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Breeding Birds of Virginia

Bryan D. Watts[1]

Center for Conservation Biology, College of William and Mary and

ABSTRACT

Virginia supports a diverse community of breeding birds that has been the focus of investigation for more than 400 years. The avifauna reflects the latitudinal position of the state and the fact that the border extends from the Atlantic Ocean to the Appalachian Mountains. A total of 224 species have been recorded breeding in Virginia, 214 of which are extant. Twenty species have colonized the state since 1900 including 14 since 1950. Of all extant species, 102 (48%) are considered common at least somewhere in the state and 64 (30%) are rare to very rare. Diversity varies by physiographic region with 179 (83%), 168 (78%) and 141 (66%) in the Coastal Plain, Mountains and Piedmont, respectively. Two significant landscape features make significant contributions to the state-wide diversity including tidal waters along the coast and isolated spruce-fir forests of the Appalachians that represent Pleistocene-era relicts. In all, nearly 25% of the state-wide avifauna is either wholly or nearly confined to tidal water and 10% is confined to "sky island" refugia.

Since 1978, 25 species of birds throughout Virginia have been identified as requiring immediate conservation action. A retrospective assessment shows that 5 of these species including osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), brown pelican (*Pelecanus occidentalis*) and piping plover (*Charadrius melodus*) have recovered to or beyond historic numbers. Three species including Bewick's wren (*Thryomanes bewickii*), Bachman's sparrow (*Peucaea aestivalis*) and upland sandpiper (*Bartramia longicauda*) have been lost from the state and the black rail (*Laterallus jamaicensis*), loggerhead shrike (*Lanius ludovicianus*) and Henslow's sparrow (*Ammodramus henslowii*) are in imminent danger of extirpation. Several species including the peregrine falcon, piping plover, Wilson's plover (*Charadrius wilsonia*) and red-cockaded woodpecker (*Picoides borealis*) are the focus of intensive monitoring and management programs. The underlying causes of imperilment remain unclear for several species of concern, limiting our ability to development effective conservation strategies.

[1] Corresponding author: bdwatts@wm.edu

INTRODUCTION

The ornithological record in Virginia stretches back more than four centuries. From the time of settlement at Jamestown in 1607, residents of Virginia and visitors to the state reported on the birds they encountered or were told about by Native Americans. William Strachey who lived in the settlement from 1610 to 1612 remarked at length on the birds he observed (Strachey 1849). Contemporaries including Captain John Smith, Raphe Hamor, and Edward Topsell describe many species including the waterfowl on the Chesapeake Bay, cardinals, mockingbirds and ruby-throated hummingbirds (Smith 1612, Hamor 1615, Christy 1933). Later in the century significant accounts by George Percy and John Clayton, Vicar of Crofton, would describe immense flocks of passenger pigeons and Carolina parakeets (Clayton 1685). These were followed by contributions by Thomas Glover and William Byrd (Glover 1676, Byrd 1841). Early accounts were primarily anecdotal descriptions or lists of birds within localities.

As time passed, early local accounts began to coalesce and were compiled into growing lists that began to provide a more complete assessment of the avifauna within the state. One of these early treatises, Mark Catesby's work (Catesby 1771), though centered to the south, had its beginning on Westover Plantation and generally includes the species described to that time. Thomas Jefferson would later give a list of 125 bird species for the "Virginias" (Jefferson 1787). These early treatments lead up to two significant works that gave a more complete assessment of the breeding birds including William Cabell Rives' "A catalogue of the birds of the Virginias" and Harold Bailey's "The Birds of Virginia" (Rives 1890, Bailey 1913).

Throughout the early 1900s a community of bird enthusiasts including academics and citizen volunteers would form, eventually leading to the establishment of the Virginia Society of Ornithology in 1929 (Johnston 2003). One of the stated missions of the organization was "to gather and assemble data on the birds of Virginia." Through annual forays designed to document breeding birds in specific locations that moved throughout the state an increasingly complete accounting of the breeding bird community would emerge over time. The long period of "ornithological exploration" in Virginia would eventually come to a close with Murray's production of "A check-list of the birds of Virginia" (1952). This benchmark work was a comprehensive compilation of birds observed in the state that provided a blueprint followed by subsequent updates (Larner 1979, Kain 1987, Rottenborn and Brinkley 2007). Incredibly, virtually all of the breeding species that have been added to the avifauna since Murray's initial checklist have been the result of range expansions into the state rather than new discoveries of long-existing species.

The early writings about Virginia birds were more than lists of occurrences. Descriptions of forces effecting populations such as market hunting and habitat loss demonstrate a conservation ethic that extends back in time. This ethic would build throughout the twentieth century and eventually become consolidated with the passage of Virginia's Endangered Species Act (§29.1-563 - §29.1-570) in 1972 and the federal Endangered Species Act (16 U.S.C. 1531-1543; 87 Stat. 884) in 1973. These two laws laid the foundation for the establishment of an organized effort to protect the nongame bird species of Virginia. In order to facilitate this mission, an avian taxonomic committee was formed and charged with identifying bird populations that were most in need of conservation efforts and funding. The committee would report on its assessment to a symposium held in Blacksburg during the spring of 1978 focused on

endangered and threatened plants and animals of Virginia (Linzey 1979). This event would be followed by subsequent assessments in 1989 (Terwilliger 1991) and 2005 (VDGIF 2005).

Both the avifauna of Virginia and the conditions experienced by threatened populations are ever changing. The objectives of this paper are 1) to present an updated list of the bird species known to breed in Virginia and 2) to provide an update and retrospective on the status of species that have been identified as requiring the highest level of conservation attention (i.e. recommended for threatened or endangered status or placed in Tier I) during the 1978, 1989 and 2005 benchmark treatments.

METHODS

This treatment includes all bird species (extant or extinct) with recognized breeding records within the state of Virginia as of June 2014. Presentation follows the scientific and English nomenclature, and the order, of the seventh edition of the American Ornithologists' Union check-list of North American Birds (American Ornithologists' Union 1998) through the 55th supplement (Chesser et al. 2014). In order to provide information on broad distribution within the state, status is provided by physiographic region. To simplify for this presentation, regions include the 1) Coastal Plain, 2) Piedmont and 3) Mountains and Valleys. The Coastal Plain is bounded by the Atlantic Ocean to the east and the fall line to the west. The fall line is an erosional scarp where the metamorphic rocks of the Piedmont meet the sedimentary rocks of the Coastal Plain. Between these two boundaries the land slopes gently toward the fall line where it generally reaches an elevation of less than 80 m. The Piedmont is bounded to the east by the fall line and to the west by the escarpment of the Blue Ridge. In the northern parts of the state the Piedmont is only 75 km wide but broadens to the south reaching nearly 300 km wide at the state line. The land slopes up to the west reaching 300 m in elevation at the escarpment. The Mountains and Valleys Region is bounded by the east slope of the Blue Ridge and the state line. For ease of presentation this region has been forged from three provinces including the Blue Ridge Province, the Ridge and Valley Province and the Appalachian Plateaus Province. The region supports many areas above 1,000 m including Mount Rogers (1,746 m) and Whitetop (1,682 m), the two highest peaks in the state.

Within each physiographic region, the status of breeding populations was assessed in broad categories including common, uncommon, and rare. For species with known population estimates these categories follow the values: common – greater than 10,000 pairs, uncommon – greater than 1,000 but less than 10,000 pairs, rare – greater than 100 but less than 1,000 pairs and very rare – less than 100 pairs. For species with no population estimates these categories follow the following conditions: common – species with a relatively common habitat that is found easily, uncommon – species that requires a limited habitat and may be difficult to find, rare – species that is restricted to a limited habitat or is so scarce that it cannot be expected with any certainty, very rare – species that is restricted to only a few localities or has a small number of documented occurrences in the state. Although these categories are broad and have not been subjected to rigorous evaluation, they provide a description of relative abundance.

Sources of data

The treatment of breeding status and distribution presented here relied heavily on the work of the Virginia Society of Ornithology. Over the past 70 years, the society has

produced four annotated checklists of Virginia birdlife published in the years 1952 (Murray 1952), 1979 (Larner 1979), 1987 (Kain 1987) and 2007 (Rottenborn and Brinkley 2007). These works represent an initial distillation of the historic records of the society and periodic updates reflecting advances in our understanding of the state's avifauna and its ongoing changes. In 1989, the society formed the Virginia Avian Records Committee to formalize the process for reviewing new records and for maintaining records of significance. The work presented here represents a continuation and update of the synthesis of those records presented in Rottenborn and Brinkley (2007).

Species of Conservation Concern

Many schemes exist for delineating and classifying species that are of high conservation concern. The benchmark symposia held in 1978 and 1989 used identical classification categories to rank relative endangerment and very similar methods for arriving at such classification for species (Linzey 1979, Terwilliger 1991). Both symposia brought together experts within taxonomic disciplines from throughout the state to assess the status of species of concern. Species were submitted for consideration to each taxonomic committee, assessed based on available information and placed into status categories. Four status categories were used including 1) endangered, 2) threatened, 3) special concern, and 4) status undetermined (Table 1). Although recommendations were considered in the listing process under Virginia law, it should be noted that recommendations from these symposia represent a statement about biological rather than legal status.

Methodology for the Wildlife Action Plan (VDGIF 2005) differed from the symposia in two respects including 1) how the list of species to be considered by taxonomic experts was derived and 2) the categories used for classifying relative endangerment. Managers used a matrix approach to delineate species for further consideration. The matrix included state, regional, national, and international conservation concern lists that included ranking schemes. An aggregation procedure was used to identify species that exhibited broad patterns of conservation concern. The resulting species list was assessed by a taxonomic committee and species were placed in one of four tiers that represented different levels of endangerment (Table 1).

For the purpose of this paper, I conducted a retrospective assessment of status for those bird species that were identified in either the 1978 or 1989 symposia or the Wildlife Action Plan as being in the highest categories of endangerment. This included those species recommended for endangered or threatened status in either symposia or species placed in Tier I in the Wildlife Action Plan. I describe each species overall breeding range, breeding history and distribution in Virginia, primary threats to breeding populations, rationale for endangerment recommendations, current status in Virginia and any management activities where applicable.

RESULTS

General Avifaunal Analysis

The breeding avifauna of Virginia is diverse reflecting both the geographic position of the state and the wide range of available habitats. A total of 224 species have been recorded breeding and 214 of these are extant (Appendix 1). Of the 10 species that have been lost to the state, 3 are globally extinct including the passenger pigeon, Carolina parakeet and Bachman's warbler. Of the remaining, the purple gallinule, roseate tern,

TABLE 1. Categories used to classify relative imperilment for bird species in Virginia during benchmark assessments.

