Partners in Flight
Bird Conservation Plan

The
Mid-Atlantic Ridge and Valley

(Physiographic Area 12)

American Bird Conservancy

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Partners In Flight
Landbird Conservation Plan:

Physiographic Area 12:
Mid-Atlantic Ridge and Valley

Version 1.0

Last updated: September 2003

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EXECUTIVE SUMMARY

Area - 5,101,400 ha
Description - The Mid-Atlantic Ridge and Valley extends from western Maryland, through the mountains of Virginia and eastern West Virginia. Most of this physiographic area consists of long mountainous ridges and intervening valleys, but it also includes the higher Allegheny Mountains of West Virginia. Predominant vegetation consists of oak and oak-hickory forests on the ridges and northern hardwood forest in the Allegheny Mountains. Important relict patches of spruce-fir exist in the Allegheny Mountains and on higher mountains along the ridge and valley of Virginia. Much of the lower valleys are in agricultural production or urban development. Human populations are relatively sparse throughout the physiographic area and are largely confined to the larger valleys. Suburban and second-home development is rapidly encroaching from large urban centers to the East. Timber extraction has been a major activity throughout the history of this region, and it continues to be important on both public and privately owned forest lands. Extraction of minerals, oil and gas, and coal are also important land uses throughout this region. At present, one of the most important disturbance factors affecting forested habitats in this region is the prevalence and spread of native and exotic insect pests and disease. Beginning with American chestnut blight, a series of such elements threaten the integrity and health of Appalachian forest ecosystems.

Priority Bird Species and Habitats –

Early succession shrub –
Bewick's Wren Appalachian subspecies – possibly extinct in this region.
Golden-winged Warbler – important stronghold for this species in the Northeast; may require maintenance of disturbed sites at higher elevations.
Prairie Warbler – declining significantly in much of its range; occurs in natural pine-oak barrens as well as regenerating pine and deciduous forest at lower elevations.
Whip-poor-will – poorly sampled; may be dependent on natural barrens.
Objective: Roughly 330,000 ha of shrubby or disturbed habitats are required to support the entire habitat-species suite (e.g. 300,000 pairs of Eastern Towhees); 19,000 ha should be optimal to support 19,000 pairs of Prairie Warblers, and 12,400 ha should be maintained specifically to support 6,200 pairs of Golden-winged Warblers.

Mature deciduous forest –
Cerulean Warbler – requires late succession (> 60 yr.); tall (broken?) canopy; upland ridges, moist cove forests, and riparian bottomlands.
Worm-eating Warbler – requires mid-late succession (> 30 yr); dense shrub understory; interior; ground-nesting; dry, upland slopes.
Louisiana Waterthrush – requires late succession (> 60 yr); rocky, flowing streams, interior.
Wood Thrush – requires mid-late succession (> 30 yr); deciduous understory.
Objective: Roughly 1.14 million ha of mature deciduous forest is required to sustain the entire habitat-species suite (e.g. 400,000 pairs of Wood Thrush); of this, 85,000 ha should be suitable to support 35,000 pairs of Worm-eating Warblers, 20,000 ha should be suitable to support 16,000 pairs of Cerulean Warblers. In addition, 25,500 km of forested streams are required to support 17,000 pairs of Louisiana Waterthrush.

Grasslands –
Henslow's Sparrow – important population on reclaimed mine sites in Maryland and possibly elsewhere.
Objective: Roughly 155,000 ha of suitable grassland habitat is required to support the entire habitat–species suite (including 52,400 pairs of Grasshopper Sparrows and 36,000 pairs of Eastern Kingbirds); protection and management of any sites supporting Henslow's Sparrow should be the highest grassland priority.

Northern hardwood/spruce-fir forests –
Black-throated Blue Warbler – dense shrubby understory; especially rhododendron thickets; primarily in Allegheny Mountains.
Blackburnian Warbler – closely tied to tallest spruce-fir forests.

Spruce-fir disjunct populations – possibly genetically distinct populations of several species restricted to relict spruce-fir forests at highest elevations.
Objective: Roughly 30,000 ha of northern hardwood forests are required to support 15,000 pairs of Black-throated Blue Warblers; 17,000 ha of relict spruce-fir forests should be protected or restored to support 8,500 pairs of Blackburnian Warblers. Setting specific objectives for other spruce-fir species with special habitat needs, such as Northern Saw-whet Owl, Olive-sided Flycatcher, and Red Crossbill, may also be desirable.

Conservation recommendations and needs –
Unlike most physiographic areas in the Northeast, nearly 40% of this area is public lands, including three important National Forests and Shenendoah National Park. Long-term planning on these lands is therefore critical to meeting the population objectives for high-priority forest birds. Conflicts between species requiring different age-structures of the forest need to be addressed in these plans. For example, use of clearcut forests and other silvicultural treatments by Golden-winged Warblers and Bewick's Wrens must be evaluated and weighed against habitat needs for Cerulean Warblers and other mature forest species. The conservation importance of high-elevation spruce-fir habitats is also controversial. Although few species of this habitat rank highly in global importance, the existence of relict, disjunct populations of several species (often distinct subspecies) and the great reduction in these forests during the past century argue for greater priority for these habitats. Specific conservation recommendations for this physiographic area include:

• intensive surveys for Appalachian Bewick's Wren, including all recent, known sites and targeted tape-playback surveys in potential habitat throughout the region;
• determine range of suitable habitats and identify present breeding sites for Golden-winged Warbler in this region;
• maintain a balance of forest-age structures, including adequate amounts of mid-successional as well as late-successional forest; ensure adequate tree-species composition and structural diversity;
• identify present-day concentrations of Cerulean Warbler within the region; determine protection status and specific threats at these sites;
• determine conservation status of relict spruce-fir forests, including potential for restoration.

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INTRODUCTION

Continental and local declines in numerous bird populations have led to concern for the future of migratory and resident landbirds. Reasons for declines are complex. Habitat loss, degradation, and fragmentation on breeding and wintering grounds and along migratory routes have been implicated for many species. Additional factors may include reproductive problems associated with brood parasitism and nest predation. Scientists and the concerned public agreed that a coordinated, cooperative, conservation initiative focusing on nongame landbirds was needed to address the problem of declining species. In 1990, Partners in Flight (PIF) was conceived as a voluntary, international coalition of government agencies, conservation organizations, academic institutions, private industry, and other citizens dedicated to reversing the downward trends of declining species and "keeping common birds common."

PIF functions to direct resources for the conservation of landbirds and their habitats through cooperative efforts in the areas of monitoring, research, management, and education, both nationally and internationally. The foundation for PIF's long-term strategy for bird conservation is a series of scientifically based Landbird Conservation Plans, of which this document is one. The geographical context of these plans are physiographic areas, modified from original strata devised by the Breeding Bird Survey (Robbins et al. 1986). Twelve physiographic areas overlap the northeastern United States (USFWS Region-5). Although priorities and biological objectives are identified at the physiographic area level, implementation of PIF objectives will take place at different scales, including individual states, federal agency regions, and joint ventures.

A. Goal

The goal of each PIF Bird Conservation Plan is to ensure long-term maintenance of healthy populations of native landbirds. This document was prepared to facilitate that goal by stimulating a proactive approach to landbird conservation. The conservation plan primary addresses nongame landbirds, which have been vastly underrepresented in conservation efforts, and many of which are exhibiting significant declines that may be arrested or reversed if appropriate management actions are taken. The PIF approach differs from many existing federal and state-level listing processes in that it (1) is voluntary and nonregulatory, (2) focuses proactively on relatively common species in areas where conservation actions can be most effective, rather than the frequent local emphasis on rare and peripheral populations.

B. Process

PIF Landbird Conservation Planning emphasizes effective and efficient management through a four-step process designed to identify and achieve necessary actions for bird conservation:

(1) identify species and habitats most in need of conservation;
(2) describe desired conditions for these habitats based on knowledge of species life history and habitat requirements;
(3) develop biological objectives that can be used as management targets or goals to achieve desired conditions;
(4) recommend conservation actions that can be implemented by various entities at multiple scales to achieve biological objectives.

Throughout the planning process and during the implementation phase, this strategy emphasizes partnerships and actions over large geographic scales. Information and recommendations in the plans are based on sound science and consensus among interested groups and knowledgeable individuals. Specific methods used to complete this process are described within the plan or in its appendices. Additional details on PIF history, structure, and methodology can be found in Finch and Stangel (1993) and Bonney et al. (2000).

C. Implementation

This landbird conservation strategy is one of many recent efforts to address conservation of natural resources and ecosystems in the Northeast. It is intended to supplement and support other planning and conservation processes (e.g. The Nature Conservancy Ecoregion Plans, USFWS Ecosystem Plans, Atlantic Coast Joint Venture, Important Bird Areas initiatives) by describing a conservation strategy for nongame landbirds that are often not addressed or only incidentally addressed in other plans.

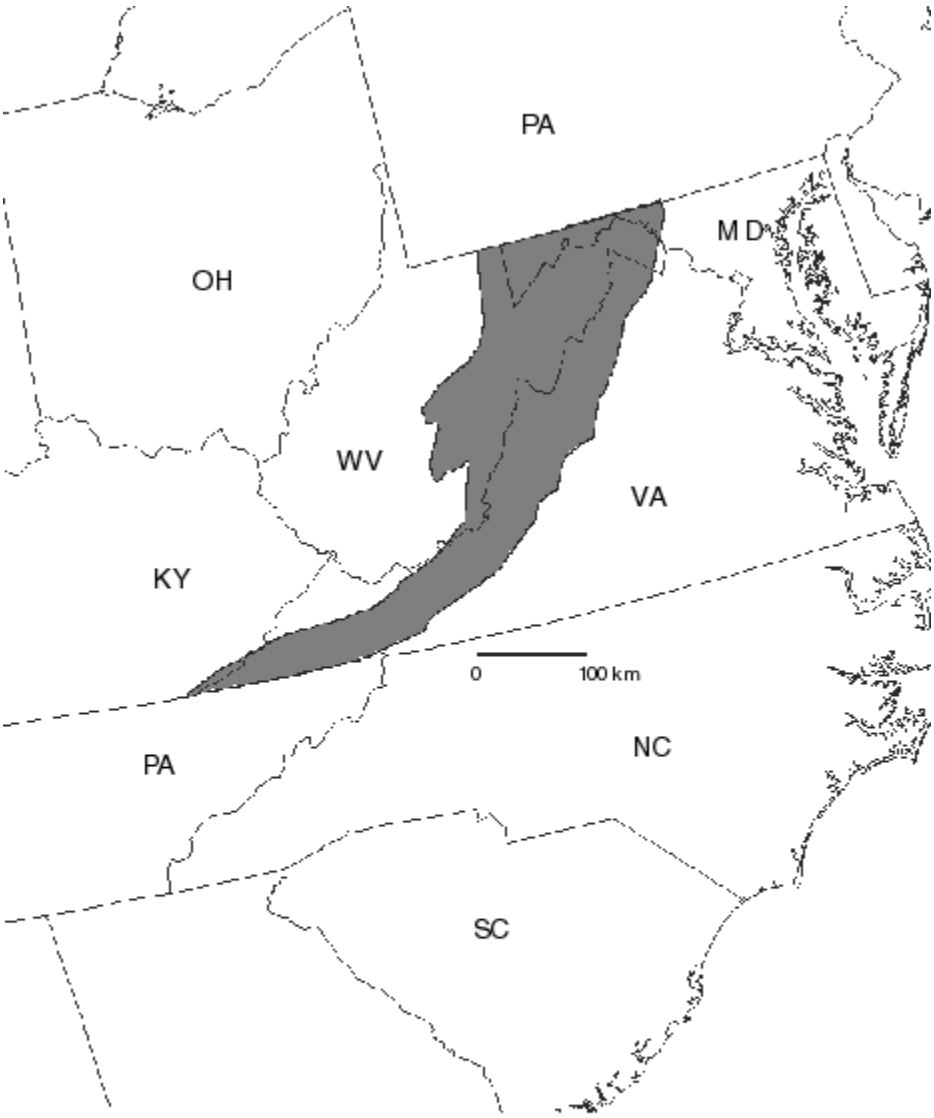
PIF strategies for landbird conservation are one of several existing and developing planning efforts for bird conservation. PIF Bird Conservation Plans are intended to complement other initiatives such as the North American Waterfowl Management Plan, United States Shorebird Conservation Plan, and North American Colonial Waterbird Plan. Ongoing efforts to integrate with these initiatives during objective setting and implementation will help ensure that healthy populations of native bird species continue to exist, and that all of our native ecosystems have complete and functional avifaunal communities. In particular, the emerging North American Bird Conservation Initiative (NABCI) will provide a geographical and political framework for achieving these ambitious goals across Canada, Mexico, and The United States.

SECTION 1: THE PLANNING UNIT

A. Physical Features

The Mid-Atlantic Ridge and Valley extends from the Pennsylsvania border south through western Maryland, eastern West Virginia, and western Virginia to the borders with North Carolina and Kentucky (Fig. 1). This area encompasses the main ridges of the Appalachian Mountains in these states, including the Allegheny Mountains, with a total area under consideration of roughly 51,308 square kilometers. Landforms within the planning unit consist primarily of long belts of parallel mountains and valleys, oriented in a northeast-to-southwest direction. The range of elevations extents about 1000 m, with some valleys as low as 100 m and some mountainous areas reaching 1,100 m. This region contains the headwaters of many rivers that feed the Chesapeake Bay and mid-Atlantic Coastal Plain, including the Potomic, James, Roanoke, New, Clinch, Holston, Big Sandy, and Cumberland River drainages.

Within the planning unit are 8 Ecological Units (Keys et al. 1995), encompassing all of the Ridge and Valley, Allegheny Mountain, and Northern Blue Ridge Mountain sections (Appendix 1). Average annual precipitation ranges from roughly 100 cm to 170 cm. Growing season ranges from 140 days in highest mountains of West Virginia to 210 days in southern Virginia valleys (climate data from Keys et. al. 1995).



The Mid Atlantic Ridge and Valley, physiographic area 12, covering 5,101,400 ha (12,605,559 ac) across Virginia, West Virginia, Maryland, and Kentucky.

Funding for the preparation of this map was provided by the National Fish and Wildlife Foundation, through a challenge grant to The Nature Conservancy, Wings of the Americas program. Matching funds for this grant were donated by Canon U.S.A., Inc.

Fig. 1.

B. Potential and present-day vegetation:

A majority of the planning unit was dominated historically by oak-pine or oak-hickory forests (Appendix 1). Today these forest types cover roughly 2.2 million ha (5.5 million ac), or 44% of the physiographic area (Fig. 2, Table 1.1). The higher Allegheny Mountains support significant areas of northern hardwood forest and patches of relict spruce-fir forest, as well as dry pine-oak barrens on ridgetops. The long valleys were covered with oak-hickory or oak-pine forests (?), but are now largely cleared for agriculture or urban development. Nonforest alliances include cedar woodlands at low and middle elevations, and high-elevation grass and heath balds.

