For a kid like me with an interest in birds, Guilford, Connecticut in the 1970s was a great place to grow up. Within a short bike ride from home I could find a wide range of habitats: woods, fields, marsh, coast, etc. A car trip on the weekends could take me to world-class concentrations of migrating birds (especially hawks) at Lighthouse Point Park in East Haven, to see the spring warblers in East Rock Park in New Haven, sandpipers and other waterbirds at Milford Point, nesting warblers and thrushes in Litchfield County, wintering gulls and waterfowl in New London, etc.

Bird populations change. Just in the decade of the 1970s I saw many changes, and with a long history of ornithological study going back to Louis Bishop and John Sage in the late 1800s, those changes are well-documented. Some species have increased in numbers, such as Red-bellied Woodpecker, Eastern Bluebird and Black Skimmer, as a result of changes in the environment. Other species have decreased. Eastern Meadowlark, Vesper Sparrow, American Kestrel and other species found in open habitat such as farmland, have all decreased as that habitat has been developed or reverted to forest. Piping Plover and Least Tern numbers decreased as the human use of their beach-front nesting sites increased.

Because of their conspicuousness, mobility and popularity, birds make good indicators, and studying trends in bird populations is an excellent way to monitor environmental health overall. Some changes in bird populations indicate undesirable trends in land use and environmental health, not just in Connecticut but across the northeastern region. Rachel Carson was alarmed by dying songbirds and alerted us all to the dangers of DDT and other pesticides in her book *Silent Spring*. Monitoring bird populations continues to be important, not just for the birds’ sake, but also for detecting and understanding broad-scale changes in our own environment. By assessing the state of the birds, therefore, we can also learn something important about the State of Connecticut.
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Least Tern family at Sandy Point in West Haven
Photo by Julian Hough
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Introduction

A primary reason Connecticut is a good place to live is its diverse and attractive landscapes and habitats that provide both visual enjoyment and places for recreation. While much of the state is urban and suburban, and growing more so, there are still shoreline beaches and tidal marshes, major rivers with accompanying grasslands, rolling farmland and forested hills.

Conserving these habitats and the biodiversity they support is critical to the future of the state as an attractive place to live and work. One of the best indicators of the health and conservation of these habitats is the state’s large number of bird species that live in them.

Connecticut Audubon Society, founded in Fairfield in 1898 as the state’s own independent bird conservation organization, is dedicated to protecting the state’s habitats and biodiversity through integrated programs in research, education and advocacy. As part of this mission Connecticut Audubon Society is launching an annual report: Connecticut State of the Birds.

This first report, organized and published by Connecticut Audubon Society, is a joint effort with authors from national conservation groups, statewide organizations, Connecticut colleges and universities and state government. It is hoped that it will provide useful information and insight for both the public and its elected representatives.

Using data on bird populations to gauge environmental health is not a perfect fit. There is always the need for more data and what is available is subject to interpretation. Furthermore, in most conservation related issues there are tradeoffs to be considered and balances struck. The purpose of Connecticut State of the Birds is to provide the best scientific data that is currently available as well as to identify where more work is needed and use this information to make sound habitat conservation decisions and investments.

To ensure that this report is both scientifically valid and impartial we have established a scientific advisory board headed by the State Ornithologist, Dr. Margaret Rubega of the University of Connecticut. However, the publication, its articles and recommendations are the responsibility of the authors and Connecticut Audubon Society, and do not necessarily imply the endorsement of the other organizations or individuals involved.

The Bald Eagle, a Federally Endangered Species is making a comeback in Connecticut and is regularly seen on the Connecticut River in winter.

Robert Martinez, President
Connecticut Audubon Society
Fairfield, Connecticut
Bird populations in Connecticut are changing, with declines particularly in those species that depend on specific habitats in contrast to those that have adapted to the variety of fragmented and mixed habitats that increasingly characterize our landscape. Of the over 400 species of birds that have been recorded in the state, 290 species occur regularly or annually, and of these, 170 are regular breeders using a variety of habitats. This report, including five independently authored articles, describes and analyzes the declines and the causes and makes recommendations for conservation actions.

Connecticut’s landscape consists of six major bird habitats. They are shoreline (beaches, dunes, bluffs and headlands), tidal marshes, inland wetlands, grasslands, shrublands and forests. The latter three are closely linked, as grasslands evolve into shrublands, which then grow into forests unless actively managed by either natural forces or humans.

The data on bird populations and trends in Connecticut come from a variety of sources and each have some shortcomings. Recommendations for their expansion and improvement are found in the report. However, taken as a whole, the information currently available is considered by scientists in the field to be sufficiently valid to allow reasonable conclusions to be drawn (see Measuring Connecticut’s Bird Population and Trends, page 8).