Classification	Definition
Symposia (1978,1989)	
Endangered	A species which is in danger of extinction throughout all or a significant portion of its range in Virginia.
Threatened	Any species which is likely to become an endangered species in the foreseeable future through all or a significant portion of its range in Virginia.
Special Concern	A species which should be monitored because one or more of the following conditions apply to its status in Virginia: 1) it is geographically restricted or occurs at low density throughout its broad range, 2) its habitat is being threatened, 3) it is a specialist, and/or 4) other factors have been identified as imminent threats.
Undetermined	A species which has been suggested for placement in any of the above categories but for which there are insufficient data to accurately determine its status.
Action Plan (2005)	
Tier I	Critical conservation need. Faces an extremely high risk of extinction or extirpation. Populations of these species are at critically low levels, face immediate threat(s), or occur within an extremely limited range. Intense and immediate management action is needed.
Tier II	Very high conservation need. Has a high risk of extinction or extirpation. Populations of these species are at very low levels, face real threat(s), or occur within a very limited distribution. Immediate management is needed for stabilization and recovery.
Tier III	High conservation need. Extinction or extirpation is possible. Populations of these species are in decline, have declined to low levels, or are restricted in range. Management action is needed to stabilize or increase populations.
Tier IV	Moderate conservation need. The species may be rare in parts of its range, particularly on the periphery. Populations of these species have demonstrated a declining trend or a declining trend is suspected which if continued, is likely to qualify this species for a higher tier in the foreseeable future. Long-term planning is necessary to stabilize or increase populations.

upland sandpiper, Bewick's wren and Bachman's sparrow have undergone range contractions away from the state and the ring-necked pheasant and Japanese green pheasant were introduced species that were unable to sustain viable populations.

In many ways, Virginia is positioned within a latitude of faunal interchange with 30 (14% of extant species) species reaching their northern and southern breeding range limits within the state and an additional 15 (7%) reaching limits within adjacent states. Included in the list of species reaching their northern limits are red-cockaded woodpecker, Wilson's plover, white ibis and loggerhead shrike while those reaching their southern limits include common merganser, bobolink, northern harrier and northern waterthrush.

Twenty species have colonized the state since 1900 including 14 (70%) since 1950. Species documented to breed for the first time prior to 1950 include black vulture, European starling and herring gull while those after 1950 include white ibis, brown pelican and Mississippi kite. The most recent species known to colonize Virginia was the anhinga that was documented to breed for the first time in 2010. Six of the colonization events resulted from introductions. All of the remaining new species reached the state through natural range expansions. Interestingly, 8 of these expansions have moved from south to north, 5 have moved from north to south and only 1 has moved west to east.

Of all the extant species documented to breed in the state, 102 (48%) of these are considered common at least somewhere in the state (Appendix 1). Sixty-four species (30%) are rare to very rare throughout the state. Although more than half (125, 58%) of all extant breeding species occur across the entire state, diversity varies by physiographic region. The Coastal Plain supports 179 (83%) species compared to 168 (78%) and 141 (66%) in the Mountains and Piedmont, respectively. Sixty-eight (32%) species are exclusive to a single physiographic region including 40 (19%) in the Coastal Plain and 28 (13%) in the Mountains and Valleys. Twenty-two and 20 of these exclusive species are rare to very rare for the Coastal Plain and Mountains respectively. Currently, no breeding species occur exclusively in the Piedmont.

Two important physical features in Virginia contribute to the high diversity in the Mountains and Coastal Plain physiographic regions and to Virginia in general. These include the high elevations of the southern Appalachians in the Mountain region and tidal waters of the Coastal Plain. Twenty-two of the 28 species that are exclusive to the mountains are confined to high elevations that support habitats that are primarily restricted to northern latitudes. Included in this community are 10 high-elevation endemic subspecies (e.g. Appalachian winter wren – *T. h. pullus*, Appalachian sapsucker - *S. v. Appalachiensis*). Similarly, 36 of 40 species that are exclusive to the Coastal Plain are associated with tidal waters including beach-nesting birds (e.g., American oystercatcher, piping plover), seabirds (e.g., brown pelican, laughing gull), long-legged waders (e.g., snowy egret, little blue heron) and marsh birds (e.g., seaside sparrow, clapper rail).

Species of Conservation Concern

Twenty-five bird species have been recommended for threatened or endangered status or placed on Tier I in Virginia since 1978 (Appendix 1). This includes 14, 17 and 15 in 1978, 1989 and 2005 respectively. Interestingly, this includes 13 species that were only included on the list during one of these benchmark treatments and 3 species that were only included on two. This list includes species that have recovered during the

interim (e.g., osprey, bald eagle), species that in retrospect were either not felt to warrant the highest designation (e.g., brown pelican, yellow-crowned night heron), species for which information remains insufficient to assess endangerment (e.g., sharp-shinned hawk, sedge wren) or species that have been faced with emerging threats in recent times (e.g., black rail, golden-winged warbler).

Nine of the species including peregrine falcon, Wilson's plover, piping plover, upland sandpiper, gull-billed tern, red-cockaded woodpecker, loggerhead shrike, Bewick's wren, and Henslow's sparrow appear on all three lists indicating a consensus on their continued imperilment. Two of these species including upland sandpiper and Bewick's wrens have been extirpated from the state and two others including loggerhead shrike and Henslow's sparrow are on the verge of extirpation. The Bachman's sparrow, appearing on the last two lists, has also been extirpated from the state. Most of the remaining species including peregrine falcon, Wilson's plover, piping plover and red-cockaded woodpecker are the focus of intensive conservation efforts. Focused management programs have not been established for gull-billed terns, loggerhead shrikes and Henslow's sparrows.

Retrospective Assessments

Brown Pelican – Threatened (1989)

Brown pelicans breed from the Chesapeake Bay of Maryland south to Venezuela and along the Pacific Coast from California to central Chile (Shields 2002). The species is highly sensitive to organochlorine pesticides (Blus 1982) and was listed as federally threatened in 1970 due to pesticide-induced reproductive failure and associated population declines in the United States and Mexico. Brown pelicans were removed from the Endangered Species List along the Atlantic Coast of North America in 1985 due to population recovery. The small population size and the potential for human disturbance within nesting colonies were listed as reasons for proposed listing as threatened in Virginia (Byrd 1991a). The decision by the taxonomic committee to propose a status of threatened is perplexing given that the regional population had been removed from the federal list four years earlier and the species had only recently colonized the state as part of a northward range expansion.

The Brown Pelican was first found breeding in Virginia on Fisherman Island in 1987 (Williams 1989). During this same year, birds were also found nesting on Metomkin Island. In 1992, an additional colony was formed in the upper Chesapeake Bay on Shanks Island north of Tangier (Watts and Byrd 1998). In the intervening years, the colony on Fisherman Island has been lost and nesting has been documented on Sandy, Ship Shoal and Wreck Islands along the Delmarva seaside. Since its discovery, the Shanks Island colony has grown exponentially, apparently fueled by continued immigration. In 1993, there were only 53 pairs documented in this colony (Watts and Byrd 1998). The colony supported 913 and 1,857 breeding pairs in 1999 and 2013 respectively (Watts 2000a, Watts and Paxton 2014). The Virginia population is now approaching 2,500 breeding pairs (Watts and Paxton 2014). Brown pelicans were not placed within any of the conservation tiers (I through IV) in 2005 (VDGIF 2005) no focused management program has been established since the 1978 recommendation.

Yellow-crowned Night Heron – Threatened (1989)

The yellow-crowned night heron breeds throughout the new world tropics and extends into the temperate zone of North America (Watts 1995). The species breeds within coastal lowlands from Baha to Peru along the Pacific Coast and from

Connecticut south through Central America and east to Brazil. Also breeds within many island groups throughout tropical to subtropical latitudes including the Greater and Lesser Antilles and the Galapagos. In North America, the yellow-crowned night heron is centered in the Deep South and associated with the extensive swamp forests. The species experienced a dramatic northward range expansion along the Atlantic Coast between 1925 and 1960 with 11 new state breeding records over this time. Many of these areas had been previously occupied during the mid-1800s but the species underwent a rapid range contraction by the late 1800s.

The yellow-crowned night heron breeds throughout Virginia but breeding is concentrated along the coast and breeding inland is isolated and periodic (Rottenborn and Brinkley 2007). The species likely bred in Virginia during the 1800s but was apparently absent by the early 1900s. The first modern breeding records were in 1944 in King William County (F. M. Jones, unpublished report) and in 1947 in Norfolk (Darden 1947). The population within the lower tidewater areas of Norfolk, Hampton, Virginia Beach and Portsmouth appear to have increased from the 1960s to at least the early 1990s (Watts, unpublished data). A series of surveys of the Coastal Plain recorded 388 pairs in 35 colonies, 241 pairs in 40 colonies and 299 pairs in 61 colonies during the breeding seasons of 1993, 2003 and 2013 respectively (Watts and Byrd 1998, Watts and Byrd 2006, Watts and Paxton 2014) a decline of nearly 23%.

The yellow-crowned night heron was recommended for threatened status in Virginia in 1989 (Watts 1991). The reasons cited for the recommendation were ongoing conflicts between residential landowners and breeding colonies and the impact of urban development on foraging habitat and prey populations. Interestingly, the decline recorded between 1993 and 2013 has been due to the loss of birds within colonies on islands of the upper Chesapeake Bay and seaside of the Delmarva Peninsula. Despite considerable movement, the urban population has remained stable. Yellow-crowned night herons were placed in Tier II in 2005 (VDGIF 2005) reflecting a reduction in concern for the population. No active management is currently focused on this species.

Osprey – Threatened (1978)

The osprey is nearly cosmopolitan in distribution breeding throughout the northern latitudes of North America, Europe and Asia and extending south into Australasia and the Caribbean (Prevost 1983). In North America osprey breed throughout the boreal zone, along both coasts and along major water bodies (Henny 1983, Poole 1989). The Chesapeake Bay is believed to support the largest breeding population in the world (Henny 1983). As with many similar populations, ospreys in the Chesapeake Bay experienced dramatic declines in the post-World War II era due to reproductive suppression (Truitt 1969, Wiemeyer 1971, Kennedy 1977) induced by environmental contaminants (Via 1975, Wiemeyer et al. 1975). The population appears to have reached a low point by the early 1970s when Henny et al. (1974) estimated its size to be 1,450 breeding pairs. By the mid-1970s the Virginia portion of the population was estimated to have declined by approximately 80% (Stinson and Byrd 1976). The osprey was recommended for threatened status in Virginia due to the recognized population decline, ongoing reproductive suppression and concerns over management of nesting substrates (Byrd 1979).

Since the 1970s osprey reproductive rates have improved (Watts and Paxton 2007) leading to a dramatic population recovery (Watts et al. 2004). In little more than twenty years, the population has more than doubled in size. Populations within the tidal fresh

and brackish portions of the Chesapeake Bay have experienced the most rapid growth rates since the 1970s. Average doubling times between the 1970s and the 2000s for several tidal fresh and oligohaline reaches of Virginia appear to be less than 4 yrs. The population has advanced down the salinity gradient and has extended into the non-tidal portions of the Piedmont and mountains for the first time in more than a century. Osprey were not placed within any of the conservation tiers (I through IV) in 2005 (VDGIF 2005) reflecting their dramatic recovery and secure status.