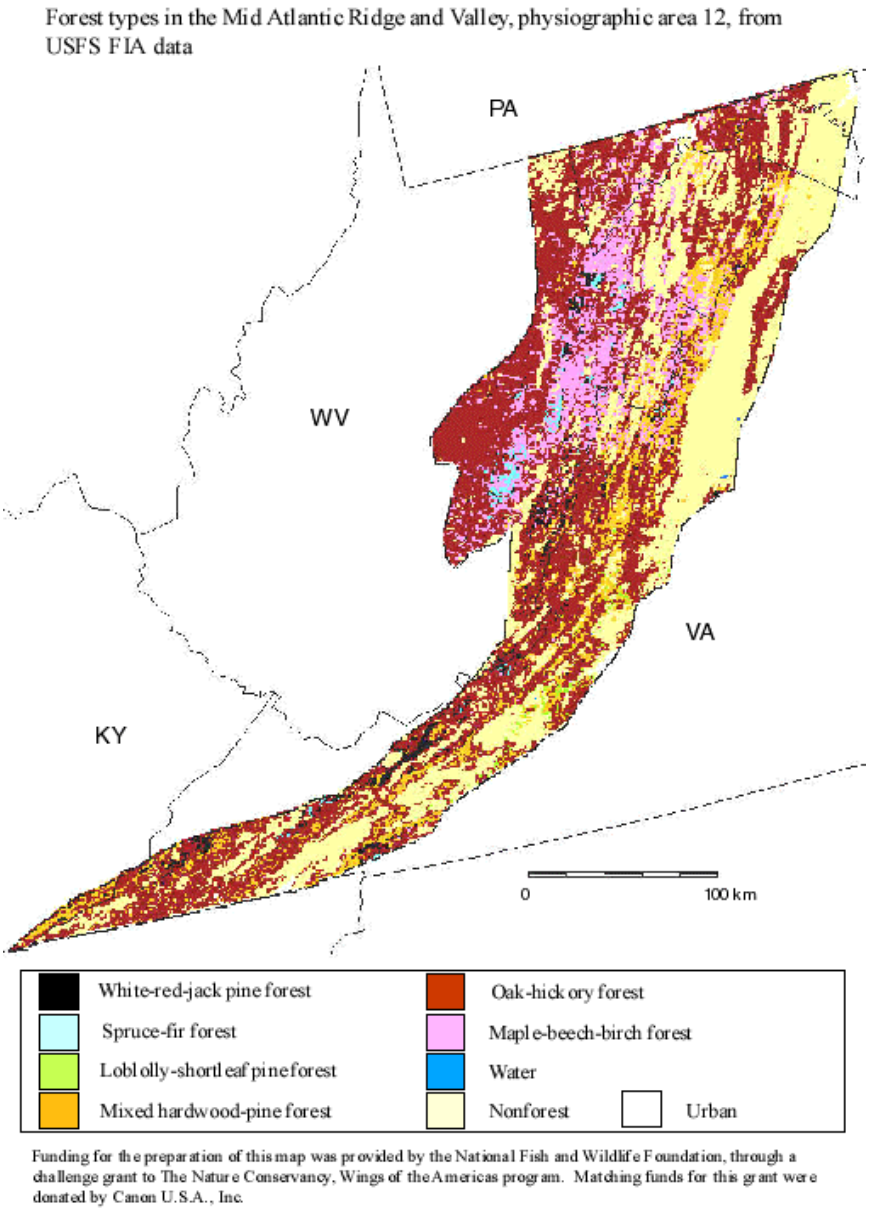


Fig. 2.

Table 1.1. Natural vegetation cover-types in the Mid-Atlantic Ridge and Valley physiographic area. Forest types are taken from USFS FIA data; nonforest types are from USGS data.

Vegetation type	Area (ha)	Area (ac)	% of area
Oak-hickory forest	2,224,600	5,496,987	43.6
Maple-beech-birch forest	1,133,500	2,800,878	9.9
Mixed hardwood-pine forest	467,100	1,154,204	9.2
White-red-jack pine forest	124,700	308,134	2.4
Spruce-fir forest	36,600	90,439	0.7
Loblolly-shortleaf pine forest	19,700	48,679	0.4

C. Natural disturbances

Historically, oak-hickory and oak-pine forests were strongly influenced by fire. In particular regeneration of oaks and certain pines is dependent on fire, and recent policies of fires suppression in the southern Appalachians has had major (primarily negative) effects on native forest composition and structure (SAA 1996). Gap-phase dynamics, or the opening of forest canopy from tree-falls or wind-throws, was also very important. An estimated 17% to 24% of old-growth, mesic-forest canopy in this region was maintained in a natural gap state (USFS 1996). Other largescale disturbance factors affecting natural communities include wind and ice storms, hurricanes, and large landslides. Biotic influences included extinct mammals (elk, bison) and birds (Passanger Pigeon), as well as major effects of beavers in maintaining wetland systems.

D. History and land use

Human populations are relatively sparse throughout the physiographic area and are largely confined to the larger valleys. Suburban and second-home development is rapidly encroaching from large urban centers to the East. Agriculture (row crops and hay/pasture land) currently constitutes roughly 30% of the land use in this planning area.

Unlike in most physiographic areas in the Northeast U.S., nearly 40% of the land area is in public ownership, including roughly one-half of all forested land (Table 1.2). Three National Forests, the Jefferson, George Washington, and Monongahela, cover about one-third of the total area. Shenandoah National Park contributes another large area to publicly owned land. In Maryland, most of the publicly owned forest land is in state ownership.

Timber extraction has been a major activity throughout the history of this region, and it continues to be important on both public and privately owned forest lands. Most of the commercial forestry has been for hardwood species, although pine has also been an important resource in some areas. Timber harvest, along with accompanying policies of fire suppression, has altered the species composition and age structure of the forests.

Extraction of minerals, oil and gas, and coal are also important land uses throughout this region. Mining activities, in particular, have the potential to significantly alter large blocks of land, frequently removing existing forest cover and reclaiming the mined area with poor-quality early-successional habitat that could last for very long periods of time.

Recreation activities also represent a growing activity, especially on public lands. This is mostly in the form of hiking, camping, and other tourist activities. Jefferson National Forest maintains 11 wilderness areas, totalling 57,654 acres.

Table 1.2. Current land-use and ownership patterns in the Mid-Atlantic ridge and Valley physiographic area. (number of hectares)

Land classification	Area (ha)	Area (ac)	% of area
Forested land	3,380,000	8,351,981	66.3
Public ownership			
State Forest Preserve	69,700	172,229	0.4
National Forest	1,688,600	4,172,531	33.1
National Park	24,000	59,304	0.5
.....Wilderness/ wild & scenic r.	61,200	151,225	1.2
Private industrial			
Private non-industrial			
Agricultural land	1,669,100	8,248,690	32.7
Urban/ developed	32,800	81,049	0.6
Other nonforest lands			
Wetlands	1,000	2,471	0.1

SECTION 2: PRIORITY BIRD SPECIES

A. General avifauna

Roughly 166 bird species (Appendix 2) have been documented as breeding within physiographic area 12 (Peterson 1985, various atlases). Of the nongame landbirds (146 species), the majority are migratory; these include roughly 88 Neotropical migratory species. The landbird avifauna is typical of the southern Appalachian region. An analysis of all Neotropical migratory species in the Northeast U.S. (Rosenberg and Wells 1995) found the composition of breeding species in this area to be most similar to the Ohio Hills and Piedmont physiographic areas. This area ranked extremely high in terms of immediate conservation concern, based on high concentrations of high-priority and declining species (Rosenberg and Wells 1995, 2000).

Fifteen species were estimated to have $\geq$ 2% of their total population breeding in the planning unit (Appendix 2). These include probably 20% of the endangered Appalachian population of Bewick's Wren (now extirpated?), 13% of the world's breeding Worm-eating Warblers, roughly 9% of all Scarlet Tanagers, and significant populations of Cerulean Warblers and Louisiana Waterthrushes.

Our primary measure of population trend at present is the Breeding Bird Survey (BBS), which provides data on roughly 127 of the 166 species breeding within Area-12 (N = 61 routes). For many species in this region, however, especially those with patchy distributions, BBS coverage is poor, and reported trends often lack statistical significance. Nevertheless, a significant declining trend for a species on existing BBS routes may be reason enough to examine the population trend more closely, and to initiate measures to halt or reverse this trend.

Of the species sampled by BBS, 34 have declined significantly ($P < 0.10$) since 1966 (including Bewick's Wren), and 7 additional species have declined since1980 (Appendix 2). The 41 declining species are nearly all associated with grassland and other early successional habitats, including 8 of the 10 species with steepest declining trends. Of the 11 forest species that are declining, 6 are associated with bottomland-hardwood forests in valleys, and several (e.g. Yellow-shafted Flicker, Eastern Wood-pewee) are associated either with forest openings or edges.

In contrast, 28 species exhibit significantly increasing population trends; 5 of these show significant trends only since 1980 (Appendix 2). A majority of these fall in two categories, either species associated with upland hardwood and coniferous forests, or species that have adapted particularly well to human activities or development. In the first group are species of northern affinity, such as Magnolia, Canada, and Black-throated Green Warblers, Blue-headed Vireo, Veery, and Slate-colored Junco, as well as widespread, mature-forest species such as Pileated Woodpecker, Ovenbird, and Red-eyed Vireo.

Species associated with human activities include those using bird feeders or nest boxes, as well as those that breed in urban wetlands. Several species, such as House Finch , Red-bellied Woodpecker, Carolina Wren, and Tufted Titmouse have experienced widespread population increases throughout the Northeast. Of note, perhaps, is the expanding population of Bobolinks in this as well as other southerly physiographic areas.

B. Priority species pool

From among the breeding avifauna, a pool of species may be derived that represents priorities for conservation action within the physiographic area (Table 2.1). Note that a species may be considered a priority for several reasons, including global threats to the species, high concern for regional or local populations, or responsibility for conserving large or important populations of the species. The different reasons for priority status are represented by categories or tiers in Table 2.1. Our primary means of identifying priority species is through the PIF species assessment process (Hunter et al. 1993, Carter et al. 2000) using scores generated by Rocky Mountain Bird Observatory. This system ranks species according to seven measures of conservation vulnerability. These include four global measures (i.e., they

do not change from area to area), as well as threats to breeding populations (TB), area importance (AI), and population trend (PT), which are specific to each physiographic area. Categories of priority status are determined by examining combinations of parameter scores, as well as the total rank score, which is a measure of overall conservation priority. This process of identifying priority species has been standardized across all physiographic areas of North America. Scores for all breeding species in the Northern Ridge and Valley region may be found at: http://www.rmbo.org/pif/pifdb.html.

Note: The parameter scores for all physiographic areas in the Northeast were updated in August 2003 to reflect and be consistent with methods used in the *PIF North American Landbird Conservation Plan* (Rich et al. 2004). The priority species pool presented below reflects these updated scores and a revised set of entry levels (i.e., Tiers). If you note changes in the priority species pool or individual scores from a previous version of this plan or those found at <http://www.rmbo.org/pif/pifdb.html>, they are likely due to the process of updating scores and entry levels to reflect the North American Plan.

There are six entry levels into the priority species pool, as follows:

Tier I. *High Continental Priority.* -- Species on the *PIF Continental Watch List* (Rich et al. 2004), 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 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 AI 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 AI 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 AI + PT ≥ 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 AI = 5 or % population > threshold (see Appendix 3).
>
> 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 TB + TN > 6, or local TB or TN = 5.

Tier III. *Additional Federally Listed*. Species listed under the U.S. Endangered Species Act 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.

Table 2.1. Priority breeding-species pool for Area 12. PIF regional and global scores from the PIF Species Assessment Database housed at Rocky Mountain Bird Observatory (Carter et al., 2000). Percent of population calculated from percent of range area, weighted by BBS relative abundance (see Rosenberg and Wells, 1999; Appendix 3). See text for definition and interpretation of entry levels. AI = Area Importance; PT = Population Trend. Species with AI = 1 are not included in this table as such a score indicates a peripheral population without manageable numbers in this area. Local status categories include species with breeding populations only (B) or species with at least part of the population found in the area year-round (R). Species that are federally or state listed are noted on the Priority Species Pool by country and/or state using the following codes: E = Endangered, T = Threatened, SC = Special Concern.

Entry Level	Species	Combined Score	% of pop.	AI	PT	Local Status
IA. *High Continental Concern + High Regional Responsibility*						
	Golden-winged Warbler (VA-SC)	27	2.4	3	5	B
	Cerulean Warbler	27	2.8	3	5	B
	Wood Thrush	24	2.8	4	5	B
	Worm-eating Warbler	24	9.9	5	2	B
	Prairie Warbler	24	1.5	4	5	B
	Kentucky Warbler	23	1.3	3	4	B
	Canada Warbler	21	< 1	3	3	B
IB. *High Continental Concern + Low Regional Responsibility*						
	Henslow's Sparrow (MD,VA-T)	26	< 1	2	3	B
	American Woodcock	22	< 1	2	5	R
	Blue-winged Warbler	22	< 1	2	3	B
	Olive-sided Flycatcher (MD-E)	21	< 1	2	4	B
	American Black Duck	20	< 1	2	3	R
	Red-headed Woodpecker	19	< 1	2	3	R
	Willow Flycatcher	18	< 1	2	3	B
IIA. *High Regional Concern*						
	Northern Parula	22	1.1	4	5	B
	Whip-poor-will	22	1.4	3	5	B
	Yellow-throated Vireo	22	1.8	4	4	B
	Field Sparrow	21	1.9	5	5	R
	Eastern Towhee	21	2.6	5	5	R
	Eastern Wood-Pewee	20	1.9	5	5	B
	Brown Thrasher	19	< 1	3	5	R
	Yellow-breasted Chat	19	< 1	3	5	B

Northern Rough-winged Swallow	19	< 1	4	5	B
Indigo Bunting	19	2.5	5	4	B
IIB. *High Regional Responsibility*					
Louisiana Waterthrush	23	5.6	5	2	B
Hooded Warbler	22	2.7	4	3	B
Acadian Flycatcher	21	3.5	4	2	B
Scarlet Tanager	21	8.6	5	2	B
IIC. *High Regional Threats*					
Black-throated Blue Warbler	22	1.3	3	2	B
Bewick's Wren (MD,VA-E)	21	< 1	2	5	R
Loggerhead Shrike (MD-E,VA-T)	20	< 1	2	5	R
Blackburnian Warbler (MD-T)	20	< 1	2	4	B
Sedge Wren (MD-T,VA-SC)	20	< 1	2	3	B
Grasshopper Sparrow	19	< 1	2	5	B
IV. *Additional State Listed*					
Long-earned Owl (VA-SC)	19	< 1	2	3	R
Northern Saw-whet Owl (VA-SC)	19	< 1	2	3	R
Yellow-bellied Flycatcher (VA-SC)	19	< 1	2	3	B
Peregrine Falcon (MD-E, VA-T)	18	< 1	2	3	B
American Bittern (MD-SC)	18	< 1	2	3	B
Mourning Warbler (MD-E, VA-SC)	17	< 1	2	3	B
Northern Goshawk (MD-E)	17	< 1	2	3	B
Barn Owl (VA-SC)	16	< 1	2	3	R
Purple Finch (VA-SC)	16	< 1	2	3	R
Red Crossbill (VA-SC)	16	< 1	2	3	R
Brown Creeper (VA-SC)	15	< 1	2	3	R
Alder Flycatcher (MD,VA-SC)	15	< 1	2	3	B
Hermit Thrush (VA-SC)	14	< 1	2	3	R
Red-breasted Nuthatch (VA-SC)	14	< 1	2	3	R
Magnolia Warbler (VA-SC)	14	< 1	2	3	B
Winter Wren (VA-SC)	13	< 1	2	3	R

Twelve species on the PIF continental Watch List (Rich et al. 2004) have manageable populations within this planning unit (Table 2.1); these species are considered to be of high overall concern throughout their range. Two additional species considered to be high priorities by other bird conservation initiatives (American Woodcock, American Black Duck) meet the same PIF watch list criteria. Of these 14 species, 7 have populations large enough for this area to be considered significant to their overall conservation, whereas an additional 7 species have smaller, more patchily distributed populations. Of these species, Golden-winged Warbler and Cerulean Warbler received the highest score in this planning unit, although the critically endangered Appalachian race of Bewick's Wren could be considered of highest concern, if it still exists in the region. The overall score presented for this subspecies reflects the score for the entire species, not the Appalachian race. Also among the species of highest global importance are Worm-eating, Kentucky, Prairie, and Canada warblers and Wood Thrush. The highest priority species are birds of both mature forests and shrub habitats.

Twenty additional species are considered to be of high regional importance. The 10 species in Tier IIA show a combination of high area importance and declining populations in the physiographic area. These are common species of shrub and forest habitats. In tier IIB, Louisiana Waterthrush, Hooded Warbler, Acadian Flycatcher, and Scarlet Tanager have disproportionately large breeding populations in the area, but these species all have stable or uncertain trends; this region holds a high responsibility for long-term planning to ensure health populations of these species into the future. Tier IIC contains 6 additional

species that are threatened within the physiographic area; 5 of these species have small breeding populations in the planning unit. These 6 species highlight the need to protect sensitive and threatened grasslands, shrublands, and spruce-fir/northern hardwood forest; note that 4 out of these 6 species are listed in at least one state.

