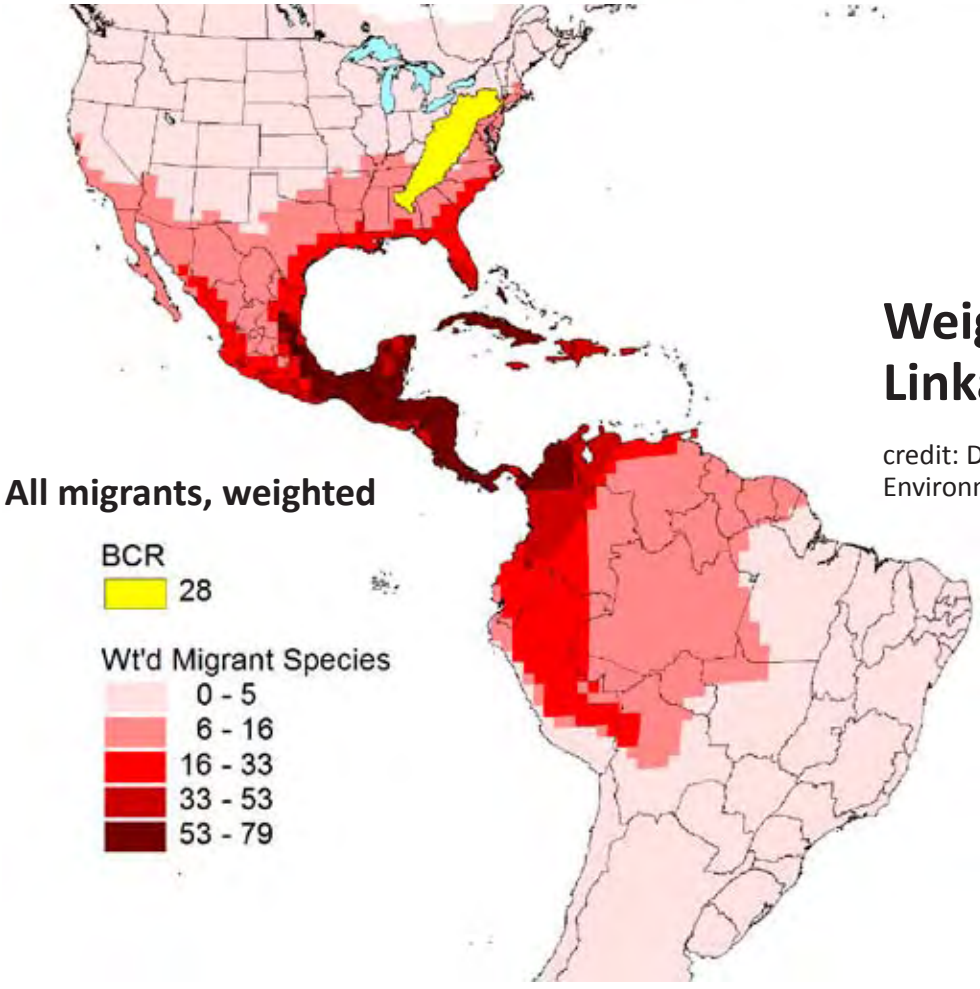
Unweighted Winter Linkage Maps

credit: Dr. Peter Blancher, Environment Canada



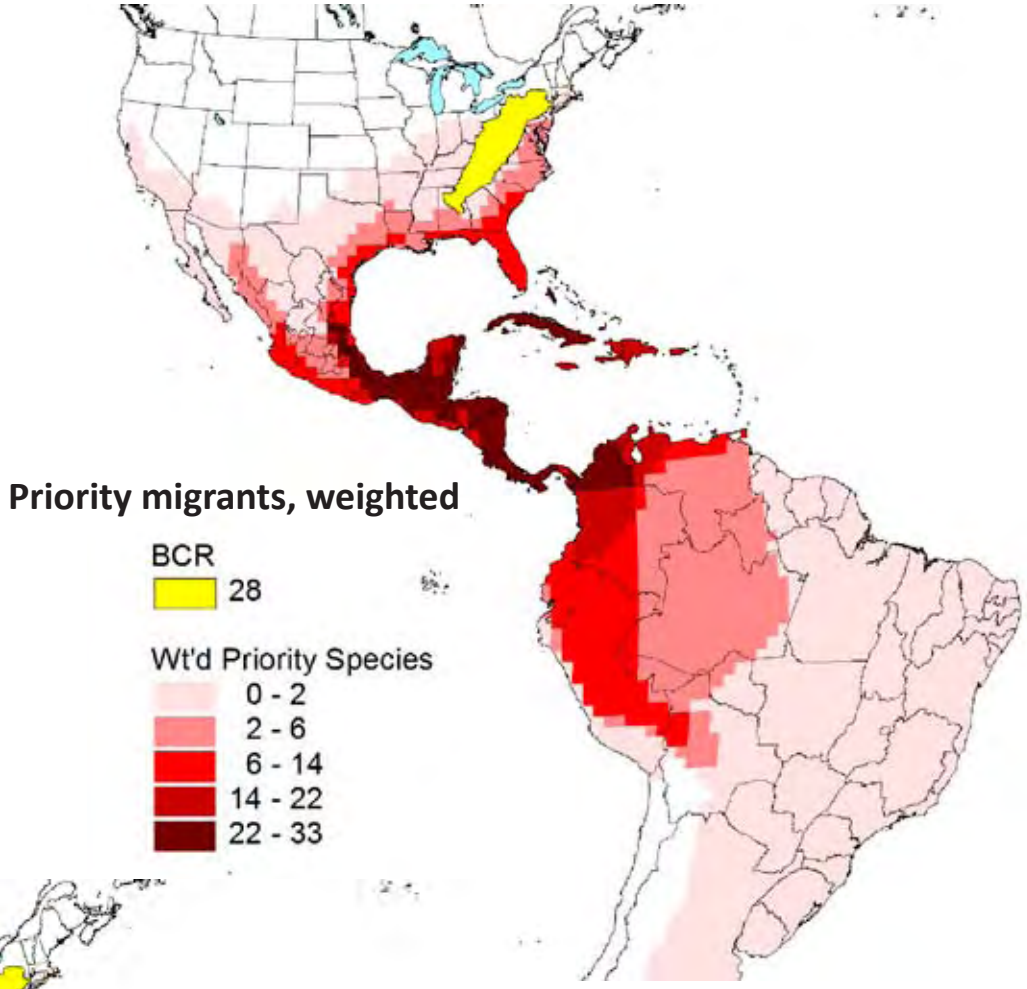
Weighted Winter Linkage Maps

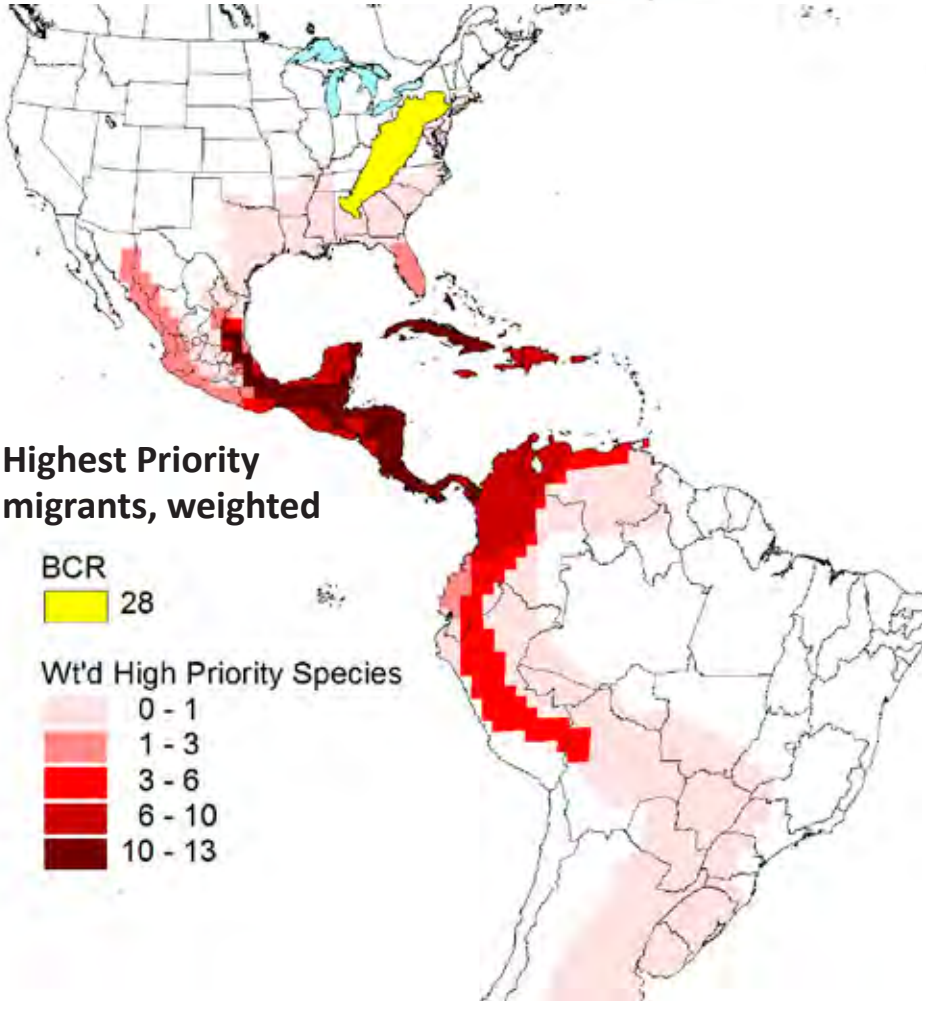
credit: Dr. Peter Blancher, Environment Canada



Weighted Winter Linkage Maps

credit: Dr. Peter Blancher, Environment Canada





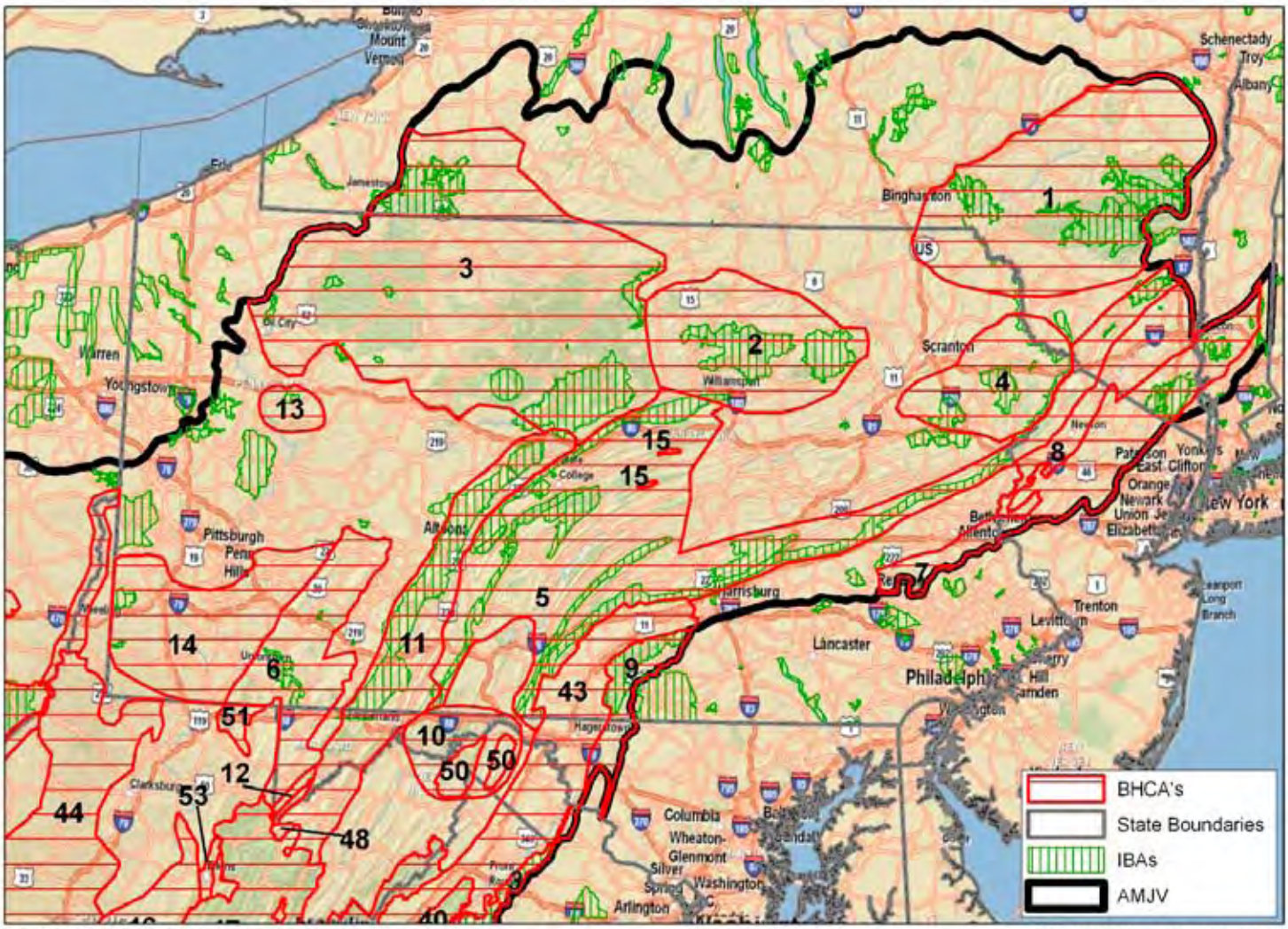
Appendix 4: Bird Habitat Conservation Areas of the Appalachian Mountains Bird Conservation Region

Bird Habitat Conservation Areas (BHCAs) of the Appalachian Mountains Bird Conservation Region (AMBCR), based on comments received from AMJV partners via e-mail and at a meeting of the AMJV Technical Committee in August 2007. For each BHCA, we provide a unique number (corresponding to a polygon on the following maps), the state(s) in which it occurs, the mapping region (corresponds to the general region in relation to the AMBCR boundary), BHCA name, estimated acreages and hectares, and the major group(s) of birds the area supports.

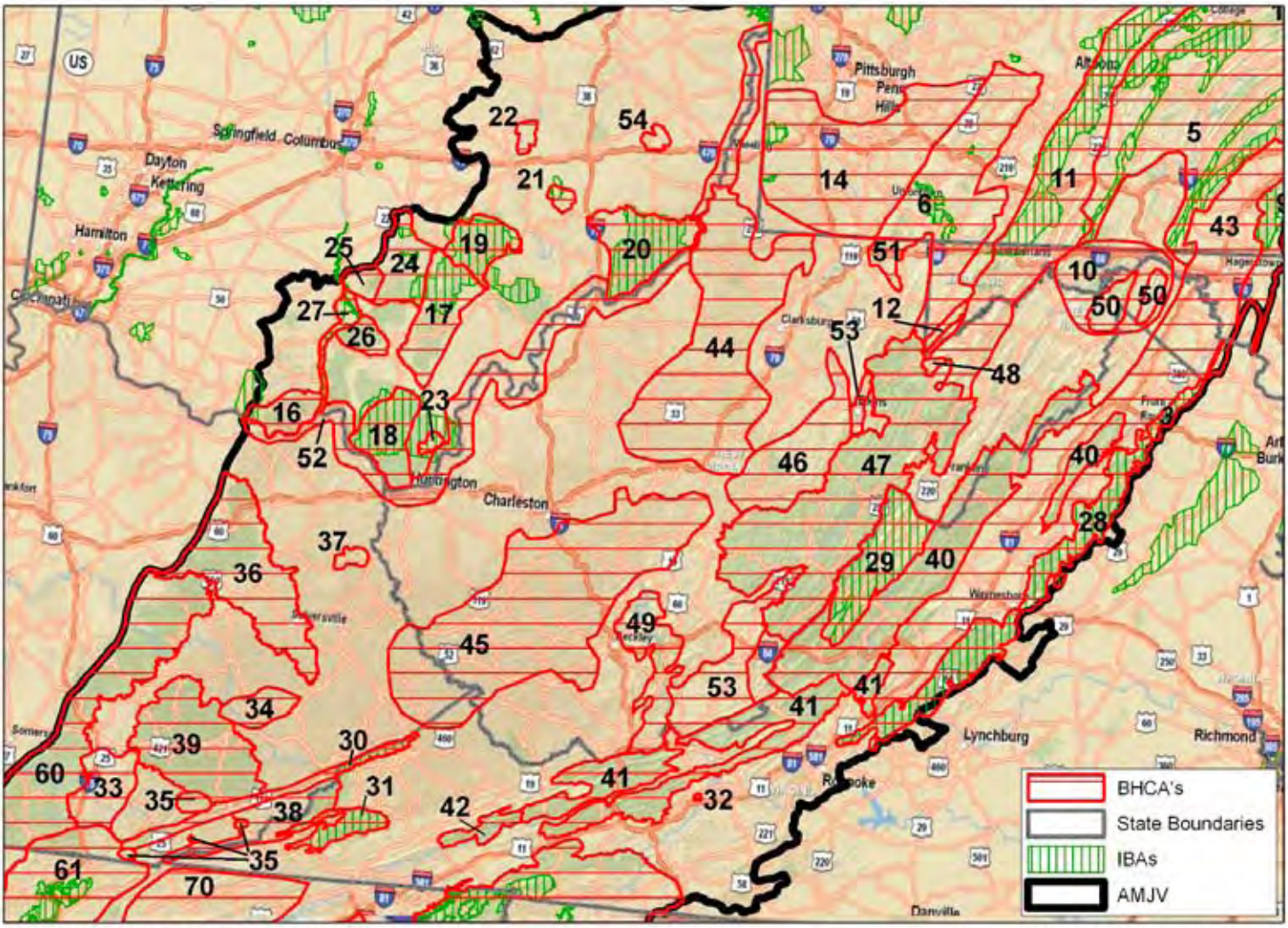
BHCA #	STATE(S)	GROUP	NAME	ACRES	HECTARES	BIRD GROUP(S)
1	NY	Northern	Catskill Mountains	2,765,600	1,119,199	landbirds
2	PA	Northern	North Mountain area	1,467,200	593,755	landbirds
3	NY/PA	Northern	North Central Highlands/Allegheny National	5,085,348	2,057,967	landbirds
4	PA	Northern	Pocono Mountains	875,128	354,152	landbirds, waterfowl
5	NJ/NY/PA	Northern	Northern Ridge and Valley forested ridges	3,954,131	1,600,180	landbirds, waterbirds, waterfowl
6	MD/PA	Northern	Laurel Highlands	1,054,868	426,890	landbirds
7	NJ/NY/PA	Northern	NJ/NY Highlands	1,190,559	481,802	landbirds
8	NJ/NY	Northern	Kittatinny Valley	580,513	234,925	landbirds, marshbirds, waterfowl
9	MD/PA	Northern	South Mountain/Catoctin Mountain	340,630	137,848	landbirds
10	MD	Northern	Green Ridge/Warrior Mountain area	423,222	171,272	landbirds
11	MD/PA	Northern	Allegheny Front	1,472,470	595,888	landbirds
12	MD	Northern	Backbone Mountain	33,062	13,380	landbirds
13	PA	Northern	PA Northwest Reclaimed Minelands	160,019	64,757	landbirds
14	MD/PA	Northern	Bituminous Grasslands	1,326,481	536,808	landbirds
15	PA	Northern	Scotia Barrens	9,619	3,893	landbirds
16	OH	Central	Shawnee State Forest	138,218	55,935	landbirds
17	OH	Central	Zaleski State Forest	339,516	137,397	landbirds
18	OH	Central	Ironton District - Wayne National Forest	256,884	103,957	landbirds
19	OH	Central	Athens District - Wayne National Forest	190,870	77,242	landbirds
20	OH	Central	Marietta District - Wayne National Forest	356,808	144,395	landbirds
21	OH	Central	AEP Recreation lands/Wilds	32,348	13,091	landbirds
22	OH	Central	Tri-Valley Wildlife Area	33,951	13,740	landbirds
23	OH	Central	Crown City Wildlife Area	21,404	8,662	landbirds
24	OH	Central	Hocking Hills	230,679	93,352	landbirds
25	OH	Central	Tar Hollow State Forest	64,644	26,161	landbirds
26	OH	Central	Scioto Trail State Forest	81,988	33,179	landbirds
27	OH	Central	Scioto River Wetlands	76,451	30,939	waterfowl, waterbirds
28	VA	Central	Upper Blue Ridge Mountains	726,997	294,205	landbirds
29	VA	Central	Allegheny Highlands	434,876	175,988	landbirds
30	VA	Central	Pine Mountain	191,983	77,693	landbirds
31	VA	Central	Powell and Stone Mountain	135,365	54,780	landbirds
32	VA	Central	Radford Army Ammunition Plant	2,525	1,022	landbirds
33	KY	Central	Pine Savanna SWAP area	245,143	99,206	landbirds
34	KY	Central	Starfire Complex	130,581	52,844	landbirds
35	KY	Central	Mineland Reclamation Conservation Areas	54,198	21,933	grassland/shrubland birds
36	KY	Central	Upper Licking River	756,833	306,280	all bird groups
37	KY	Central	Yatesville Lake	33,139	13,411	waterfowl, waterbirds
38	KY	Central	Black and Cumberland Mountains	273,758	110,786	landbirds
39	KY	Central	Daniel Boone National Forest	661,127	267,549	landbirds
40	VA	Central	George Washington National Forest	1,279,041	517,609	landbirds