Although there are now significant protections for tidal marshes and inland wetlands, the quantity of this habitat has been considerably depleted over the years and, as a result, the birds that depend on it have either very small populations or are declining. Connecticut shorelines are used with increasing intensity, which except for special protections for endangered species, has a detrimental impact on the birds.

Grassland and shrubland birds show serious declines and a number are state listed (Endangered, Threatened, Special Concern) species. As farmland decreases and agricultural practices intensify, the few large grasslands that are left are places such as airports that are inaccessible and regularly mowed after the birds are done nesting. As farmland continues to be abandoned, it grows into shrubland then into forest. This has gone on long enough that shrublands are shrinking and shrubland birds, therefore, generally also show serious declines.
The state is becoming increasingly forested which should bode well for woodland species. The trends on forest-using birds however are mixed, some declining and some increasing with the group as a whole stable. The concern here is that the birds that are decreasing are the ones that need large tracts for successful breeding and the woods are becoming increasingly fragmented, which is a major conservation issue (see *Birds Dependent on Specialized Habitats*, page 24). There are other threats in forested areas, particularly to ground nesting species, including over browsing by deer.

The only groups of birds that are consistently increasing are those that are well adapted to the suburban and fragmented woodland habitats as well as those species that have moved their ranges northward. These include familiar backyard birds such as the Northern Cardinal and Downy Woodpecker.

The bird population and habitat picture is not as simple as that painted in the broad strokes above. For example, there are some birds, such as Saltmarsh Sharp-tailed Sparrow, for whom Connecticut is home to the majority of the world’s population, and others that have never been common in the state but are increasing or stable elsewhere.

Thus, there are a number of conservation issues related to individual species.

The final piece in this report, before the recommendations section, is the Department of Environmental Protection’s (DEP) article on p.34, *Developing a Comprehensive Wildlife Strategy for Connecticut*. Historically, the funding for non-game wildlife has been minimal in most states, including Connecticut. As of this writing, the details of the *Comprehensive Wildlife Strategy* were not available, and the federal funds that may become available under the State Wildlife Grants program, as well as the allocation of those funds are not known.

In conclusion, the state of the birds in Connecticut is of concern and the prognosis is for further degradation if conservation action is not accelerated. Habitats are shrinking and becoming increasingly fragmented as should be obvious to anyone who travels around the state. As a result the indicators of habitat health, our birds, are also generally declining.

The recommendations section makes a number of specific suggestions for improved management of the state’s bird populations and habitats. All of these will be best and most economically accomplished through a cooperative coordinated effort among the DEP, the Legislature and the conservation organizations in the state. Connecticut Audubon Society is committed to this effort and has initiated and published *Connecticut State of the Birds* and will do so annually to provide a common framework for all those involved.

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**Recent Event**

As *Connecticut State of the Birds* was going to press, the Connecticut Comprehensive Wildlife Conservation Strategy (CWCS) was approved by the U.S. Fish and Wildlife Service. This strategy, a massive multi-year effort by the Department of Environmental Protection covers all types of wildlife, not just birds, and runs 175 pages of text with almost 500 pages of exhibits.

We have not had the opportunity to study the CWCS in detail, so more than a general comment is not appropriate here. However, their findings, conclusions and recommendations on the threats to Connecticut’s wildlife and habitats are consistent with what you will find in *Connecticut State of the Birds* (see Recommendations, page 41).

There are a number of key open issues including the priority of numerous needs for research, monitoring, habitat management and conservation as described in the CWCS.

The Connecticut Audubon Society is ready, willing and, in fact, anxious to work in cooperation with the DEP, the Legislature and all of the state’s non-governmental organizations and academics to move ahead on a coordinated conservation program for the state. It is hoped that the CWCS will open a new chapter of cooperative effort for conservation in Connecticut.

- M.G.B.
Over 400 species of birds have occurred in the state according to the official record keeper, the Avian Records Committee of the Connecticut Ornithological Association. This includes everything from regular breeders to extreme rarities that have only been documented once, as well as two extinct species (Labrador Duck and Greater Prairie Chicken or Heath Hen). However, for the purpose of this discussion it is appropriate to focus on about 290 species that occur regularly or annually.

Virtually all of Connecticut’s birds engage in migratory behavior to some degree, from notable long-distance migrants, such as Blackpoll Warbler and American Golden Plover, to largely sedentary species that undergo irregular short movements, such as Downy Woodpecker and White-breasted Nuthatch. Many of the summer birds, such as our state bird, the American Robin, spend more time further south in the U.S., or in the tropics, than in Connecticut. About a dozen far northern species, such as Snowy Owl and Common Redpoll visit the state in winter through irruptive movements linked to boreal food supplies. Some birds breed here and migrate south and some are year-round residents.