Sixteen additional species are listed in Maryland or Virginia as endangered, threatened, or special concern. As in most northeastern states, a majority of state-listed species are peripheral in the region. This tier mostly reflects the numerous species that are dependent on threatened high-elevation spruce-fir or northern hardwood habitats.

The overall priority pool of 50 species (30% of the breeding avifauna) is dominated by common forest-breeding and early-successional species. Considering all priority categories, the species of highest conservation concern include Appalachian Bewick's Wren, Golden-winged Warbler, Cerulean Warbler, and a suite of additional deciduous-forest breeders. These may represent focal species that help define conservation actions in their respective habitats (see Section 4). Regional concern for high-elevation spruce-fir and northern hardwood habitats is also apparent from the appearance of Canada Warbler, Blackburnian Warbler, Black-throated Blue Warbler, and several other state-listed species.

SECTION 3: BIRD CONSERVATION ISSUES AND OPPORTUNITIES

A. Early vs. late-successional habitats and species -- historical baselines

Because most of the Northeast region has undergone major changes in forest cover during the past two centuries, the relative importance placed on early- versus late-successional species and their habitats today depends in large part on the historical baseline chosen for comparison. This issue, which permeates bird-conservation planning throughout the Northeast, must be resolved before priority species and habitats are determined. As elsewhere in the region, species with relatively large proportions of their total population in the planning unit (or those with high AI scores) are mostly associated with mature forest habitats. In contrast, early successional species are less represented here than elsewhere within their range, and the vast majority of these show declining population trends.

To some extent, deciding on the "value" of early-successional bird populations is subjective; for example, the fact that two species with significant declining trends in the region are Brown-headed Cowbird and House Sparrow is hardly reason for concern. Other species such as Golden-winged Warbler, however, rank high in regional importance and is dependent on successional or disturbed habitats. Similarly, the Appalachian Bewick's Wren is a species of global concern that occurred in naturally disturbed sites in this area.

This plan recognizes the overriding importance of mature-forest species in long-term conservation planning, but calls for a balance of maintaining naturally disturbed habitats as well as some early successional stages within the managed forest landscape. In addition, areas that are currently in agricultural production could be managed to benefit high-priority grassland species, thus maintaining the overall diversity of the avifauna.

B. Regional economics of commercial timber production

Clearly, any successful landbird conservation plan in this region must reconcile the needs of long-term, sustainable timber production and the habitat needs of high-priority bird species. Loss of the economic sustainability of commercial forestry could result in conversion of forest habitats to urban development or other less bird-friendly landscapes. In general, over a century of timber harvesting in this region has not resulted in the significant loss of species or populations of forest birds. Avifaunal changes have mostly been in the form of changes in local composition and relative abundances, as the mix of successional stages and tree-species composition shifted across the landscape.

The primary goal of this bird conservation plan is to ensure the long-term maintenance of all important forest types in the future landscape mosaic. This must be achieved through careful forest-planning on both private and public lands, with the goals of economic gains and sustainability balanced with the needs of birds and other wildlife. This balance will likely differ in areas of different land ownership. By taking a landscape perspective, we can take advantage of the opportunities in each area, such that the cumulative result will be to maintain healthy bird populations into the future.

C. Urban and recreational development

Urban/suburban areas cover a relatively small portion of this planning unit. Perhaps the greatest threat from urbanization is the loss of agricultural land through abandonment and development. Loss of shrubland habitats is a major factor where development takes place in areas that were previously left fallow. Subdivision of pastureland and large farms is particularly detrimental to area-sensitive grassland species, such as Upland Sandpiper and Henslow's Sparrow.

Forests along riparian corridors in this region are typically the first forested areas to be impacted by human activity, as development tends to happen along streambeds and floodplains first. However, as populations grow and development begins to reach onto ridges, forest fragmentation becomes more of an issue. Landscape context should be monitored in areas with rapid human development. Although urban habitats are often thought of as non-habitat for most birds, municipal parks and even wooded neighborhoods can provide suitable stopover habitat that is critically needed by migrating landbirds in largely deforested valleys.

D. Mining

The mining methods of mountaintop removal/valley filling being practiced in the southern WV and southern VA portions of this planning unit represent an immediate threat to many forest-breeding birds. These methods typically remove forest cover over large extents (1000s of acres), directly eliminating large amounts of forest habitat as well as increasing fragmentation and edge effects. They also directly affects two primary habitats used by many priority species in this physiographic area -- mature deciduous forest on Appalachian ridge tops, and mature mixed-mesophytic forest along headwater streams (coves). The total cumulative forest loss from mining activities is likely to substantial and to have negative impacts on many forest-dependent birds in this area. In addition, current methods of reclamation following mountaintop removal mining/valley fill activities result in poor-quality early successional habitats of non-native grasses and shrubs that are likely to remain in these early successional conditions for hundreds of years due to the soil compaction during the mining and reclamation process and the resulting length of time it will take tree species to re-colonize these areas. Better methods for mine reclamation need to be developed that will result in higher quality habitat. Every effort should be made to develop techniques for restoring mature, native hardwood forests to all mined sites within time frames approximating natural successional processes.

E. Forest health

At present, the most important disturbance factor affecting forested habitats in this region is the prevalence and spread of native and exotic insect pests and disease. Beginning with American chestnut blight, a series of such elements threaten the integrity and health of Appalachian forest ecosystems. These include gypsy moth, which stresses oak and other hardwood forests, southern pine beetle, dogwood anthracnose, hemlock woolly adelgid, and balsam woolly adelgid. The latter pest threatens relict stands of native fraser fir. In addition, oak decline is a condition that further threatens dominant oak forests. Threats from these factors are particularly insidious, because in most cases, no effective control agents are currently known (SAA 1996, USFS 1996).

F. Bird conservation opportunities and solutions

Several factors contribute to an optimistic assessment of future bird conservation planning in this region: (1) most priority bird species are still abundant and widespread, exemplifying the PIF objective of

"keeping common birds common;" (2) The economic base of the region is in commercial forestry and recreation, so it is unlikely that habitats for forest birds will be severely threatened in the near future; (3) A large proportion of forested land in this physiographic area is in public ownership (primarily National Forests), increasing the potential to implement a region-wide bird conservation strategy.

The landbird conservation strategy of the U.S. Forest Service for its southern national forests (Gaines and Morris 1996) represents an extremely positive step towards meeting the population and habitat objectives for priority bird species in this and other physiographic areas. Important elements of the USFS strategy include:

- explicit adoption of PIF's physiograhic area and species-prioritization approaches;
- recognition of priority landbird species and their habitats as important resources on national forest land;
- incorporation of priority bird-species objectives into overall forest planning;
- coordination among National forests to meet regional objectives
- implementation of an ambitious monitoring strategy, and associated database management, to track priority-species populations and monitor the effectiveness of conservation actions.

(Note that some priority species listed in this plan differ from those listed in the USFS 1996 strategy; however, the same priority habitats are represented.)

Similarly, in the Maryland portion of the physiographic area, a fairly large proportion of land is in State Forest ownership. Several important State Forest lands exist in West Virginia as well.

Important Bird Areas Program
Preliminary identification of Important Bird Areas (IBA) within Maryland, Virginia, and West Virginia has occurred but official designations have not yet been made. Conservation planning for these many of these Important Bird Areas will include implementation of PIF plan objectives for high-priority landbirds. How the IBA program fits into the Partners in Flight bird conservation planning and implementation process has not been fully resolved. The IBA program is not only targeted at protecting sites that are important to PIF priority species, but also protects areas that are important migratory habitat for many species, support large numbers of particular species during the breeding or wintering seasons, provide habitat for birds listed as endangered, threatened or species of concern by state or federal agencies, sites that hold unique habitat types with characteristic bird life or sites that provide extraordinary opportunities for research or monitoring.

SECTION 4: PRIORITY HABITATS AND SUITES OF SPECIES

When species in the priority pool (Table 2.1) are sorted by habitat, the highest priority habitats and associated species can be identified (Table 4.1). These represent the habitats that are either in need of critical conservation attention or are critical for long-term planning to conserve regionally important bird populations. The highest priority species do not form a cohesive habitat group, but rather divide among several different forest types, early successional, and wetland habitats. The species of greatest concern, however, are Golden-winged Warbler and the possibly extinct Appalachian race of Bewick's Wren. By association, the disturbed and early successional habitats that might support these species rank first in regional priority. Within each habitat-species suite, certain species that represent particular limiting requirements (e.g., area sensitivity, snags) are considered focal species for setting population-habitat objectives and determining conservation actions.

Table 4.1. Priority habitat-species suites for Area 12. TB (threats breeding), AI (area importance), PT (population trend) and Combined Score from RMBO prioritization database (Carter et al.2000), as updated for the Northeast (see note above in Sect. 2.B.). The focal species for each habitat are in bold type. Species are sorted within habitat types according to action level and then combined score. Scale of Concern indicates whether a species is of continental (C) or regional (R) concern. State-listed species are not included in this analysis because they may not be of concern in all states within a region.

Habitat	Common Name	Scale of Concern	Action Level [a]	Combined Score	TB	AI	PT
Shrub-early succession/ barrens/balds							
	Golden-winged Warbler	C	IM,MO	27	4	3	5
	Bewick's Wren (Appalachian)	R	IM,MO	21	5	2	5
	Prairie Warbler	C	MA	24	3	4	5
	American Woodcock	C	MA	22	3	2	5
	Whip-poor-will	R	MA, MO	22	3	3	5
	Field Sparrow	R	MA	21	3	5	5
	Eastern Towhee	R	MA	21	3	5	5
	Brown Thrasher	R	MA	19	3	3	5
	Yellow-breasted Chat	R	MA	19	3	3	5
	Blue-winged Warbler	C	PR	22	3	2	3
	Indigo Bunting	R	PR	19	2	5	4
	Willow Flycatcher	C	PR	18	3	2	3
Mature deciduous (oak) forest							
	Cerulean Warbler	C	MA,MO	27	4	3	5
	Wood Thrush	C	MA	24	3	4	5
	Kentucky Warbler	C	MA	23	3	3	4
	Northern Parula	R	MA	22	3	4	5
	Yellow-throated Vireo	R	MA	22	3	4	4
	Eastern Wood-Pewee	R	MA	20	3	5	5
	Red-headed Woodpecker	C	MA	19	4	2	3
	Worm-eating Warbler	C	PR	24	3	5	2
	Louisiana Waterthrush	R	PR	23	3	5	2
	Hooded Warbler	R	PR	22	3	4	3
	Acadian Flycatcher	R	PR	21	3	4	2
	Scarlet Tanager	R	PR	21	2	5	2
Spruce-fir/N. Hardwood Forest							
	Canada Warbler	C	MA	21	3	3	3
	Olive-sided Flycatcher	C	MA	21	5	2	4
	Blackburnian Warbler	R	MA	20	4	2	4
	Black-throated Blue Warbler	R	PR	22	4	3	2
Grassland							
	Henslow's Sparrow	C	IM, MO	26	5	2	3
	Loggerhead Shrike	R	IM, MO	20	5	2	5
	Sedge Wren	R	MA, MO	20	4	2	3
	Grasshopper Sparrow	R	MA, MO	19	4	2	5
	Northern Rough-winged Swallow	R	PR	19	2	4	5
Riparian/Wetland							
	Cerulean Warbler	C	MA, MO	27	4	3	5
	Louisiana Waterthrush	R	PR	23	3	5	2
	Acadian Flycatcher	R	PR	21	3	4	2
	American Black Duck	C	PR	20	3	2	3

[a] Action levels: IM = immediate management or policy needed to prevent regional extirpation; MA = management or other actions needed to reverse or stabilize declining populations or reduce threats (TB + PT ≥ 7 or =6 if continental action level=MA); PR = long-term planning to ensure stable populations (TB + PT < 7); MO = additional monitoring needed to better understand status or population trends.

A. Early successional shrub

Importance and conservation status: This general habitat grouping includes a variety of specific ecological communities, most notably high-elevation balds, naturally occuring disturbance such as landslides, beaver-created wetland systems, abandoned pastureland, early regenerating clearcuts, and reclaimed strip mines. As such, it is difficult to generalize about the conservation status of these habitats.

Naturally occurring shrub communities should be given high priority for conservation, because these likely represent ancestral habitats that supported original populations of bird species dependent on this habitat type. Examples are grassy and heath balds associated with high mountaintops, beaver impoundments in headwater streams and valley bottoms, margins of montane ponds, shale barrens, and shrub bogs (USFS 1996). A majority of these natural communities occur at higher elevations and potentially support the highest-priority bird species in this suite. High elevation balds cover an estimated 25,000 acres throughout the southern Appalachian area, with 22% occurring on federal lands (SAA 1996). The largest threat to these habitats is overuse by human visitors.

Regenerating clearcuts and reclaimed surface mines provide habitats that mimic natural shrub communities in structure and may be important to native shrub-nesting birds. These habitats are usually ephemeral, lasting generally five to ten years after disturbance, and they occur in a wider variety of forest types and at lower elevations. In addition to providing habitat for native priority species, these areas support additional early successional species that may formerly have been rare in this forested region.

GIS mapping of most early successional habitats is difficult, because they occur interspersed with adjacent forests and are often classified incorrectly. The Southern Appalachian Assessment (1996) identified roughly 1.5 million acres of early successional habitats, a large majority of which occurred on private land. About 3% of land on National Forests is in early successional stages, representing a decline of 26% since the mid 1970s. Projection analyses suggest that the proportion of this habitat on National Forests will continue to decline slightly (4%) over the next 20 years (Gaines and Morris 1996).

Associated priority species: APPALACHIAN BEWICK'S WREN, GOLDEN-WINGED WARBLER, Prairie Warbler, Whip-poor-will, Field Sparrow, etc.

Because of their diverse habitat requirements, these species probably do not constitute a "habitat-species suite" per se. Listing them together, however, highlights the need to include early successional habitats in the conservation plan, where doing so is not in conflict with higher-priority forest-bird objectives.

BEWICK'S WREN
Status: The present status of Bewick's Wren in this area is uncertain. The West Virginia Breeding Bird Atlas recorded this species at three localities within the physiographic area between 1984 and 1989, and at two additional localities just to the west of the area (Buckelew and Hall 1994). The population has declined precipitously (20.1% per year) in this physiographic area between the years of 1966 and 1999 according to the Breeding Bird Survey. Bewick's Wrens were seen fairly regularly on Christmas Bird Counts from at least 1949 through the mid-1970s, with 30 or more individuals found each year at about 20 different sites. In 1977, the population began its rapid decline and was then restricted to "dry valleys of the Ridge and Valley Region" (Hall 1983). The Appalachian population of Bewick's Wren ranged historically from southwestern Pennsylvania, Ohio, and Kentucky south to Georgia and Alabama. Today, this population has all but vanished. Only 20 pairs were found in Maryland, Virginia and West Virginia during the 1990s (MD DNR). Currently, the only remaining stronghold of the Eastern Bewick's Wren is in the central hardwoods area of southern Indiana and Illinios, western Kentucky, central Tennessee, and central and southern Missouri into northern Arkansas (UNSABCI 2000).

Breeding Habitat Characterization: Before the decline of the Eastern population of the Bewick's Wren, this species was well known for being well adapted to human disturbance; it was often found nesting in old cars, junkyards, and outbuildings. The known breeding habitat of this species today varies from thickets, openings in woodlands to overgrown farmlands or pastures. In the eastern portion of its

breeding range, it is found mostly above elevations of 4,000 feet in brushy habitat, heath balds, rocky outcrops, and around rural residences. It is listed by Gaines and Morris (1996) as a species of early successional pine-oak, oak-hickory, and northern hardwood forests. A critical need is to identify the main causes for such drastic population declines and then to identify any extant populations of this species, ascertain their habitat needs, and assure their strict protection by controlling threats.