BHCA #	STATE(S)	GROUP	NAME	ACRES	HECTARES	BIRD GROUP(S)
41	VA	Central	Jefferson National Forest	945,584	382,664	landbirds
42	VA	Central	Southwestern VA WMAs	80,609	32,621	landbirds
43	VA	Central	Great Valley	2,552,862	1,033,107	landbirds
44	WV	Central	Intact Mixed-Mesophytic Forest	1,613,881	653,115	landbirds
45	WV/KY	Central	Mountain-top Mining Area	2,183,189	883,505	landbirds
46	WV	Central	Industrial Forests	523,673	211,923	landbirds
47	WV	Central	Monongahela National Forest	1,704,377	689,737	landbirds
48	WV	Central	Canaan Valley	16,443	6,654	landbirds, waterfowl, wetland
49	WV	Central	New/Gauley/Bluestone River corridors	343,240	138,904	all bird groups
50	WV	Central	Eastern Panhandle (Cacapon, Sleepy Creek)	150,488	60,900	landbirds
51	WV	Central	Laurel Highlands	75,616	30,601	landbirds
52	WV/KY/ OH	Central	Ohio River Valley	1,143,475	462,748	all bird groups
53	WV	Central	Highland River Valley Complex	485,272	196,382	all bird groups
54	OH	Central	Egypt Valley	33,754	13,660	grassland birds
55	AL	Southern	Bankhead National Forest	346,680	140,297	landbirds
56	AL	Southern	Lake Guntersville State Park/TN River	64,837	26,239	all bird groups
57	AL	Southern	Little River Canyon/DeSoto State Park	13,564	5,489	landbirds
58	AL	Southern	Monte Sano State Park	23,829	9,643	landbirds
59	AL/TN	Southern	Skyline WMA/Bear Hollow Mtn WMA	692,247	280,142	landbirds
60	TN/KY	Southern	Northern Cumberland Plateau	2,615,387	1,058,410	landbirds
61	TN/KY	Southern	Cumberland Mountains	940,653	380,669	landbirds
62	GA/NC/ TN	Southern	Southern Blue Ridge Forest Block	9,104,191	3,684,335	landbirds, waterfowl
63	TN	Southern	Hiawassee Refuge/Yuchi WMA	107,719	43,592	all bird groups
64	GA/TN	Southern	Chattanooga	11,195	4,530	landbirds, waterfowl
65	TN	Southern	Lick Creek/Douglas Lake	565,146	228,706	landbirds, shorebirds, waterfowl
66	GA	Southern	Conasauga District/Chattahoo	372,601	150,786	landbirds
67	TN	Southern	Oak Ridge WMA	42,443	17,176	landbirds, waterbirds
68	AL/TN	Southern	Savage Gulf, Cumberland Plateau	617,407	249,856	landbirds
69	TN	Southern	Prentice Cooper State Forest WMA Ridge	646,664	261,696	landbirds
70	TN	Southern	Grasslands and Forested Ridges	932,523	377,379	landbirds
71	TN	Southern	Fall Creek Falls State Natural Area/WMA	135,689	54,911	landbirds

Northern BHCAs of the AMBCR: NY, NJ, PA, and MD



Central BHCAs of the AMBCR:
OH, KY, WV, and VA



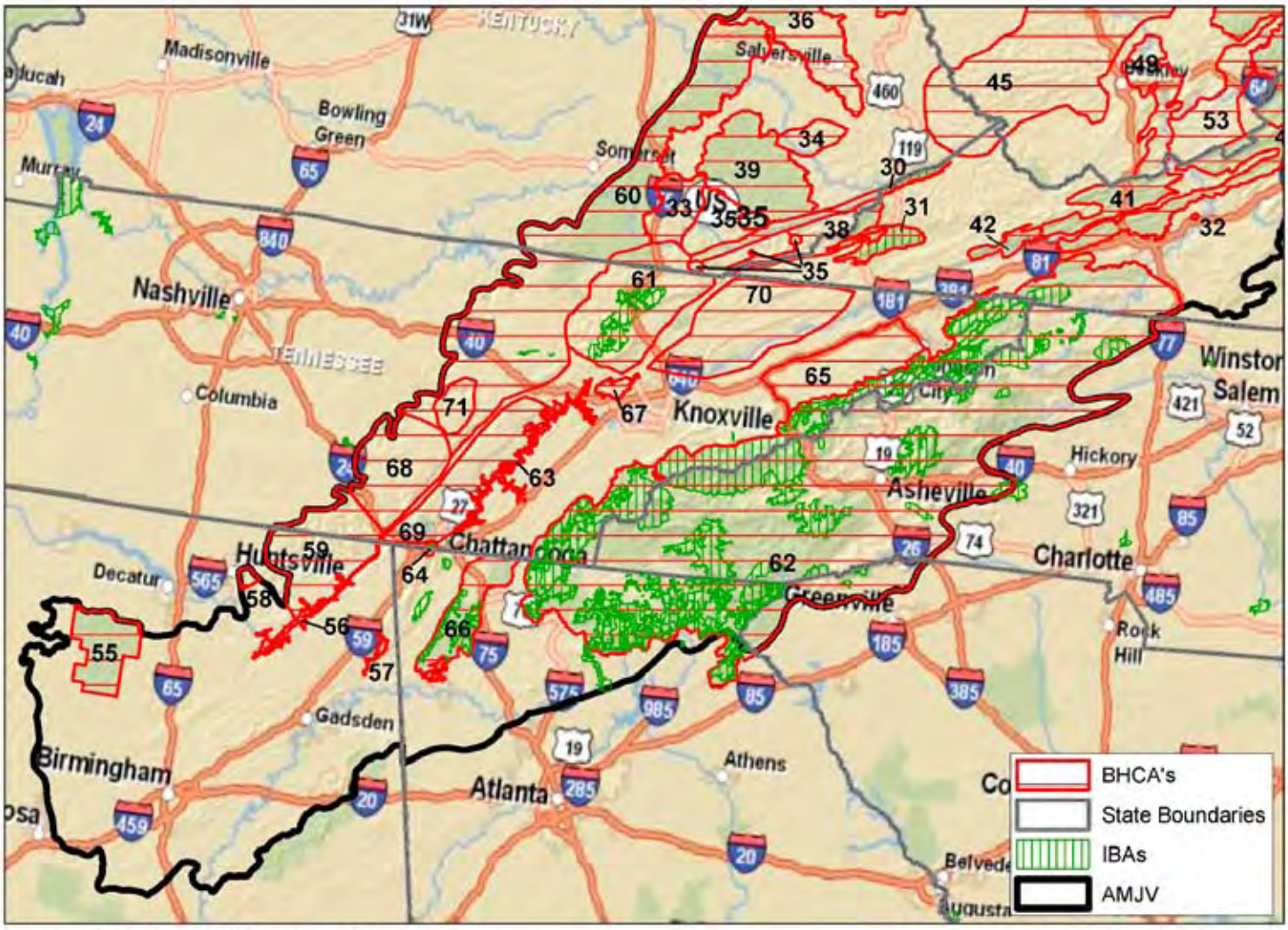
Central AMJV Bird Habitat Conservation Areas

Data: IBA's Audubon, 11/29/07
ESRI Streetmap

0 25 50 75 100 Kilometers

Appalachian Mountains Joint Venture
kirsten_luke@fws.gov
March 2008

Southern BHCAs of the AMBCR: TN, NC, SC, GA, and AL

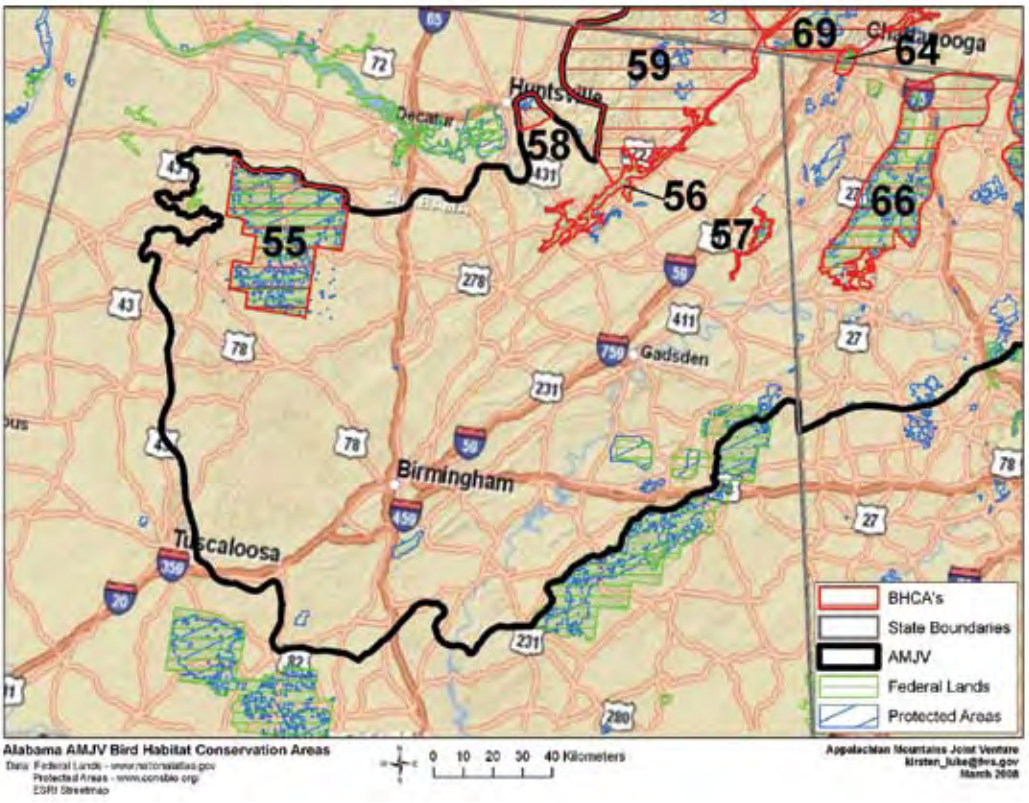


Appendix 5: Bird Habitat Conservation Areas, Forest Patch Size, and NLCD 2001 Data for the Appalachian Mountains Bird Conservation Region, Organized by State

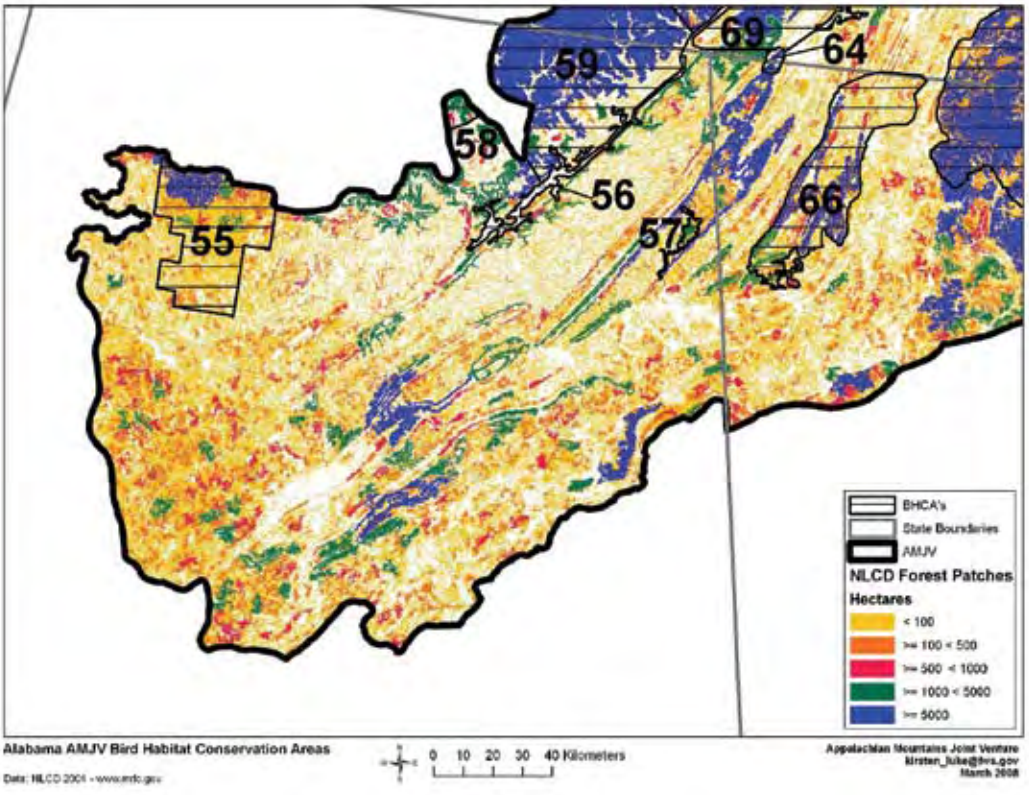
The following maps are grouped by state and sorted alphabetically. For each state, there are 4 maps in the following order: BHCAs, forest patch size, NLCD 2001 (all classes), NLCD 2001 (rare classes). The last 3 maps provided ancillary information to Technical Committee members (Roanoke meeting, 2007) as they drafted BHCAs throughout the AMBCR. The BHCA maps in this appendix are simply smaller-scale depictions (i.e., zoomed in to each state) of the BHCAs in the maps of the Northern, Central, and Southern regions of the AMBCR (Appendix 4). Number labels on the BHCA maps correspond to the list of BHCAs in Appendix 4.

The BHCA maps are the culmination of the initial Technical Committee draft in August 2007, review by outside experts and administrators, and subsequent refinements based on reviewers' comments and suggestions. We recognize that our BHCAs are coarse assessments of geographically important areas and other areas within the AMBCR do (or could) provide high quality bird habitat. However, based on expert opinion, these BHCAs have the highest conservation and restoration potential in the AMBCR. Therefore, identifying areas of known 'high potential' for conservation will allow us to examine factors within those BHCAs that influence avian populations, and apply that knowledge to other appropriate areas in order to achieve our objectives. Also, as additional data becomes available, we recognize that these BHCAs may need to be modified in future planning iterations.

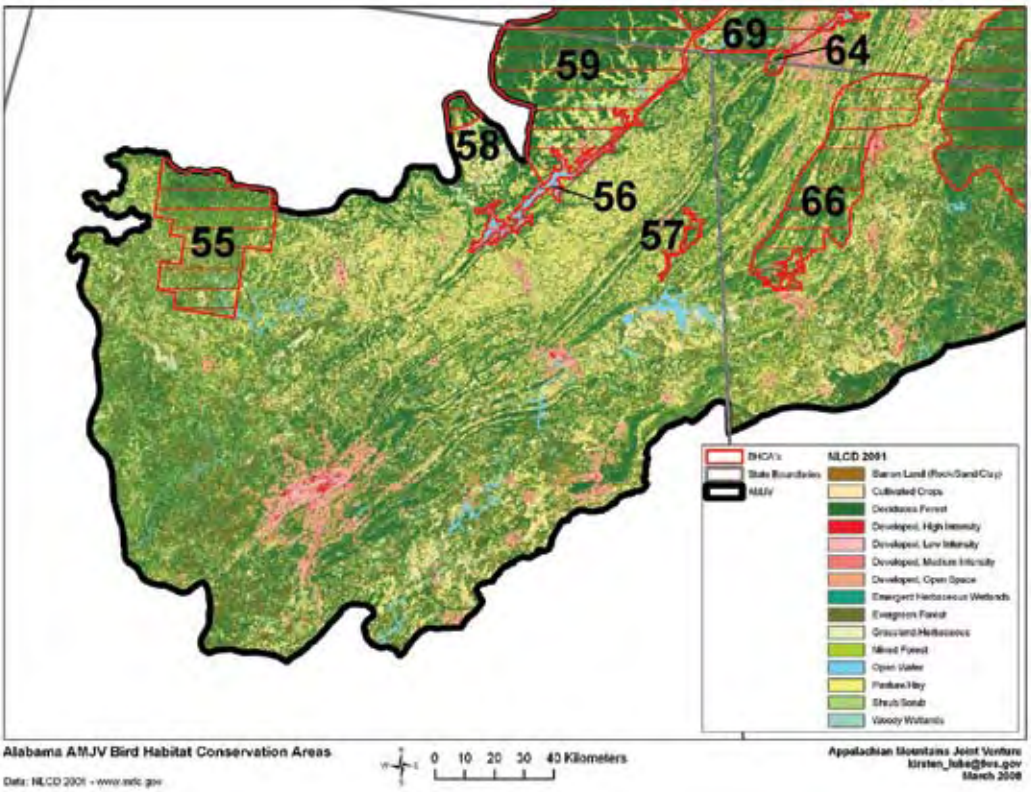
ALABAMA BHCAs



ALABAMA Forest Patch Size



ALABAMA NLCD 2001 (all classes)



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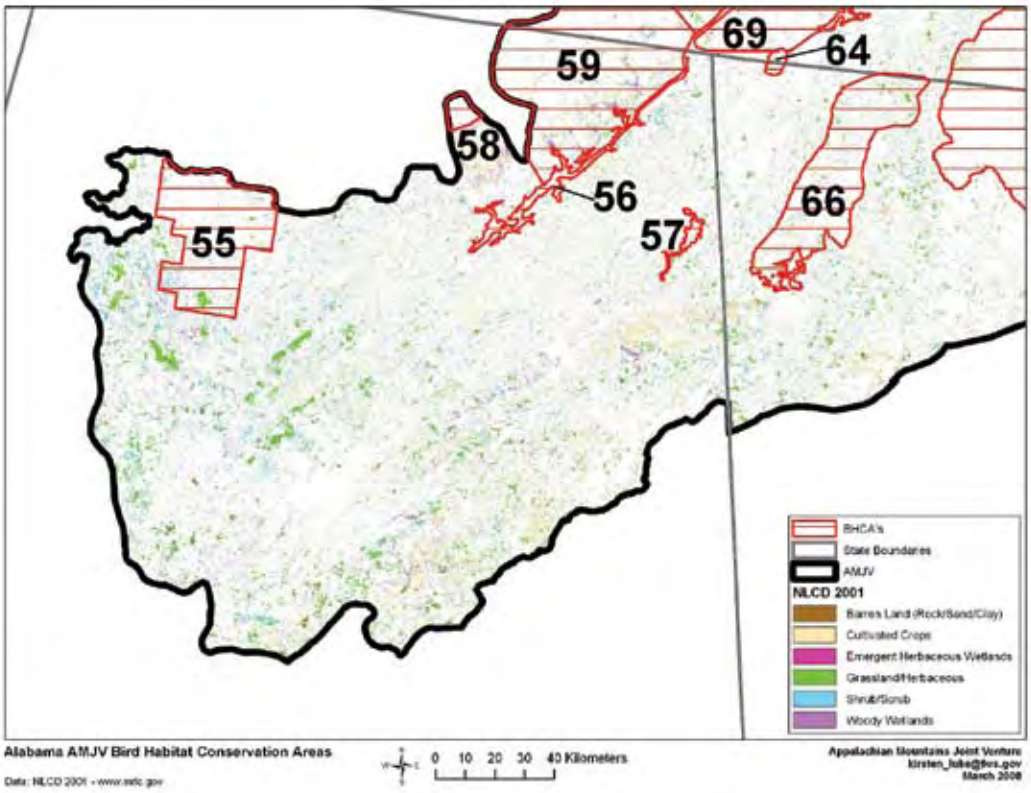