Illustration by Paul J. Fusco

The Labrador Duck, now extinct, once wintered along the coasts of Long Island and Connecticut.

- About 290 Species of Birds Occur Annually in Connecticut
- 170 Species Regularly Nest Here
- 70-80 Species Nest in Woodlands
- 20-30 Species Nest in Shrublands
- 15-20 Species Nest in Freshwater Wetlands
- 10 Species Nest in Grasslands
Of the 290 species that occur annually, about 170 are regular breeders using a variety of habitats. The assignment of species to habitats is inexact due to overlap, but Connecticut’s varied habitats contribute to its diversity of breeding birds. A loss of breeding habitat also contributes to a loss of habitat used by migrant and resident birds as well; therefore, breeding bird populations are excellent indicators of environmental health.

The largest number of Connecticut’s breeding bird species, between 70 and 80 species, occurs in woodlands and woodland edges. These include warblers, vireos, thrushes, and some hawks and owls that use a variety of sub-habitats within the woodlands.

Grasslands and farmlands are critical to about ten species for nesting sites, including the State Endangered Upland Sandpiper and Grasshopper Sparrow, but this habitat also provides feeding areas for swallows and raptors including our smallest falcon, the declining American Kestrel.

Shrublands (brushy meadows slowly reverting to forests), support 20 to 30 breeding bird species including a number of warblers, sparrows and flycatchers, as well as provide critical winter habitat for many other species.

Freshwater wetlands directly support about 15 to 20 bird species, including the State Endangered Pied-billed Grebe and American Bittern as well as Wood Duck. A number of additional woodland and shrubland birds overlap into this category in wooded swamps and marshes. An example of the complexity of habitat use here is the American Woodcock, a game bird that needs moist shrublands and wetland edges to find its main food item, earthworms.

Tidal marsh habitat provides the only acceptable nesting areas for a variety of birds such as Willets, Clapper Rails, Saltmarsh Sharp-tailed Sparrows and Seaside Sparrows. Tidal...
marshes also provide critical feeding areas for breeding birds such as herons, migrants such as shorebirds and winterers such as raptors and waterfowl.

The remnant bits of barrier beach support the state’s only breeding sites for the Federally Threatened Piping Plover, Least Tern and Black Skimmer. Common Terns and American Oystercatchers use both barrier beaches and coastal islands. The state’s most significant coastal island, Falkner’s Island off Guilford, supports a significant colony of Common Tern and Endangered Roseate Terns. Mixed heron and egret colonies are found on other coastal islands such as Charles’ Island in Milford and Cockenoe Island in Westport.

Much of Connecticut’s natural habitat has been lost to urbanization and suburbanization. A number of birds have adapted to these areas, a process that is ongoing. Suburbs can contain elements of both woodland and shrubland, and some birds from both categories occur there. Suburbs merge into urban centers, that, at their most densely developed, support a minimal number of species dominated by non-natives such as Rock Pigeons, European Starlings and House Sparrows.

Connecticut has seen the pendulum swing from heavily wooded old growth forest in pre-Colonial time, to widespread agricultural use with the clearing of the forests by the first waves of European settlers. During the last 100 years the pendulum has swung back as the decline of agriculture has contributed to the regeneration of wooded habitats. The return of the woods, along with residential and commercial development, has been at the expense of both grassland and shrubland. Most wetland habitats now enjoy some measure of governmental protection, but much wetland was lost or altered before protection was put into place.

Over 400 Species of Birds Have Occurred Historically in Connecticut

Two Species are Extinct, Heath Hen and Labrador Duck

A typical inland wetland, a beaver marsh at Sessions Woods Wildlife Management Area in Burlington.

The non-native race of the Canada Goose stays here year round and has become a pest in many areas.
Changes in habitat over time have contributed to the current status of Connecticut's birds. In a broad sense, woodland birds are faring the best while those birds that depend on grassland, shrubland and wetland are under the most pressure. However, the fragmentation of large, wooded tracts by residential development poses a threat to those habitats as well.

Biological forces beyond the borders of Connecticut (and not completely understood) also play a role in the occurrence and distribution of our birds. For more than half a century, an overriding trend in eastern North America has been the expansion of some southern breeding species northward. The casual observer may ask about some birds that seem more common than ever before, such as Turkey Vulture, Red-bellied Woodpecker and Northern Cardinal. More recent examples include Black Vulture and Boat-tailed Grackle. Conversely, some predominantly northern species, such as Yellow-bellied Sapsucker and Magnolia Warbler have been increasing and expanding their breeding ranges in Connecticut.

Introduced, non-native species have also increased in numbers in recent decades. Mute Swans, Canada Geese (non-migratory race) and Monk Parakeets all now have substantial populations in Connecticut.