GOLDEN-WINGED WARBLER

Status: Although populations of Golden-winged Warblers are considered relatively large in this region, the species has shown a precipitous long-term decline (-8.6% per yr) over the last 30 years. Besides loss of early successional habitats, this species is susceptible to displacement by and hybridization with the closely related Blue-winged Warbler. The two species segregate largely by elevation in this physiographic area, although the Blue-winged Warbler continues to expand its distribution towards the East and upward in elevation. Breeding Bird Atlas work during the mid-late 1980s showed little overlap in distribution or evidence of hybridization in this area; both species were found together in only 4 out of 60 atlas-blocks with Golden-wings in the West Virginia portion, 4 out of 29 blocks in Virginia, and 13 out of 100 blocks in Maryland; overall 11% of blocks with Golden-wings also had Blue-wings, and actual co-occurrence at specific sites was probably less. Declines of Golden-Winged Warblers may also be due to the loss of wintering habitat due to deforestation and/or nest parasitism by the brown-headed cowbird (Confer1992, and from Wings of America Rept). Nevertheless, a critical need is to determine what specific habitat conditions favor Golden-winged Warblers or promote long-term coexistence with little or no hybridization.

Breeding Habitat Characterization: Golden-winged Warbler occurs primarily in early successional, open deciduous woodlands (formerly oak-hickory, northern hardwood) at middle and high elevations (>3500 ft). This species also uses power line right-of-ways and open pine-oak woodland on reclaimed mine sites as they seem to prefer areas of dense patches of herbs and shrubs with sparse trees (WVPIF, Canterbury, Confer 1992. It's original habitat in this region, however, may have included high-elevation heath balds and beaver-created wetlands. Several territories will often be clustered close together in the fashion of a loose colony. Patches of 10-15 ha can support up to six pairs, and these may be preferred over smaller or larger habitat patches (Confer 1992). Nests are often located along field-forest edges very close to the ground, often supported by the base of a cluster of herbaceous plant material (Confer 1992, Klaus 1999). Golden-winged Warbler habitat is ephemeral and requires periodic disturbance such as logging, burning, and intermittent farming to return it to favorable early successional conditions.

Many of the remaining species in this group occur in high densities in a variety of suitable shrubby habitats and, although declining, are not an immediate conservation concern. Of these, Prairie Warbler and Whip-poor-will are of highest regional priority. Both occur primarily at lower elevations (< 2500 ft), and both are associated typically with open or regenerating pine or pine-oak forest types. Habitat needs and causes of declines in Whip-poor-will are poorly understood. Alder Flycatcher is at the southern periphery of its range, and although breeding sites are of interest to local birders and agencies, their specific conservation is not a high regional priority. Northern Bobwhite is an important game species, and its regional decline is of concern to state agencies and other land managers. Efforts to manage for bobwhite may be highly compatible with meeting habitat objectives for other high-priority landbird species; ways to combine these objectives should be investigated.

Habitat and population objectives: Based on extrapolations from BBS relative abundances, VERY ROUGH estimates of population size for priority species in this habitat suite can be derived (Table 4.3). These crude estimates are most useful in illustrating the relative population sizes of various species and, perhaps, giving order-of-magnitude figures for setting population objectives for the region.

For species that have declined significantly during the BBS period, a population target may be set to approximate pre-BBS population levels; an annual decline of 2.4% per year corresponds with a 50% loss over 30 years. For species suffering a 50% or greater loss since 1966 (PT=5), this plan calls for roughly a doubling of present-day populations as a practical objective. For species suffering a 15-50% loss since 1966 (PT=4), this plan calls for increasing the current population by 1.4. For species showing stable or unknown trends, population targets are roughly rounded up from current population estimates by a factor

of 1.1. Note that the relative abundances used to for these estimates are averages across all BBS routes in the physiographic area using data from 1990-1998. For more details on methods used for calculating populations and targets, see Appendix 3.

Table 4.2. Population estimates and targets (number of pairs) for priority species of early successional and forest-edge habitat in the in the Mid-Atlantic ridge and Valley physiographic area. Percent of Atlas blocks based on number of 5-km blocks in which the species was reported within Area 12 during the Virginia (N=225 blocks; Virginia BBA, unpublished data), West Virginia (Buckelew and Hall 1994), and Maryland (N=219; Robbins and Blom 1996) state breeding bird Atlases.

Species	BBS population	% lost since 1996	Population target	% Atlas blocks VA	WV	MD
Golden-winged Warbler	3,100	> 50%	6,200	13	31	50
Bewick's Wren (Appalachian)	extirpated?	> 50%	100	2	2	1
Prairie Warbler	9,700	> 50%	19,400	37	33	46
Whip-poor-will	9,400	> 50%	18,800	31	33	36
Field Sparrow	77,700	> 50%	155,400	87	81	98
American Woodcock	??	> 50%	??			
Eastern Towhee	146,600	> 50%	293,200	91	96	100
Brown Thrasher	20,200	> 50%	40,400		74	93
Yellow-breasted Chat	24,900	> 50%	49,800	56	33	73
Blue-winged Warbler	500	uncertain	550	3	3	10
Indigo Bunting	350,800	15-50%	491,100	95	93	98

OBJECTIVE 1. Identify any extant populations of Appalachian Bewick's Wren, ascertain habitat needs and assure strict protection; strive to secure and maintain a breeding population of > 100 pairs over next 20 years.

OBJECTIVE 2. Reverse declines of Golden-winged Warbler by maintaining known breeding sites in suitable habitat condition and replicating these conditions wherever feasible; strive to maintain long-term population of 6,000+ breeding pairs.

OBJECTIVE 3. Stabilize population of Prairie Warbler; provide suitable habitat for 19,000+ pairs.

Based on published density estimates, roughly 330,000 ha of “suitable” shrubby or disturbed habitats are required to support the entire habitat-species suite (e.g. 300,000 pairs of Eastern Towhees); 19,000 ha should be optimal to support 19,000 pairs of Prairie Warblers, and 12,400 ha should be maintained specifically to support 6,200 pairs of Golden-winged Warblers.

Assumption: maintaining suitable habitat for Bewick's Wren, Golden-winged Warbler and Prairie Warbler will be sufficient to support sustainable populations of most other birds in this habitat suite.

Implementation strategy: Conserving populations of early successional species will require active management to maintain early successional conditions, as well as tracking changes in abundance of naturally-maintained early successional communities. Development of best management practices for utility corridors might utilize a minimal application of herbicides to control woody plants and allow for sufficient growth to be suitable for some members of this suite of species.

Important components of an implementation strategy should include:

- outreach targeted at both professional and private audiences (see "*Outreach*").
- identification and protection of naturally occurring shrub, bald, or barrens habitat and potentially designating these as Important Bird Areas.
- improved monitoring for species that show long-term declines, especially at the state level.
- building partnerships with utility operators for maintenance of shrubby conditions along powerlines and other corridors.
- building a volunteer network for monitoring of shrub (and forest) birds along utility corridors.

Opportunities for conserving shrubland habitat will often be tied to management of grasslands or agricultural lands, because the majority of habitat for both species will not be maintained without human intervention. A continuum of grassland to shrubland habitat may be achieved by varying the intensity of management on any given property. Whereas many grassland species are area sensitive, most shrub-associated birds are typically not sensitive to patch size. Many of these species will use small patches of habitat within an otherwise undesirable matrix. [Bryan Watts patch assessment model]

Furthermore, maintaining shrubland species in primarily forested landscapes may be possible without causing many of the negative effects of fragmentation that affect forest dwelling species. This is because shrub species can take advantage of small habitat patches distributed throughout the forested matrix. For example, a narrow power-line corridor extending though a forested landscape may support large numbers of shrub-nesting birds without reducing suitability of the region to forest-breeding species.

A list of landowner incentive programs is presented in Appendix 4 of this report and is separated out by habitat type. Landowners and managers can reference this section to locate programs that will help promote bird conservation through habitat acquisition and management and other conservation measures.

***Research and monitoring needs*:**
- intensive surveys for Appalachian Bewick's Wren, including all recent, known sites and targeted tape-playback surveys in potential habitat throughout the region
- determine range of suitable habitats and identify present breeding sites for Golden-winged Warbler in this region.
- compare early successional habitats resulting from natural disturbances vs. forestry practices and mine reclamation, with regard to suitability for high-priority species

Outreach:
This group of species, with the exception of American Woodcock is largely overlooked by land managers and biologists. Considerable attention has focused on the decline of American Woodcock populations and where management programs have been introduced for this species other birds of early successional habitats have likely benefited. Recently, awareness of habitat loss for early successional species has broadened to include nongame birds. Consequently, attention, especially by conservationists, has been focused on grassland and shrub-nesting birds.

One of the greatest challenges ahead in dealing with the decline of early-successional habitat and associated bird species is convincing the public that action is needed that such efforts are not contradictory to maintaining diverse ecosystems (Litvaitis et al. 1999). Important components of a public (and professional) outreach message would include:

- many species using this habitat type are in decline.
- shrubland-associated species are not typically sensitive to patch size, unlike grassland birds, therefore even efforts on small properties can effect local populations.
- The origin of much of this habitat in the Allegheny Plateau is via human disturbance either through forestry practices or former agricultural land.
- suitable habitat for some species exists in such heavily managed systems as utility corridors.
- periodic disturbances, either mechanical or fire for example, are important if persistence of this habitat type is desired over long periods of time.

B. Mature deciduous forest

Importance and conservation status: The deciduous forests of the middle and southern Appalachians are among the most diverse forests in North America. The majority of these forests are dominated by oaks, with important distinctions in species composition (including mixing with pines) that are dependent on gradients of moisture and elevation. Forests broadly classified as oak-hickory cover 5.5 million acres, or 44% of the physiographic area. The largest tracts are on ridges throughout the Ridge and Valley and on western and southern slopes of the Allegheny Mountains.

A primary distinction is made between oak-hickory forests and mixed-mesophytic, or cove-hardwood, forest communities. Cove hardwood forests occur at low-to-middle elevations on mesic sites, in stream valleys and ravines, and on north- and east-facing slopes (USFS 1996). They are more prevalent in the southern portions of the physiographic area; for example they cover roughly 81,000 acres (12%) of the Jefferson National Forest. These are typically tall, diverse forests well-developed and diverse small-tree, shrub, and herbaceous layers. This forest type also includes bottomland-hardwood communities, including forests dominated by sycamore, cottonwood, yellow poplar, elms, maples, ash, or sweetgum. The SAA (1996) identified 32,000 acres of riparian forest on Jefferson National Forest; however, 80% of these habitats throughout the southern Appalachians are located on private land.

A variety of other oak-hickory forest types dominate at higher elevations and more xeric sites. A gradation of types exist from mesic-oak to xeric-oak to mixed pine-oak forests. Forests classified as mixed hardwood-pine forests covers roughly 1.1 million acres, or 9% of the physiographic area.

From a bird-conservation perspective, the importance of this habitat type is great, because of the number of associated species with high priority scores in the planning unit. In general, these species are relatively abundant throughout the region, although a majority of the priority species are declining significantly. In addition, most priority species are habitat generalists, occurring in varying densities in most of the oak-hickory, cove-hardwood, and even mixed hardwood-pine forest types. Setting habitat and population objectives for this suite is therefore not as straightforward as in rare or patchy habitat types. Conservation planning should focus on extensive tracts of representative forest types, and should address the microhabitat needs of species showing regional or local declines.

Associated priority species: CERULEAN WARBLER, WOOD THRUSH, WORM-EATING WARBLER, LOUISIANA WATERTHRUSH, Eastern Wood-Pewee, Acadian Flycatcher, Scarlet Tanager, etc.

The highest priority species in this suite occupy the full range of mature deciduous forest types (Table 4.3) and represent optimal conditions of canopy structure (Cerulean Warbler), understory structure (Wood Thrush, Worm-eating Warbler), and specialized conditions along streams (Louisiana Waterthrush). Although mixed-mesophytic and bottomland forests are considered most productive and most threatened, no priority landbird species is primarily dependent on this forest type.

Table 4.3. Habitat associations and requirements for priority species of mature deciduous forest habitats in the Mid-Atlantic ridge and Valley physiographic area. Based on Gaines and Morris (1996), Buckelew and Hall (1994), and working groups of WV, VA, and MD PIF. Forest-types: MM = mixed mesophytic; BH = bottomland hardwood; O-H = oak-hickory; O-P = mixed oak-pine.

Species	Forest type				Habitat needs
	MM	BH	O-H	O-P	
Cerulean Warbler	X	X	X		late succession (>60 yr); tall (broken?) canopy; interior
Wood Thrush	X	X	X	X	mid-late succession (>30 yr); deciduous understory, interior?
Worm-eating Warbler	X		X	X	mid-late succession (>30 yr); dense shrub understory; interior; ground-nesting
Louisiana Waterthrush	X	X	X		late succession (>60 yr); rocky, flowing streams, interior
Eastern Wood-Pewee	X	X	X	X	mid-late succession (>30 yr); forest openings, snags
Yellow-throated Vireo	X	X	X		low elevation; tall canopy
Northern Parula	X	X		X	nest substrate (trapped litter)
Black-and-white Warbler	X		X	X	closed canopy, sparse ground cover; ground-nester

Acadian Flycatcher	X	X	X	X	well-developed understory; streamsides
Scarlet Tanager	X		X	X	closed canopy

CERULEAN WARBLER

Status: The Cerulean Warbler is declining over much of its breeding range. It had the greatest decline of any North American warbler between 1966 and 1982 and this decline may be continuing (Degraaf and Rappole 1995). In the last 30 years, the Cerulean Warbler population in this physiographic area has declined at a rate of 6.1% per year for an overall loss of over 90% of the pre-BBS population estimate. This species is currently listed as a species of concern in 13 states, threatened in two states and endangered in one state. In many parts of its range, the Cerulean Warbler is not adequately sampled by BBS making it difficult to accurately measure population trends within states or phyiographic areas.

Breeding Habitat Characterization: Cerulean Warbler has the most local (patchy) distribution of the priority species, although it is found throughout the physiographic area below 2000 ft. elevation.(?) Populations occupy mature oak forests on dry ridge tops, mixed-mesophytic forests on slopes, and tall bottomland forests of sycamore, cottonwood, or maples. The common feature of these habitats appears to be mature trees, a tall and uneven emergent canopy layer, and large tracts of land. The size of trees is of primary importance whereas the type of tree is secondary (Hamel 2000 from CeWAP). In the West Virginian Ridge and Valley region, Cerulean Warblers are mostly limited to river valleys (Rosenberg et al 2000). According to the Cerulean Warbler Atlas Project (1996-1998), the birds may seek out the most mature forest conditions available in the region. This species is sensitive to forest loss and fragmentation because of its large area requirements making the conservation of mature forests within its range a high management priority.

WOOD THRUSH

Status: Even though it is very common in Eastern forests, the Wood Thrush's steady long-term population declines have made it a species of high conservation concern. It has declined nearly 60% in this region and 43% overall. Possible causes of the recent population declines are habitat loss in both its breeding and wintering range and forest fragmentation in breeding range because it may lead to increased nest parasitism by brown-headed cowbirds (Wings of America rept cites Robinson and Wilcove 1994).

Breeding Habitat Characterization: The Wood Thrush requires mature forests with moderate to dense shrubby understory, and a fairly open forest floor with decaying leaf litter. Usually these areas are cool, moist sites and they are often found near water. The breeding range goes from southern Quebec and Ontario to northern Minnesota and Michigan and south to northern Florida and southeastern Texas. It has long been argued that forest fragmentation has led to an increase in Wood Thrush nest parasitism by brown-headed cowbirds, making fragmented areas Wood Thrush population sinks. However, a recent study by Friesen et al. (1999) found Wood Thrush nesting success in a fragmented agricultural landscape was able to sustain a viable population. Similarly, Wood Thrushes can be commonly found in woodlots 1-5 ha in size (Whitcom et al. 1981 in Degraaf and Rappole 1995). Understanding the breeding habitat requirements more thoroughly will be an important step in reversing population declines and building and maintaining future population.