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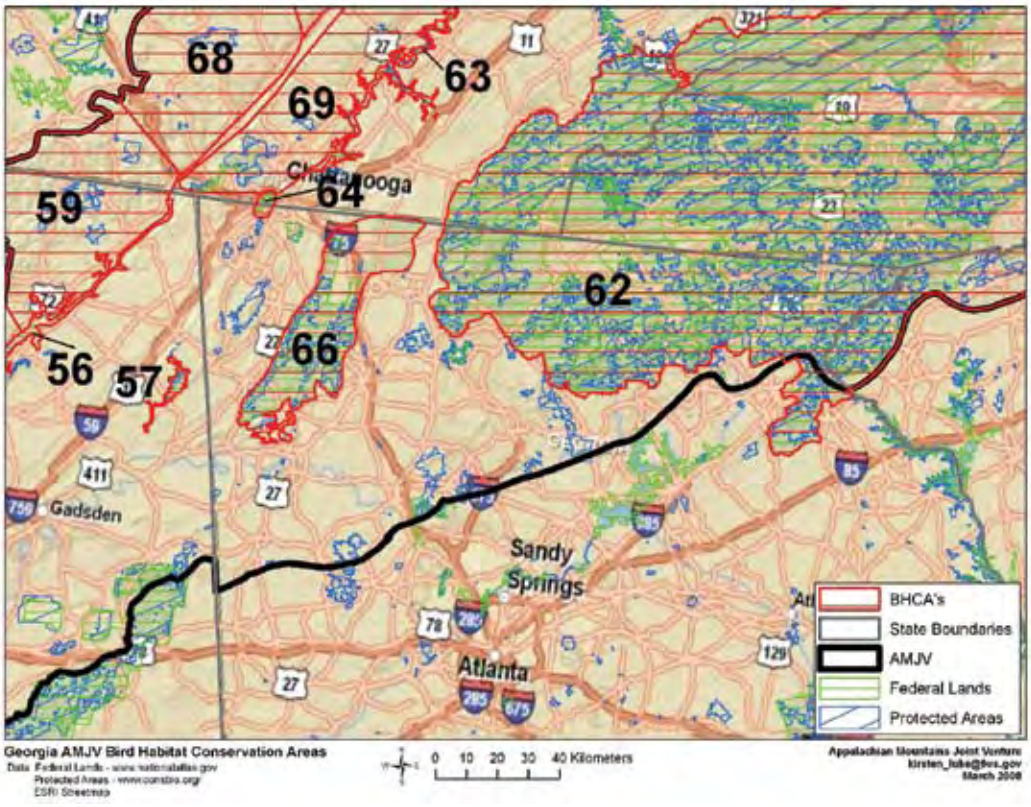
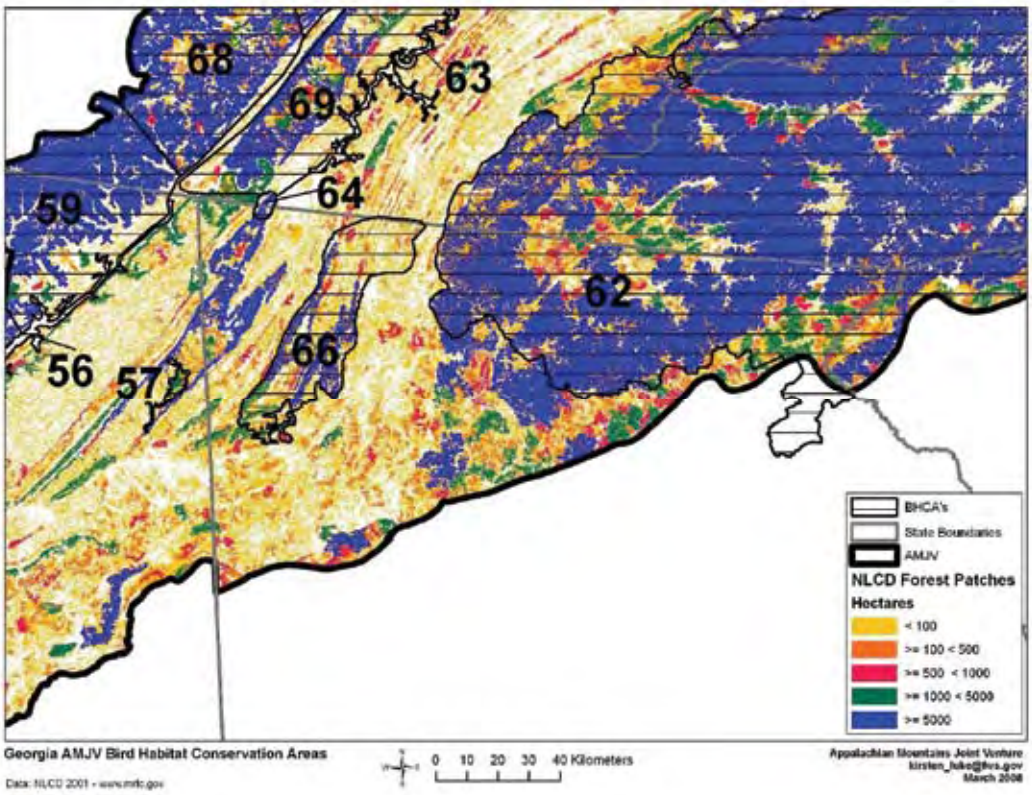


GEORGIA Forest Patch Size



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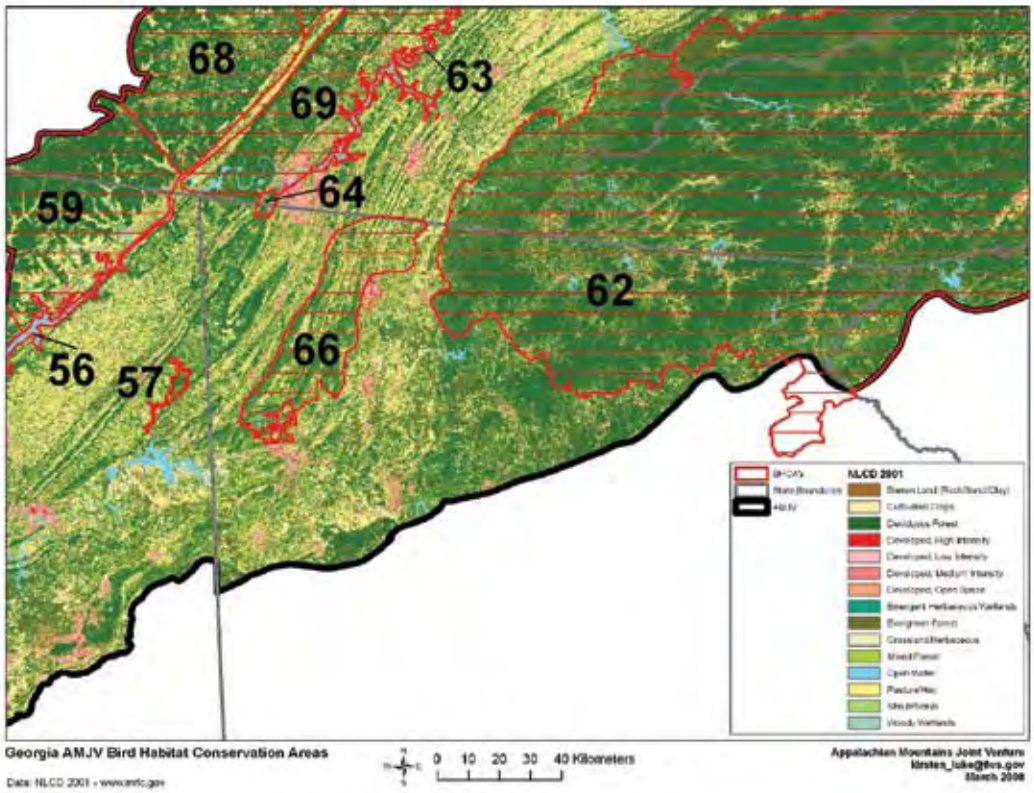

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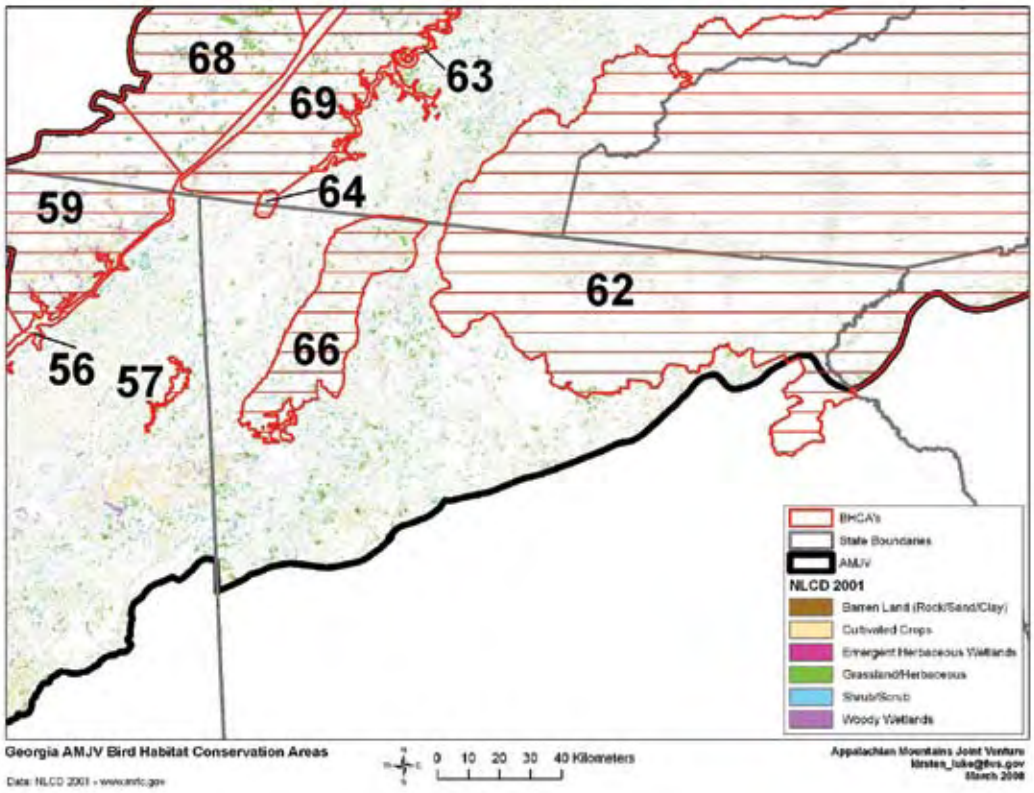
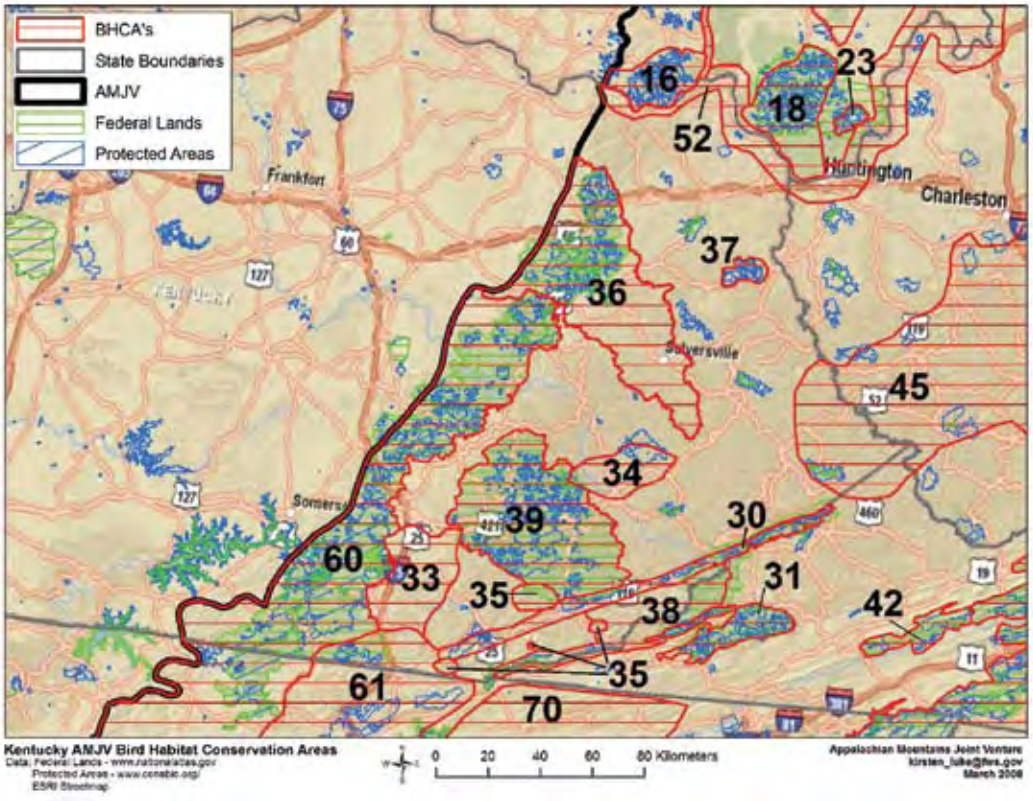
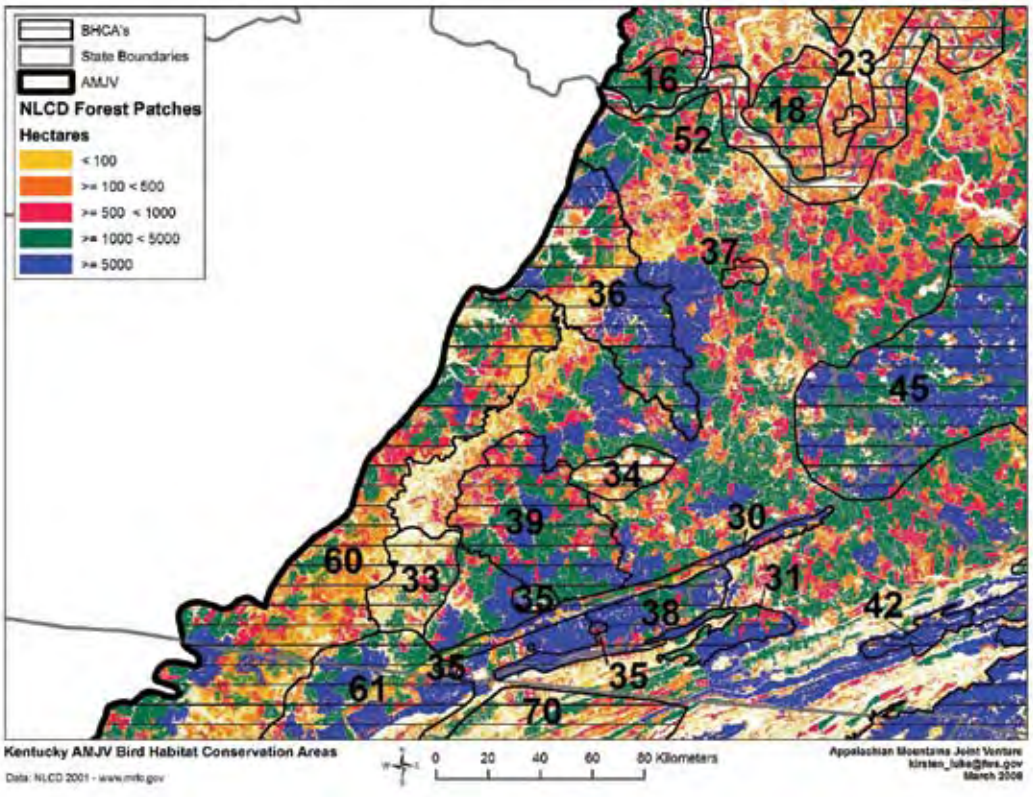


KENTUCKY BHCAs



KENTUCKY Forest Patch Size



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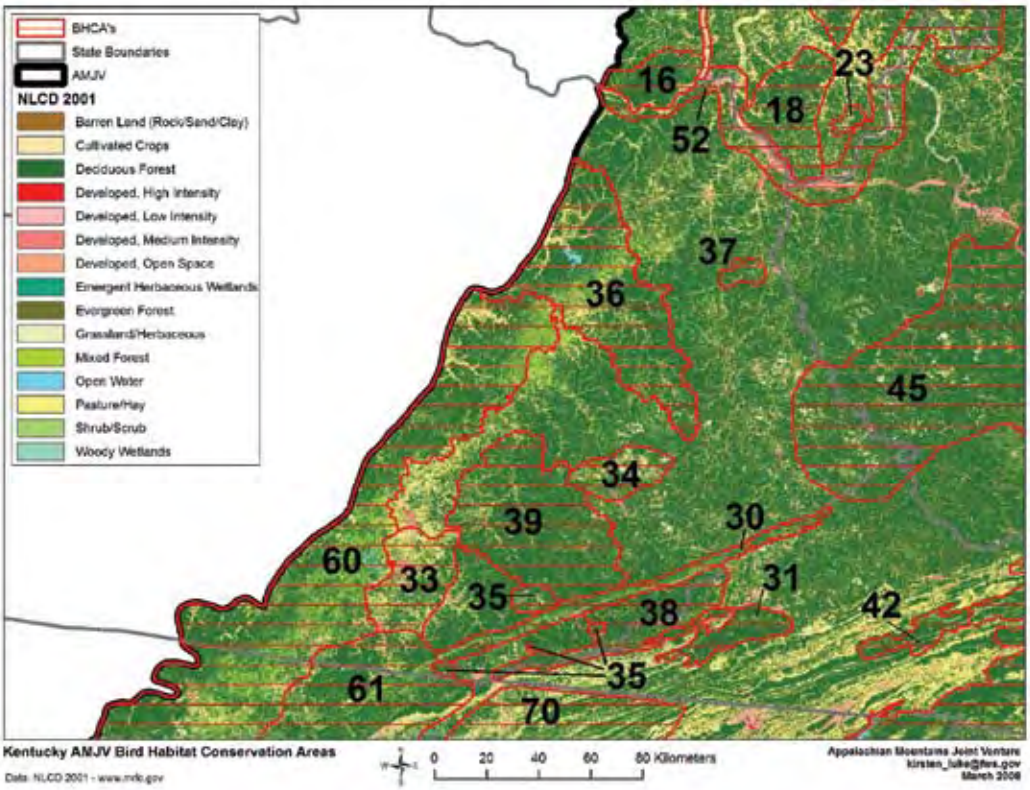

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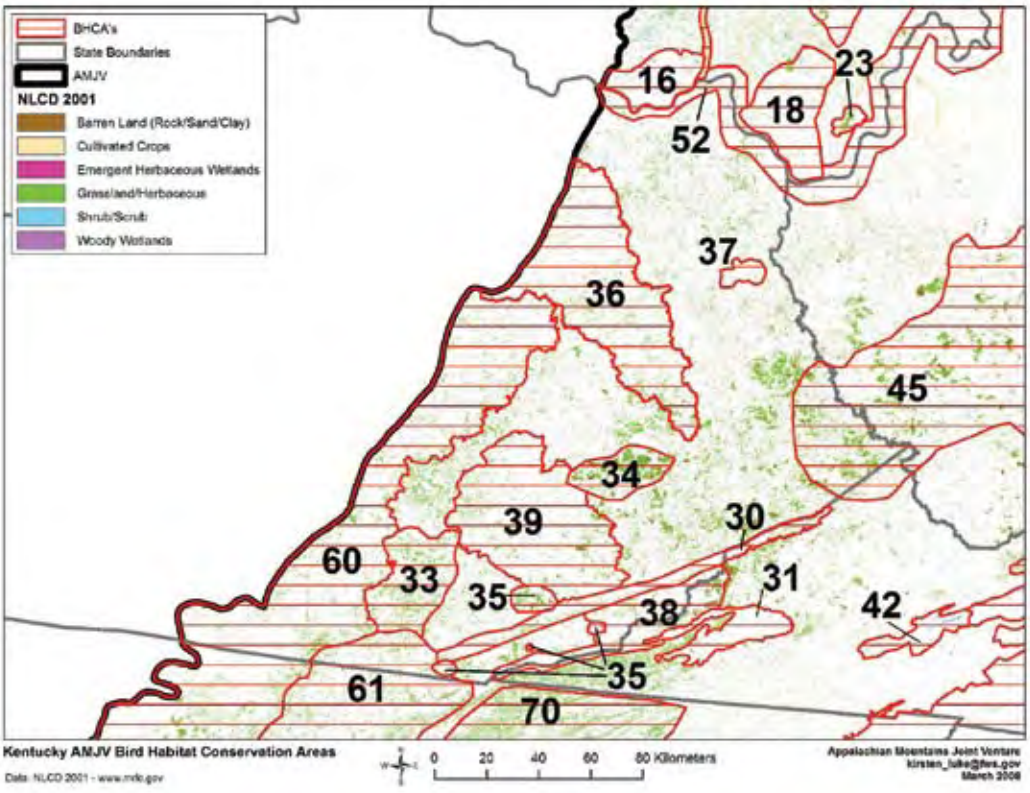
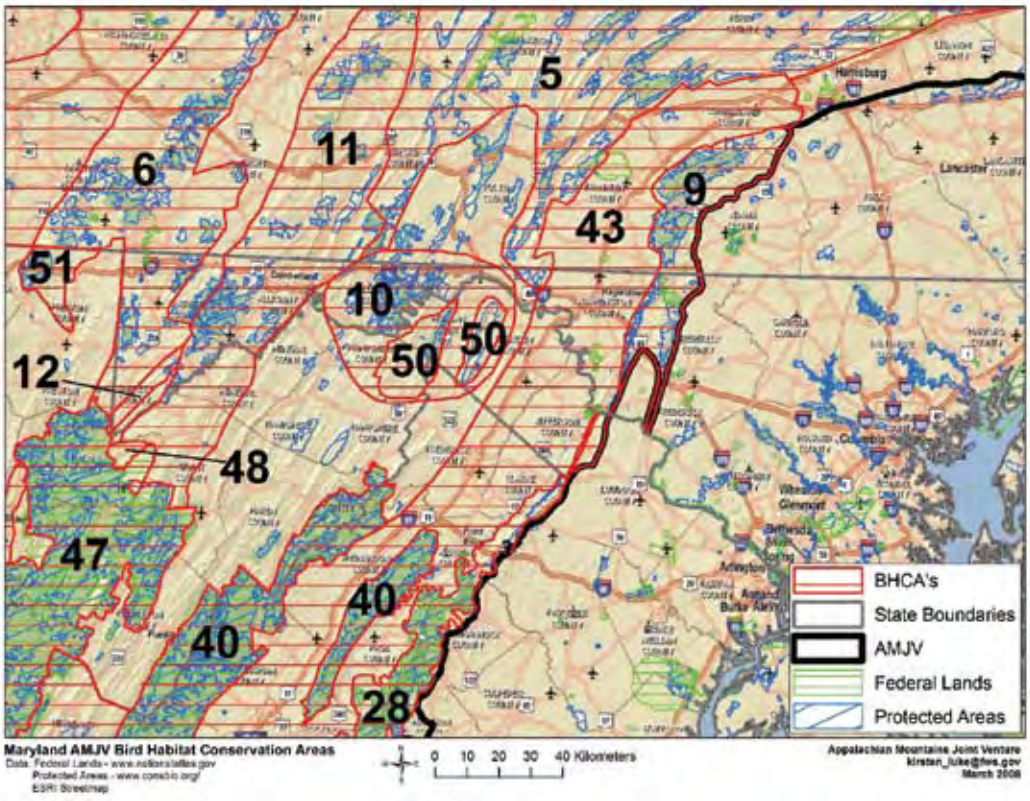
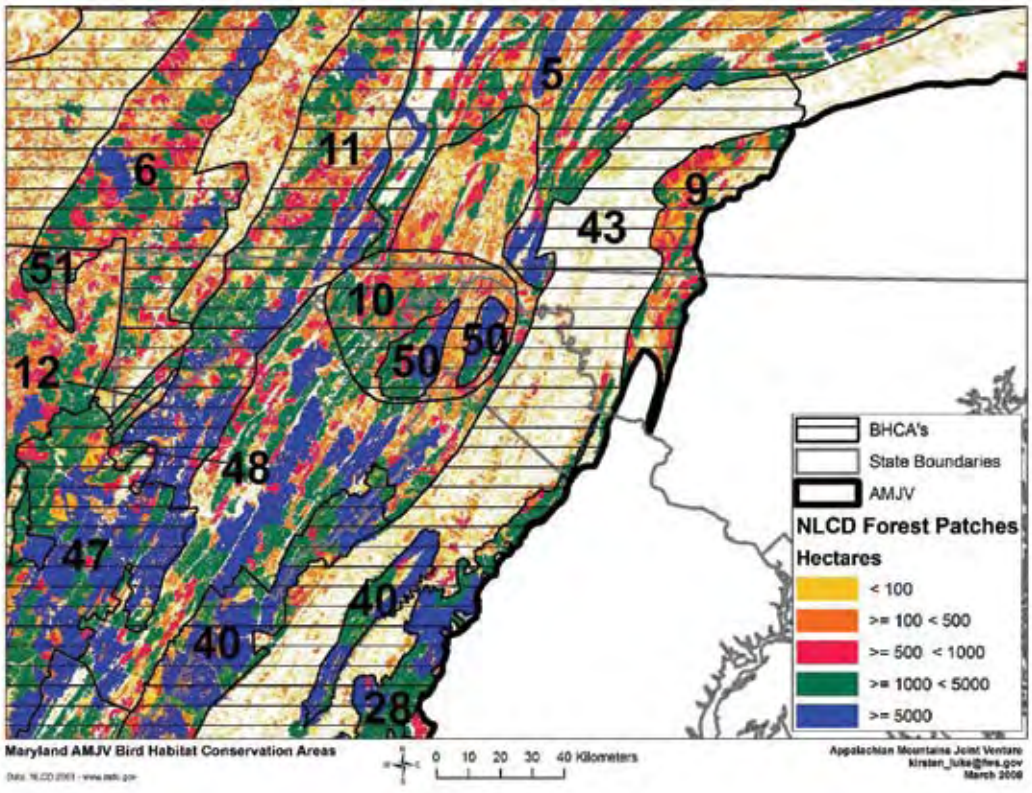