Bald Eagle – Endangered (1978, 1989)

The bald eagle breeds throughout much of North America along both the Atlantic and Pacific Coasts and near significant water bodies throughout the continent (Buehler 2000). The United States Fish and Wildlife Service (FWS) originally listed the bald eagle as federally endangered on 11 March 1967 under The Endangered Species Protection Act of 1966 (16 U.S.C. 668aa-668cc) and subsequently under The Endangered Species Act of 1973 (16 U.S.C. 1531 et seq). The primary reason cited for the original listing was broad-scale population declines linked to dichloro-dephenyl-trichloroethane (DDT) and associated reproductive failure. Since the ban on DDT and formal listing under The Endangered Species Act, bald eagle populations have increased dramatically across much of the lower 48 states. During a periodic population review, the FWS determined that specific reclassification goals had been reached as outlined in regional recovery plans. The bald eagle was formally reclassified from endangered to threatened on 12 July 1995 (60 FR 36000) and subsequently removed from the list on 28 June, 2007 (72 FR 37346). The species continues to be protected under the Bald and Golden Eagle Protection Act (16 U.S.C. §668-668d).

The Virginia bald eagle population is part of the broader breeding population within the Chesapeake Bay region (Watts 2005). The population has been systematically monitored from the air since 1962 (Watts 2010) and reached a low of 26 pairs in the early 1970s (Abbott 1975). The species was proposed for endangered status within Virginia during both 1978 and 1989 (Byrd 1979b, 1991b) due to the reduced population status, contaminant-induced reproductive suppression and ongoing habitat loss. Since this time, the population has undergone a dramatic recovery with an average doubling time of approximately 8 years (Watts and Byrd 2002, Watts et al. 2007, 2008) reaching 726 pairs by 2011 (Watts and Byrd 2011). The population is now estimated to exceed 1,000 pairs (Watts and Byrd, unpublished data). Although habitat loss due to urban expansion continues to be a concern for the population (Watts 2006), the bald eagle was removed from the list of threatened and endangered species of Virginia on 1 January, 2013. The bald eagle was placed on Tier II in 2005 (VDGIF 2005) reflecting the recovered status of the population but ongoing concerns about disturbance and habitat loss.

Northern Harrier – Endangered (1989)

The northern harrier (also known as hen harrier) breeds throughout the Palearctic including North America, Europe and Asia (Brown and Amadon 1989). Breeding is widespread in North America including Alaska and Canada, extending down into the mid-continent grasslands to Oklahoma and Texas and along portions of the Pacific Coast to California (Smith et al. 2011). Along the Atlantic coast, harriers reach their southern limit of normal breeding in coastal Virginia, becoming a rare and erratic breeder further south (Dinsmore and Williams 1997).

The status of the Northern Harrier breeding population in Virginia has never been well known. Bailey (1913) describes breeding as uncommon to rare and primarily along the barrier islands. This status had apparently not changed by 1952 (Murray 1952). Watts and Rottenborn (2002) compiled observations made from 1991 – 1996 and estimated a population of 25 breeding pairs on the outer Coastal Plain. Pairs were restricted to large patches of salt marsh along the lower Western Shore of the Chesapeake Bay and bayside of Accomack County and on the barrier islands of the Eastern Shore. Very few pairs have been reported within inland locations. Watts and Rottenborn (2002) observed pairs over agricultural fields in both Henrico and Sussex Counties and Brown (1937) observed a pair near Blacksburg. Reclamation of mountain top removal coal mining throughout the southern Appalachians has expanded the range of this species (Brauning 1992) and this may result in colonization of the western mountains of Virginia. In 1989, the Northern Harrier was recommended for the status of endangered in the state of Virginia due to its small breeding population and threats to habitat (Bazuin 1991a). However, the small population size in the state appears to reflect the limited amount of habitat available for the population and the fact that Virginia represents the edge of the breeding range. There is no indication that either the distribution or status of the species has changed substantively over the past 100 years. The northern harrier was placed in Tier III in 2005 (VDGIF 2005). No management program has been established for this species.

Sharp-shinned Hawk – Threatened (1978)

The sharp-shinned hawk breeds widely throughout the Americas but is confined to boreal-type coniferous forests and is rarely observed outside of unbroken forest canopies during the breeding season (Bildstein and Meyer 2000). Within eastern North America breeding extends down the southern Appalachians in boreal forests of the higher elevations. In Virginia, the status and distribution of the breeding population has been poorly understood due both to the secretive nature of the species during the breeding season and confusion by observers in separating the species from the more widely distributed Cooper's hawk (Kain 1987). Breeding is almost entirely confined to the higher elevations in the mountains.

The sharp-shinned hawk was recommended for threatened status throughout Virginia in 1978 citing a lack of suitable habitat and ongoing threats to reproduction from persistent chemicals (Williams 1979). A nearly complete lack of information on population status was noted. Since this recommendation there has been no significant change in available information on status. The species appears to have maintained the same distribution with a similar low rate of breeding reports (Rottenborn and Brinkley 2007) compared to the 1970s. Despite being recommended for threatened status in 1978, sharp-shinned hawks were not placed within any of the conservation tiers (I through IV) in 2005 (VDGIF 2005) reflecting the ongoing confusion about status.

American Kestrel – Threatened (1978)

The American kestrel breeds throughout the Americas including North America, Central America, South America and the Caribbean wherever nest cavities are available near open habitats with short, ground vegetation (Smallwood and Bird 2002). The population in North America has remained relatively stable. However, the continental trend masks the fact that increases in the central United States are offsetting declines in the North East and Pacific Coast. Dramatic declines experienced in the North East are believed to reflect losses of open foraging habitat caused by secondary succession

on lands cleared in the late 1800s and residential development of farmlands. The population in Virginia has experienced the largest declines throughout the Coastal Plain with farmlands of the Piedmont and the Great Valley remaining strongholds. Breeding within the Coastal Plain is mostly confined to industrial and urban areas with adequate foraging habitat.

The American Kestrel was recommended for threatened status throughout Virginia in 1978 citing dramatic declines in the previous 25 years possibly due to the broad use of agricultural chemicals (Scott 1979). Since this time, the species has continued to decline throughout the state with the exception of geographic locations that continue to maintain a high proportion of area in open habitats. In recent years, populations within these locations have been assisted by nest box programs. Despite being recommended for threatened status in 1978 and continued declines since this time, not placed within any of the conservation tiers (I through IV) in 2005 (VDGIF 2005).

Peregrine Falcon – Endangered (1978, 1989), Tier I (2005)

The peregrine falcon has a global distribution and is only absent as a breeder from the Amazon Basin, Sahara Desert, most of the steppes of central and eastern Asia, and Antarctica (White et al. 2002). Historically, peregrines nested throughout North America where sufficient nesting substrate was found (Hickey 1969) and in recent decades the addition of human-made structures to the landscape has allowed them to colonize new areas (Cade et al. 1996). Throughout the 1950s and 1960s peregrine falcon populations throughout parts of Europe and North America collapsed (Hickey 1969) due to reproductive suppression related to broad-scale use of persistent pesticides (Cade et al. 1971, Peakall et al. 1975, Ratcliffe 1980). The species was believed to have been extirpated east of the Mississippi River by the early 1960s (Berger et al. 1969). The peregrine falcon was listed as endangered under the Endangered Species Conservation Act of 1969 (P.L. 91-135, 83, Stat. 275) and, subsequently, under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq). The historic status and distribution of peregrine falcons in Virginia is not completely known because no systematic survey of the species was completed prior to the loss of the population. From published records and accounts, there have been 24 historical peregrine eyries documented in the Appalachians of Virginia (Gabler 1983) and 2 nesting sites were documented on old osprey nests along the Delmarva Peninsula (Jones 1946).

The peregrine falcon was recommended for endangered status throughout Virginia in 1978 (Byrd 1979c) and 1989 (Byrd 1979c) and was placed in Tier I in 2005 (VDGIF 2005) due to the complete loss of the population and continuing concerns about disturbance. As part of a national restoration effort, the Virginia Department of Game and Inland Fisheries, Cornell University, and the College of William and Mary initiated an aggressive program to restore peregrines to Virginia in 1978. Between 1978 and 1993, approximately 250 captive-reared falcons were released in Virginia including phases on the coast (1978-1985) and mountains (1985-1993) (Watts et al. 2011a). Since 2000, nearly 300 wild-reared falcons have been translocated from the coast to the mountains of Virginia. From a single breeding pair in 1981, the Virginia population has increased to 27 known pairs in 2015 (Watts and Mojica 2015). Although the population has now reached the population size estimated from historic accounts, only 4 breeding territories have been identified in recent years and their use appears to be erratic. All remaining pairs nest on artificial structures on the Coastal Plain (Watts et al., In press). On 25 August 1999, *F. p. anatum* was officially removed from the federal list of

threatened and endangered species (Mesta 1999). Peregrine falcons continue to be listed as threatened in the state of Virginia.

Black Rail – Tier I (2005)

The black rail breeds in tidal and freshwater marshes throughout the Americas with two subspecies including the eastern black rail (*L. j. jamaicensis*) and California black rail (*L. j. coturniculus*) breeding in North America and three subspecies occurring elsewhere (Eddleman et al. 1994). Historically, the eastern form bred along the Atlantic Coast north to Massachusetts, around the Gulf Coast, inland to Colorado, south to Panama and the West Indies. The California form nests in large estuaries in California south into Baja with some inland occurrences. The range of both forms has been contracting in recent decades (Eddleman et al. 1994). In addition to a retreat from the northern and western edges of the range, the eastern black rail has virtually collapsed within the core of the breeding range (Wilson et al. unpublished data).

Historically, the black rail bred widely throughout Virginia within wet meadows inland and in tidal marshes along the coast (Wilson and Watts 2012). Most inland records are from the 1930s through the 1950s following the period of broad land clearing (e.g., Murray 1931, Handley 1939, 1941, Stevenson 1946). The species is now rare inland with periodic observations of single individuals (Rottenborn and Brinkley 2007). Breeding records along the coast included both the seaside (Bailey 1927, Clapp 1997) and bayside (Wilson et al. 2009) marshes of the Delmarva Peninsula. The species is now apparently absent from the seaside marshes and much reduced along the bayside. A systematic survey conducted in 2009 recorded no birds within 110 locations in the seaside marshes and only 10 birds within 128 locations along the bayside (Wilson et al. 2009). A subsequent survey detected only 2 birds within the same network of sites along the bayside (Wilson et al. 2015a).

The black rail population in Virginia has collapsed over the past two decades and was listed on Tier I in 2005 (VDGIF 2005). Since that time a survey program has been initiated to assess status, distribution and trends (Wilson et al. 2009, 2015). Management options are not clear at this time. Currently, the black rail is in eminent danger of extirpation in Virginia.

Wilson's Plover – Threatened (1978), Endangered (1989), Tier I (2005)

The Wilson's plover is restricted to coastal areas breeding along the Pacific Coast from California to Peru, along the Atlantic Coast from Virginia to the Florida Keys, around the Gulf Coast from Florida to Belize, and on many islands throughout the Caribbean (Corbat and Bergstrom 2000). The breeding range of the Atlantic Coast population (*C. w. wilsonia*) has been contracting south with the last known breeding record in New Jersey in 1955 (Sibley 1997) and in Maryland in 1985 (Hoffman 1996). Because they require beaches for nesting, Wilson's plovers continue to suffer from human disturbance and development throughout much of their range.