WORM-EATING WARBLER

Status: The Worm-eating Warbler is especially vulnerable to serious population declines because of its dependence on large tracts of forest for nesting and as a result of significant losses of over-wintering tropical broadleaf forest habitat (Petit et al. 1993 cited in conserveonline.org spp report). The BBS data show a substantial population decline in eastern North America over the period of 1978-1988 (Sauer and Droege 1992 cited in conserveonline.org). The Northeast regions are home to the largest proportion of Worm-eating Warblers and is the area where the long-term population trends have declined the most. In this physiographic region, the Worm-eating Warbler has declined 30% over the past 30 years. Populations appear to be stable today, despite earlier declines.

Breeding Habitat Characterization: The primary breeding habitat requirements for Worm-eating Warblers consist of mature deciduous forest with understory patches of dense shrubs like mountain laurel and a

topography of moderate to steep slopes (Patton et al. 1996). However, they can also be found in young and medium-aged stands (Bushman and Therres 1988 in Patton et al. 1996). They are also found near streams or swamps surrounded by shrubs and deciduous woods (Degraaf and Rappole 1995). Worm-eating Warblers probably require large tracts of forest for successful reproduction (Patton et al 1996). Most research suggest that viable populations occur in forest tracts of 300 ha or more (Patton et al. 1996). Possible management strategies, therefore, requires identification, maintenance and restoration of large tracts of land that offer potential to be population sources.

LOUISIANA WATERTHRUSH
Status: The Louisiana Waterthrush is believed to have relatively stable population levels in Canada and the US with local declines in some areas due to habitat loss and degradation (Brown et al. 1999). Currently, the breading range is expanding northward into northeastern states including New York, Vermont, and Connecticut most likely because of the recent reforestation of these areas (Brown et al. 1999). Although this species has not had a significant decline in numbers over the years, it is still an important priority species because of its association with riparian woodlands – a very unique and increasingly threatened habitat type.

Breeding Habitat Characterization: The preferred habitat for the Louisiana Waterthrush consists of moist forest, woodland, and ravines along streams. They can sometimes also be found in swamp forests and mature deciduous forests in floodplains. Preferable habitat is large tracts of land (probably greater than 100 ha) with little undergrowth near flowing waters of streams (Brown et al. 1999). The key component of the Louisiana Waterthrush's breeding habitat is rapidly, clean flowing water (BFL cornell). They are not usually found in areas of high fragmentation or areas where water quality is negatively affected by urban or agricultural landuse (Brown et al. 1999).

Habitat and population objectives: Based on extrapolations from BBS relative abundances, VERY ROUGH estimates of population size for priority species in this habitat suite can be derived (Table 4.3). These crude estimates are most useful in illustrating the relative population sizes of various species and, perhaps, giving order-of-magnitude figures for setting population objectives for the region.

For species that have declined significantly during the BBS period, a population target may be set to approximate pre-BBS population levels; an annual decline of 2.4% per year corresponds with a 50% loss over 30 years. For species suffering a 50% or greater loss since 1966 (PT=5), this plan calls for roughly a doubling of present-day populations as a practical objective. For species suffering a 15-50% loss since 1966 (PT=4), this plan calls for increasing the current population by 1.4. For species showing stable or unknown trends, population targets are roughly rounded up from current population estimates by a factor of 1.1. Note that the relative abundances used to for these estimates are averages across all BBS routes in the physiographic area using data from 1990-1998. For more details on methods used for calculating populations and targets, see Appendix 3.

Table 4.4. Population estimates and targets (number of pairs) for priority species of early successional and forest-edge habitat in the in the Mid-Atlantic ridge and Valley physiographic area. Percent of Atlas blocks based on number of 5-km blocks in which the species was reported within Area 12 during the Virginia (N=225 blocks; Virginia BBA, unpublished data), West Virginia (Buckelew and Hall 1994), and Maryland (N=219; Robbins and Blom 1996) state breeding bird Atlases.

Species	BBS Population	% lost since 1966	Population target	% Atlas blocks VA	WV	MD
Cerulean Warbler	8,000	> 50%	16,000	12	10	44
Wood Thrush	202,700	> 50%	405,400	86	90	99
Worm-eating Warbler	35,500	stable	35,500	44	27	48
Louisiana Waterthrush	14,700	stable	16,700	43	50	65
Kentucky Warbler	15,800	15-50%	22,120	37	25	55
Eastern Wood-Pewee	58,200	> 50%	116,400	90	91	99
Yellow-throated Vireo	30,300	15-50%	42,400	49	32	54
Northern Parula	36,800	> 50%	73,600	36	50	43
Hooded Warbler	48,900	uncertain	53,800	39	22	54

Acadian Flycatcher	80,100	stable	80,100	65	67	99
Scarlet Tanager	103,500	stable	103,500	86	90	95

OBJECTIVE 1. Stabilize or reverse declining population trend for Cerulean Warbler; maintaining long-term population of 16,000+ breeding pairs (0.8 birds per BBS route), distributed in at least 10% of Atlas blocks in each state.

OBJECTIVE 2. Maintain stable population of 35,000+ Worm-eating Warbler pairs throughout the physiographic area (1.7 birds per BBS route).

OBJECTIVE 3. Maintain stable population of 16,000+ Louisiana Waterthrush pairs throughout the physiographic area distributed among at least 30% of major drainages in each state.

Based on published density estimates, roughly 1.14 million ha of "suitable" mature deciduous forest is required to sustain the entire habitat-species suite (e.g. 400,000 pairs of Wood Thrush); of this, 85,000 ha should be suitable to support 35,000 pairs of Worm-eating Warblers, 20,000 ha should be suitable to support 16,000 pairs of Cerulean Warblers. In addition, 25,500 km of forested streams are required to support 17,000 pairs of Louisiana Waterthrush.

Assumptions: maintaining suitable habitat for Cerulean and Worm-eating warblers and Louisiana Waterthrush will be sufficient to support sustainable populations of most other birds in this habitat suite.

***Implementation strategy*:** Implementing the broad objectives for this habitat-species suite will require a comprehensive forest management plan for the entire Mid-Atlantic ridge and Valley region (and adjacent physios) that acknowledges the long-term importance of maintaining large source populations of priority forest birds. Elements of such a plan that are most relevant to the high-priority birds include:

- maintaining a balance of forest-age structures, including adequate amounts of mid-successional as well as late-successional forest
- ensuring long-term tree-species composition; i.e. prevent loss of particular species, such as hemlock, white pine, or beech, through disease or selective harvest
- ensuring adequate structural diversity, especially regarding canopy and understory components (shrubs, treefalls); monitor effects of natural disturbances (e.g. wind storms) as well as insect outbreaks, deer browsing, and forestry practices
- set maximum allowable levels of forest fragmentation due to forestry practices or planned development; e.g. do not allow any 10,000 km^2 landscape to fall below 70% forest cover

Management options:

Landscape Level

Maryland Partners in Flight Provides an excellent publication on habitat management guidelines for forest and other landbirds (Maryland PIF1997). Maintaining the largest possible forest tracts are of primary importance, ideally at least 7,500 acres (3000 ha) for conservation. Construction and other activity and disturbance should be concentrated on the periphery to prevent fragmentation and edge effects and maintain the largest possible areas of suitable habitat for species that are area-sensitive.

Maryland PIF emphasize the importance of maximizing the amount of contiguous forest "interior" (forest area more than 100m from the forest edge) within each forest tract. Management and acquisition efforts should be targeted at less isolated forest patches and should promote the reforestation of gaps between forest patches. Increasing forest connectivity is likely to benefit the dispersal ability and habitat quality for many forest interior birds.

On a landscape scale there are few large areas of contiguous forest of high quality habitat for forest birds.

Where these areas remain, primarily in state and national parks, private forest preserves and timber holdings, forest interior birds may reproduce at high rates, creating a large surplus of young birds on a yearly basis. On the other hand, forest birds occupying highly fragmented forests, especially those in an agricultural landscape, may have extremely low reproductive rates due to the effects of predators and nest parasites. Area-sensitive species may not occupy these patches at all. Only through the influx of new birds from "source" habitats can these populations be maintained. As a result, conservation of highly productive source populations may be essential to maintaining viable populations throughout an entire region. Conservation efforts that attempt to maintain large patches of contiguous habitat and suspected source populations may be especially effective in achieving regional bird conservation goals.

Publicly owned land such as state parks and forests contain some of the few remaining large patches of contiguous forest in the Northern Ridge and Valley. Management of these areas should emphasize the types of forest present (plant species composition, successional age, vegetation structure, habitat heterogeneity), patterns of habitat across the landscape (patch configuration and shape, patch size, distance between patches, amount of non-forest edge, juxtaposition of habitats), and forest cover (historical, current and potential future).

Franzreb et al. (2000) suggest a perspective for forest management in different landscape patterns. Even-aged management may only be consistent with goals for conservation of forest birds in highly forested landscapes. Even-aged harvests are more extreme forms of local disturbance and may have a severe impact upon habitat suitability of surrounding forest more agriculturally dominated regions. But even in more forested areas, attempts should be made to aggregate harvest areas and optimize cut shape and area to minimize forest fragmentation.

Ownership Level

Private land owners can play an important role in forest bird conservation within the context of their land ownerships and management objectives (Wigley and Sweeney 1993).

Locally, Maryland PIF (1997) suggest avoiding even the loss of small forests (<25 acres or 10 ha), especially along coastlines, streams and riparian corridors, and peninsula tips where forests are scarce. These sites are important, perhaps critical, to the survival of migrating birds in many habitat suites. Removal of small woods that would improve the quality of grassland habitat may be a consideration for land managers.

Timber activity near forested riparian areas can negatively impact bird populations in these areas by reducing the overall forest cover and habitat distribution. Some species are easily extirpated from strips of riparian forest if strips are too narrow. Studies designed to ascertain specific recommendations for the suggested width of strips has yielded a variety of results. Some suggest that riparian strips should be at least 60 meters on either side of a river in order to prevent extirpation of more area sensitive species, other suggest more or less. Maintaining riparian forest buffers of at least 100m is probably a good working rule.

Other forest management recommendations by the authors include promoting a diverse forest understory by controlling deer numbers through exclosures and hunting. Controlled burns can also promote forest regeneration and provide snags and other habitat characteristics that are important for fire- or gap-dependent native forest vegetation and some bird species.

Research and monitoring needs:

- identify present-day concentrations of Cerulean Warbler within the region; determine protection status and specific threats at these sites;
- determine specific habitat needs (and causes of declines) for Cerulean Warbler, Louisiana Waterthrush, and Worm-eating Warbler;
- better understanding of landscape-level effects of land-use practices on forest bird populations
- better understanding of role of stand age and stand structure on habitat quality and ultimately survival and reproductive success of priority species.

• better methods for monitoring species that use patchily distributed components of the forest, such as treefall gaps, small wetlands, snags.

***Outreach*:** Although a large proportion of this planning area is under public ownership, outreach targeted at owners of private woodlots and large timber companies to manage (or not manage) their land to benefit forest birds should still be an outreach goal. In the Mid-Atlantic Ridge and Valley, the Cerulean Warbler is of particular concern and is currently under consideration for federal threatened listing by the US Fish and Wildlife Service. Proactive management on private lands would benefit conservation efforts and landowner interests.

Another tool for forestland conservation with tremedous potential is conservation of open space. Conservation of open space has benefits for property tax stability, ecotourism and maintenance of nearby property values (Kerlinger 2000). As an example, the state of New York has a state open space plan (NYDEC 1998) that outlines regional priorities for state land acquisition. Wildlife and ecosystem conservation may act as supporting criteria in qualifying a land for acquisition and increasing its priority. Unfortunately, many current priorities are targeted at purchasing access areas for recreational activities and little money is even indirectly targeted at wildlife conservation. Continuing effort to include wildlife conservation priorities in the agenda may yield great rewards.

C. Northern hardwood / Spruce-fir forest

Importance and conservation status: These high-elevation forest types represent an extension of widespread communities to the north of this region. Because of the disjunct distribution of these forests throughout the high Appalachian Mountains, they are considered of very high local conservation interest. Spruce-fir groves were probably much more extensive before these areas were logged in the 19th century. Today the relict patches are considered a threatened community type; in particular, endemic fraser fir is strongly impacted by the balsam woolly adelgid (USFS 1996). Less than 1% of the physiographic area is classified as spruce-fir, nearly all located on National Forest lands in West Virginia and Virginia. In addition, 10% of the area is northern hardwood (maple-beech-birch) forest, mostly distributed in the Allegheny Mountains of West Virginia.

From a global perspective, most of the high-priority bird species in this habitat suite are associated broadly with the northern hardwood forest types and not necessarily with the relict spruce-fir groves. Also, existing data do not indicate population declines in this species-suite, with the exception of Olive-sided Flycatcher. In addition to these species, however, a second suite of species represent disjunct populations that are dependent on spruce-fir habitats, and these are often considered of high conservation priority (Table 4.5). The distinctiveness and importance of these populations is underscored by the existence of several subspecies endemic to the southern Appalachians. If these distinct populations are recognized, then the conservation importance of this habitat type within the physiogrophic area may be greatly underestimated in the current PIF plan. This issue is currently being debated within the SEPIF working group (Hunter et al., in litt.)

Associated priority species: BLACK-THROATED BLUE WARBLER, CANADA WARBLER, Blackburnian Warbler, Olive-sided Flycatcher, etc.[plus SPRUCE-FIR DISJUNCT POPULATIONS]

Both Black-throated Blue and Canada warblers are associated with dense shrubby understory of northern hardwood or mixed spruce-hardwood forests, particularly where rhododendron thickets are common. Both are largely restricted to the Allegheny Mountains portion of the physiographic area, as well as some of the highest peaks along the Ridge and Valley sections. Of the priority species, Blackburnian Warbler is most closely associated with mature spruce-fir habitat, but it also occurs in white pine-hemlock-hardwood forest types.

The remaining species in this suite are at the southern periphery of their ranges, and are listed here because of special concern status in one or more states. Olive-sided Flycatcher is declining throughout its eastern range and was formerly more widespread in the West Virginia mountains (Hall 1994). Both

Mourning and Nashville warblers are associated with disturbance and early successional stages of the northern forest, and both species have expanded their distributions in response to forestry practices.

BLACK-THROATED BLUE WARBLER

Status: The population of Black-throated Blue Warblers is increasing in this physiographic region and is generally stable throughout the rest of its range. It qualifies as a priority species because of its small overall range, low densities even in suitable habitat, and a very restricted winter range in the forests of the Greater Antilles. Also of concern is that this species is restricted to sensitive or threatened spruce habitats at high elevations of the southern Appalachians (BFL cornell).

Breeding Habitat Characterization: The Black-throated Blue Warbler's breeding range stretches from the Great Lakes region east through southern Canada to the Maritimes. It then extends southward through New England and the higher elevations of New York and the Appalachians down to northern Georgia. Breeding habitat consists mainly of northern hardwood or mixed coniferous forests. An important component of the habitat for Black-throated Blue Warblers is a dense shrubby understory consisting of plants like hobblebush, striped maple, rhododendron, or regenerating conifers. The breeding density seems to be linked to the thickness of this shrub layer as thicker understories will often have more breeding pairs (NC Wild BTBW Wildlife Profiles). Size of the habitat patch is also an important variable for Black-throated Blue Warbler breeding, as research also shows that they only occur in forest tracts larger than 100 ha (Rosenberg et al. 1999).

CANADA WARBLER

Status: The BBS data show a decrease of Canada Warblers over a significant part of their range of 1.8% per year from 1966 to 1998, and 2.7 % per year from 1980 to 1998 (Catlin 1999). The overall decline is 40% since 1966. In this region, the Canada Warbler is stable if not increasing in areas. Like the Black-throated Blue Warbler, it is listed as a priority species because of its connection to the sensitive spruce habitats of the southern Appalachians, its low overall density, and rapid deforestation in wintering grounds.