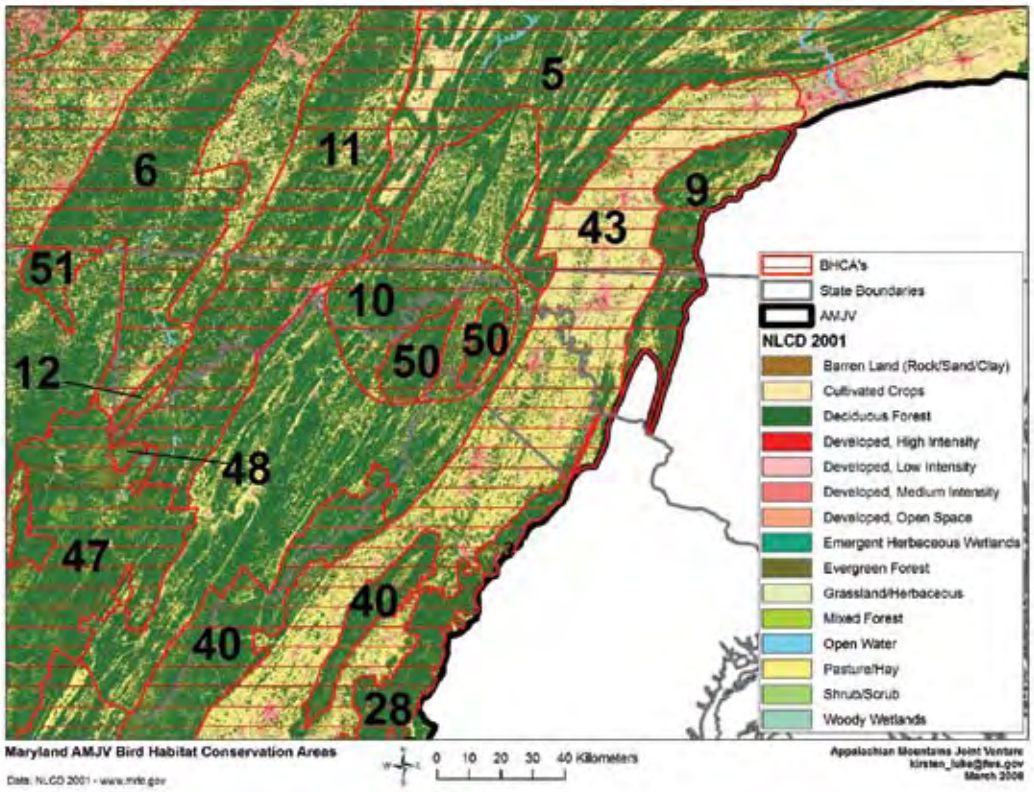
MARYLAND BHCAs



MARYLAND Forest Patch Size



MARYLAND NLCD 2001 (all classes)



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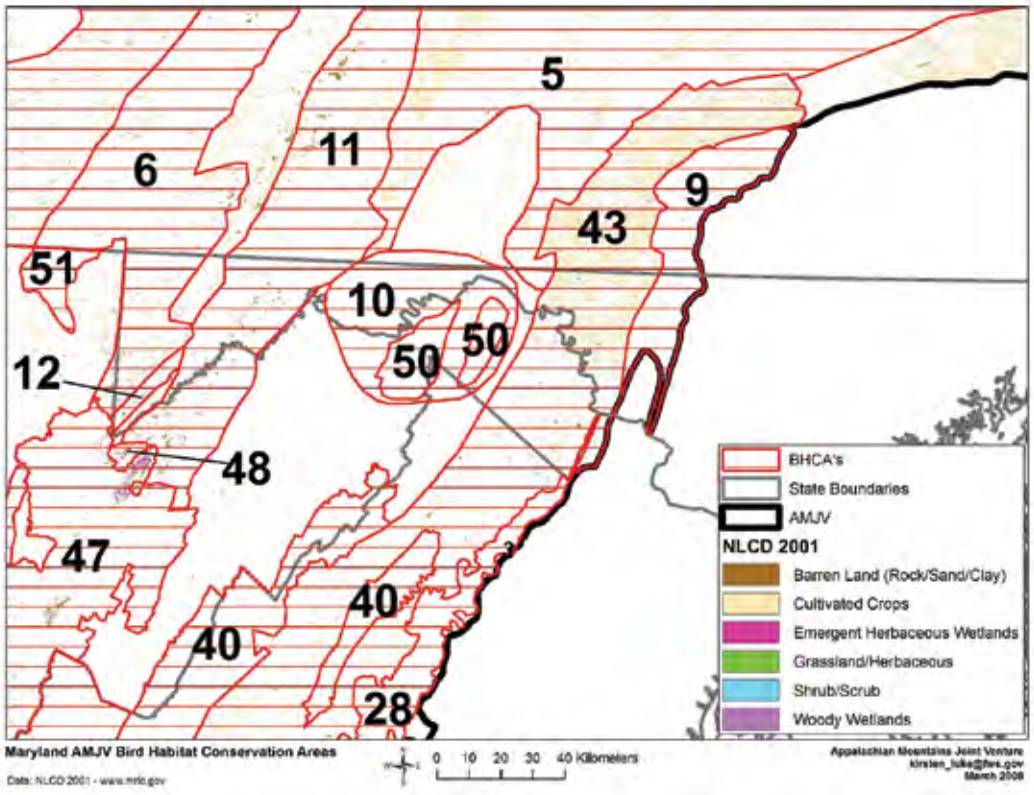
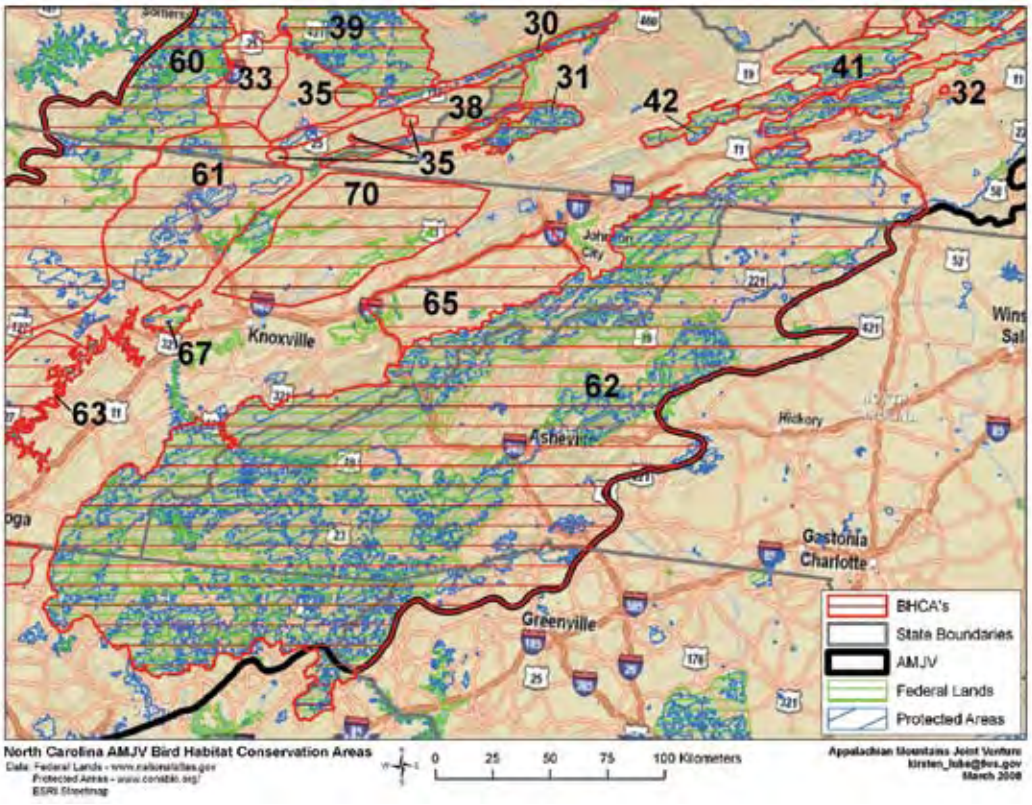
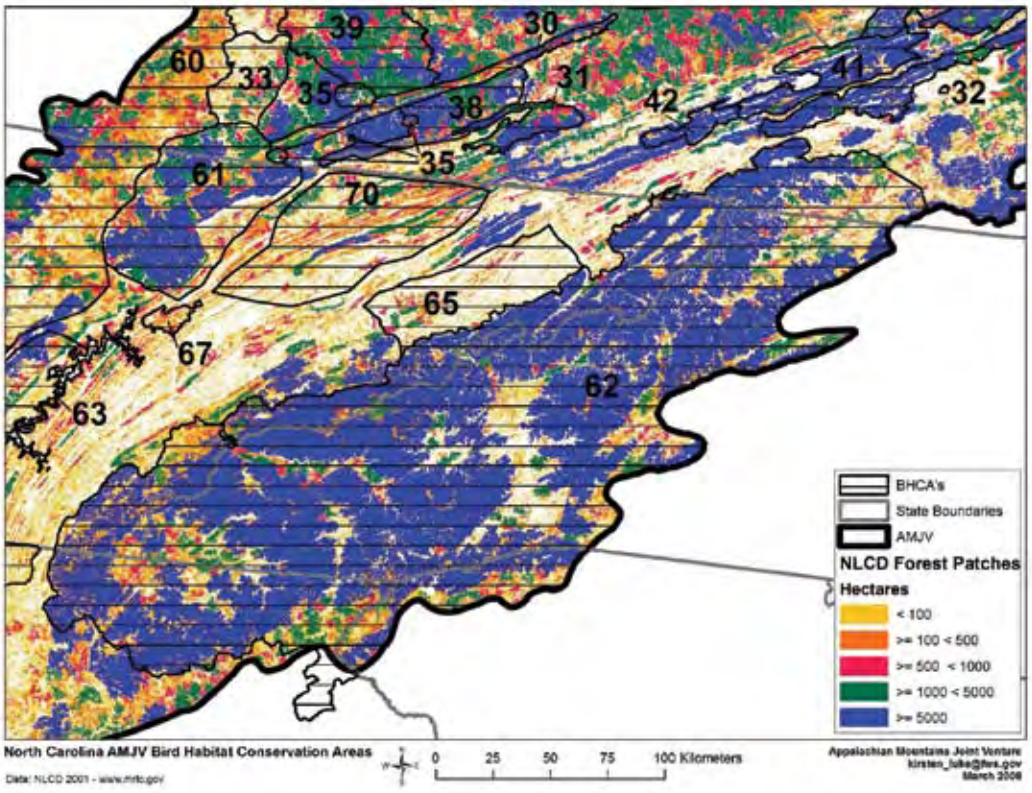


NORTH CAROLINA BHCAs



NORTH CAROLINA Forest Patch Size



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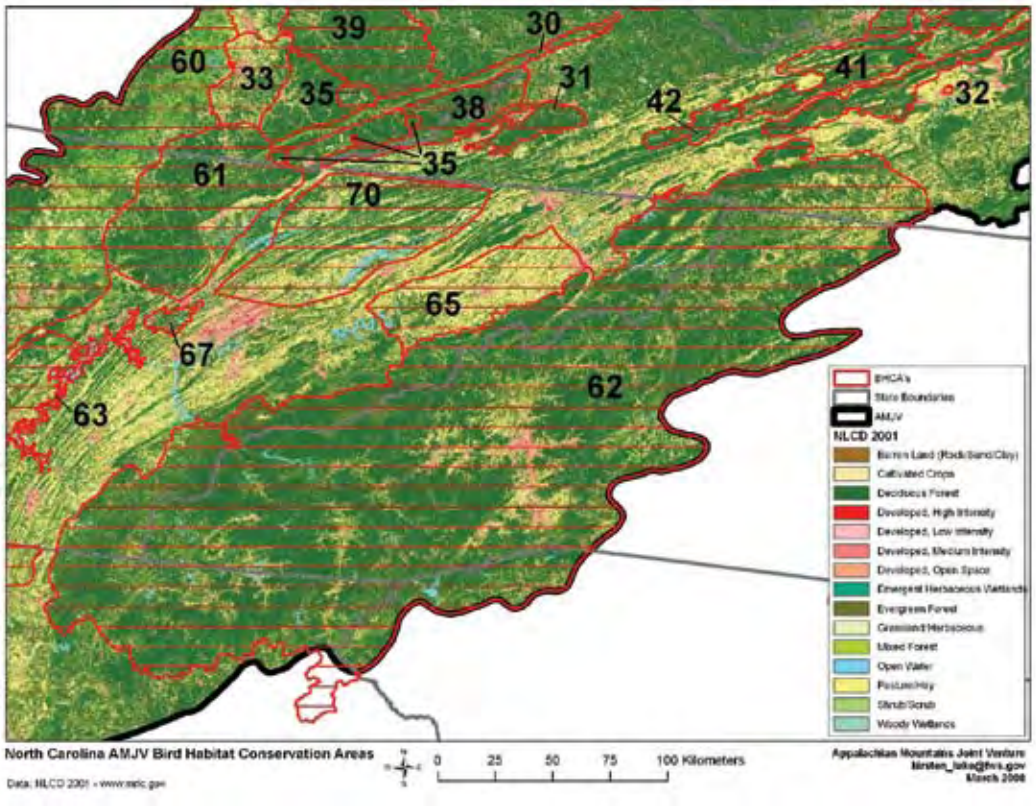

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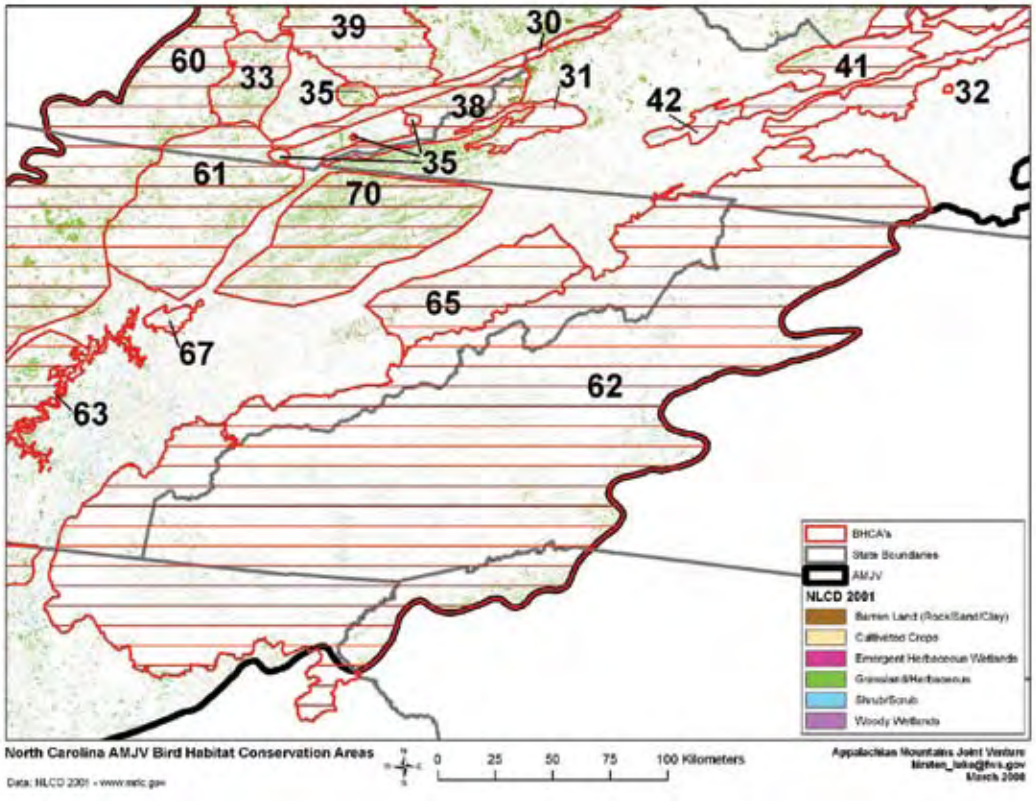

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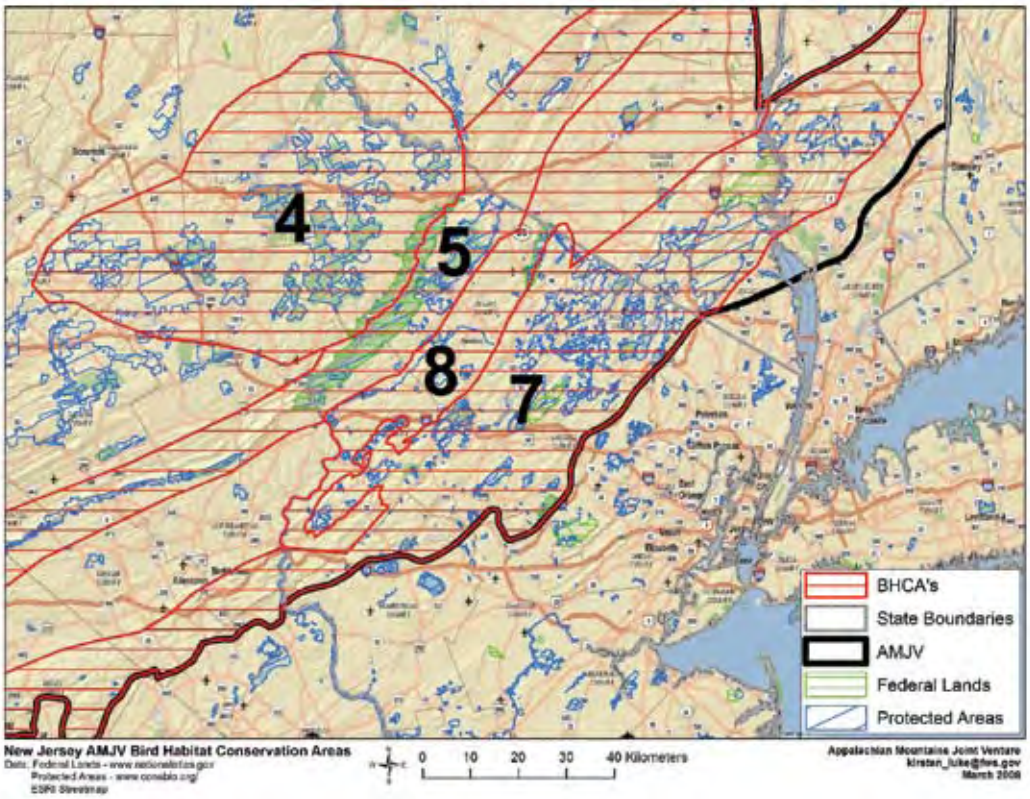