The Virginia barrier islands represent the northern range limit for breeding Wilson's plovers. Once considered common along the islands (Rives 1890, Chapman 1903, Murray 1937a) the species has experienced significant declines. Surveys of the islands from 1975 to 1988 recorded a range of 18 to 64 individuals (Williams et al. 1990). Systematic surveys for pairs between 1989 and 1995 recorded a mean of 40 pairs that used 11 of the 15 islands surveyed (Watts et al. 1996). The population declined since this time, averaging just below 30 pairs from 1997 to 2015 (VDGIF unpublished data). Wilson's plovers were recommended for threatened status in 1978 (Via 1979a),

endangered status in 1989 (Bergstrom 1991) and were placed on Tier I in 2005 (VDGIF 2005). The primary threats listed to the population for listing were mammalian and avian predation, human disturbance to nesting birds, and habitat loss. Since this time the population has been intensively monitored, a predator control program has been executed on strategic islands and nesting areas have been posted to reduce human disturbance.

Piping Plover – Threatened (1978), Endangered (1989), Tier I (2005)

The piping plover is endemic to North America breeding in three distinct geographic areas including the Atlantic Coast from the Maritime Provinces of Canada to North Carolina, the northern Great Lakes region along the shores of Lake Superior, Lake Michigan and Lake Huron, and the northern Great Plains from the southern prairies of Canada south to Kansas, Colorado and Iowa (Haig and Elliot-Smith 2004). The species has suffered significant declines throughout most of its range due to human disturbance of nesting birds, predation, development of coastal areas, and control of inland water levels (Haig 1986). The piping plover is listed as endangered in Canada and the United States Great Lakes and threatened elsewhere (Haig 1985, U.S. Fish and Wildlife Service 1985). In recent years, the species has contracted from the northern reaches of its breeding range.

In Virginia, the piping plover is restricted to beach habitats on the outer coast. Birds have been documented to nest along the western shore of the Chesapeake Bay, including Gwynn's Island (White 1981), Grandview Nature Preserve in Hampton (Akers 1975) and Craney Island Dredge Material Management in Portsmouth. Since the late 1990s the population has been confined to the barrier islands in Accomack and Northampton counties. Between 1986 and 1995 the population along the island chain was relatively stable averaging nearly 105 pairs per year (Watts et al. 1996). The population remained stable through 2003 when an intensive mammalian predator management program began to bear fruit and the population increased to 152 pairs in 2004 (Boettcher et al. 2007).

The piping plover was recommended for threatened status in 1978 (Via 1979b), endangered status in 1989 (Cross 1991), and was listed as a Tier I species in 2005 (VDGIF 2005). Reasons cited for the recommendations were human disturbance of nesting birds, habitat loss and predation pressure. Since these recommendations were made an intensive monitoring and management program has been executed within all breeding locations. Management has included control of mammalian and avian predators on targeted islands, use of nest exclosures on selected islands, and posting of all breeding areas to reduce human traffic (USFWS 2006, Boettcher et al. 2007). The population has responded dramatically, increasing to a high of 259 pairs in 2012 (VDGIF unpublished data). Piping plovers should be considered to be recovered in Virginia.

Upland Sandpiper – Threatened (1978), Endangered (1989), Tier I (2005)

The core of the upland sandpiper's breeding range includes the prairies of the north-central United States extending north into Manitoba, Saskatchewan and Alberta (Houston and Bowen 2001). Isolated breeding areas also occur in western Canada and Alaska. Beginning in the 1800s the species underwent a large range expansion into the northeastern United States coincident with broad land clearing. A peak in abundance was reached from the late 1800s to the mid-1900s before precipitous declines began in the 1950s as open habitats were lost to secondary succession and urban expansion (Foss

1994, Smith 1996). By the mid-1990s the upland sandpiper was listed as either threatened or endangered within 10 northeastern states (French and Pence 1996).

The historic stronghold for upland sandpiper in Virginia was the Great Valley with most consistent breeding in Pulaski, Montgomery, Rockbridge, Albemarle and Botetourt counties. By the mid-1980s only a few sites were known. The Virginia Breeding Bird Atlas (1989-1992) detected only one potential nesting site in Loudon County (Ridd 1990). The site supported breeding pairs from the mid-1930s through the early 1990s (Bazuin 1990). The upland sandpiper was recommended for threatened status in 1978 (Scott 1979a), endangered status in 1989 (Bazuin 1991b) and was placed on Tier I in 2005 (VDGIF 2005). Since this time, no effort to manage habitat for this species has been initiated. The upland sandpiper is now believed to have been extirpated from the state with the last known breeding site on Remington Sod Farm in Faquier County in 2001 (Iliff 2002).

Least Tern - Threatened (1978, 1989)

The least tern breeds on open sandy beaches and islands along both coasts of North America, in Central America from Mexico to Belize and Honduras, widely throughout the Caribbean Basin and inland along rivers and lakes where such habitat occurs (Thompson et al. 1997). Least terns have experienced a roller coaster of population changes over the past 150 years with steep declines related to the millenary trade followed by recovery prompted by the passage of the Migratory Bird Treaty Act, followed by inland declines related to the installation of water-control devices and coastal declines caused by development and recreational use of beaches. Although protections have been established over much of their breeding range, most populations have not recovered to former levels.

Historically, the least tern bred throughout the Coastal Plain of Virginia along the outer coast and Chesapeake Bay shorelines extending up tributaries to the fall line (Rives 1891, Murray 1952). The birds were shot out for the millinery trade by the early 1900s (Howell 1911, Bailey 1913). They returned to nest along the barrier islands (Williams et al. 1990), in lower tidewater (Grey 1950a, Murray 1952), within the upper bay islands (Akers 1979) and lower western shore (Scott 1953) of the Chesapeake Bay reaching a peak possibly during the early 1980s only to decline again (Beck et al. 1990). The population has continued to decline from 1,178 pairs in 1993 to 925 pairs in 2013 (Watts and Byrd 1998, Watts and Paxton 2014). Currently, 60% of the population nests on the barrier islands of the Eastern Shore and remaining birds are within urban areas of lower tidewater including two roof-top colonies.

The least tern was recommended for threatened status in 1978 (Akers 1979a) and 1989 (Beck 1991a). The primary reason cited for the recommendation included the loss of breeding sites due to residential development and human disturbance. Since this recommendation, the population has been monitored periodically and breeding sites have been posted to reduce human disturbance.

Gull-billed Tern - Threatened (1978, 1989), Tier I (2005)

The gull-billed tern has a nearly global distribution breeding throughout the Americas, parts of Europe, Asia, the Middle East, northwest Africa and Australia (Blakers et al. 1984, Cramp 1985, Parnell et al. 1995). Despite this wide distribution, the species is very localized throughout its range and has a relatively small population size. Two subspecies breed in North America including *S. n. aranea* that breeds from Long Island, NY to Florida and along the Gulf Coast to northeastern Mexico and *S. n.*

vanrossemi that breeds locally from California to at least northwestern Mexico. The mid-Atlantic population has experienced a severe decline and is listed as endangered in Maryland and threatened in Virginia and North Carolina (Molina and Erwin 2006).

The Gull-billed Tern has experienced extreme population swings in coastal Virginia over the past 150 years. Considered to be abundant on the Virginia barrier islands in the mid-1800s, the population was much reduced by the late 1800s (Rives 1891) and virtually shot out by the early 1900s (Bailey 1913). Throughout the early 1900s, numbers remained very low (Austin 1932). The population appears to have reached a peak by the mid-1970s. Surveys along the barrier islands declined by 88% from 1975 (high of 2,228) to 1988 (Williams et al. 1990). This decline has continued to the present time. Surveys of the Coastal Plain recorded only 294 pairs in 9 colonies in 2013 compared to 606 pairs in 30 colonies in 1993 (Watts and Byrd 1998, Watts and Paxton 2014) a decline of nearly 52%. The species is now nearly restricted to shell piles within the barrier island/lagoon system and to a single colony on the Hampton Roads Bridge Tunnel.

The gull-billed tern was recommended for threatened status in Virginia in 1978 (Akers 1979b) and 1989 (Williams 1991) as was placed in Tier I in 2005 (VDGIF 2005). The primary reasons cited for the recommendations were loss of habitat to erosion and development, human disturbance of nesting birds, threats posed by predators, and potential exposure to agricultural pesticides. Since these recommendations, most of the population has moved from the barrier islands to shell piles within the lagoon system. The underlying causes of both these shifts and the ongoing declines are unclear.

Appalachian Yellow-bellied Sapsucker – Tier I (2005)

The yellow-bellied sapsucker breeds within hardwoods and conifers across the boreal region of North America from Alaska to Newfoundland (Walters et al. 2002). Within the northeast, sapsuckers extend south to Pennsylvania and then are patchily distributed within the higher elevations along the spine of the southern Appalachians south to Georgia. A distinct subspecies (*S. v. Appalachiensis*) of the yellow-bellied sapsucker referred to as the "Appalachian yellow-bellied sapsucker" occupies the extreme southern Appalachians from southwest Virginia through Georgia (Granier 1954). The location of the transition from this form to the northern subspecies (*S. v. atrothorax*) is not clear but the latter is believed to occupy most of the Blue Ridge and northern Appalachians.

The status of the Appalachian sapsucker in Virginia has never been well known. The form appears to be restricted to southwestern Virginia including Mount Rogers within Smyth and Grayson counties (Murray 1937b, Scott 1974, Scott 1982), the vicinity of Mountain Lake in Giles County (Hostetter 1937, Burns 1960) and Tazewell County (Scott 1973). The form was placed in Tier I in 2005 (VDGIF 2005) suggesting that it is a conservation priority and among the species of greatest conservation need in the state. Why this form was selected for this status over several other southern Appalachian endemics (e.g. Appalachian winter wren (*T. h. pullus*), Appalachian Swainson's thrush (*C. u. appalachiensis*) is not clear. No targeted management program has been established for this species.

Red-cockaded Woodpecker – Endangered (1978, 1989), Tier I (2005)

The red-cockaded woodpecker is endemic to the southeastern pine ecosystem breeding from Texas and Oklahoma east to Florida and north to Virginia (Jackson

1994). Highly specialized, the species requires old growth, fire maintained pine savannas. Throughout the twentieth century advances in transportation, wood processing, and silvicultural practices shifted the emphasis from long-rotation lumber production to maximum-yield fiber production and resulted in catastrophic declines in habitat availability for this species. Breeding distribution contracted from the edges of the range and became localized within the core of the historic range where remnant old growth remained. The red-cockaded woodpecker was listed as endangered in 1970 and received protection with the passage of The Endangered Species Act in 1973 (16 U.S.C. 1531 et seq).

The historic status and distribution of the red-cockaded woodpecker in Virginia is poorly known because no systematic survey of the species was completed prior to dramatic habitat losses. Early accounts of red-cockaded woodpeckers were made from all physiographic provinces of Virginia. Jurisdictions with records include the counties of Giles (Bailey 1913), Albemarle (Rives 1890), Brunswick (Murray 1952), Dinwiddie (Murray 1952), Chesterfield (Murray 1952), Southampton (Steirly 1949), Sussex (Steirly 1950), Prince George (Steirly 1957), Greensville (Steirly 1957), Isle of Wight (Steirly 1957) and the current independent cities of Norfolk (Bailey 1913), Suffolk (Steirly 1957), Virginia Beach (Sykes 1960), and Chesapeake (van Eerden and Bradshaw, unpublished observation). The first systematic survey of the species was initiated in 1977 and resulted in the documentation of 43 clusters within 5 counties (Miller 1978). By 1980, only 9 of these clusters were still forested (Bradshaw 1990). During the 20-year period between 1980 and 2000, the decline of the Virginia population is well documented (Watts and Bradshaw 2005). By 1990, only 5 of the original 23 clusters detected in 1977 were still active. During the breeding season of 2002, Virginia supported only 2 breeding pairs and 2 clusters with solitary males.