Breeding Habitat Characterization: The breeding habitat for Canada Warblers is coniferous and mixed northern hardwood forests with dense undergrowth that is often wet. The breeding range of the Canada Warbler is similar to the Black-throated Blue Warbler except that it extends further north and westward into Southern Canada. Canada Warblers sometimes occupy sites with heavier stocking of coniferous species (Morse 1994, Conway 1999 (in Eastrn Spruce Hardwood report). It appears to prefer limited ground cover, but high foliage density between 0.3 and 1 meter (Robins et al. 1989 cited in Catlin 1999). Canada Warblers can also be found in bogs, tall shrubbery along streams or near swamps, and deciduous second growth. Although they appear to be somewhat tolerant of moderate disturbances, including forestry practices that promote brushy succession, this species' sensitivity to habitat fragmentation and alteration is not well known. Some do speculate that population declines are related to forest succession and the loss of forested wetlands (Conway 1999) (in Catlin et al 1999).

Habitat and population objectives: Based on extrapolations from BBS relative abundances, VERY ROUGH estimates of population size for priority species in this habitat suite can be derived (Table 4.3). These crude estimates are most useful in illustrating the relative population sizes of various species and, perhaps, giving order-of-magnitude figures for setting population objectives for the region.

For species that have declined significantly during the BBS period, a population target may be set to approximate pre-BBS population levels; an annual decline of 2.4% per year corresponds with a 50% loss over 30 years. For species suffering a 50% or greater loss since 1966 (PT=5), this plan calls for roughly a doubling of present-day populations as a practical objective. For species suffering a 15-50% loss since 1966 (PT=4), this plan calls for increasing the current population by 1.4. For species showing stable or unknown trends, population targets are roughly rounded up from current population estimates by a factor of 1.1. Note that the relative abundances used to for these estimates are averages across all BBS routes in the physiographic area using data from 1990-1998. For more details on methods used for calculating populations and targets, see Appendix 3.

Table 4.6. Population estimates and targets (number of pairs) for priority species of early successional and forest-edge habitat in the in the Mid-Atlantic ridge and Valley physiographic area. Percent of Atlas blocks based on number of 5-km blocks in which the species was reported within Area 12 during the Virginia (N=225 blocks; Virginia BBA, unpublished data), West Virginia (Buckelew and Hall 1994), and Maryland (N=219; Robbins and Blom 1996) state breeding bird Atlases.

Species	BBS population	% lost since 1966	Population target	% Atlas blocks VA	WV	MD
Blackburnian Warbler	4,200	> 50%	8,500	5	18	16
Olive-sided Flycatcher	??	??	??	0	1	1
Black-throated Blue Warbler	14,000	increase?	15,000	0	40	25
Canada Warbler	5,200	stable	6,000	9	25	21

OBJECTIVE 1: Maintain stable populations of 15,000 Black-throated Blue Warblers and 6,000 Canada Warblers, distributed throughout the Allegheny Mountains region of West Virginia and Maryland.

OBJECTIVE 2: Maintain stable population of 8,000-9,000 Blackburnian Warblers, throughout the spruce-fir forests.

Based on published density estimates, roughly 30,000 ha of "suitable" northern hardwood forests are required to support 15,000 pairs of Black-throated Blue Warblers; 17,000 ha of relict spruce-fir forests should be protected or restored to support 8,500 pairs of Blackburnian Warblers.

Assumption: providing adequate habitat for 8,500 Blackburnian Warblers will support sustainable regional populations of many other spruce-fir dependent bird species. (NOTE: setting specific population objectives for other spruce-fir species with specific habitat needs, such as Northern Saw-whet Owl, Olive-sided Flycatcher, and Red Crossbill, may be desirable.)

Implementation strategy:

Research and monitoring needs:

Outreach:

D. Grasslands and agricultural land

Importance and conservation status: Natural grasslands were not a major feature of the presettlement landscape of the Mid-Atlantic ridge and Valley, and it is unclear whether other natural openings, such as barrens or balds, supported many grassland birds. Today, agricultural land represents roughly one-third of the physiographic area, primarily in the easternmost, large valleys. About one-third of the agricultural land (1 million acres) is in pasture or hay production and may be suitable for grassland species. Reclaimed strip mines...

With the exception of Henslow's Sparrow, grassland birds are a relatively low priority in this physiographic area, other than maintaining overall bird species diversity in the region. Where land is in active agricultural production, however, efforts to maintain populations of priority bird species will contribute to conservation objectives for these species throughout the Northeast.

Associated priority species: HENSLOW'S SPARROW, Upland Sandpiper, Grasshopper Sparrow, etc..

The only priority species with a sizable population in this physiographic area is Grasshopper Sparrow, and this population is declining significantly. Loggerhead Shrike, which is listed as endangered in Virginia and Maryland, persists in small numbers, especially in the Virginia valleys. Bobolink has recently expanded its population in recent years, especially in the Allegheny Mountains.

HENSLOW'S SPARROW

Status: The Henslow's Sparrow formerly bred in this region, but may be now extirpated. Breeding Bird Survey data show that 99.9% of the estimated pre-BBS population has disappeared from the area. Henslow's Sparrow is identified as a migratory nongame bird of management concern by the U.S. Fish and Wildlife Service (Smith 1992 (in L. Gt. Lks rep)). Populations have declined throughout the range, except in the western portion of the Great Lakes Plain and in Minnesota where they remain most abundant (Smith 1992). Population declines have been attributed to grassland habitat loss, fragmentation, and the intensification of farming (Smith 1992 and Audubon watch list).

Breeding Habitat Characterization: Breeding habitats for Henslow's Sparrow include a variety of grassland habitats with tall, dense grass and herbaceous vegetation (Smith 1992). Smith (1997) (in lwr gt lks rep) suggests that Henslow's Sparrows in the East probably historically occupied primarily the edges of inland wet meadows created by beaver activities and coastal saltmarshes. Today, in the Northeastern portion of its range, it can be found in the following types of habitat: active and inactive pastures, wet meadows, old weedy fields, wet or damp fields and swales, abandoned strip mines, hayfields, wet and dry grassy fields with scattered shrubs, and grasslands. Smith (1997) concluded that 30 ha might be the minimum size field for a breeding pair of Henslow's Sparrows finding them absent in smaller tracts.

Habitat and population objectives: Based on extrapolations from BBS relative abundances, VERY ROUGH estimates of population size for priority species in this habitat suite can be derived (Table 4.3). These crude estimates are most useful in illustrating the relative population sizes of various species and, perhaps, giving order-of-magnitude figures for setting population objectives for the region.

For species that have declined significantly during the BBS period, a population target may be set to approximate pre-BBS population levels; an annual decline of 2.4% per year corresponds with a 50% loss over 30 years. For species suffering a 50% or greater loss since 1966 (PT=5), this plan calls for roughly a doubling of present-day populations as a practical objective. For species suffering a 15-50% loss since 1966 (PT=4), this plan calls for increasing the current population by 1.4. For species showing stable or unknown trends, population targets are roughly rounded up from current population estimates by a factor of 1.1. Note that the relative abundances used to for these estimates are averages across all BBS routes in the physiographic area using data from 1990-1998. For more details on methods used for calculating populations and targets, see Appendix 3.

Table 4.5. Population estimates and targets (number of pairs) for priority species of early successional and forest-edge habitat in the in the Mid-Atlantic ridge and Valley physiographic area. Percent of Atlas blocks based on number of 5-km blocks in which the species was reported within Area 12 during the Virginia (N=225 blocks; Virginia BBA, unpublished data), West Virginia (Buckelew and Hall 1994), and Maryland (N=219; Robbins and Blom 1996) state breeding bird Atlases.

Species	BBS population	% lost since 1966	Population target	% Atlas blocks VA	WV	MD
Henslow's Sparrow	200	> 50%	400	0	0	5
Loggerhead Shrike	200	> 50%	400	13	6	3
Sedge Wren	??	??	200	0	0	1
Grasshopper Sparrow	26,200	> 50%	52,400	42	46	67

Henslow's Sparrow is the most area-sensitive species in the suite and most or all sites supporting this species would also support one or more of the other species.

OBJECTIVE 1: Locate and protect any extant populations of Henslow's Sparrow; strive to maintain a regional population of 400+ individuals.

OBJECTIVE 2: Maintain existing population of 150-200 Loggerhead Shrikes, ensuring the long-term representation of the habitat-species suite in this region.

Based on published density estimates, roughly 155,000 ha of "suitable" grassland habitat is required to support the entire habitat–species suite (including 52,400 pairs of Grasshopper Sparrows); protection and management of any sites supporting Henslow's Sparrow should be the highest grassland priority.

Implementation strategy: Maintaining existing populations of any grassland bird species in the Mid-Atlanitc Ridge and Valley is closely associated with human use of their habitats. Most of the grasslands in the region are of agricultural origin, yet, many modern agricultural practices can be detrimental to successful reproduction of these species. This contradiction needs to be considered in any implementation strategy. If farmers are unable to "earn a living", these lands will be converted to other uses such as residential developments and surrounding land will revert to forest. This scenario is evident throughout the Northeast. Keeping farmland as farmland and balancing any detrimental effects of agricultural uses will be key to successful implementation. Combinations of increased awareness among conservationists and the public are essential for successful implementation.

Mitchell et al. (2000) recommend a multi-faceted approach to curtail declines in grassland breeding birds throughout the Northeast. It includes:

- Maintenance of existing grassland habitats
- restoration of degraded grasslands
- creation of new grassland habitats
- education and outreach efforts to encourage agricultural practices that reduce impacts on grassland nesting birds.
- ongoing monitoring, evaluation and assessment programs.

A list of landowner incentive programs is presented in Appendix 4 of this report and is separated out by habitat type. Landowners and managers can reference this section to locate programs that will help promote bird conservation through habitat acquisition and management and other conservation measures.

Management recommendations*:* In the Northeast, habitat destruction through urbanization, row-crop agricultural techniques, and ecological succession in which encroachment of woody species into grasslands reduce the available breeding habitat are drastically affecting populations of nearly all the priority species in this habitat suite. Fragmentation of habitat into small, widely scattered plots is another serious threat affecting multiple species.

For the most part, grassland birds in this region depend upon human activity to maintain grassland habitat. Small changes in management practices and, in some cases, creation of new grassland habitat will benefit grassland species. Grassland birds have always depended on the creation of ephemeral habitat and have a strong ability to locate and colonize new areas (Askins 2000).

Numerous studies in the Northeast have revealed a positive relationship between grassland area and the diversity and abundance of breeding birds using a grassland (Bollinger and Gavin 1992, Smith and Smith 1992, Vickery et al. 1994, Norment et al. 1999). These clear results suggest that increasing grassland area is one obvious means of increasing grassland bird populations. Consideration should be given to consolidation of adjacent grassland fields, through the elimination of hedgerows, stone fences, or tree lines, in areas where open land occupies a considerable amount of the surrounding landscape and grassland management can be identified as a reasonable management alternative. Connecting adjoining fields could increase the overall abundance or diversity of grassland birds using an area above what the fields would accommodate separately.

Intact grasslands large enough to support breeding populations of some of the more area-sensitive species and those with larger home ranges are rare in this physiographic region. In general, fields < 10 ha in size should be considered low priorities for grassland maintenance or enhancement activities, while areas > 100 ha should be the highest priorities for such actions. While grasslands as small as 150 acres may be sufficient for more area sensitive species such as Upland Sandpiper, evidence shows that these birds are more likely to persist and reproduce in grasslands of higher acreage. Ideally, grasslands of 500+ ha would provide viable populations of all species in this habitat suite (Carter 1992, Herkert 1994, Jones and Vickery 1997, Tate et al. 1999, Johnson et al. 1999).

Prescribed fire can be an effective tool to prevent woody encroachment in grasslands. Fire alters the structure of grasslands by reducing woody species cover, decreasing litter, and removing dead, aboveground vegetation (DeBano et al. 1998). These effects could reduce vegetation density and overall community height in warm season grasslands, making them more attractive as nesting habitat for grassland birds. However, fire also has been shown to increase productivity of warm season grasses (Howe 1995, DeBano et al. 1998). Prescribed fire could increase height and density of live stems of tall grasses in warm season grass plantings, making them potentially less attractive to grassland breeding birds.

Many Refuge managers and other wildlife managers in the region prefer to establish warm season instead of cool season grasses because of ease of maintenance with prescribed fire. Warm season grasses emerge late in the spring, creating a wide window of opportunity for conducting dormant-season prescribed burns, which stimulate warm season grass productivity. Studies in the Midwest have demonstrated that several species of grassland birds respond positively to prescribed fire in warm season grasslands (Sample and Mossman 1997). Species such as Grasshopper Sparrow, Savannah Sparrow, and Bobolink have shown increases in breeding activity following prescribed burns (Herkert 1994, Johnson 1997). In contrast, recent studies have shown that dormant-season burns fail to increase grass cover (Howe 1995, Mitchell et al. 2000) and often fail to reduce shrub cover (Euler 1974, Mitchell et al. 2000) in cool season grasslands.

If current mixtures of warm season grasses fail to provide adequate habitat for grassland breeding birds in the Northeast, it may be advisable for managers to focus on cool season grasslands to meet habitat objectives. As described by Norment (1999b), “if the primary management goal is to create good habitat for grassland birds, then planting nonnative cool season grasses may be a more effective strategy, at least in cooler parts of the Northeast.” As an alternative, different warm season grass mixtures may need to be developed. Work by Norment (1999a, 1999b) and Paton (1999), and studies in Wisconsin (Sample and Mossman 1997, p. 65), indicate that alternative grassland mixes, such as shorter grasses, lower seeding rates, or mixes of warm and cool season grasses, may provide better grassland bird breeding habitat.

Used on a large scale, fire can also be more cost-effective than mowing and herbicide treatments. Similar management practices that apply prescribed burns of agricultural mowing in early spring or well after breeding will likely benefit most species in this habitat suite (Carter et al. 1999, Dechant et al. 1999, Tate et al. 1999, Stewart 1975, Whitmore 1981, Frawley 1989, Rodenhouse et al. 1995, Vickery 1996). However, inappropriately applied these management tools are detrimental to grassland birds.

Mowing can also be an effective means of managing grassland habitat, but can also negatively affect grassland birds if done during the wrong time of year. Furthermore, it may not be totally effective in eliminating woody vegetation from shrub-dominated fields. Since many of the high priority grassland birds in this planning unit can raise two broods in a single breeding season, postponing mowing until after September 1 will allow these birds the greatest opportunity to maximize annual reproductive success. At a minimum, mowing should be delayed until late June to allow for young to fledge from first nesting attempts. Bollinger (1995) found that fields with early mowing dates the previous year had lower bird densities than fields with later mowing dates. He suggested that mowing-induced nest destruction was partially responsible for lower breeding densities in the following year. While some studies have shown that abundance of some grassland birds is reduced in the year following mowing (Bollinger 1995, Herkert 1994, Mazur 1996), Norment (1999a) found high numbers of grassland birds in fields that had been mowed during late summer or fall of the previous year.

If mowing every two or three years is sufficient to deter woody growth, such a schedule may be more beneficial to grassland birds than annual mowing. Warm season grassland do not need to be mowed as frequently as cool season grassland to control shrub invasion, so a three to four year schedule may be adequate for warm season grasses (Myers and Dickson 1984). Thus, dividing fields and mowing sections on a rotational basis, where feasible, may be the most appropriate means of using mowing to manage grasslands for bird populations.

Restoration or new establishment of grasslands (e.g., from strip-mined areas) may offer potential habitat. Short-eared Owls, Henslow's Sparrow and several others have been shown to breed in old strip-mines. This species suffers from loss of grassland to development, changing land-use patterns, wetland loss, and changing farming practices (Tate et al. 1999). Airports and airfields also offer excellent habitat for breeding colonies, providing level expanses of short grass fields attractive to Upland Sandpipiers and other grassland birds in this region.Restoring natural disturbance regimes such as reestablishment of the role of fire and beavers should be encouraged where ever possible.

***Research and monitoring needs*:** Monitoring of grassland birds like other species with patchy distributions will require special efforts targeted toward appropriate habitats. A monitoring program for grassland birds within the Mid-Atlantic Ridge and Valley, may be inappropriate. Rather, specific sites within the region could be included in a northeast regional program. Monitoring of IBAs may become a substantial portion of that effort.