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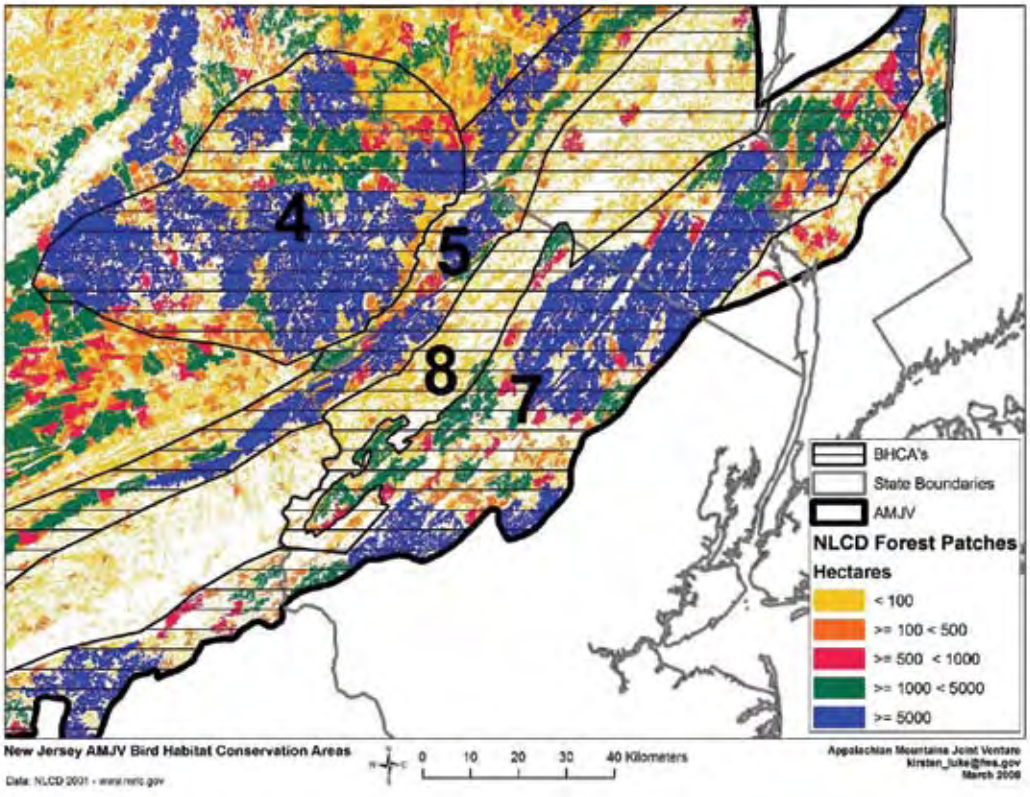

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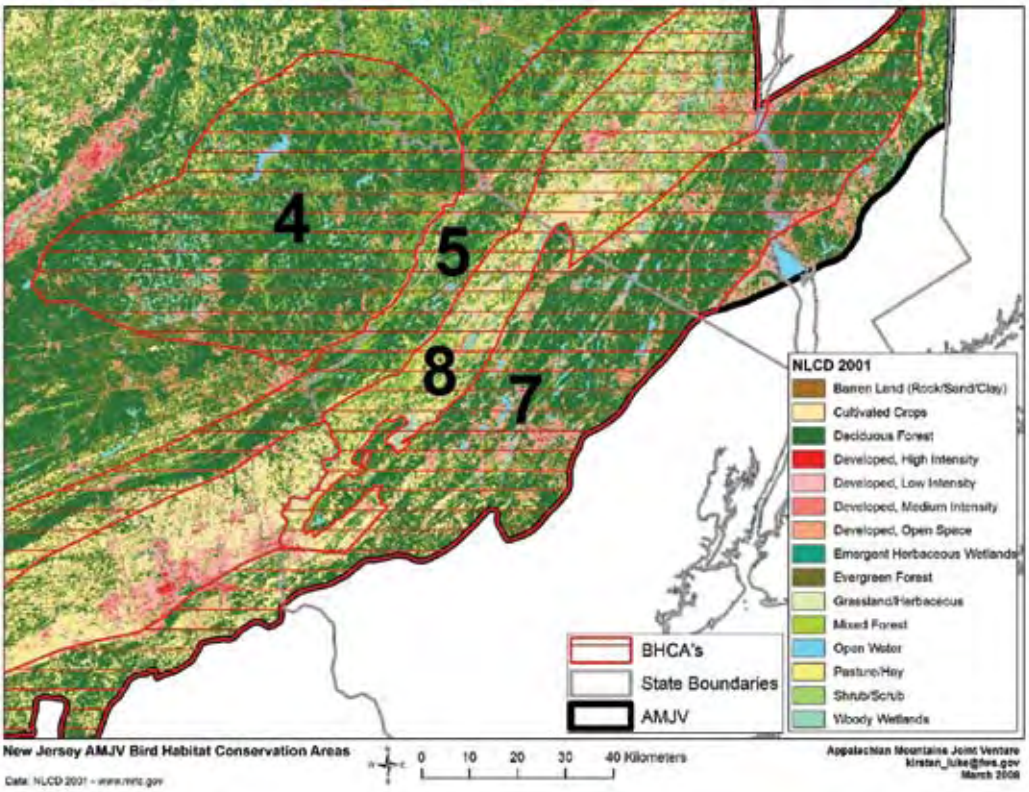

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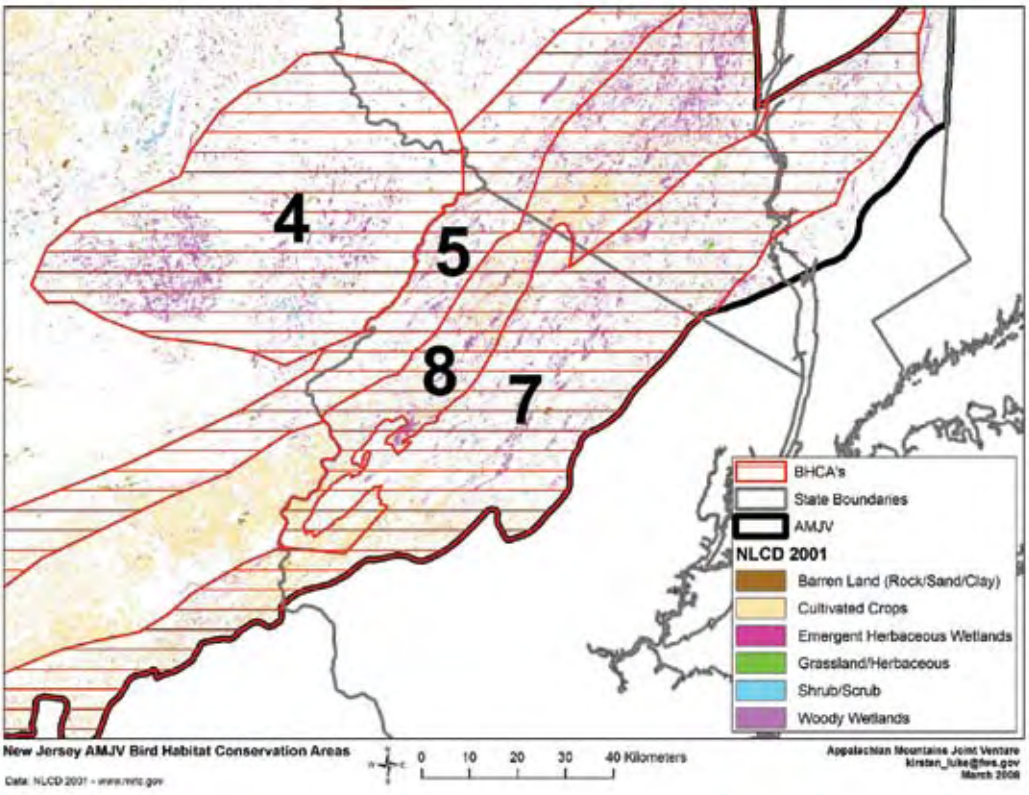
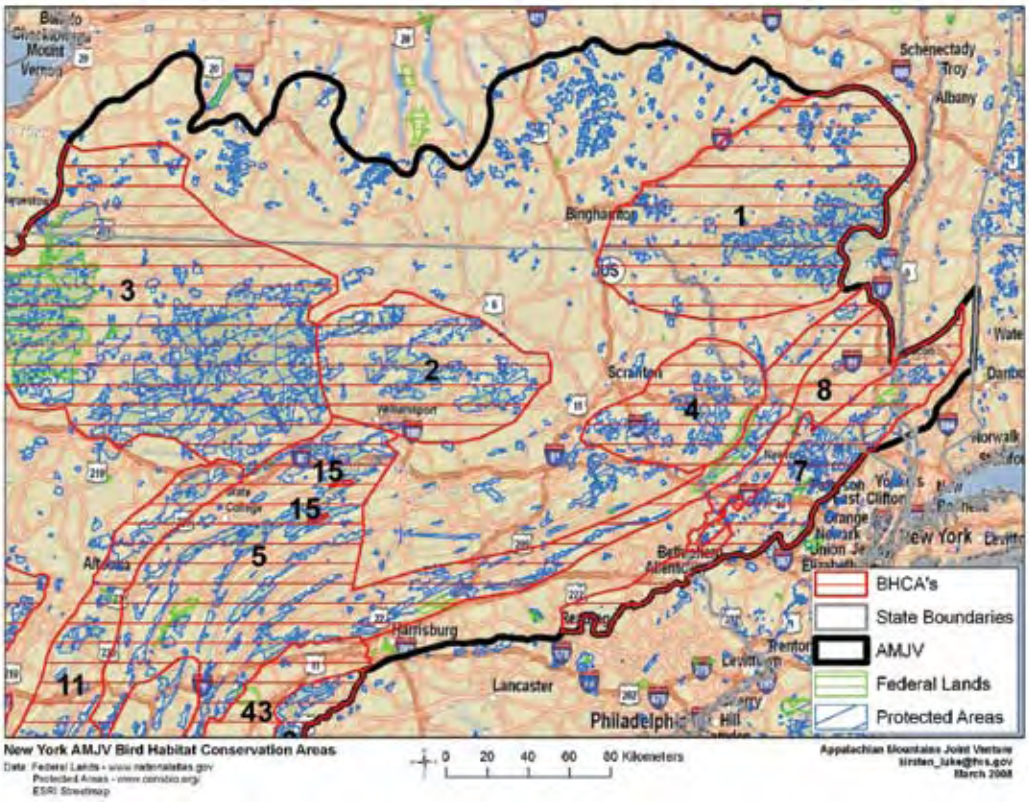


NEW YORK BHCAs



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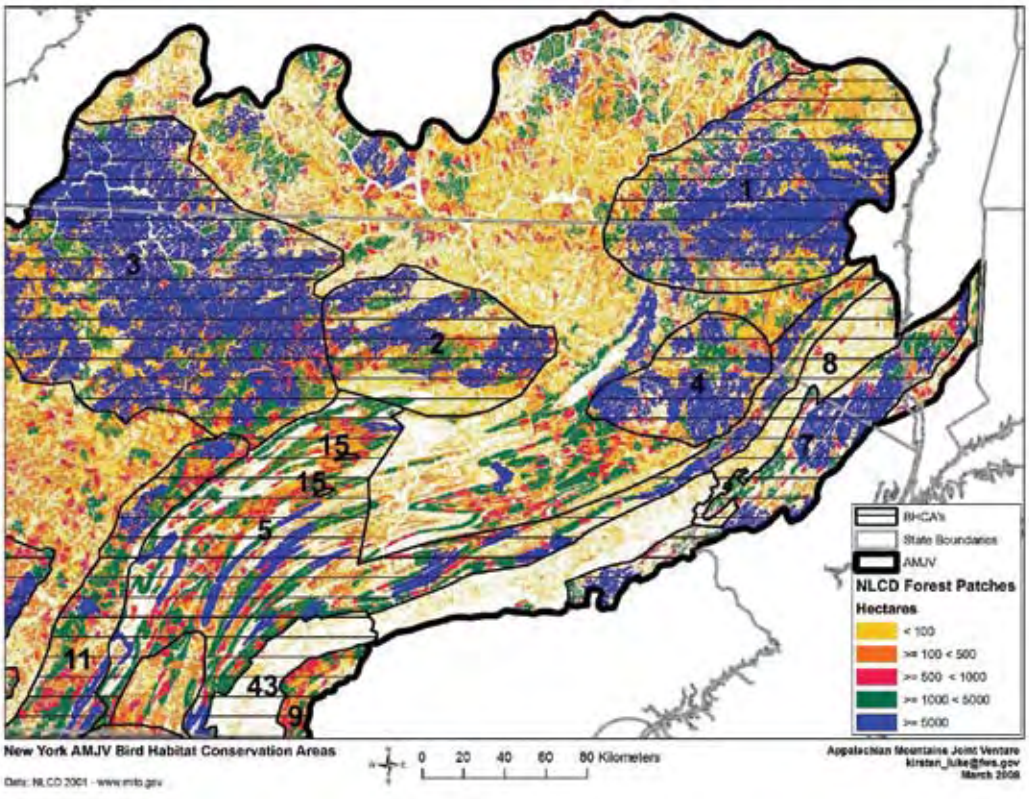

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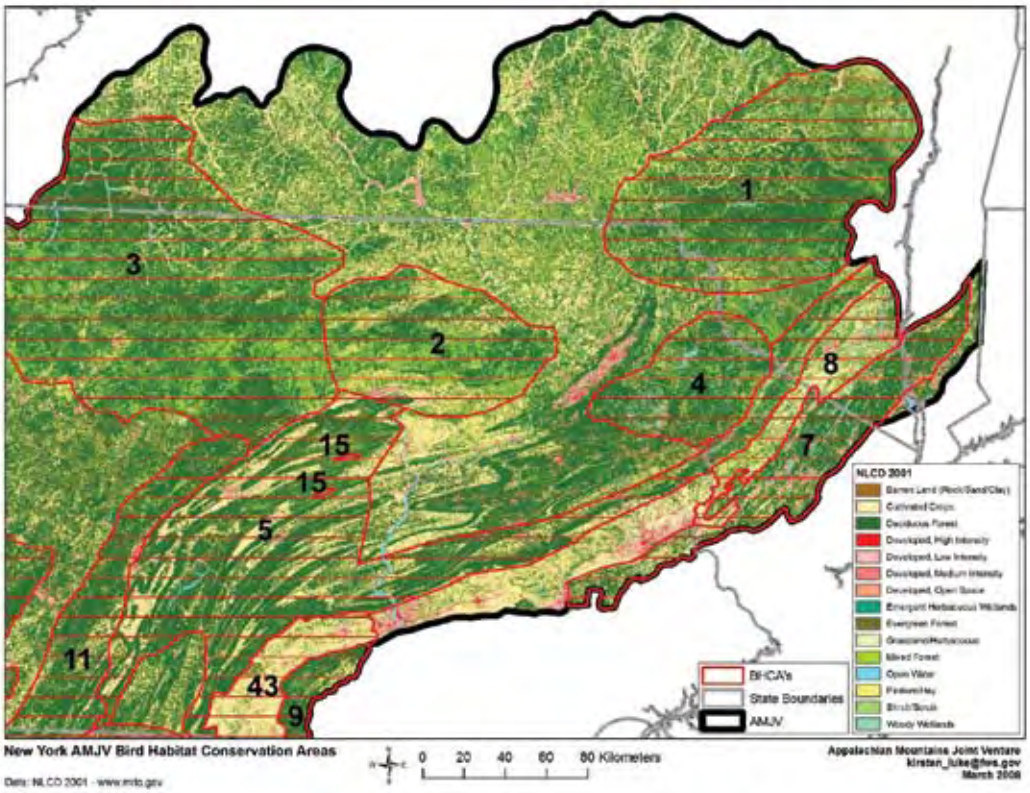

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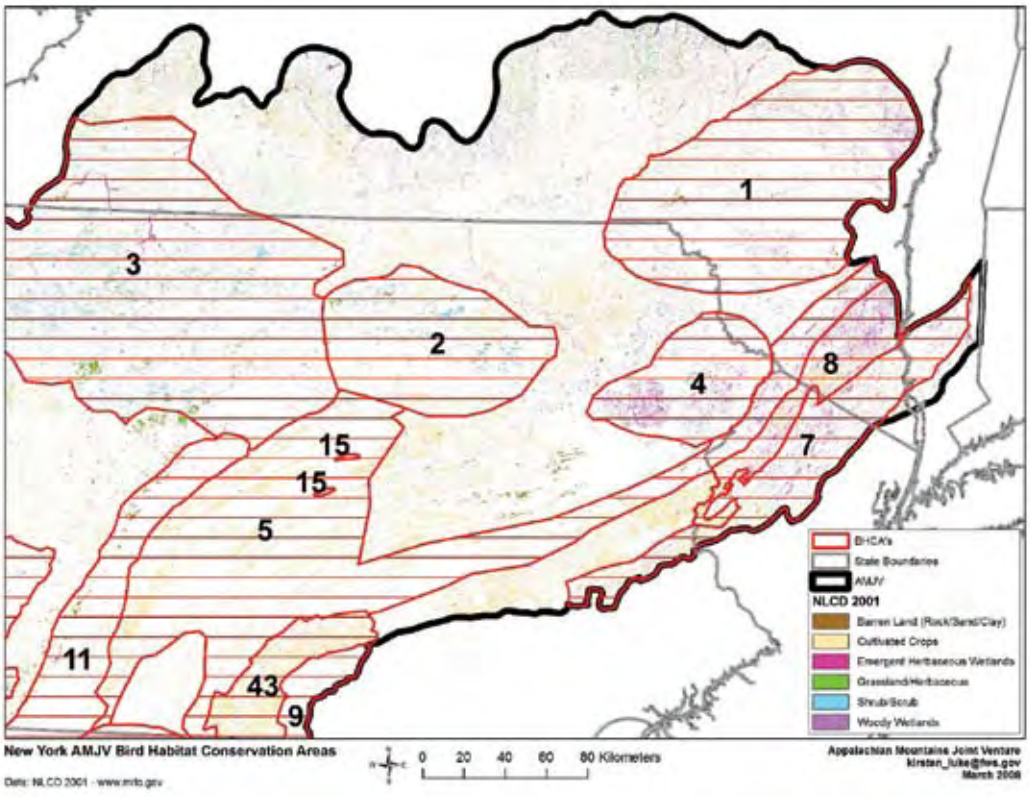

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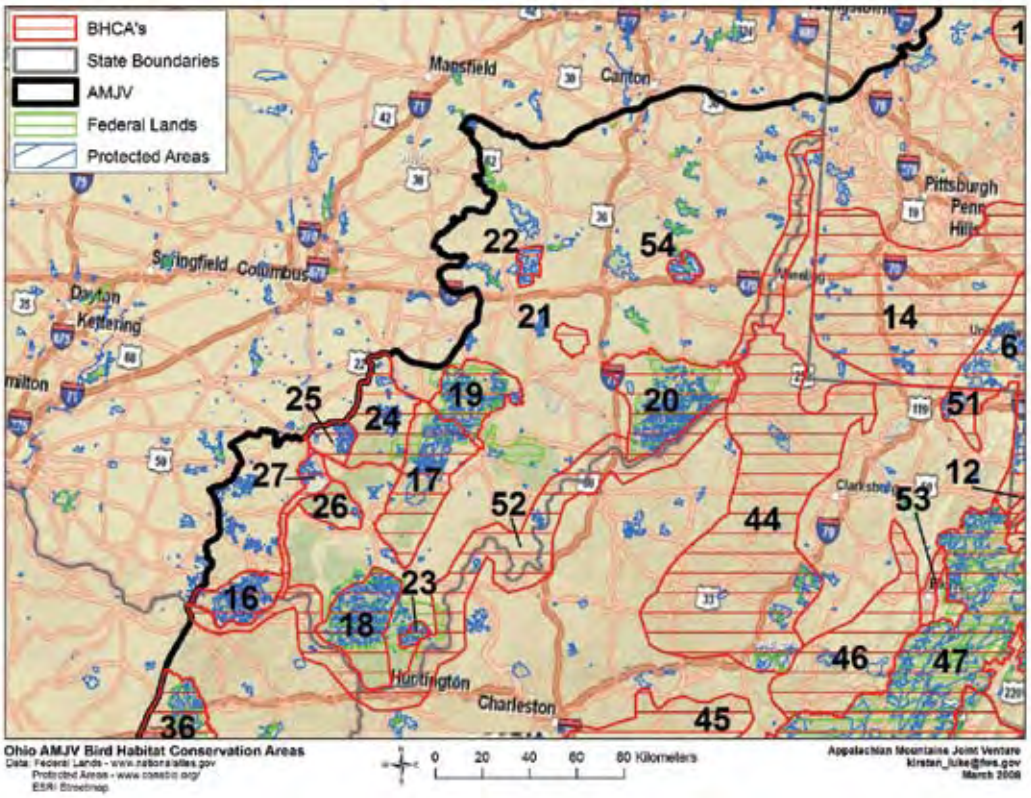