The red-cockaded woodpecker was recommended for endangered status in 1978 (Byrd 1979d) and 1989 (Beck 1991b) and was listed on Tier I in 2005 (VDGIF 2005). The stated rationale for recommendations was the extremely low and declining population in Virginia, continued loss and degradation of required old growth forests and the fact that all remaining breeding sites existed on private lands making appropriate management unfeasible. Following these recommendations, the Virginia Department of Game and Inland Fisheries and partners have mounted extensive monitoring and management efforts for the past 30 years. Acquisition of the Piney Grove Preserve in 1998 by The Nature Conservancy was a critical turning point in the species' recovery (Watts and Bradshaw 2005). Intensive habitat and population management on this last remaining site in Virginia has resulted in a population increase from 2 breeding groups in 2002 to 13 breeding groups in 2014 (Wilson et al. 2015b). A three-phase conservation plan is in place for the Virginia population that includes the establishment of additional breeding locations (Watts and Harding 2007). Translocation of birds into the Great Dismal Swamp is planned for the fall of 2015.

Loggerhead Shrike - Threatened (1978), Endangered (1989), Tier I (2005)

The loggerhead shrike breeds throughout the southern latitudes of North America, extends north through the mid-continent open lands and south through Mexico (Yosef 1996). During the early to mid-1800s the species underwent a large range expansion throughout the forested region of eastern North America as lands were cleared for farming with first breeding records across New England and eastern Canada recorded from the 1850s to the early 1900s. As small farms were abandoned throughout the

region and were returned to forest and as horsepower gave way to tractors and more intensive farming practices, loggerhead shrikes quickly retreated south and last breeding records were recorded throughout the region from the 1970s through the 1990s.

During the heyday years, the loggerhead shrike bred throughout all physiographic regions of Virginia and has been documented in 54 of 95 counties and 12 of 41 independent cities (Luukkonen and Fraser 1987). By 1989, breeding was confirmed in only 26 counties (Trollinger and Reay 2001). Over the past 30 years, the population in Virginia has declined by more than 50% (Sauer et al. 2005) and has likely been extirpated over most of the Coastal Plain (Watts and Scholle 1999). The 2 remaining strongholds appear to be the Shenandoah Valley and the southern Piedmont with most recent records concentrated in Culpeper, Rappahannock, and Madison counties. The loggerhead shrike was recommended for threatened status in 1978 (Via 1979c) for endangered status in 1989 (Fraser 1991) and was listed as a Tier I species in 2005 (VDGIF 2005). The underlying causes for declines are poorly understood. Factors contributing to status recommendations include the loss of appropriate breeding habitat and winter mortality possibly linked to contaminants (Blumton et al. 1990). The loggerhead shrike was formally listed as threatened in Virginia in 2002 (4VAC15-20-130). Since this time, no management actions have been taken and the population has continued to decline.

Sedge Wren – Endangered (1989)

The sedge wren breeds throughout densely vegetated wetlands, wet grasslands, hayfields, and retired croplands where these habitats occur throughout the Americas (Herkert et al. 2001). The core of the North American range includes the north-central United States and Canada extending south to Missouri and Illinois. Localized breeding occurs from New England to Virginia. The sedge wren expanded its range beyond its core breeding area both east and north in response to extensive land clearing during the 1800s (Gibbs and Melvin 1992). The population within the eastern breeding range has been declining in recent decades (Gibbs and Melvin 1992, Peterjohn and Sauer 1999) due to reforestation and conversion of meadows to agriculture or development.

The sedge wren reaches its southern range limit in Virginia and is a sporadic breeder throughout all physiographic areas of the state (Rottenborn and Brinkley 2007) reflecting its nomadic life history (Herkert et al. 2001). Historically, the most consistent breeding locations have been within large wetland patches in the Coastal Plain including lower tidewater (Howell and Burleigh 1934, Grey 1950b), the lower Western Shore of the Chesapeake Bay (Watts 1992) and the bayside of Accomack County (Ake and Scott 1975, Kinzie and Scott 1983). Breeding within inland physiographic regions has been in wet fields with scattered shrubs and has been more erratic (e.g., Stevens 1952, Scott 1953, Mays 2005). Inland breeding locations may be more vulnerable to impacts such as filling and ditching that influence the "wet-dry" dynamics required by sedge wrens. The sedge wren was recommended for endangered status in 1989 (Day 1991) due to its small population size in the state and threats to inland habitats from urban expansion and the intensification of agricultural practices. Sedge wrens were placed in Tier III in 2005 (VDGIF 2005) and no management efforts have been initiated on their behalf.

Bewick's Wren - Threatened (1978), Endangered (1989), Tier I (2005)

The Bewick's wren currently breeds throughout the south-central United States into Mexico and along the Pacific Coast from British Columbia to Baha (Kennedy and White 1997). The species expanded its range east of the Mississippi River from the early 1800s through the early 1900s coincident with land clearing for small farms and pasturelands. At the peak of its distribution in the early 1900s, Bewick's wren nested from New York south to central Georgia. Decline of the eastern range began in the 1920s and continued through the 1970s as secondary succession overtook abandoned farms and as the house wren expanded its range (Kennedy and White 1997). By the 1980s, the species was absent throughout virtually the entire range east of the Mississippi River.

Historically the Bewick's wren bred throughout Virginia with the highest numbers reported from the mountains. As within other eastern states, the species appears to reach its greatest distribution and numbers in Virginia during the first half of the twentieth century only to decline sharply after 1950. By the 1970s the species was considered rare in the state. The most recent nesting record was collected from Dickenson County in 1989 (Ridd 1990). Other recent nesting records were collected from Highland County in 1982 (Teuber 1985) and Montgomery County in 1974 (Conner 1975) and 1976 (Adkisson 1991). Unpublished breeding season observations were being reported throughout the 1980s and into the 1990s. Most of these were of single birds. The last known breeding season observations are from Highland County in 1998 (S. Thornhill, unpublished data – David Shoch, personal comm.) and 1991 (D. Schwab and T. Gwynn, personal comm.), and in Dickenson County in 1990 (Sauer et al. 2007). There were no birds detected in a systematic survey of 863 patches in 2006 (Wilson et al. 2007). Bewick's wrens appear to have been extirpated from Virginia during the 1990s.

The Bewick's wren was recommended for threatened status in 1978 (Adkisson 1979), endangered status in 1989 (Adkisson 1991) and was placed in Tier I in 2005 (VDGIF 2005). Due to their clear association with small farms, townships and settlements during the height of the population expansion (Bent 1948), a suggested management approach was to utilize nest boxes within known population strongholds (Adkisson 1991). However, no active management program was initiated prior to extirpation.

Golden-winged Warbler – Tier I (2005)

The core of the breeding range for the golden-winged warbler is now centered around the Great Lakes, extending from Manitoba to Ontario in the north and including open habitats from Minnesota to New York (Confer et al. 2011). Breeding extends down the higher elevations of the southern Appalachians to Georgia. The species has undergone a dramatic range expansion over the past 150 years as forest lands were cleared for farmland and subsequently abandoned. The breeding population appears to have been released from traditional high-elevation meadows into cleared lands resulting in both a range expansion and a movement into lower altitudes. The population is now contracting back from many areas colonized more than 100 years ago. Breeding areas within the southern Appalachians have declined dramatically over recent decades while the population continues to expand in north-central states and adjacent southern Canada (Confer et al. 2003, Buehler et al. 2007). Recent declines throughout the historic core of the breeding range have been attributed to both habitat loss as secondary succession

has reclaimed much of the previously cleared land and competition with blue-winged warblers. Golden-winged and blue-winged warblers interbreed, produce fertile hybrid offspring and have been genetically isolated for a relatively short period of time (Vallender et al. 2007). Over the past 50 years blue-winged warblers have expanded their range into areas formerly occupied by golden-winged warblers.

Historically, golden-winged warblers likely bred where shrub habitats occurred throughout the higher elevations of Virginia. In recent decades, Highland and Bath counties have supported the greatest concentration of pairs (Larner and Scott 1983, Spahr 2003, Wilson et al. 2007) with smaller concentrations in Craig and Tazewell counties (Scott 1973, 1981a). Like elsewhere in the southern portion of the breeding range, the Virginia population has declined dramatically over the past several decades. Golden-winged warblers were placed in Tier I in 2005 (VDGIF 2005). Since that time, a systematic survey of 863 early successional patches in 2006 (Wilson et al. 2007) found the species breeding in much lower numbers compared to historic counts in core areas and no pairs in many counties where they were once documented to breed. In recent years, work within core breeding areas has been focused on developing potential management strategies (Bullock, Pers. Comm.).

Swainson's Warbler – Threatened (1989)

The Swainson's warbler breeds in the southeast from Texas and Oklahoma east to the Atlantic Coast and north to Maryland and Delaware but excluding peninsular Florida (Meanley 1971, Brown and Dickson 1994). Historically believed to be a specialist of southern swamp forests, a disjunct population was discovered in the southern Appalachians during the 1930s that expanded the general perception of the species. Swainson's warblers are vulnerable to changes in silvicultural practices that have altered the structure and availability of bottomland hardwood forests. The species was believed to have declined throughout the early twentieth century (Meanley 1971) but more recently may be increasing in the southern Coastal Plain but declining in the Appalachians (Hunter et al. 1993).

The Swainson's warbler breeds in two distinctly different systems in Virginia including the humid swamp forests of the southern Coastal Plain and steep ravines of the southwestern mountains (Peake 1991). A common characteristic of breeding sites within both regions is dense understory vegetation including primarily switch cane (*Arundinaria spp.*) on the coast and mountain laurel (*Kalmia latifolia*) in the mountains. Distribution in the Coastal Plain is mostly restricted to the Great Dismal Swamp (Meanley 1976, 1977) but likely includes several of the other remote swamps south of the James River. Distribution in the mountains is focused on the Holston and Big Sandy drainages and includes records from Ablemarle (Merkel 1961, Murray 1962), Amherst (Larner and Scott 1982), Caroll (Dalmas 1999), Dickenson (Peake 1986), Grayson (Dalmas 1999), Roanoke (Middleton 1981), Smyth (Decker 1999), Tazewell (Peake 1987), and Wise counties (Stevens 1976). The population within the Great Dismal Swamp appears to have declined over the past two decades (Schwab, pers. comm). Very little information is available on the population in southwestern Virginia. The population within the southern Appalachians appears to have increased since the 1960s (Sauer et al. 2001). The Swainson's warbler was recommended for threatened status in 1989 (Peake 1991) due to habitat loss in both regions of occurrence related to residential development, lumbering, and mining. The species was listed on Tier II in

2005 (VDGIF 2005). Since this time, no active management program has been initiated that focuses on habitat for Swainson's warblers.