Effective censusing for some species can be difficult and some techniques have the potential to increase nest predation. In areas with dense, regularly occurring populations of priority grassland species, local population should be monitored by annual census. Where breeding activity is very scarce and sporadic, casual reports from birdwatchers may be the only feasible means of surveying populations. Birdwatchers should be actively encouraged to search in old fields and along grassy, wetland margins throughout the summer months. Biologists employed by private consulting firms to inventory wetlands and farmlands associated with potential development sites may represent a valuable source of information on occurrences.

Specific research and monitoring needs in this physiographic area include:

- Determine precise habitat and area needs of Henslow's Sparrow in this region. Research should include demographic factors in order to determine characteristics of sites with potential to support source populations.

- Develop and implement supplemental inventory and monitoring programs to identify important sites for Henslow's Sparrow and other uncommon, patchily distributed grassland species not well monitored by BBS.

- Evaluate the effects of specific farming and management practices, such as timing of haying and grazing intensity, on productivity of grassland birds.

Other species-specific research needs can be found in their respective TNC wings management abstracts: www.tnc.org/wings/wingresource/birddata.htm

Outreach: Considerable effort has been given to developing guidelines for management of grassland habitats in the northeast (see booklets by Jones and Vickery 1997). We encourage the broad distribution of these materials throughout the region. Agency personnel could be especially effective at encouraging airports to consider habitat management for grassland birds, which may actually discourage loafing by species such as gulls and other large birds. Agency personnel also should consider their land management practices on refuges and wildlife management areas in the region and consider delaying mowing for as long as possible. Despite the overall increased awareness and outreach materials developed for this suite of species more needs to be done to reverse declining trends in populations of grassland birds in the Mid-Atlantic Ridge and Valley.

Another tool for grassland conservation with tremendous potential is conservation of open space. Conservation of open space has benefits for property tax stability, ecotourism and maintenance of nearby property values (Kerlinger 2000). Wildlife and ecosystem conservation may act as supporting criteria in qualifying a land for acquisition and increasing its priority. Unfortunately, many current priorities are targeted at purchasing access areas for recreational activities and little money is even indirectly targeted at wildlife conservation. Continuing effort to include wildlife conservation priorities in the agenda may yield great rewards.

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APPENDIX 1: ECOLOGICAL UNITS AND VEGETATION ALLIANCES

Appendix 1. Ecological Units and associated vegetation alliances within the Mid-Atlantic Ridge and Valley PIF planning unit (physiographic area 12). Modified from Keys et al. (1995). Human use categories: F = forestry, A = agriculture, R = recreation, U = urban, M = mining, D = Development.

Subunit (state)	Description	Vegetation	Human use
M221Aa (VA, WV, MD, PA)	Ridge and Valley	chestnut oak-oak-hickory forest, shortleaf pine-pitch pine-chestnut oak woodland	F
M221Ab (WV, VA, TN)	Great Valley of Virginia	chestnut oak-oak-hickory forest, shortleaf pine-virginia pine forest	F, A
M221Da (VA, MD, PA)	Northern Blue Ridge Mountains	chestnut oak-scarlet oak Forest	F, R
M221Ba (WV)	Northern High Allegheny Mountains	N. hardwood forest, yellow birch-spruce transitional forest, oak-heath dry forest	F, R, M
M221Bb (PA, MD, WV)	Western Allegheny Mountains	oak-heath dry forest, oak-pine dry forest, sycamore-box elder floodplain forest	F, R, M
?M221Bc (WV)	Southern High Allegheny Mountains	N. hardwood forest, ridgetop pitch pine-scrub oak barrens, yellow birch-spruce transitional forest	F, R, M
?M221Bd (WV)	Eastern Allegheny Mountain and Valley	oak-heath dry forest, oak-pine dry forest, ridgetop pitch pine-scrub oak barrens	F, R, A
?M221Be (WV)	Western Allegheny Mountain and Valley	oak-heath dry forest, oak-pine dry forest	A, R

APPENDIX 2: AVIFAUNAL ANALYSIS

The 166 bird breeding species within physiographic area 12 are listed in Table A2.1. All species have been ranked by the PIF prioritization system (Carter et al. 1998), and all global and physiographic area scores are presented.

A. Species of regional importance

Species with high proportions of their total populations in this region are considered of greatest importance for long-term conservation planning; ie., this region has the greatest responsibility for the long-term maintenance of their populations (Rosenberg and Wells 1995, in press). Because of the small size of this planning unit, we consider a species to be of regional importance if ≥ 2% of its population occurs in the unit (see Rosenberg and Wells 1995, in press for methods), or if the area supports an exceptionally high relative abundance (BBS data). Twenty species were estimated to have ≥ 2% of their total population breeding in the planning unit (Table A2.1).

Table A2.1. Species with high proportions of their total population in Area-12. Percent of population calculated from percent of range area, weighted by BBS relative abundance (see Rosenberg and Wells 2000). Population trend from BBS data (% change per year from 1966-1999). Area Importance (AI) CBO (Carter et al. 2000).

Species	% of pop.	N routes	rel. abun.	Pop. trend	P value	AI (reg)
Bewick's Wren (Appalachian)	??			ext?		2
Worm-eating Warbler	9.9	41	2.22 [a]	0.9	ns	5
Scarlet Tanager	8.6	60	12.22 [a]	1.1	ns	5
Lousiana Waterthrush	5.6	40	0.89	-0.3	ns	5
Acadian Flycatcher	3.5	56	4.48	0.5	ns	4
Pileated Woodpecker	2.9	59	3.93	5.8	0.00	5
Cerulean Warbler	2.8	29	0.85	-6.1	0.02	4
Wood Thrush	2.8	61	13.18	-2.5	0.00	5
Hooded Warbler	2.7	42	3.32	-0.7	ns	4
Eastern Towhee	2.6	61	15.69	**-3.0**	0.00	4
Indigo Bunting	2.5	61	30.63	**-0.9**	0.00	5
Gray Catbird	2.5	58	8.44	**-1.2**	0.04	4
Golden-winged Warbler	2.4					
Eastern Phoebe	2.1					
Tufted Titmouse	2.0	61	12.51	1.6	0.00	5

[a] Relative abundance is the highest recorded for any physiographic area

B. Species of immediate concern

The assessment of regional importance of bird species did not take into account whether those species were declining within the planning unit or elsewhere. Species of high regional importance, that are also declining, are of greatest concern in terms of short-term conservation action (Rosenberg and Wells 2000). Of the 20 species with ≥ 2% of their total population in the planning unit, 9 have declined significantly ($P < 0.10$) since 1966 (Table A2.1; including Bewick's Wren). This represents the highest proportion of priority species declining of any northeastern physiographic area **[check this]**. Among the species ranking high in regional importance, species associated with upland forest on ridges (e.g. Worm-eating Warbler, Scarlet Tanager, Black-throated Blue Warbler) tend to have stable or increasing populatins, whereas species associated with bottomland forest (e.g. Cerulean Warbler, Wood Thrush) and shrub habitats (e.g. Golden-winged Warbler, Eastern Towhee) are declining (Fig. A2.1).

Other declining species may be of local or regional concern, even if they don't rank highly in regional importance. In addition, suites of declining species may signal added regional concern for a habitat type that also supports high-priority species. The list of species with significant declining trends in Area-12 is very different from the regional importance list (Table A2.2).

Table A2.2. Species showing significant population declines within Physiographic Area 12, based on Breeding Bird Survey, 1966-1999 trends (N = 61 routes). Relative abundance is the mean number of birds/BBS route from 1990-1999. CF = conifer forests; HF = hardwood or mixed forests; ES = early successional; GR = grassland; W = wetland; UR = urban.

Species	Trend (% per year)	N	Significance	Relative abundance	Primary habitat
Ring-necked Pheasant	-24.4 [a]	7	0.02	0.11	GR
Purple Martin	-23.4 [a]	11	0.01	0.49	ES, W
(Appalachian) Bewick's Wren	-20.8	7	0.00	0.06	ES
Summer Tanager	-11.5 [a]	5	0.06	0.04	HF
Swamp Sparrow	-11.0 [a]	6	0.07	0.15	W, ES
Common Nighthawk	-10.5	5	0.02	0.05	ES
Golden-winged Warbler	-9.2	26	0.00	0.43	ES
Northern Bobwhite	-7.8	32	0.00	7.91	GR, ES
Yellow-breasted Chat	-7.2	37	0.00	3.69	ES
Cerulean Warbler	-6.9	21	0.01	0.25	HF
Black-and-white Warbler	-6.6	31	0.00	1.43	HF
Whip-poor-will	-6.5	17	0.00	0.32	ES?
Vesper Sparrow	-6.5	21	0.00	0.44	GR
Blackburnian Warbler	-6.4	10	0.09	0.27	CF, HF
N. Rough-winged Swallow	-6.4	33	0.04	1.41	ES, W
Cooper's Hawk	-5.2	5	0.00	0.01	HF
White-eyed Vireo	-4.6	30	0.00	1.26	ES
Northern/Gilded Flicker	-4.4	44	0.00	4.35	HF
Prairie Warbler	-4.2	33	0.00	1.50	ES
Brown-headed Cowbird	-4.0	44	0.00	6.04	ES
Eastern Kingbird	-3.8	43	0.00	2.45	GR, ES
Belted Kingfisher	-3.6	35	0.01	0.54	W
Eastern Wood-Pewee	-3.5	44	0.00	7.08	HF
Grasshopper Sparrow	-3.4	39	0.00	3.02	GR
House Sparrow	-3.4	44	0.00	20.85	UR
Field Sparrow	-3.3	44	0.00	12.26	ES
Downy Woodpecker	-3.1 [a]	43	0.07	2.18	HF
Least Flycatcher	-3.1	23	0.05	0.60	HF
Killdeer	-3.0	43	0.04	2.26	GR, W
Eastern Towhee	-3.0	44	0.00	14.34	ES
Eastern Meadowlark	-2.8	43	0.00	15.12	GR
Wood Thrush	-2.7	44	0.00	13.10	HF
Common Yellowthroat	-2.5	44	0.00	5.46	ES, W
Northern Parula	-2.5	36	0.01	1.69	HF
Rose-breasted Grosbeak	-2.4 [a]	26	0.08	1.16	HF
Brown Thrasher	-2.4	44	0.00	3.44	ES
Yellow-throated Vireo	-2.3	35	0.05	1.32	HF
Yellow Warbler	-2.2	44	0.00	4.07	ES
Kentucky Warbler	-1.9	32	0.03	0.85	HF
Red-winged Blackbird	-1.9	44	0.01	27.13	ES, W
Acadian Flycatcher	-1.5 [a]	42	0.07	3.32	HF
Gray Catbird	-1.3	44	0.01	9.03	ES

Northern Cardinal	-1.1	44	0.00	16.97	ES, UR
American Goldfinch	-1.1	44	0.04	14.81	ES, UR
Chipping Sparrow	-1.0	44	0.07	17.83	CF, UR
Indigo Bunting	-1.0	44	0.00	34.95	ES
Song Sparrow	-0.7	44	0.02	22.25	ES

[a] Significant declining trend for period 1980-1999 only.

C. Increasing species

It is informative to also examine the species that are increasing significantly in a physiographic area. In the Mid-Atlantic Ridge and Valley, 28 species show increasing population trends. (Table A2.3).

Table A2.3. Species showing large or significant population increases within Physiographic Area 12, based on Breeding Bird Survey, 1966-1999 trends (N = 61 routes). CF = conifer forests; HF = hardwood or mixed forests; ES = early successional; GR = grassland; W = wetland; UR = urban.

Species	Trend (% per year)	N	Significance	Relative abundance	Primary habitat
Canada Goose	41.4	15	0.09	0.83	W, UR
Tree Swallow	33.2	34	0.00	0.70	W
Red-shouldered Hawk	28.9	9	0.05	0.07	
Wood Duck	20.8 [a]	13	0.00	0.15	
House Finch	16.1	37	0.00	2.82	UR
Magnolia Warbler	8.7	12	0.04	0.51	CF
Red-tailed Hawk	8.4	22	0.06	0.17	
Bobolink	8.0	13	0.01	0.57	GR
Black-billed Cuckoo	6.7 [a]	32	0.08	0.33	HF
Hairy Woodpecker	5.6	36	0.07	0.55	
Canada Warbler	5.2 [a]	17	0.03	0.53	CF, HF
Pileated Woodpecker	4.7	44	0.00	3.00	HF
Black-throated Green Warbler	4.1	22	0.04	1.04	HF, CF
Red-bellied Woodpecker	3.3	36	0.00	2.38	HF, UR
Veery	3.2	15	0.08	1.72	HF
White-breasted Nuthatch	3.0	44	0.01	2.61	HF, UR
Turkey Vulture	2.7	41	0.02	2.93	
Ovenbird	2.7 [a]	59	0.00	9.85	HF
Blue-headed Vireo	2.6	25	0.07	0.93	HF, CF
Dark-eyed Junco	2.5	12	0.04	0.71	
Mourning Dove	2.4	44	0.00	15.44	ES, UR
Carolina Wren	2.3 [a]	50	0.00	4.43	HF, UR
Blue Jay	1.8	44	0.00	8.75	HF, UR
Eastern Bluebird	1.8	44	0.03	5.36	ES
Tufted Titmouse	1.6	44	0.00	13.24	HF, UR
American Crow	1.1	44	0.00	47.01	ES, UR
Red-eyed Vireo	1.0	44	0.01	27.22	HF
American Robin	0.7	44	0.02	39.09	ES, UR

[a] Significant increasing trend for period 1980-1999 only.

APPENDIX 3: POPULATION ESTIMATES AND ASSUMPTIONS

In this PIF bird conservation plan, several estimates are presented of relative or absolute bird population sizes. Relative population size (percent of global population) is used to illustrate the importance of a given geographic area to priority bird species, whereas estimates of absolute population size are used to set numerical population objectives for habitat-species suites within a physiographic area. Both types of estimates are derived using Relative Abundance values from the Breeding Bird Survey (BBS). These values represent the average number of birds per BBS route, across all routes in a physiographic area, for the period 1990 through 1998 (J.R. Sauer, pers. com.). These same Relative Abundance values are used to calculate Area Importance (AI) scores in the PIF species prioritization database (see Carter et al. 1999). Note that prior to July, 1999 BBS Relative Abundance was calculated differently; so any previously presented or published population estimates using these values will differ from those calculated after July 1999 (J.R. Sauer, pers. com.).

A. Percent of Population

The percent of total or global population (% pop) for a species is calculated according to the methods originally described by Rosenberg and Wells (1999). For species sampled by the BBS, the Relative Abundance value for each physiographic area is multiplied by the size of that area (km^2) and then summed across all the physiographic areas in which the species occurred to yield a total "BBS population." The area-weighted value for each physiographic area is then divided by this total to yield the proportion of the total population in that area. Thus:

$$\%\ Pop = \frac{(\text{Relative Abundance}) \times (\text{area})}{\sum (\text{Relative Abundance}) \times (\text{area})}$$

Estimates of % Pop are relative values and are not dependent on the "correctness" of Relative Abundance values for individual routes; i.e., even if BBS greatly underestimates absolute abundance of "poorly sampled" species, such as nightjars and raptors, Relative Abundance values and % pop estimates should be valid, *as long as the detectability of a species on BBS routes is relatively constant across the range of the species*. These estimates are more questionable for species occupying very patchy habitats (e.g. wetlands) in regions where BBS routes do not adequately sample these habitats.

In cases where additional survey data for groups of species are available (e.g. waterfowl, colonial waterbirds), relative abundance and % pop estimates should be calculated with these data to compare with or replace BBS data. For some species (e.g. Piping Plover), direct censuses of populations exist and should be used to calculate the percentage of the total population in each region. Wherever supplemental data exist, these new estimates should be entered into the PIF prioritization database at the Rocky Mountain Bird Observatory.