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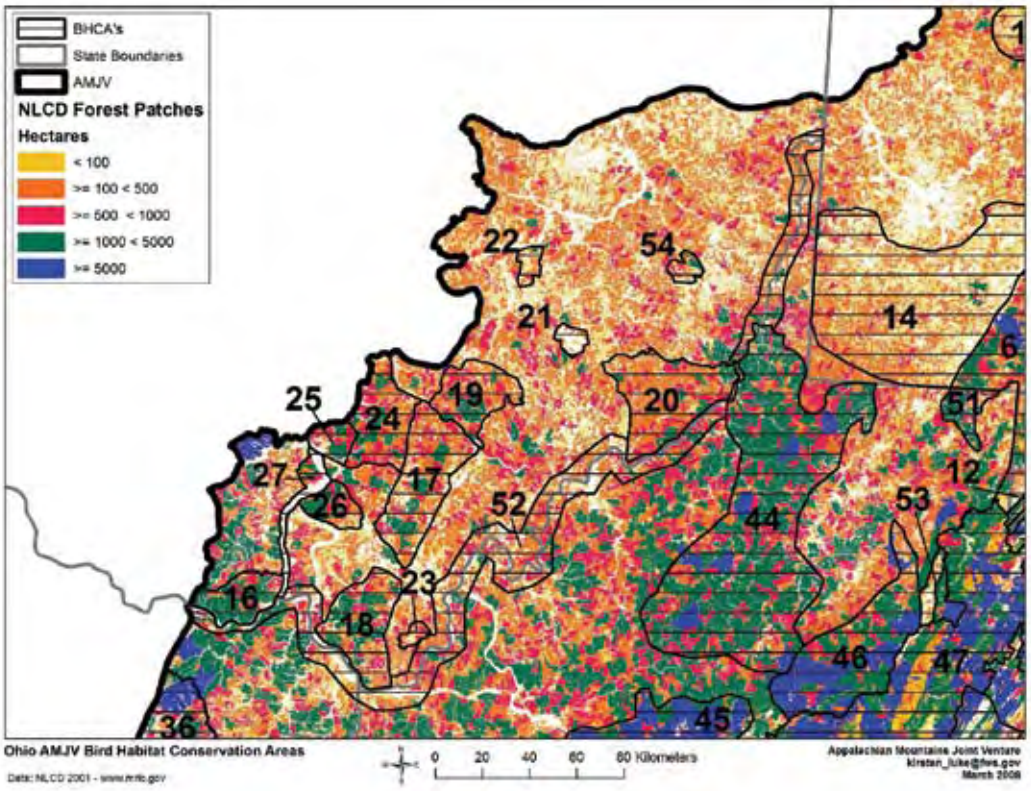

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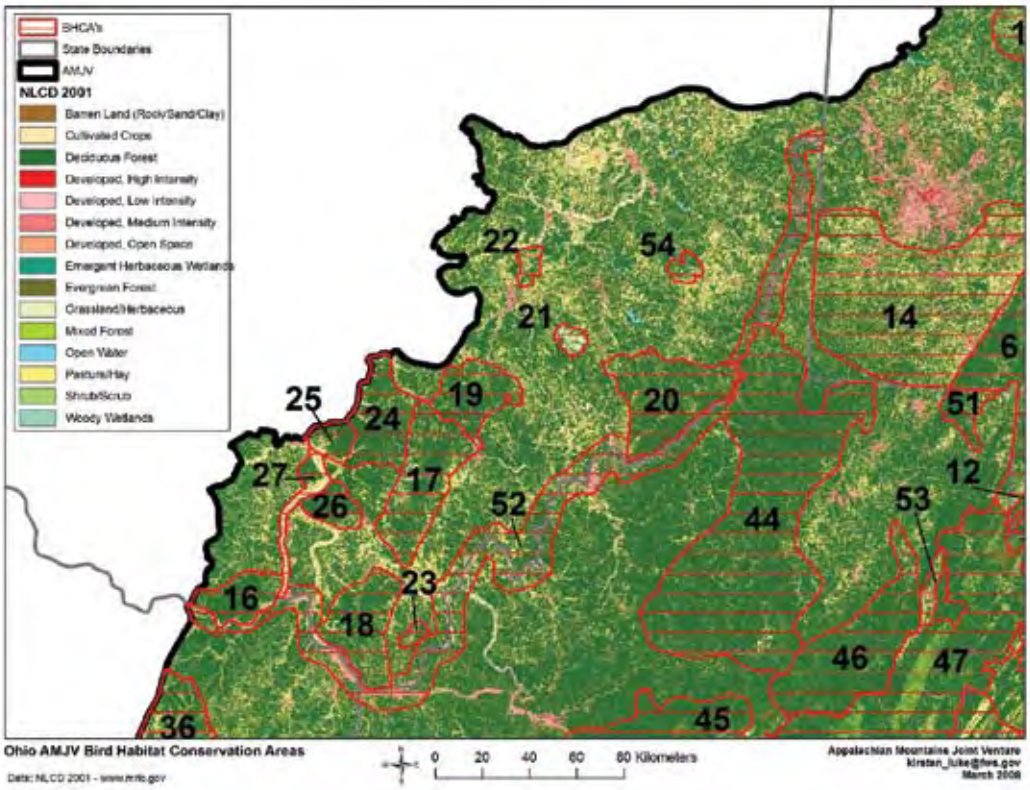
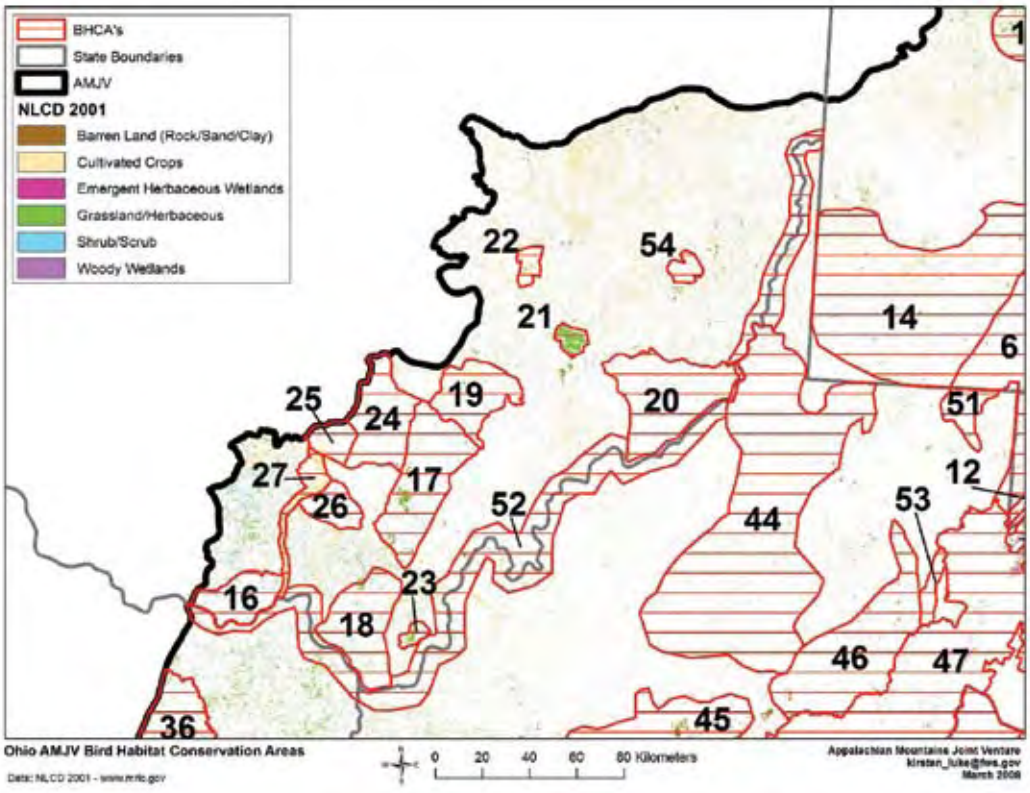
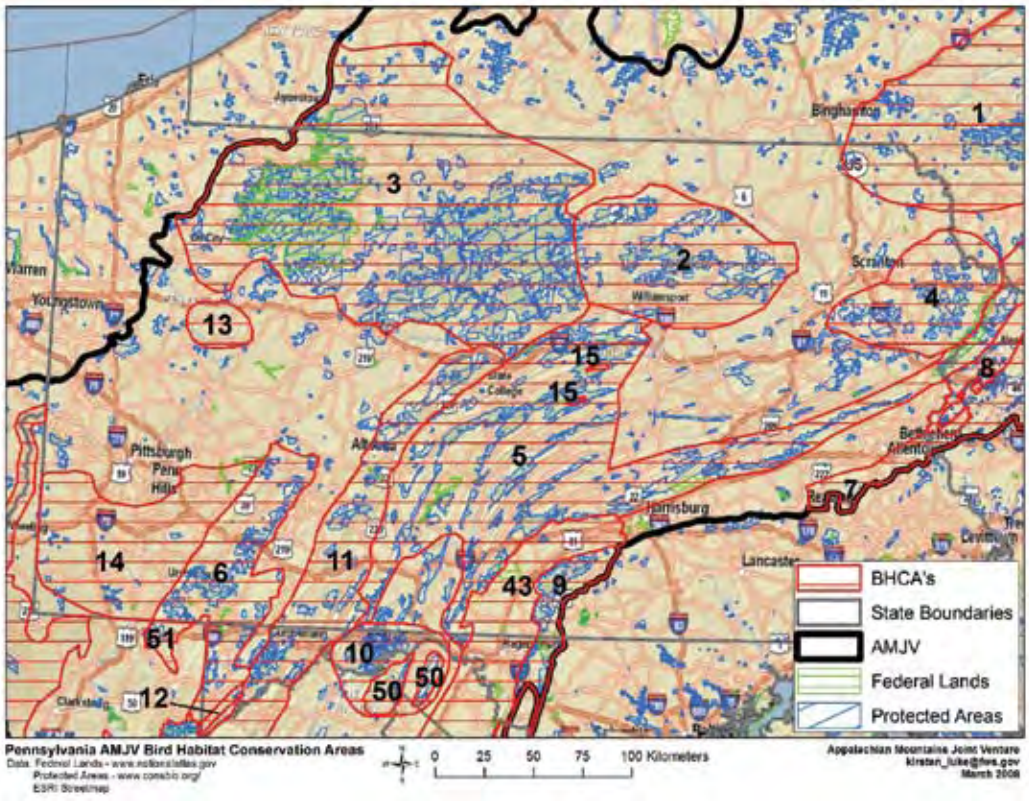


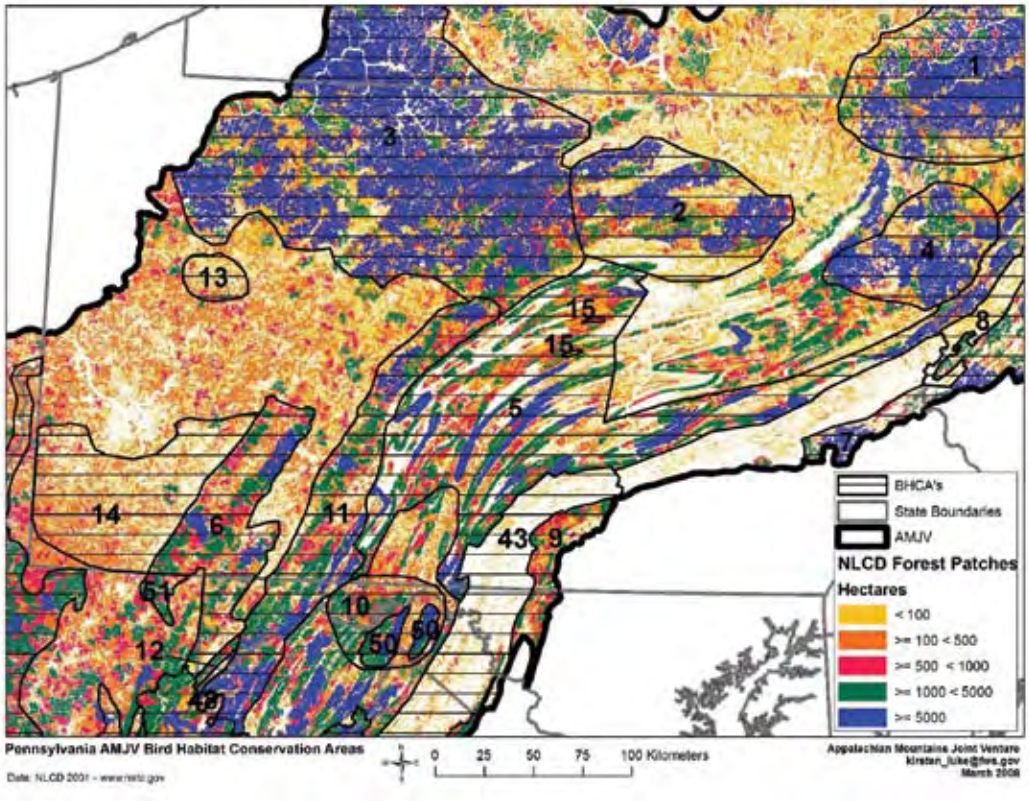
OHIO NLCD 2001 (rare classes)



PENNSYLVANIA BHCAs



PENNSYLVANIA Forest Patch Size



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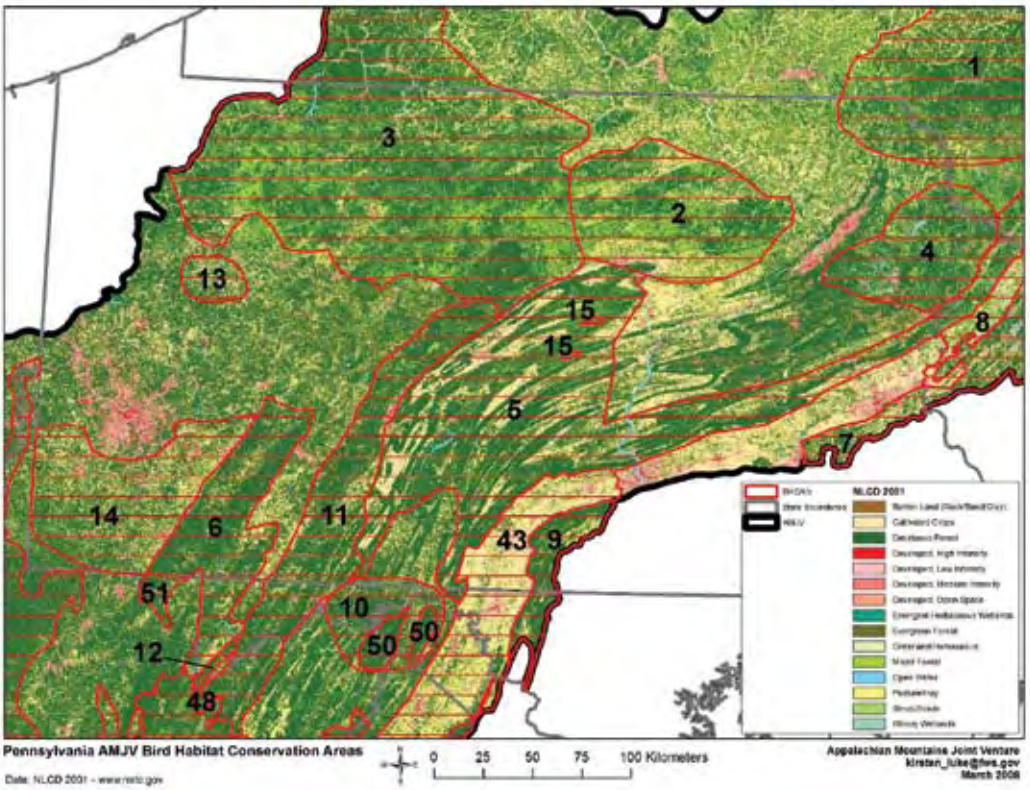

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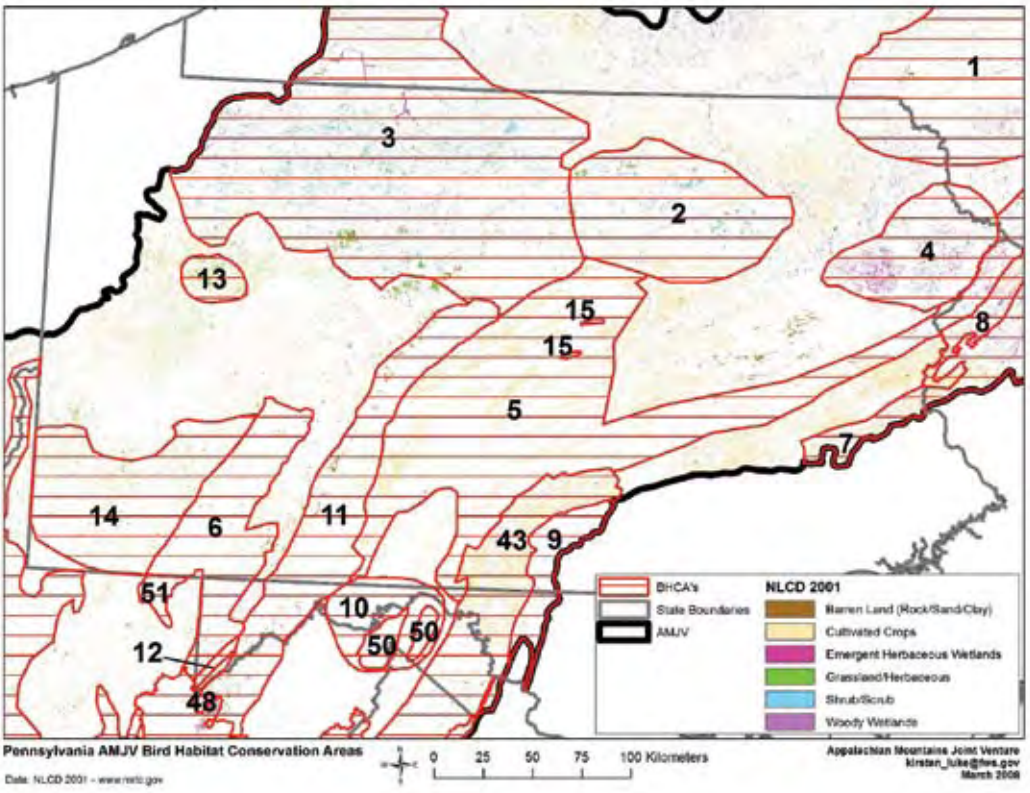
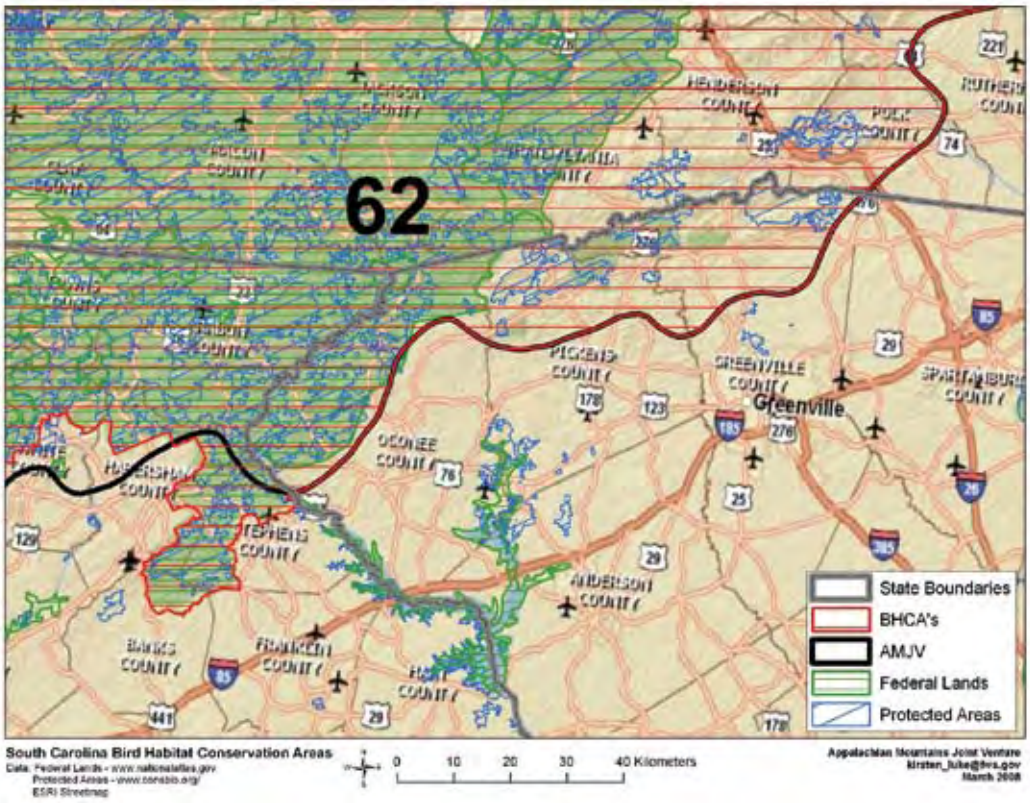
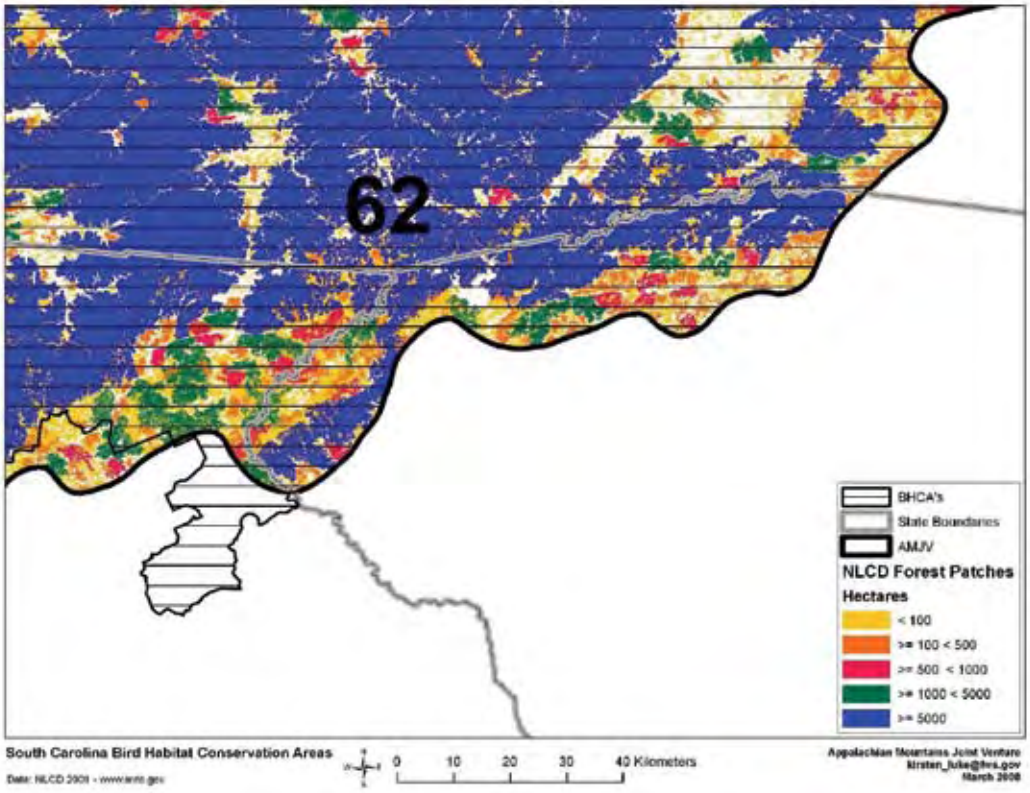