Wayne's Black-throated Green Warbler – Tier I (2005)

The black-throated green warbler breeds in conifers throughout the northern boreal forest from Newfoundland to British Columbia where it is often the most numerous breeding bird (Morse and Poole 2005). Black-throated green warblers extend down the higher elevations of the southern Appalachians to Georgia and Alabama. The Wayne's warbler (*S. v. waynei* Bangs) is a unique, disjunt subspecies of the black-throated green warbler (Bangs 1918) that is restricted to a narrow band within the outer Coastal Plain from Virginia to South Carolina (Sprunt 1953). This population is 500 km east of the Appalachian population and 1,200 m lower in elevation. The factors that lead to the isolation of the Wayne's form from the nominate race are not known. It is possible that this subspecies was originally associated with the extensive stands of Atlantic White Cedar (*Chamaecyparis thyoides*) that were once an important component of the regions plant community (Watts et al. 2011b). Wayne's appears to reach its highest density from southeastern Virginia through northeastern North Carolina, the historic location of the most extensive tracts of white cedar (Ashe 1894). More than 100,000 acres of this habitat were harvested in the area in the late 1800s and early 1900s for the shingle industry. This event virtually eliminated this unique plant community from the region. The vegetation that has reclaimed many of the historic sites after harvest is dominated by hardwoods rather than white cedar (Frost 1987).

The Wayne's warbler appears to have declined dramatically in Virginia in recent decades (Wilson and Watts 2012). The only known regular occurrence of the form in Virginia is from the Great Dismal Swamp (Meanley 1977). High counts from the accessible portions of the swamp have varied from 12 to 23 birds (Murray 1931, Meanley 1977). A recent foray detected only 5 birds in 2000 (LeClerc 2001). A systematic survey within the breeding range of North Carolina and Virginia detected birds within 114 of 266 (52.6%) survey plots but failed to detect any within 83 plots in the swamp (Watts et al. 2011). Wayne's warbler was placed in Tier I in 2005 (VDGIF 2005). No focused management program has been established for this species.

Bachman's Sparrow – Endangered (1989), Tier I (2005)

The Bachman's sparrow is endemic to the southeastern United States where, historically, it inhabited open pinelands and savannah-like habitats (Dunning and Watts 1990, Dunning 1993). At the beginning of the 20th century, this species underwent a large northerly range expansion coincident with a broad wave of deforestation. First breeding records were reported from Illinois, Ohio, West Virginia and Pennsylvania (Eifrig 1915, Brooks 1938). Since the 1930s this trend has apparently been reversed throughout the northern fringe of the species' new range as secondary succession has reclaimed much of the landscape. This range contraction coupled with declines within the original range (Dunning and Watts 1990) has led to ongoing concerns about status.

The Bachman's sparrow was first documented as a breeding species in Virginia in 1897 (Murray 1933). Throughout the early 1900s the species was observed during the summer months in 16 different Virginia counties, primarily west of the fall line (Watts 2000b). The number of sightings declined throughout the mid-1900s ending abruptly in the late 1960s. Between 1968 and 1986, no observations of Bachman's sparrows were reported for Virginia (Watts 2000b). In 1986 the species was rediscovered in Brunswick County (Dalmas, unpublished report). This finding was followed by reports

from Sussex County (Hilton 1990) and Greensville County (Dalmas 1992). Breeding populations were also located within artillery firing ranges on Fort Picket and Fort A. P. Hill (Fleming and Alstine 1994a, 1994b). In 1996 a systematic survey of a one degree block including all modern locations outside of military installations was conducted that included portions of Brunswick, Dinwiddie, Greensville, Sussex and Southampton Counties (Watts et al. 1998). Birds were detected within only 4 (1.4%) of 280 clearcuts surveyed. Fort Picket appears to be the last site supporting the species in Virginia (Haas and Titus 1998, Murray et al. 2004).

The Bachman's sparrow was proposed for endangered status throughout Virginia in 1989 due to the ongoing population decline related to habitat loss and degradation (Ridd 1991). Recommendations were made to locate remaining breeding sites for protection and management. Although efforts have been made to survey recently occupied sites (Haas and Titus 1998, Watts et al. 1998) there has been no effort to manage either critical habitat or the population. Despite the fact that Bachman's have been retained as a Tier I species within the Virginia (VDGIF 2005) the species is believed to have been extirpated from the state in the early 2000s (Wilson and Watts 2012).

Henslow's Sparrow - Threatened (1978), Endangered (1989), Tier I (2005)

Prior to 1850, the Henslow's sparrow had two centers of occurrence including the central prairies and the coastal salt marshes from Massachussets to Virginia (Herkert et al. 2002). These two isolated populations represent weakly differentiated subspecies including *A. h. henslowii* (Audubon) that inhabited prairies and *A. h. susurrans* (Brewster) that inhabited coastal marshes. As the extensive forests between these two areas were cleared providing suitable habitat, Henslow's sparrows expanded their range. By 1915, the breeding range extended from Nebraska east to the coast with the exception of the higher elevations of the Appalachians (Hyde 1939). The range expansion brought the two subspecies into contact. Although it is presumed that the expansion moved from west to east and mostly involved the prairie subspecies, this issue remains unresolved.

During the peak in abundance, the Henslow's sparrow was considered a common breeder throughout the Coastal Plain and Piedmont of Virginia and rare in the mountains (Murray 1955). During the 1930s inland breeding records within the Coastal Plain were common (Haynes 1935, Nelson and Greenfield 1936, Mcllwaine 1940) but declined rapidly between the 1970s and 1990s. The last breeding report from Fairfax was during the atlas period (Ridd 1990). Six individuals were found in Sussex County in 1991 (Dalmas 1992) and at two locations in 1998 (Watts et al. 1998). Four birds were found in Prince William County as recently as 2005 (Day 2005). All of these records were within wet clearcuts. In the Piedmont, observations have declined dramatically with the only regular occurrences reported from Loudon County. Dulles Airport supported a high of at least 30 birds and has been the most consistently used site (Scott 1980). The Henslow's sparrow has never been regularly detected within the mountains. The single location where the species regularly occurs is the Radford Arsenal in Pulaski County (Titus et al. 1998). Of particular significance is that the coastal subspecies (*A. h. susurrans*), the historic form associated with Virginia appears to have been extirpated. Once regularly observed in Saxis Marsh (Ake and Scott 1975, Kinzie et al. 1983, Armistead 1991) there have been none recorded since 1995

(Schwab, pers. com.). The last known record suspected to be this form was in the Wallops Island salt marsh in 2006 (Smith, pers. com.).

The Henslow's sparrow was recommended for threatened status in 1978 (Scott 1979b) for endangered status in 1989 (Brindza 1991) and was placed in Tier I in 2005 (VDGIF 2005). The primary rationale cited was low population size relative to historic levels and threats to inland habitats. No active management program has been initiated to reverse population declines.

Red Crossbill – Tier I (2005)

The red crossbill breeds throughout the northern hemisphere from North America through Asia where appropriate conifers occur (Cramp and Perrins 1994, Adkisson 1996). In North America, breeds throughout Taiga forests from Alaska to Newfoundland and south along the Pacific Coast and the Rockies to the limits of conifers. Also breeds through central Mexico south to Honduras and Nicaragua. A small, disjunct population occurs in the southern Appalachians. The species represents a complex taxonomy with several distinct forms occurring in North America (Groth 1993). Eastern populations almost certainly declined during the period of widespread logging (Dickerman 1987).

In Virginia, breeding red crossbills are confined to the high elevations with records from 11 counties (Kain 1987). Focal areas appear to be Mount Rogers and vicinity (Scott 1974) and Shenandoah Mountain (Scott 1981b). Our understanding of their distribution and ecology has been hampered by their restriction to remote locations, their early breeding season, and their wide-ranging movements. Most records involve fleeting glimpses of small flocks (Murray 1966, Stevens 1968). Red crossbills were listed as a species of special concern in 1989 (Shelton 1991) and were placed on Tier I in 2005 VDGIF (2005). The primary threat listed is the ongoing loss and degradation of high-elevation forests. Given the lack of information on status, distribution and trends the selection of this species for Tier I designation over the list of other species that depend on the same habitat and have similar population concerns is unclear. No monitoring or management efforts have been initiated for this species.

DISCUSSION

The breeding avifauna of Virginia is diverse reflecting the geographic position of the state and the wide range of available habitats. In many ways, the avifauna is transitional containing a mix of species centered in the southeast or the northeast with some additional species spilling over from more inland physiographic regions. More than 14% of the species reach their southern or northern range limit within Virginia. These include southern species such as the Wilson's plover, Red-cockaded woodpecker, white ibis and loggerhead shrike and northern species such as the bobolink, northern harrier and northern waterthrush. Species that have recently expanded their range into Virginia such as the Mississippi kite and anhinga have added to this growing diversity. This pattern of south-to-north colonization is expected to continue into the foreseeable future as the ongoing shift in climate drives southern habitats into Virginia and provide conditions suitable for species historically centered in the Deep South.

One of the most significant factors contributing to bird diversity in Virginia is that the state extends from the Atlantic Ocean to the Appalachian Mountains and so includes a wide range of habitats. Two features that contribute a great deal to the state-wide diversity are tidal waters and high-elevation forests. Water and water-associated

habitats are essential to the character of the regional avifauna. Throughout the Coastal Plain, hundreds of permanently flooded tidal rivers and streams come in close contact with virtually the entire upland surface area. Subsidence of coastal sediments has "drowned" the mouths of major rivers and lead to the formation of shallow bays. For species such as the bald eagle, osprey, brown pelican and great blue heron that depend on fish or other aquatic prey, these waters define their distribution. Slowly draining soils have led to the development of extensive wetlands of numerous types. Hundreds of thousands of hectares of wetlands exist within coastal Virginia with dominant types including forested wetlands and salt marshes. Species such as seaside sparrows, least bitterns and clapper rails are confined to these habitats. Finally, sandy beaches used by American oystercatchers, least terns and piping plovers are created and maintained by the forces of tidal waters. In all, more than 50 species (representing nearly 25% of the state-wide avifauna) are either wholly or nearly confined to this landscape feature.

Near Virginia's western border, cooler temperatures and elevated humidities within higher elevations allow mountain summits to serve as refugia for species that once had much broader distributions in the region. These ecological communities are relicts of the colder Pleistocene eras when spruce-fir forests covered much of eastern North America (Delcourt and Delcourt 1981). Climate warming around the beginning of the Holocene resulted in shifts in these communities upslope and northward, leaving isolated "sky islands" within the southern Appalachians. In Virginia, high-elevation forest communities include a gradient of assemblages moving south to north that are typified by the red spruce-Fraser fir forest of Mount Rogers, the red spruce forests of Beartown Mountain (Russell County) and Allegheny Mountain (Highland County) and the mixed spruce and broadleaf forests of Mountain Lake (Giles County). The plant communities and the animal populations that depend on them are extensions of the boreal communities to the north. Because these communities represent isolated relicts, they have received attention from observers and researchers for more than 100 years (e.g., Rives 1884, 1889, Murray 1938). Currently, these refugia support 22 bird species (representing more than 10% of the state-wide diversity) that occur nowhere else in the state including 10 endemic subspecies.

With relatively few exceptions that represent habitat specialists (e.g., peregrine falcon, red-cockaded woodpecker, Swainson's warbler), most bird species in Virginia occur within upland habitats that are widely distributed throughout the state. These habitats include deciduous forests, pine forests, shrublands and grasslands. Because these habitats relate to commercial enterprises (i.e. agriculture, forestry) and are subject to residential and urban development, they have experienced dramatic swings in distribution and availability through time with obvious consequences to bird populations.