Within PIF plans, a threshold of % Pop has been determined that signifies a disproportionate abundance of a priority species in a physiographic area, or that an area shares a disproportionate responsibility for the long-term conservation of that species. This threshold is based on the size of a physiographic area relative to the total area of North America south of the open boreal forest (roughly 12 million km^2). An analysis of North American bird species' distribution and abundance (K. V. Rosenberg, unpublished data) resulted in the % Pop thresholds listed in Table A3.1.

Table A3.1. Percent of Population thresholds, signifying disproportionate population size, relative to size of physiographic area.

Physiographic area size (km^2)	Percent of North America	Percent of population threshold
< 57,000	< 0.50	2
57,000 - 80,000	0.51 - 0.69	3
81,000 - 100,000	0.70 - 0.89	4

101,000 - 125,000	0.90 - 1.09	5
126,000 - 153,000	1.10 - 1.30	6
154,000 - 173,000	1.31 - 1.49	7
174,000 - 191,000	1.50 - 1.69	8
192,000 - 222,500	1.70 - 1.89	9
223,000 - 246,000	1.90 - 2.10	10
300,000 - 500,000	2.60 - 3.50	15
> 600,000	> 5.0	25

B. Absolute population estimates

In order to set appropriate and justifiable habitat goals within physiographic areas, it is usually necessary to first set numerical population objectives for priority bird species. Population estimates rarely exist, however, for most nongame bird species. For relatively widespread and common species of forest, shrub, and some grassland habitats, the BBS may provide a landscape-level density estimates that can be converted into regional population estimates if the following assumptions are made:
(1) BBS routes constitute a random sample of the landscape;
(2) habitats in question are fairly evenly distributed across the region; and
(3) each bird species has a relatively fixed average detection distance at BBS stops, within which a reasonable estimate of the number of individuals present may be obtained.

Because BBS route locations are selected at random (ref), the first assumption is reasonable. Furthermore, several studies have shown that common habitat types are represented along secondary roads used as BBS routes in roughly the same proportions as in the overall landscape (refs). The third assumption is the most problematic; although most species probably do have a fairly constant average detection distance, selecting that distance is difficult and has a large effect on total population estimates. For example, an entire BBS route composed of 50 stops, each consisting of a 0.25 mi. (400 m)-radius circular count, potentially surveys roughly 25 km^2 of heterogeneous landscape. For a species that is detected routinely only out to 200 m at each stop, the effective area surveyed is reduced to 6.3 km^2; for a species detected only out to a distance of 100 m, the BBS route surveys 1.6 km^2. A simple method of extrapolating avian density from counts of singing males using detection threshold distances was proposed by Emlen and DeJong (1981), who also provided average maximum detection distances for 11 species of common forest birds. These distances ranged from 72 m (Blue-gray Gnatcatcher) to 186 m (Wood Thrush) and averaged 128 m for the 11 species. Emlen and DeJong (1981) further proposed that numbers of singing males be doubled to obtain a total population estimate and that a correction factor be applied to account for variable singing rate (i.e. birds that were missed because they didn't sing during the survey period).

In the absence of additional empirical data on species-specific detection distances and singing frequencies, we may take a simple and conservative approach to estimating regional population sizes from BBS relative abundance data. Species were initially placed in three categories, according to their presumed detection-threshold distances. A majority of forest-breeding songbirds and similar species of scrubby and open habitats were assigned a detection distance of 125 m (close to the average distance for forest birds in Emlen and DeJong's study) -- for these species a BBS route samples an effective area of 2.5 km^2. A second group of species that are detected primarily visually or have unusually far-carrying vocalizations in open habitats were assigned detection distances of 400 m; ie., they are detected out to the limit of each BBS circular stop (e.g. raptors, Upland Sandpiper). For these species the BBS samples roughly 25 km^2. A third group of species is considered to be intermediate and was assigned a detection distance of 200 m (effective sampling area = 6.3 km^2). These include species, such as Bobolink and Eastern Meadowlark, that are detected by a combination of song and visual observations in open habitats.

Population estimates for a physiographic area are then calculated as the average landscape-level density (number of birds per route * effective area sampled by each route) multiplied by the size (km^2) of the physiographic area. Note that landscape-level densities are not assumed to be similar to species densities in uniform optimum habitats, but rather reflect habitat heterogeneity at larger scales as sampled

by BBS routes. Because the great majority of detections on typical BBS routes are of singing or displaying males, the population estimate derived from this method is assumed to represent number of breeding pairs, unless specifically noted otherwise.

Clearly, much additional research and analysis is necessary to (1) test assumptions of this approach, (2) provide refined empirical estimates of detection distances and frequencies that can be applied to density estimation, and (3) to develop independent means of estimating population size in order refine or calibrate estimates derived from BBS data. The crude population estimates provided in this PIF plan are a reasonable starting point, however, that are based on the best information yet available, and that can serve as preliminary population objectives for priority species in each physiographic area. These population objectives can then be translated into habitat objectives, with the goal of assuring the long-term sustainability of priority species in each region. As better population data become available, these should be incorporated into later versions of the PIF conservation plans.

APPENDIX 4: LANDOWNER INCENTIVE PROGRAMS

Exerpts from Maryland PIF (1997):

There is a wide variety of incentive programs for private landowners designed to promote forest conservation and management, agricultural best management practices, and other conservation measures. Many are intended specifically to benefit wildlife. Many more provide varying degrees of incidental benefit to wildlife habitat. Incentives range from technical assistance, cost-sharing, or direct payments to property tax benefits, and both state and federal income tax deductions. Among the many relevant state and federal laws, the "Federal Agricultural Improvement and Reform Act of 1996," commonly known as the 1996 Farm Bill, is of special interest, since it is the major source of federal funding for conservation programs for privately owned land.

Indeed, the number and variety of programs, of agencies that administer them, and of eligibility conditions seem at times bewildering in their complexity. Individual programs that are here today may be gone tomorrow as federal and state priorities, laws, and appropriations change. In this brief account, it is possible to mention only some of the most important and to suggest where the landowner should go for more complete accurate, and current information.

The **Land and Water Conservation Fund** was first passed in 1964 and was amended in 2000. The LWCF provides money to federal, state, and local governments to purchase land, water and wetlands. Lands and waters purchased are used to provide recreational opportunities and clean water, preserve wildlife habitat and maintain the pristine nature of wilderness areas among others. Land is bought from landowners at fair-market value (unless the owner chooses to offer the land as a donation or at a bargain price). The Fund receives money mostly from fees paid by companies drilling offshore for oil and gas. Other funding sources include the sale of surplus federal real estate and taxes on motorboat fuel. Funding includes $900 million in permanent funding split evenly between federal and state programs, with half of state funds going to local governments. Also, $125 million are dedicated to urban parks and recreation under the **UPARR** program.

New Jersey's **Green Acres Program** awards loans and grants to local units for the acquisition of land for conservation purposes. Signed in 1999, the program will allow New Jersey to preserve 1 million acres over 10 years. Green Acres' primary focus is acquiring land that creates linkages between existing protected lands to form open space corridors. Increasingly, Green Acres gathers other public and private partners together to assist in buying and managing open space. The Program works with municipal and county governments, nonprofit organizations, and the state Farmland Preservation Program to meet compatible conservation goals. Green Acres also accepts donations of conservation and recreation land to the State. Since the 1980s, private citizens interested in land preservation have donated more than 5,400 acres of land. The **Natural Lands Trust** was established by statute to preserve land in its natural state for the enjoyment of the public and biodiversity protection. Waterfowl habitat is acquired and protected with monies from the sale of waterfowl stamps.

Pennsylvania is able to support some research and protection efforts through its **Wild Resource Conservation Fund.** The fund is financed entirely by public contributions, either through voluntary checkoffs on the state income tax return, or through direct donations or the purchase of a license plate.

Forestry Incentives

Forestry incentive programs are generally intended primarily to conserve forested land as forest and to promote reforestation and good forest management. Although the individual landowners' objectives may vary, the overall goals are to ensure a continuing supply of forest products while also providing such environmental benefits as clean water, clean air, wildlife habitat, recreation, and natural beauty.

The **Forest Stewardship Program (FSP)** in conjunction with the **Stewardship Incentive Program (SIP)** and the **Woodland Incentive Program (WIP)** are among the most important assistance programs for non-industrial private forest landowners. SIP is federally funded under the 1996 Farm Bill. WIP is funded

by the state and user fees. The administrating agency will vary by state. These programs provide both technical assistance and cost-sharing for reforestation and various forest management activities. Landowners' objectives under FSP may include wildlife habitat enhancement or the protection of soil, water quality, wetlands, and streams. They may also include, but are not required to include, the production of timber and other forest products. To be eligible, landowners must have at least 1 and no more than 1,000 acres of non-industrial forest land and an approved Forest Stewardship Plan covering all the contiguous forest and meet other requirements.

The **Forestry Incentives Program**, also federally funded under the 1996 Farm Bill, provides up to 65 percent cost-share assistance for tree planting, site preparation, and timber stand improvement. Its primary purpose is to increase future supplies of softwood sawtimber and to continue sustained-yield, multipurpose management of private non-industrial forest land. Requirements include an area of 10-1,000 acres, with the potential to produce at least 50 cubic feet per acres per year, and a forest management plan. Those interested should check with their Project Forester or Soil Conservation District (see below) for current information.

Private forest landowners may also be eligible for a variety of tax incentives. Under the **Forest Conservation and Management Agreement (FCMA)** program, the assessment of forestland for property tax purposes may be frozen at a use-rate valuation of $100 per acres. The agreement requires a Forest Stewardship Plan prepared by a professional forester and approved by the Forest Service on a minimum of 5 contiguous acres. The landowner must sign a 15-year legal contract with the state to follow the plan. There are entry and inspection fees and back-tax penalties for premature withdrawal or nonperformance.

There is also a **Federal Income Tax Incentive (PL96-451)** that permits up to $10,000 of capitalized reforestation costs each year to be eligible for a 10-percent investment tax credit and a 7-year amortization. Federal timber tax law is complicated and poorly understood, even by many IRS agents and other wise qualified accountants. It is best to consult an expert in this specialized field for advice.

Agricultural and Wetland Incentives

There are numerous incentive programs for instituting agricultural best management practices (BMPs) and various conservation practices, generally related to control of soil erosion; the protection of streams from sediment, excess nutrients, and other pollutants; management of animal wastes; and the preservation or restoration of wetlands. Incentives include3 technical advice, cost-sharing, and direct payments.

Most of the conservation programs available to farmland owners are provided under the 1996 Farm Bill. The Primary sources of information for landowners are the local offices of the USDA Farm Service Agency (FSA), the Soil Conservation District (SCD), the USDA Natural Resources Conservation Service (NRCS), and the Cooperative Extension Service-these last two having offices in each county.

The **Conservation Reserve Program (CRP)** is intended to protect highly erodable and environmentally sensitive croplands by encouraging landowners to establish grass, trees, or other long-term cover in order to reduce soil erosion, improve water quality, and enhance wildlife habitat. As a benefit for nesting birds, grass-planing contracts now provide that the grass cannot be cut before July 15. The program offers cost-share assistance and annual rental payments. Marginal pastureland may be eligible if it will be devoted to a riparian buffer to be planted to trees or other wildlife cover. Eligible acreage is ranked by the expect environmental benefits. Factors considered include vegetation most beneficial to wildlife, water and soil quality benefits, and tree plantings. Contracts are from 10-15 years. The program targets environmentally sensitive croplands and encourages producers to plant long-term conserving cover to improve soil, water and wildlife habitat.

The **Environmental Quality Incentives Program (EQIP)** combines the functions of the former Agricultural Conservation Program and Water Quality Incentives Program, among others, and is intended to maximize environmental benefits per dollar expended. It provide technical and educational assistance to farmers and cost-share and incentive payments up to 75 percent of cost for conservation practices

such as manure management facilities, riparian corridor management (including streambank stabilization, tree planting, and fencing), pastureland management and cropland erosion control practices. Nationally, overall funds are allocated half for cop production and half for livestock operations. The primary focus is soil conservation and water quality, but incentive payments can be made for wildlife habitat management.

The Wetlands Reserve Program (WRP) as amended under the 1996 Farm Bill offers landowners financial incentives and technical assistance to enhance wetlands in exchange for retiring marginal agricultural land. It focuses on restoring and protecting wetland to enhance water quality and wildlife habitat. It provides for an enrollment caop of 975,000 acres, on third to be placed in permanent easements, one their in 30-year easements, and one third in restoration-only cost-share programs. The renewed "**Swampbuster**" provisions are designed to induce farmers no to drain agricultural wetlands or else to mitigate losses.

The **Conservation of Private Grazing Land** initiative is designed to provide landowners with technical, educational, and related assistance to improve management of private grazing lands.

Wildlife Programs

Traditionally, most government wildlife programs have been geared to game species such as grouse, turkey, quail and ducks. Many projects designed to improve wetlands and other habitat for game species will also benefit nongame species, as will the more general wildlife habitat enhancements offered through forestry and agricultural programs. For more detailed information, contact your state wildlife agency, local SCD and NRCS offices, and the US Fish and Wildlife Service (USFWS).

The **Wildlife Habitat Incentives Program (WHIP)** under the 1996 Farm Bill provides $50 million over the life of the bill for wildlife habitat improvement on private lands. It is designed to address regionally specific goals by providing cost-share payments to private landowners to improve food, shelter, and nesting areas. Unlike most agricultural programs, it is not restricted to productive farmland but may be available to relatively small holdings. For eligible practices, NRCS will pay up to 75 percent of the establishment costs, up to $10,000. Projects must be maintained for at least 10 years. The program may be used for the establishment of native warm-season grasses.

USFWS programs that emphasize wetlands include North American Waterfowl Management Plan Joint Venture Projects, which offer financial assistance for the restoration of wetlands significant to waterfowl and other wetland-dependent species; and the North American Wetlands Conservation Act, which provides funding for cost-shre grants for wetland conservation projects involving acquisition, restoration, and enhancement.

Several private organization also have programs to improve habitat for game birds and sport fish. Among these are Ducks Unlimited, Trout Unlimited, the Izaak Walton League, the Ruffed Grouse Society, Quail Unlimited, and Pheasants Forever. While specifically designated for the benefit of game species, their programs may also benefit nongame wildlife. For example, the Chesapeake Bay Foundation and Ducks Unlimited are engaged in a multiyear initiative to restore, protect and enhance wetlands, stream buffers and wildlife habitat in Maryland, Virginia and Pennsylvania. Pheasants Forever, as another example, has supported landowners wishing to establish warm season grasses.

Conservation Easements

Conservation easement programs may be used to preserve from development farmland, forest land, wetlands, and other real property with conservation values. Generally, they restrict the use of land to specified purposes such as farming, forestry, or wildlife conservation. While permitting the landowner to continue managing the land productively, they generally prohibit or sharply restrict future development. Most easements are required to be in perpetuity. Most easement programs are voluntary but some easements are mandatory (e.g., under the Forest Conservation Act).

Easements may be donated to private or public land trusts or they may be transferred in a "bargain sale"

for less than full market value. Generally, depending on the individual conditions of the contract, the granting or "bargain sale" of a conservation easement will provide the landowner with income, property, and/or estate tax benefits.

According to a 1994 Land Trust Alliance survey, or the 1,100 land trusts in the United State, 80 percent devote at least some attention to protecting wildlife habitat (American Farmland, Summer 1995).

Other programs provide direct payment to the landowner in exchange for a restriction on future development. IN some cases these may also involve the transfer of development rights to an area designated for intensive development. Sale of easements frequently result in a capital gains tax to the seller but because the loss of development potential usually lower the market value of the property, it may result in lower property or estate taxes.

Programs that provide for the purchase of development rights include the federally funded **Forest Legacy Program** (reauthorized in the 1996 Farm Bill). The 1996 Farm Bill also introduced a new federal **Farmland Protection Program** to provide up to $35 million in additional support to states that have farmland conservation programs for the purchase of easements so that farmers can preserve their land in agriculture.

Natural Area Registries programs have been established to recognize landowners with areas of special significance. They provide some technical advice and a personal sense of stewardship but no financial benefit. Interested landowners should consult The Nature Conservancy.