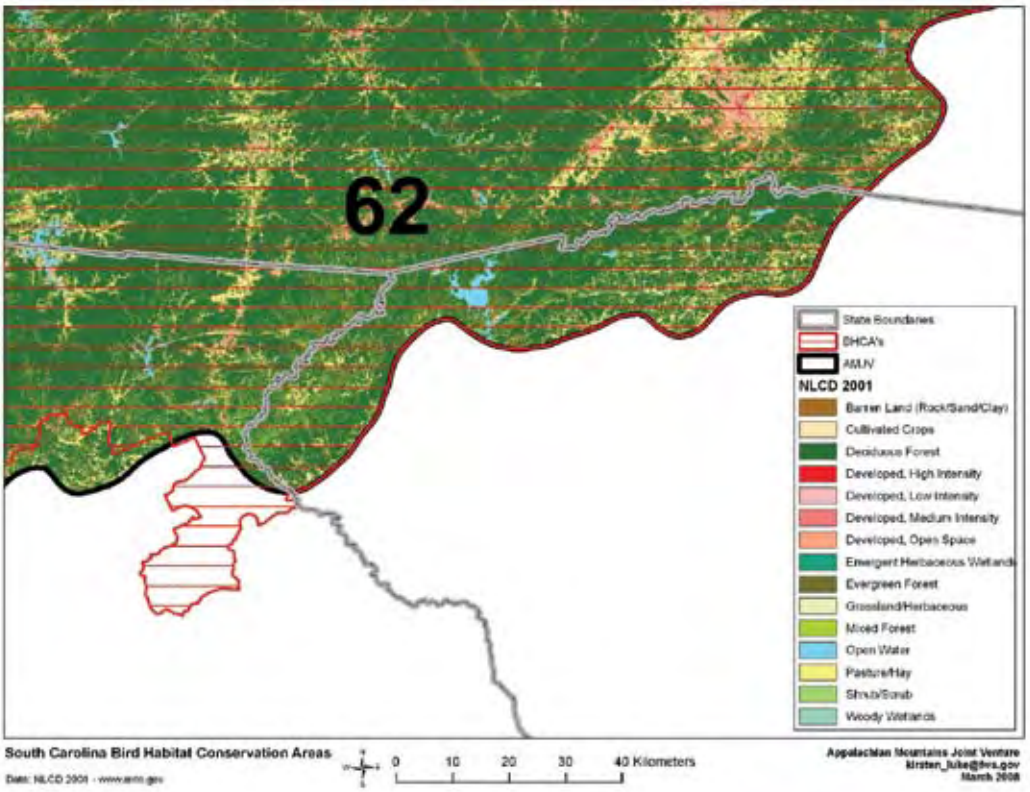
SOUTH CAROLINA BHCAs



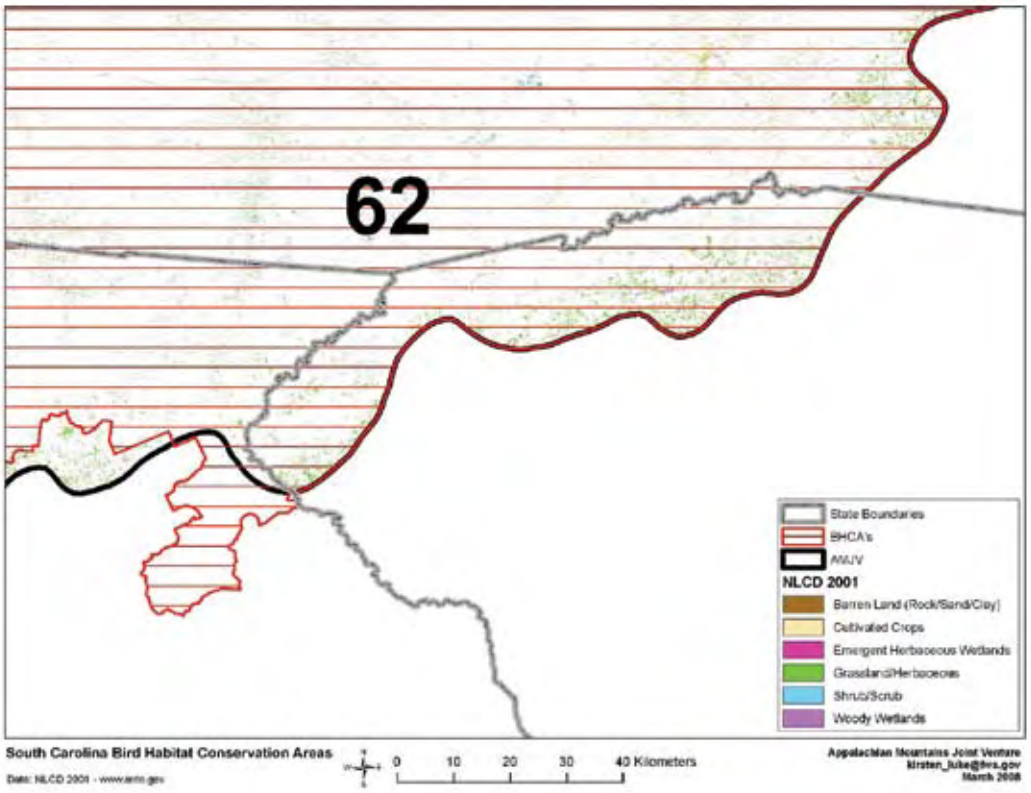
SOUTH CAROLINA Forest Patch Size



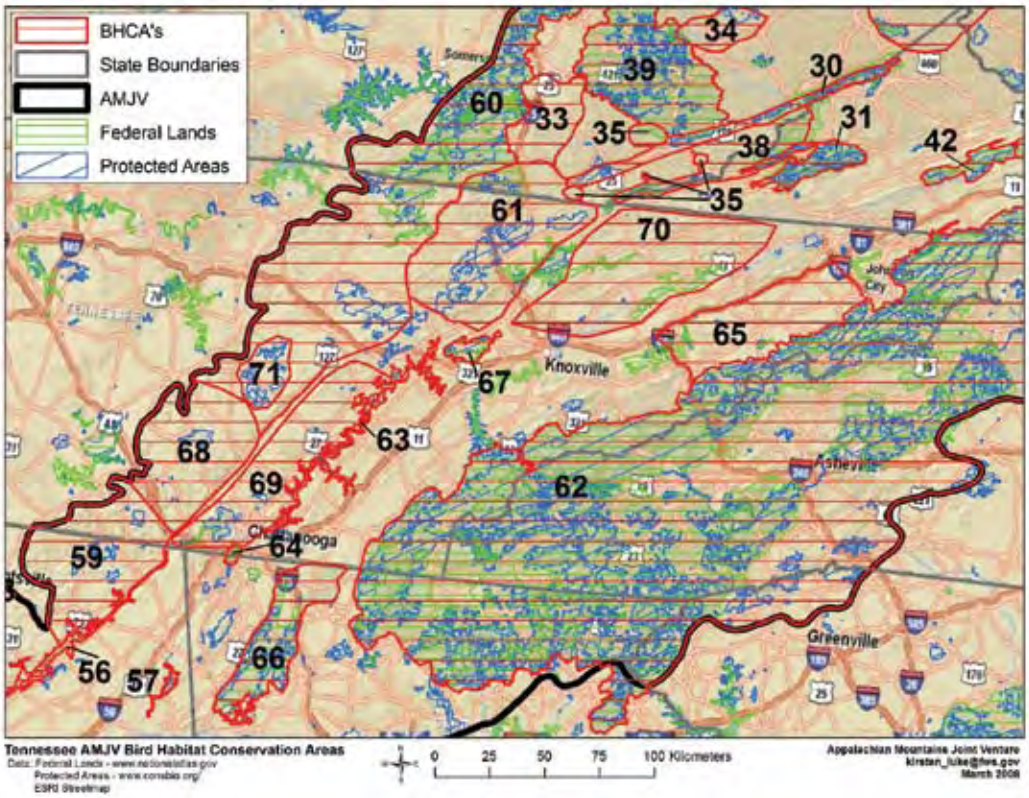
SOUTH CAROLINA NLCD 2001 (all classes)



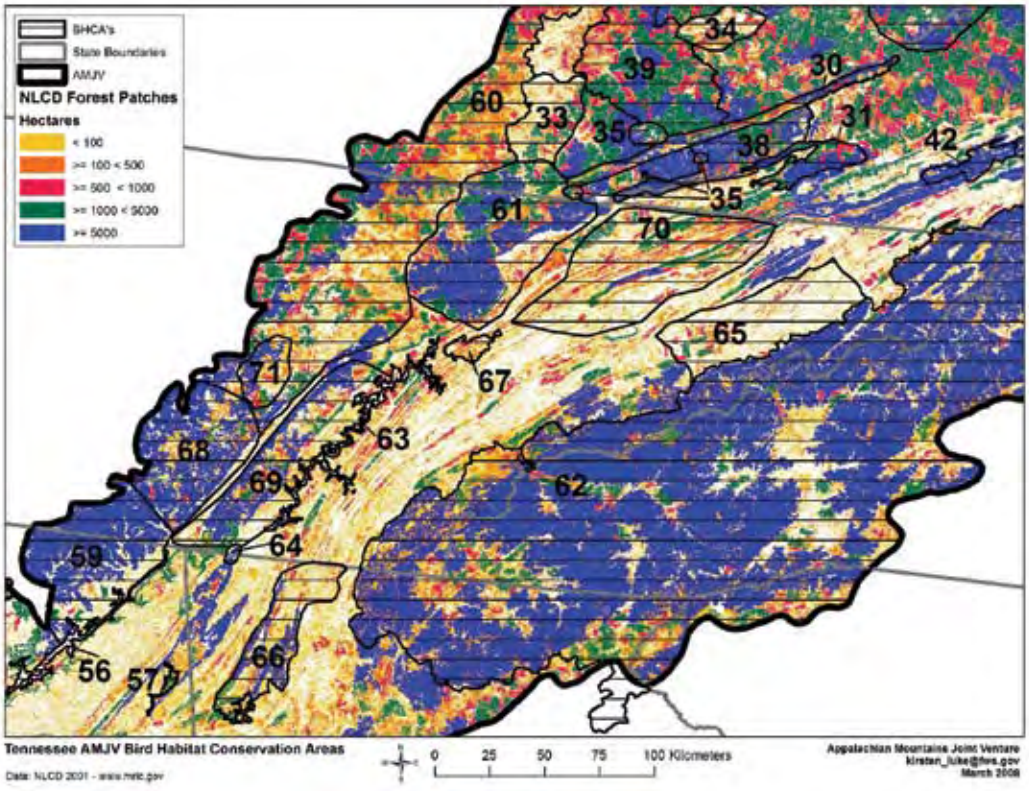
SOUTH CAROLINA NLCD 2001 (rare classes)



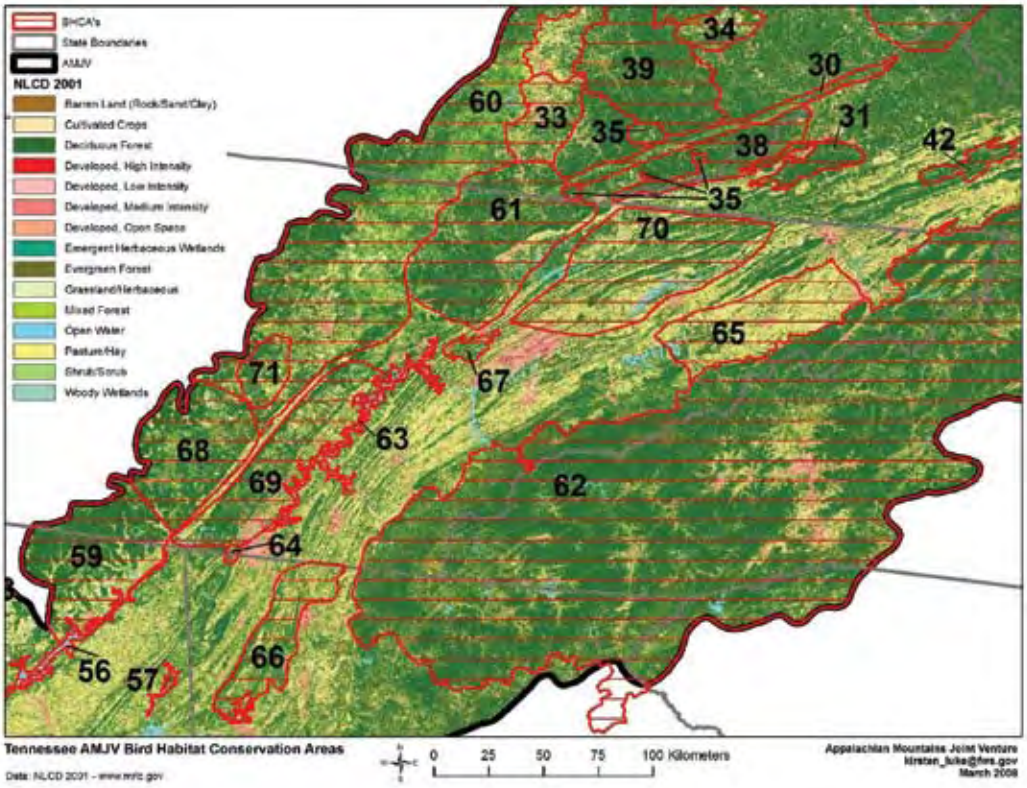
TENNESSEE BHCAs



TENNESSEE Forest Patch Size



TENNESSEE NLCD 2001 (all classes)



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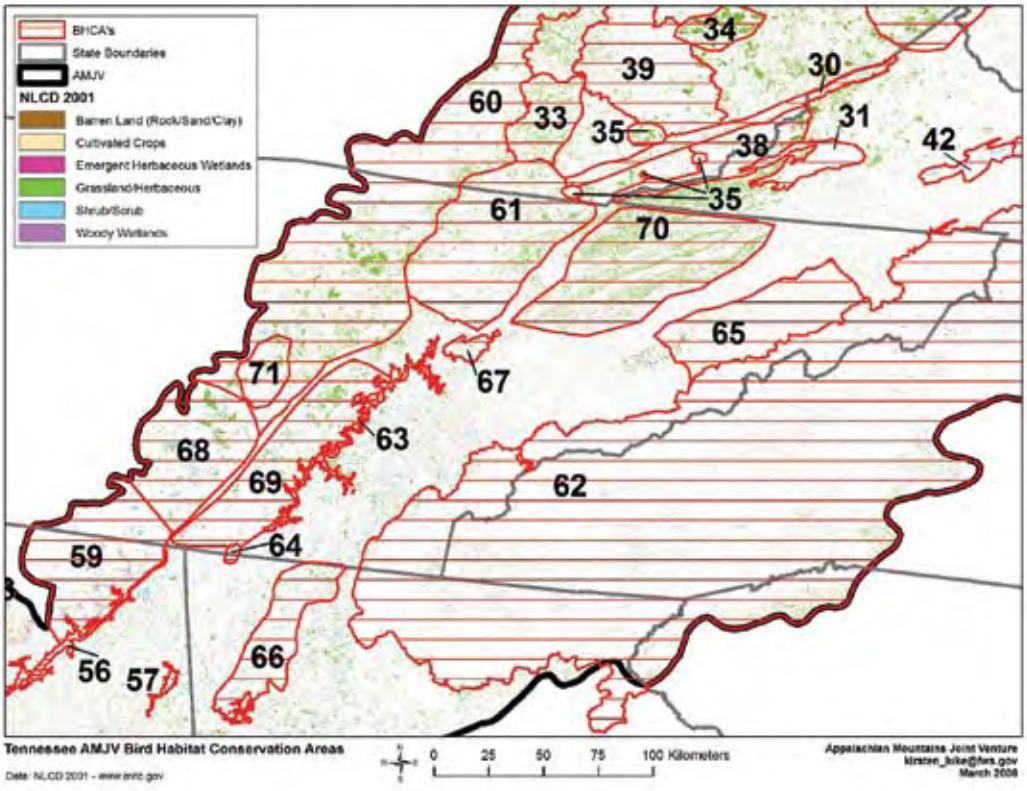
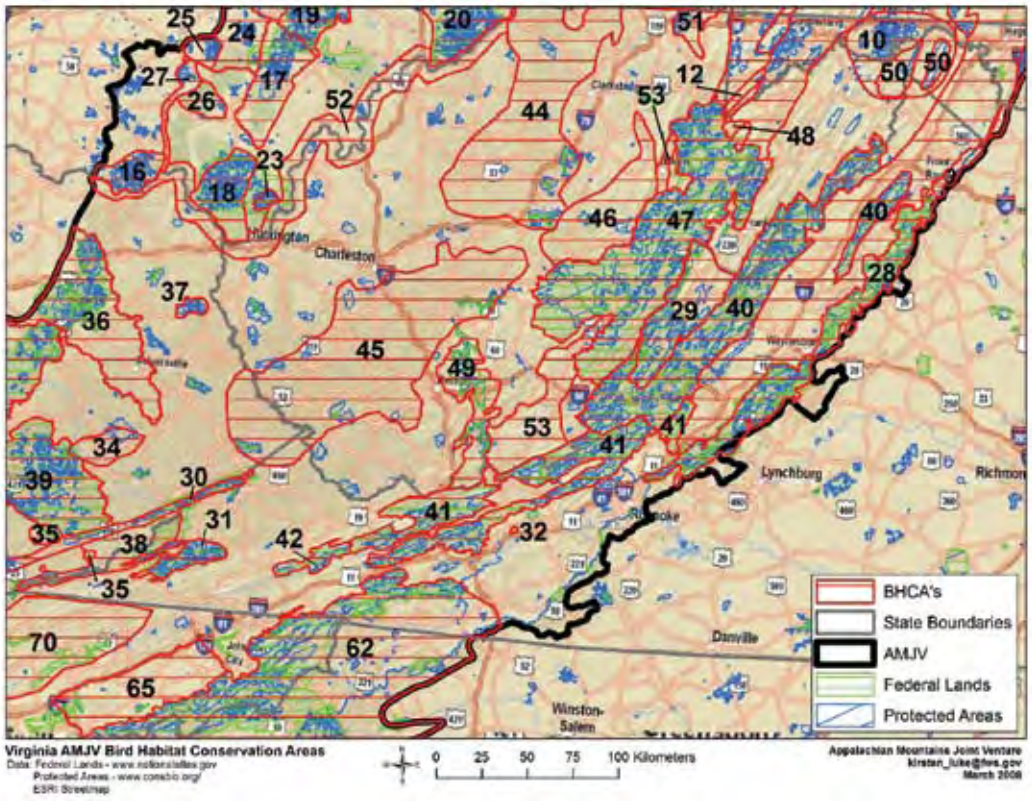
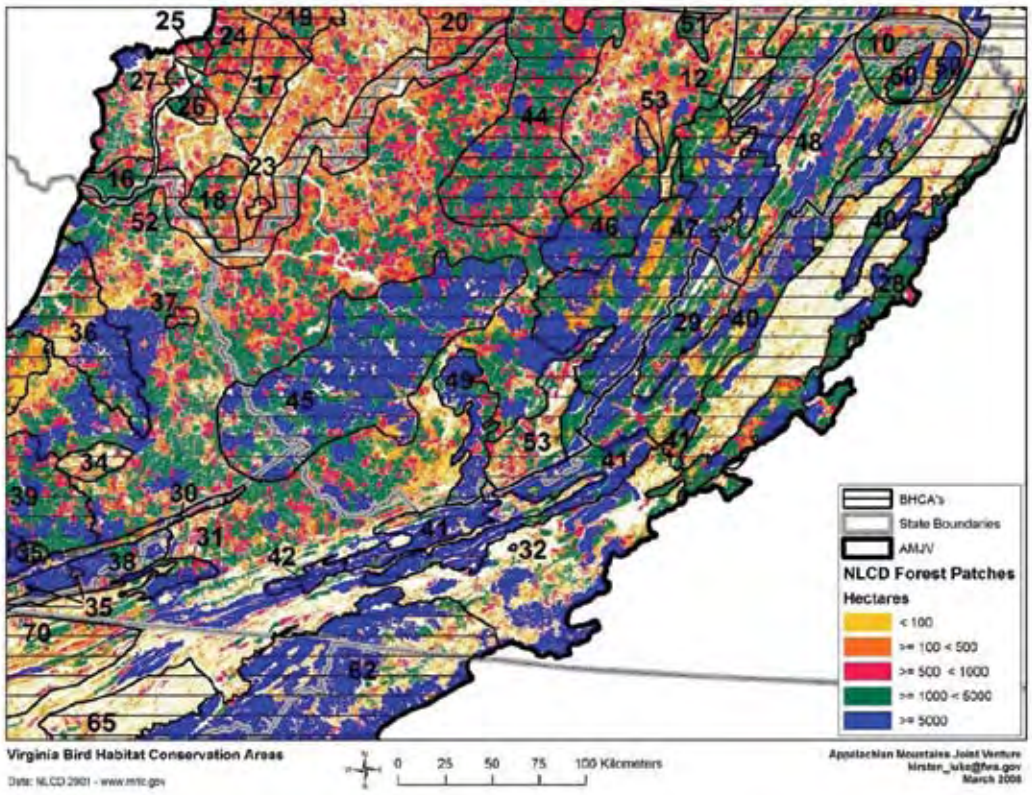