No single historical event has shaped the avian community throughout eastern North America more than the wave of land clearing that followed European colonization and the subsequent wave of secondary succession that followed. Between 1750 and 1940 forests were cleared beginning along the Atlantic Coast and moving westward as settlers dispersed from colonial centers (Williams 1989, Pimm and Askins 1995). Forests were cleared for wood products to fuel colonial development and for agricultural expansion leaving only small forest patches in the form of farm woodlots (Harper 1918). This trend would later reverse as small family farms were out competed by more productive farming operations in the Midwest, leading to a wave of

abandonment and forest regeneration (Black 1950, Irland 1982, Trani et al. 2001). Across many landscapes of the east, forest cover declined from more than 90% to below 50% only to recover back to more than 90% in the span of a century (Litvaitis 1993).

The whip-saw in the availability of open habitats has had a profound influence on the bird community within Virginia. Many species including Bachman's sparrow, loggerhead shrike, upland sandpiper, Bewick's wren and horned lark expanded their range into the state while many other early successional species experienced population increases in response to the habitat boom. Large-scale forest regeneration would reclaim these lands and result in population declines since the 1950s. Bachman's sparrow, upland sandpiper and Bewick's wren would all contract back toward their former ranges and become extirpated in the state. Although the initial land clearing predated the establishment of agencies and organizations such as the United Stated Department of Interior, the Virginia Game Commission, and the Virginia Society of Ornithology that are concerned with species conservation, species declines resulting from forest regeneration did not and these species would draw the attention of the broader conservation community. Nearly one third of all species that have been proposed for the highest level of conservation concern in Virginia are part of this habitat change.

The list of species suggested as requiring the greatest conservation attention in Virginia has evolved over the past 40 years. This evolution reflects the recovery of species that were previously imperiled, increases in information about populations that have improved our assessment of populations and risks and the emergence of new threats either real or perceived. In general, causes of imperilment fall into two classes including demographic (animals are not reproducing enough to offset mortality) and habitat loss. All of the species recommended for high conservation status where threats were demographic in nature have recovered back to historic levels. Osprey, bald eagle and peregrine falcon populations that were decimated due to contaminant-induced reproductive suppression coupled with elevated adult mortality have recovered over recent decades. The combined effects of banning DDT and establishing management programs have resulted in improved reproductive rates, releasing populations to recover. In a similar way, consistent execution of a predator control program along the barrier islands has greatly improved productivity of piping plovers and allowed the population to recover.

No species that was recommended for the highest level of concern in Virginia due primarily to habitat constraints has recovered. Although strides have been made in halting and reversing the decline of red-cockaded woodpeckers in recent years, the population remains a fraction of historic levels. Early successional species that expanded their ranges into Virginia during the height of forest clearing have mostly contracted back to their historic breeding ranges. Although we may hold some of these species in the state within agricultural strongholds like the Great Valley, the populations will never return to levels reached during the late 19th and early 20th centuries. As species have moved across the landscape in response to waves of habitat change, we must adjust our expectations for species recovery to the realities of habitat trends.

The underlying cause of imperilment is unclear for several species (e.g., gull-billed tern, black rail, Wayne's warbler, red crossbill) that have been recommended for high

concern, some of which are in imminent danger of extirpation from the state. Without some understanding of the principal drivers of declines it is not possible to design conservation strategies to reverse them. Recovery of these species depends on basic research focused on the roots of population declines and such research should be a priority moving forward.

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APPENDIX. List of bird species documented to breed in Virginia. Superscript dates associated with common names indicate dates of estimated colonization (c) or extirpation (e). See methods for description of physiographic areas and definitions of status terms. Recommendations from the avian taxonomic committee for the 1978 and 1989 symposia include E – endangered, T – threatened, SP – special concern – and SU – status undetermined. See Table 1 for definitions of these terms and for Tier designations for the 2005 committee meeting.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Canada Goose 1940(c)	*Branta canadensis*	Common	Common	Common			
Mute Swan 1957(c)	*Cygnus olor*	Uncommon	Very Rare				
Wood Duck	*Aix sponsa*	Common	Common	Common			
Gadwall 1955(c)	*Anas strepera*	Very Rare					
American Black Duck	*Anas rubripes*	Uncommon	Rare	Very Rare			Tier II
Mallard	*Anas platyrhynchos*	Common	Common	Common			
Blue-winged Teal	*Anas discors*	Very Rare	Occasional	Occasional			
Northern Pintail	*Anas acuta*	Occasional					
Green-winged Teal	*Anas crecca*	Occasional					
Hooded Merganser 1977(c)	*Lophodytes cucullatus*	Rare	Rare	Rare			
Common Merganser	*Mergus merganser*	Occasional	Occasional	Occasional			
Northern Bobwhite	*Colinus virginianus*	Uncommon	Uncommon	Uncommon			Tier IV

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Ring-necked Pheasant 2003(e)	*Phasianus colchicus*	Former	Former	Former			
Japanese Green Pheasant 1995(e)	*Phasianus versicolor*	Former					
Ruffed Grouse	*Bonasa umbellus*	Former	Uncommon	Uncommon			
Wild Turkey	*Meleagris gallopavo*	Common	Common	Common			
Pied-billed Grebe	*Podilymbus podiceps*	Very Rare	Very Rare	Very Rare			
Double-crested Cormorant 1978(c)	*Phalacrocorax auritus*	Uncommon					
Anhinga 2010(c)	*Anhinga anhinga*	Very Rare					
Brown Pelican 1987(c)	*Pelecanus occidentalis*	Uncommon				T	
American Bittern	*Botaurus lentiginosus*	Very Rare			SU		Tier II
Least Bittern	*Ixobrychus exilis*	Uncommon	Rare	Rare	SU	SU	Tier III
Great Blue Heron	*Ardea herodias*	Common	Uncommon	Rare	SC		
Great Egret	*Ardea alba*	Uncommon			SC	SC	
Snowy Egret	*Egretta thula*	Rare					

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Little Blue Heron	*Egretta caerulea*	Rare			SC	SC	Tier II
Tricolored Heron	*Egretta tricolor*					SC	Tier III
Cattle Egret	*Bubulcus ibis*						
Green Heron	*Butorides virescens*	Uncommon	Uncommon	Uncommon			Tier IV
Black-crowned Night-Heron	*Nycticorax nycticorax*	Rare	Occasional	Occasional	SC		Tier III
Yellow-crowned Night-Heron 1946(c)	*Nycticorax violacea*	Rare	Very Rare	Very Rare	SU	T	Tier II
White Ibis 1977(c)	*Eudocimus albus*	Rare					
Glossy Ibis	*Plegadis falcinellus*	Rare			SC	SC	Tier III
Black Vulture 1920(c)	*Coragyps atratus*	Common	Common	Common			
Turkey Vulture	*Cathartes aura*	Common	Common	Common			
Osprey	*Pandion haliaetus*	Common	Uncommon		T		
Mississippi Kite 1995(c)	*Ictinia mississippiensis*	Very Rare					
Bald Eagle Northern	*Haliaeetus leucocephalus*	Uncommon	Rare	Rare	E	E	Tier II
Harrier	*Circus cyaneus*	Very Rare				E	Tier III

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Sharp-shinned Hawk	*Accipiter striatus*	Rare	Rare	Uncommon	T	SU	
Cooper's Hawk	*Accipiter cooperii*	Common	Common	Common	SU	SU	
Red-shouldered	*Buteo lineatus*	Common	Uncommon	Uncommon	SC		
Hawk Broad-winged	*Buteo platypterus*	Very Rare	Very Rare	Uncommon			
Hawk Red-tailed	*Buteo jamaicensis*	Common	Common	Common			
Hawk Black Rail	*Laterallus jamaicensis*	Very Rare				SU	Tier I
Clapper Rail	*Rallus crepitans*	Common					Tier IV
King Rail	*Rallus elegans*	Uncommon	Very Rare	Very Rare		SU	Tier II
Virginia Rail	*Rallus limicola*	Uncommon	Very Rare	Very Rare		SU	Tier IV
Sora	*Porzana carolina*	Very Rare	Very Rare	Very Rare			
Purple Gallinule	*Porphyrio martinicus*	Former					
Common Moorhen	*Gallinula chloropus*	Occasional	Occasional		SU	SU	
American Coot	*Fulica americana*	Occasional	Occasional				
Black-necked Stilt	*Himantopus mexicanus*	Very Rare					
American Avocet 1971(c)	*Recurvirostra americana*	Occasional					

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
American Oystercatcher	*Haematopus palliatus*	Uncommon					Tier II
Wilson's Plover	*Charadrius wilsonia*	Very Rare			T	E	Tier I
Piping Plover	*Charadrius melodus*	Rare			T	E	Tier I
Killdeer	*Charadrius vociferus*	Common	Common	Common			
Spotted Sandpiper	*Actitis macularius*	Rare	Rare	Rare		SU	
Willet	*Tringa semipalmata*	Common					
Upland Sandpiper	*Bartramia longicauda*	Former	Former	Former	T	E	Tier I
American Woodcock	*Scolopax minor*	Uncommon	Uncommon	Uncommon			
Laughing Gull Herring	*Leucophaeus atricilla*	Common					
Gull 1942(c)	*Larus argentatus*	Common					
Great Black-backed Gull 1970(c)	*Larus marinus*	Common					
Least Tern	*Sternula antillarum*	Rare			T	T	Tier II
Gull-billed Tern	*Gelochelidon nilotica*	Rare			T	T	Tier I
Caspian Tern	*Hydroprogne caspia*	Very Rare			SC	SC	

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Roseate Tern 1927(e)	*Sterna dougallii*	Former					
Common Tern	*Sterna hirundo*	Uncommon					Tier III
Forster's Tern	*Sterna forsteri*	Uncommon			SC		Tier IV
Royal Tern	*Thalasseus maximus*	Uncommon			SC		Tier II
Sandwich Tern	*Thalasseus sandvicensis*	Very Rare			SU	SC	
Black Skimmer	*Rynchops niger*	Uncommon					Tier II
Rock Pigeon	*Columba livia*	Common	Common	Common			
Eurasian Collared-Dove 2001(e)	*Streptopelia decaocto*	Very Rare					
Passenger Pigeon	*Ectopistes migratorius*			Former			
Mourning Dove	*Zenaida macroura*	Common	Common	Common			
Yellow-billed Cuckoo	*Coccyzus americanus*	Common	Common	Common			Tier IV
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Rare	Rare	Uncommon	SU		
Barn Owl	*Tyto alba*	Very Rare	Rare	Rare	SU	SC	Tier III

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Eastern Screech-Owl	*Megascops asio*	Uncommon	Uncommon	Uncommon			
Great Horned Owl	*Bubo virginianus*	Common	Common	Common			
Barred Owl	*Strix varia*	Common	Common	Common			
Long-eared Owl	*Asio otus*		Rare	Rare		SU	
Short-eared Owl	*Asio flammeus*	Occasional	Occasional			SU	
Northern Saw-whet Owl	*Aegolius acadicus*			Very Rare		SU	Tier II
Common Nighthawk	*Chordeiles minor*	Very Rare	Rare	Rare			
Chuck-will's-widow	*Antrostomus carolinensis*	Common	Uncommon	Rare			Tier IV
Whip-poor-will	*Antrostomus vociferus*	Uncommon	Uncommon	Common			Tier IV
Chimney Swift	*Chaetura pelagica*	Common	Common	Common			Tier IV
Ruby-throated Hummingbird	*Archilochus colubris*	Common	Common	Common			
Belted Kingfisher	*Megaceryle alcyon*	Common	Common	Common			
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Uncommon	Uncommon	Uncommon			
Red-bellied Woodpecker	*Melanerpes carolinus*	Common	Common	Common			

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Yellow-bellied Sapsucker	*Sphyrapicus varius*			Rare	SU		Tier I
Downy Woodpecker	*Picoides pubescens*	Common	Common	Common			
Hairy Woodpecker	*Picoides villosus*	Uncommon	Uncommon	Uncommon			
Red-cockaded Woodpecker	*Picoides borealis*	Very Rare	Former		E	E	Tier I
Northern Flicker	*Colaptes auratus*	Common	Common	Common			
Pileated Woodpecker	*Dryocopus pileatus*	Common	Common	Common			
American Kestrel	*Falco sparverius*	Rare	Uncommon	Uncommon	T		
Peregrine Falcon	*Falco peregrinus*	Very Rare		Very Rare	E	E	Tier I
Monk Parakeet 1973(c)	*Myiopsitta monachus*	Very Rare					
Carolina Parakeet	*Conuropsis carolinensis*	Former					
Olive-sided Flycatcher	*Contopus cooperi*			Possible			
Eastern Wood-Pewee	*Contopus virens*	Common	Common	Common			Tier IV
Yellow-bellied Flycatcher	*Empidonax flaviventris*			Very Rare			
Acadian Flycatcher	*Empidonax virescens*	Common	Common	Common		SU	

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Alder Flycatcher	*Empidonax alnorum*			Rare	SU	SU	
Willow Flycatcher	*Empidonax traillii*	Very Rare	Uncommon	Uncommon			Tier IV
Least Flycatcher	*Empidonax minimus*			Rare			
Eastern Phoebe	*Sayornis phoebe*	Uncommon	Uncommon	Uncommon			
Great Crested Flycatcher	*Myiarchus crinitus*	Common	Common	Common			
Eastern Kingbird	*Tyrannus tyrannus*	Common	Common	Common			Tier IV
Scissor-tailed Flycatcher	*Tyrannus forficatus*		Occasional	Occasional			
Loggerhead Shrike	*Lanius ludovicianus*	Foremer	Very Rare	Very Rare	T	E	Tier I
White-eyed Vireo	*Vireo griseus*	Common	Common	Common			
Yellow-throated Vireo	*Vireo flavifrons*	Uncommon	Uncommon	Uncommon			Tier IV
Blue-headed Vireo	*Vireo solitarius*		Rare	Common			
Warbling Vireo	*Vireo gilvus*	Rare	Uncommon	Uncommon	SC		
Red-eyed Vireo	*Vireo olivaceus*	Common	Common	Common			
Blue Jay	*Cyanocitta cristata*	Common	Common	Common			

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
American Crow	*Corvus brachyrhynchos*	Common	Common	Common			
Fish Crow	*Corvus ossifragus*	Common	Uncommon	Uncommon			
Common Raven	*Corvus corax*		Uncommon	Common			
Horned Lark 1940(c)	*Eremophila alpestris*	Uncommon	Uncommon	Uncommon			
Purple Martin	*Progne subis*	Common	Uncommon	Uncommon			
Tree Swallow	*Tachycineta bicolor*	Uncommon	Uncommon	Rare			
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Uncommon	Common	Common			Tier IV
Bank Swallow	*Riparia riparia*	Uncommon	Uncommon	Uncommon		SC	
Cliff Swallow	*Petrochelidon pyrrhonota*	Rare	Uncommon	Uncommon	SC	SC	
Barn Swallow	*Hirundo rustica*	Common	Common	Common			
Carolina Chickadee	*Poecile carolinensis*	Common	Common	Common			
Black-capped Chickadee	*Poecile atricapillus*			Common			
Tufted Titmouse	*Baeolophus bicolor*	Common	Common	Common			
Red-breasted Nuthatch	*Sitta canadensis*			Rare			

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
White-breasted Nuthatch	*Sitta carolinensis*	Common	Common	Common		SU	
Brown-headed Nuthatch	*Sitta pusilla*	Common	Uncommon	Rare			Tier IV
Brown Creeper	*Certhia americana*	Former		Rare			Tier IV
House Wren	*Troglodytes aedon*	Common	Common	Common			
Winter Wren	*Troglodytes hiemalis*			Rare		SU	Tier II
Sedge Wren	*Cistothorus platensis*	Rare	Occasional	Occasional		E	Tier III
Marsh Wren	*Cistothorus palustris*	Common	Rare	Occasional			Tier IV
Carolina Wren	*Thryothorus ludovicianus*	Common	Common	Common			
Bewick's Wren 1989(e)	*Thryomanes bewickii*	Former	Former	Former	T	E	Tier I
Blue-gray Gnatcatcher	*Polioptila caerulea*	Common	Common	Common			
Golden-crowned Kinglet	*Regulus satrapa*			Rare		SU	
Eastern Bluebird	*Sialia sialis*	Common	Common	Common			
Veery	*Catharus fuscescens*			Uncommon			
Swainson's Thrush	*Catharus ustulatus*			Vary Rare		SU	

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Hermit Thrush	*Catharus guttatus*			Rare		SU	
Wood Thrush	*Hylocichla mustelina*	Common	Common	Common			Tier IV
American Robin	*Turdus migratorius*	Common	Common	Common			
Gray Catbird	*Dumetella carolinensis*	Common	Common	Common			Tier IV
Brown Thrasher	*Toxostoma rufum*	Common	Common	Common			Tier IV
Northern Mockingbird	*Mimus polyglottos*	Common	Common	Common			
Bachman's Warbler 1958(e)	*Vermivora bachmanii*	Former					
Golden-winged Warbler	*Vermivora chrysoptera*			Rare		SU	Tier I
Blue-winged Warbler	*Vermivora cyanoptera*		Rare	Uncommon			Tier IV
Black-and-white Warbler	*Mniotilta varia*	Uncommon	Uncommon	Common			Tier IV
Prothonotary Warbler	*Protonotaria citrea*	Common	Uncommon	Rare			Tier IV
Swainson's Warbler	*Limnothlypis swainsonii*	Rare		Very Rare		T	Tier II
Nashville Warbler	*Oreothlypis ruficapilla*			Rare			
Mourning Warbler	*Geothlypis philadelphia*			Rare		SC	

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Kentucky Warbler	*Geothlypis formosa*	Common	Common	Common			Tier Iv
Common Yellowthroat	*Geothlypis trichas*	Common	Common	Common			
Hooded Warbler	*Setophaga citrina*	Common	Common	Common			
American Redstart	*Setophaga ruticilla*	Uncommon	Uncommon	Uncommon			
Cerulean Warbler	*Setophaga cerulea*	Former	Rare	Uncommon			Tier II
Northern Parula	*Setophaga americana*	Common	Common	Common			Tier IV
Magnolia Warbler	*Setophaga magnolia*			Uncommon		SU	
Blackburnian Warbler	*Setophaga fusca*			Rare			
Yellow Warbler	*Setophaga petechia*	Uncommon	Common	Common			Tier IV
Chestnut-sided Warbler	*Setophaga pensylvanica*			Common			
Black-throated Blue Warbler	*Setophaga caerulescens*			Common			
Pine Warbler	*Setophaga pinus*	Common	Common	Common			
Yellow-rumped Warbler	*Setophaga coronata*			Rare			
Yellow-throated Warbler	*Setophaga dominica*	Common	Common	Uncommon			

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Prairie Warbler	*Setophaga discolor*	Common	Common	Common			Tier IV
Black-throated Green Warbler	*Setophaga virens*	Rare	Rare	Uncommon	SC		Tier I
Canada Warbler	*Cardellina canadensis*			Uncommon			Tier IV
Yellow-breasted Chat	*Icteria virens*	Common	Common	Common			Tier IV
Eastern Towhee	*Pipilo erythrophthalmus*	Common	Common	Common			Tier IV
Bachman's Sparrow 2000(e)	*Peucaea aestivalis*	Former	Former	Former		E	Tier I
Chipping Sparrow	*Spizella passerina*	Common	Common	Common			
Field Sparrow	*Spizella pusilla*	Common	Common	Common			Tier IV
Vesper Sparrow	*Pooecetes gramineus*		Very Rare	Uncommon			
Lark Sparrow	*Chondestes grammacus*		Occasional	Occasional			
Savannah Sparrow 1973(c)	*Passerculus sandwichensis*		Very Rare	Very Rare			
Grasshopper Sparrow	*Ammodramus savannarum*	Common	Common	Common	SC		Tier IV
Henslow's Sparrow	*Ammodramus henslowii*	Former	Rare	Rare	T	E	Tier I
Saltmarsh Sparrow	*Ammodramus caudacutus*	Rare				SC	Tier II

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Seaside Sparrow	*Ammodramus maritimus*	Common					Tier IV
Song Sparrow	*Melospiza melodia*	Common	Common	Common			
Swamp Sparrow	*Melospiza georgiana*	Very Rare		Rare		SU	
Dark-eyed Junco	*Junco hyemalis*			Common			
Summer Tanager	*Piranga rubra*	Common	Common	Uncommon			
Scarlet Tanager	*Piranga olivacea*	Uncommon	Common	Common			Tier IV
Northern Cardinal	*Cardinalis cardinalis*	Common	Common	Common			
Rose-breasted Grosbeak	*Pheucticus ludovicianus*			Uncommon			Tier IV
Blue Grosbeak	*Passerina caerulea*	Common	Common	Uncommon			
Indigo Bunting	*Passerina cyanea*	Common	Common	Common			
Dickcissel	*Spiza americana*	Rare	Rare	Rare	SU	SU	
Bobolink	*Dolichonyx oryzivorus*	Very Rar	Rare	Rare			
Red-winged Blackbird	*Agelaius phoeniceus*	Common	Common	Common			
Eastern Meadowlark	*Sturnella magna*	Common	Common	Common			Tier IV

APPENDIX continued.

Common Name	Species Name	Coastal Plain	Piedmont	Mountains	1978	1989	2005
Common Grackle	*Quiscalus quiscula*	Common	Common	Common			
Boat-tailed Grackle	*Quiscalus major*	Common					
Brown-headed Cowbird	*Molothrus ater*	Common	Common	Common			
Orchard Oriole	*Icterus spurius*	Common	Common	Common			
Baltimore Oriole	*Icterus galbula*	Rare	Common	Common			
House Finch 1976(c)	*Haemorhous mexicanus*	Common	Common	Common			
Purple Finch	*Haemorhous purpureus*			Rare		SC	
Red Crossbill	*Loxia curvirostra*			Rare		SC	Tier I
Pine Siskin	*Spinus pinus*			Rare			
American Goldfinch	*Spinus tristis*	Common	Common	Common			
House Sparrow	*Passer domesticus*	Common	Common	Common			