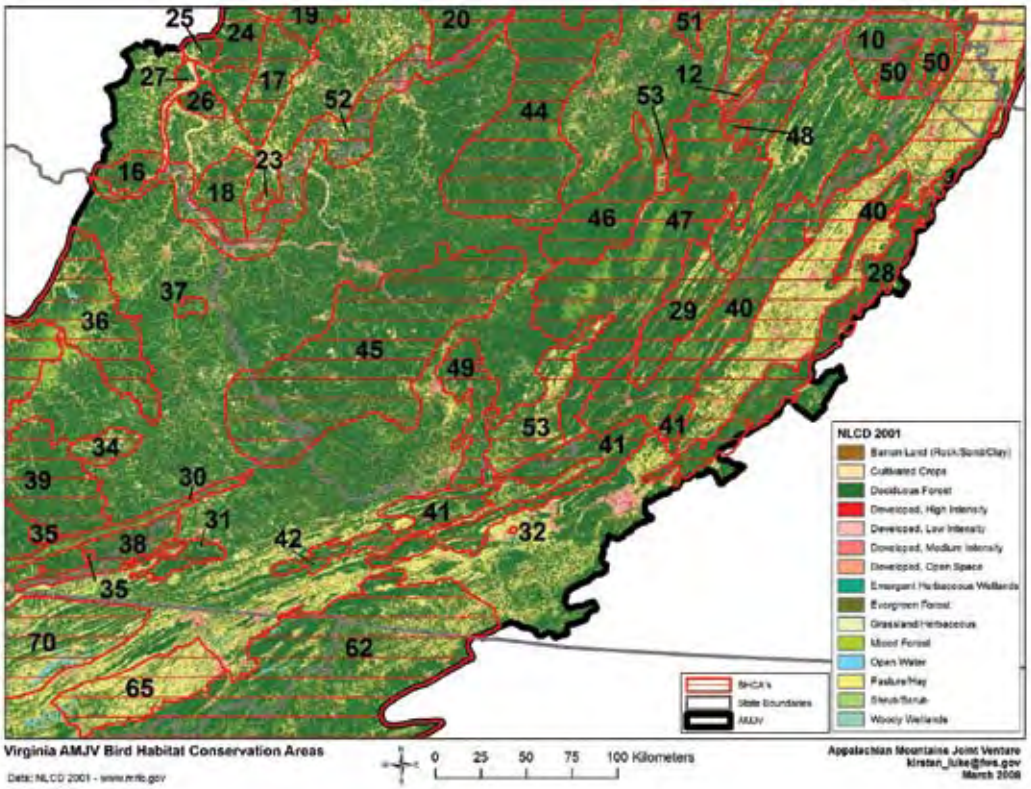
VIRGINIA BHCAs



VIRGINIA Forest Patch Size



VIRGINIA NLCD 2001 (all classes)



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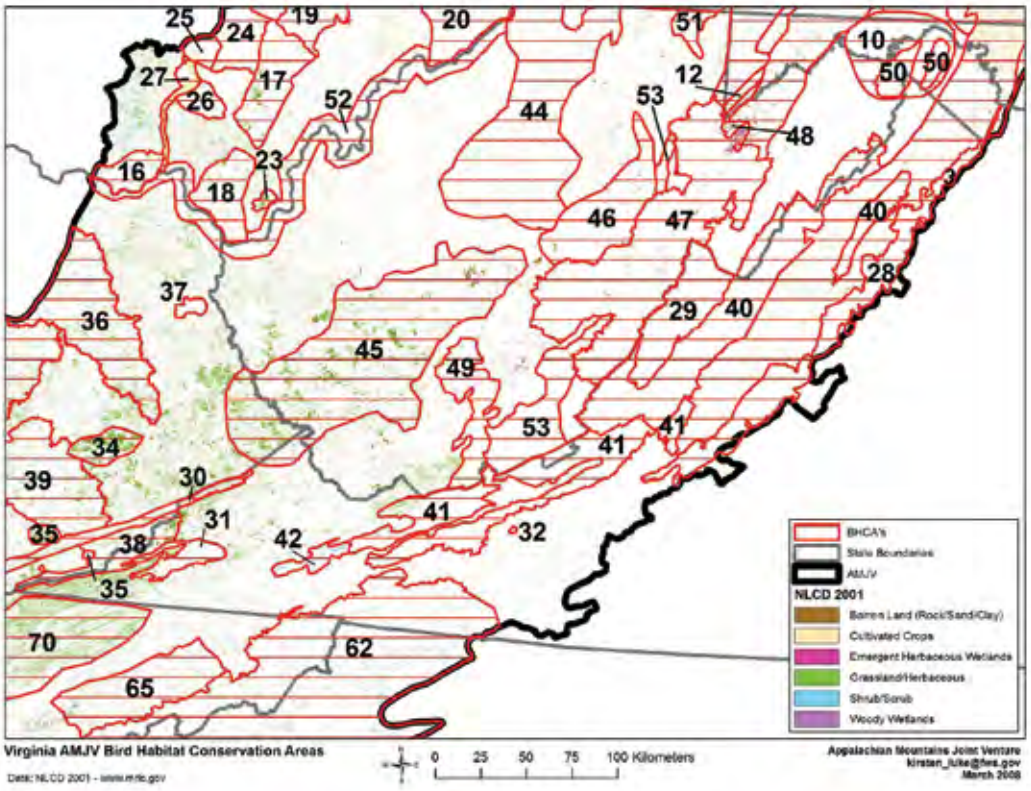
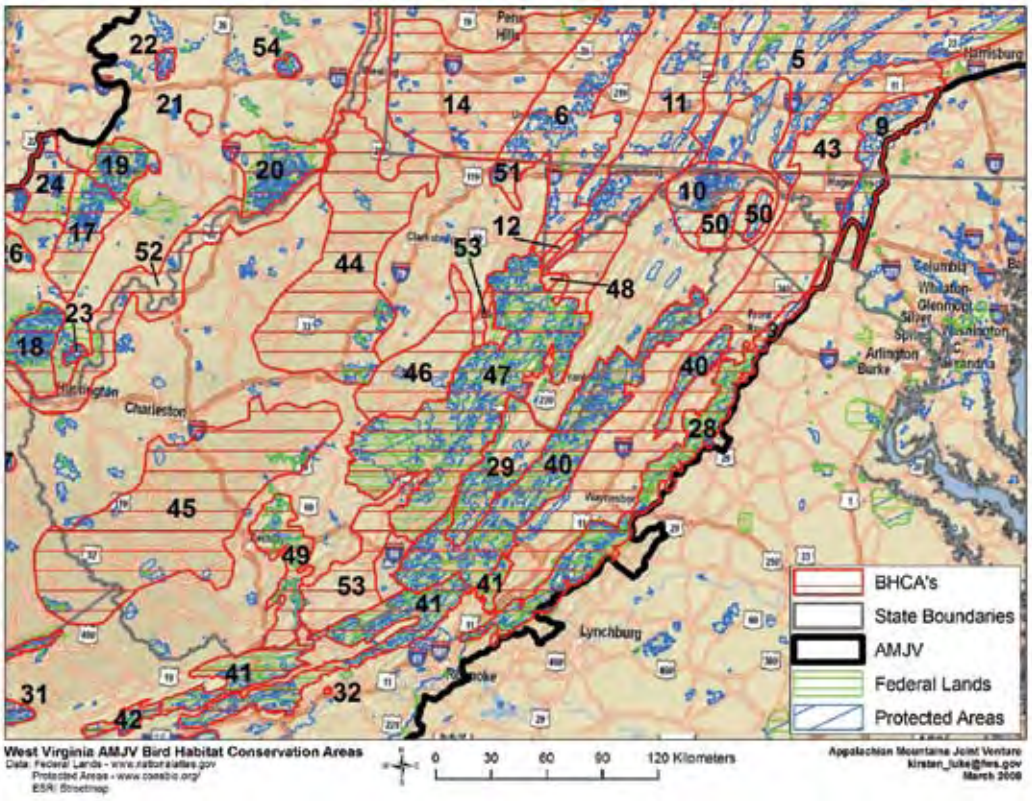
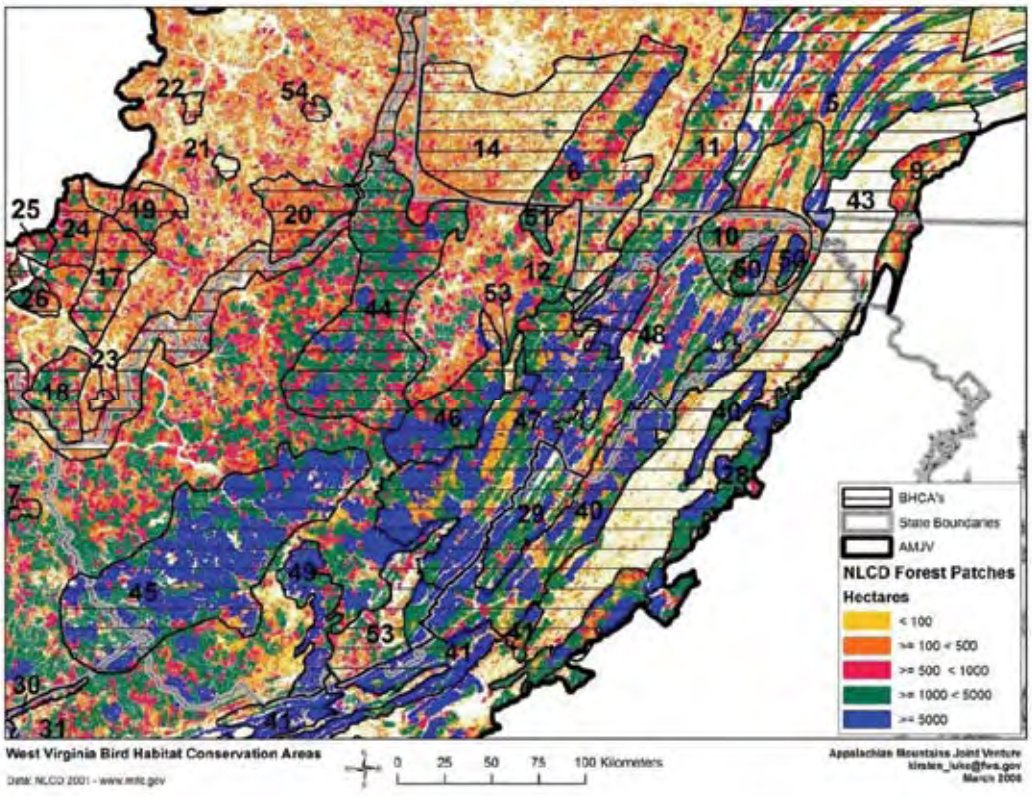


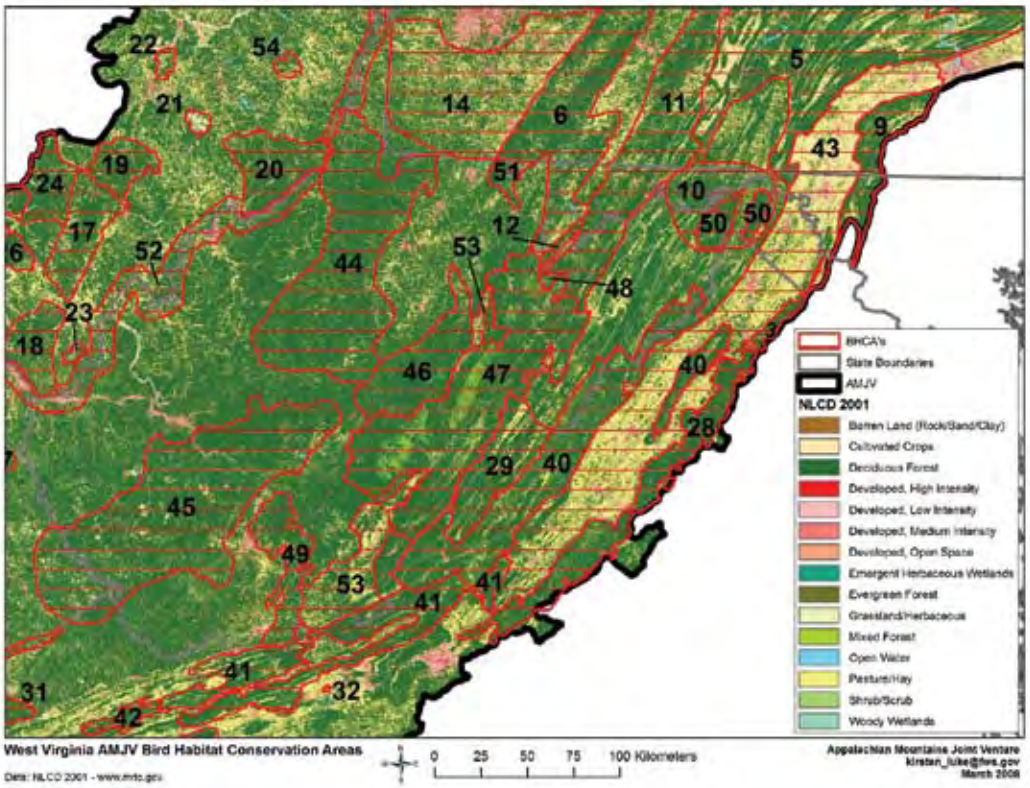
WEST VIRGINIA BHCAs



WEST VIRGINIA Forest Patch Size



WEST VIRGINIA NLCD 2001 (all classes)



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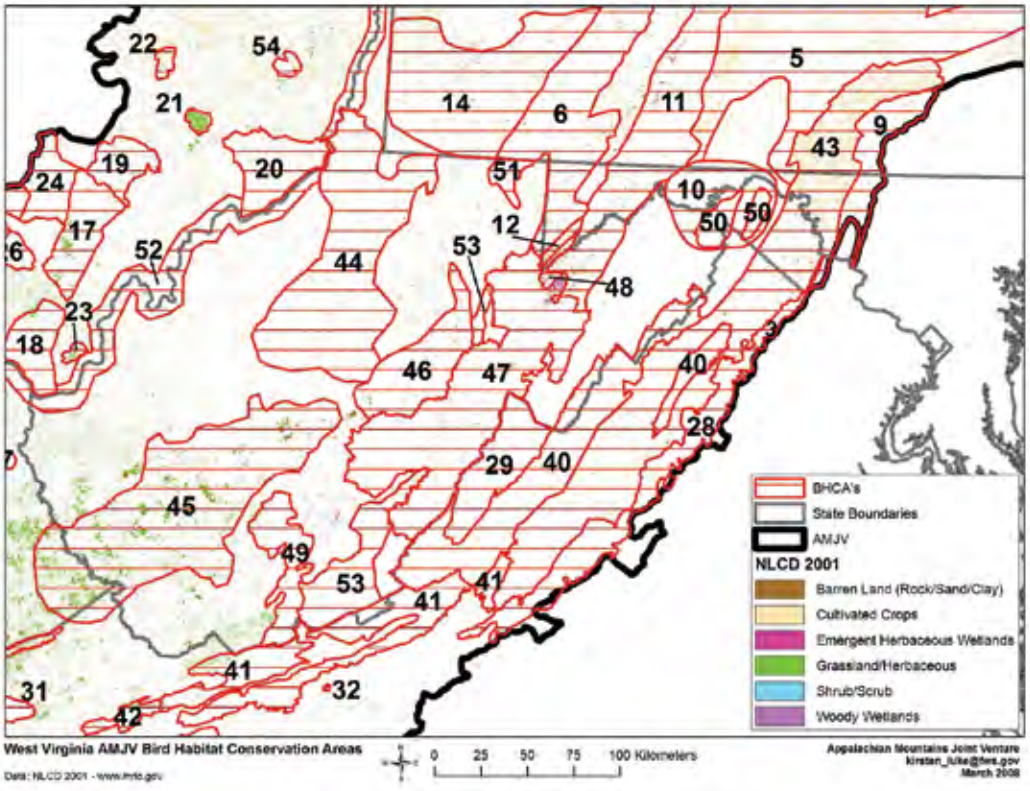

GIS Metadata notes for AMJV Bird Habitat Conservation Areas (BHCA)

Kirsten Luke, GIS Specialist, Atlantic Coast Joint Venture
Created October 18, 2007
Updated December 28, 2007
Updated March 20, 2008

Base data:

a) Meeting Maps and excel spreadsheets from the Appalachian Mountains Joint Venture Technical Committee Meeting August 7-9, 2007
b) National Land Cover Database (NLCD) 2001
c) ESRI Street Map
d) Federal Land: National Atlas Federal Lands Layer (2004) – these are proclamation boundaries not actual fed land ownership boundaries
e) Protected Areas: Conservation Biology Institute Protected Areas Database (CBI –PAD) version 4. Land ownership boundaries – not proclamation boundaries.
f) Audubon IBA's (2007)

BHCA polygons were drawn using the meeting maps and notes. Where the meeting notes expressed intention that the desired area should be a national forest, IBA or other protected land type (and the spatial data for that land type were available) then its boundaries were used as the BHCA. Otherwise, polygons were hand drawn from meeting maps. See BHCA descriptors.xls, GIS notes.
No BHCA's overlap. Where a BHCA may be encompassed within another, the areas were erased such that there is no overlap when calculating acreage.

March 20, 2008:
All edits to the draft BHCA's/ maps sent out January 08 have been incorporated and attribute table updated to reflect I-plan BHCA's labels.

APPALACHIAN MOUNTAINS JOINT VENTURE

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Sunrise over the Cumberland Mountains, within the Appalachian Mountains Joint Venture administrative area. Photo: Keith Watson