As can be seen, habitats and bird populations are closely related, making Connecticut's bird diversity an important environmental indicator. Similar to other organisms, from reptiles and amphibians to insects and plants, it is the generalists who flourish and the specialists who are particularly vulnerable. Habitat loss results in reduced biodiversity.
Measuring Connecticut's Bird Population & Trends

Dr. Chris S. Elphick, Assistant Professor, Dept. of Ecology & Evolutionary Biology, University of Connecticut, Storrs

Saltmarsh Sharp-tailed Sparrow
Assessing the state of anything requires that one look at what one has, and how it is changing. In other words, we must first take inventory, and then monitor. In this section of the report, the goal is to examine what it will actually take to assess the state of Connecticut’s birds on a regular basis, to determine what information we already have to help us achieve this task, and to consider what else we might do in the future.

What Information Do We Want?

What we really want is to have it all: detailed information on how population sizes change, and why. Collecting sufficient data to adequately achieve these goals for all of the state’s birds, however, would be extremely expensive and logistically challenging to implement. Consequently, we must face the fact that we will probably have to settle for less than the ideal, and that priorities will have to be drawn.

To date, the data that have been collected by organizations interested in the state’s birds have provided a mixed solution to the problem. Some efforts collect general data on all of the state’s birds, while others focus on particular species of special management interest. In general terms, this strategy is a sensible one. Some basic level of monitoring for all species is preferable, in order to ensure that no large changes go unnoticed. But, there also are certain species that we consider to be especially important – for instance because they are rare – and for which more detailed information is valuable.

Two key questions, however, remain. First, has a good job been done of identifying species that are the subject of detailed studies? In some cases, the answer is clearly “yes”. For instance, the Department of Environmental Protection’s (DEP) annual census of the abundance and breeding success of Endangered Piping Plovers and declining Least Terns – both beach nesting species that are extremely vulnerable to human recreation activities – is an obvious choice for detailed monitoring. Other species, however, perhaps should receive more consideration. Connecticut harbors nationally important numbers of several shrubland-nesting species (e.g., Blue-winged Warbler), for example, and these might warrant more attention than is currently the case.

Second, is the monitoring being done as effective as it could be? Ideally, a monitoring program would be based on a solid inventory of the species under study and a thorough understanding of the biological characteristics that influence our ability to track populations. The importance of an accurate inventory should be obvious – if it isn’t known where a species occurs and how many there are, how can one determine where to conduct surveys or whether populations have changed?

Understanding what is meant by the need to understand a species’ “biological characteristics” may not be so obvious, especially as the exact issues can vary among species. As an example, consider that much monitoring of breeding songbirds relies on methods that involve counting the number of vocalizing males. One of the main reasons why birds sing is to attract mates, and once they have accomplished this goal, singing rates often drop dramatically. This is why the woods fall so quiet in July. Individuals that fail to attract a mate - young males, birds in low quality habitat, or lost birds that somehow ended up outside their normal breeding range – may just keep on singing. A consequence of this is that mistimed surveys that rely on detecting birdsong may simply tell us where the “losers” are those males that are failing to contribute to the population’s long-term health.

To make these points more clear, here is a specific example. Current efforts to design a monitoring program for Common Nighthawks and Whip-poor-wills, are hampered by the fact that there is only partial knowledge of where these species are most likely to be found breeding. Currently a lot of places where these birds are reported calling in early summer are known, but it is likely, especially in the less-frequently visited portions of the state, that there are other places that are not known. There is no reason to believe, however, that these unknown places are any less deserving of...
inclusion in a night-bird monitoring program than those sites that we know about.

What Information Do We Have?

Connecticut is fortunate compared to many states, in that there is a long history of detailed ornithological knowledge. Although this history goes back much further, the best baseline for an assessment of the state’s avifauna is the atlas project conducted from 1982 to 1986, largely by volunteers (The Atlas of Breeding Birds of Connecticut, Bevier 1994). This project laid the groundwork for our understanding of modern species distributions in the state and, by virtue of its systematic nature, lacks many of the biases inherent to any compilation of anecdotal bird sightings.

There are relatively few species in Connecticut for which there is a complete inventory. Most of those species for which we do have good population estimates are either colonial waterbirds (e.g., egrets, terns) or species that are extremely rare in the state (e.g., Bald Eagle, Northern Harrier, Peregrine Falcon, Piping Plover, American Oystercatcher, Upland Sandpiper, Golden-winged Warbler, American Oystercatcher, Upland Sandpiper, Golden-winged Warbler, American Kestrel, Golden-winged Warbler, Grasshopper Sparrow). Some information is available on the population sizes for other species that are state-listed (e.g., Sharp-shinned Hawk, American Kestrel, Golden-winged Warbler, Grasshopper Sparrow) or otherwise of interest to wildlife managers (e.g., Mute Swan), and intensive research is under way to provide estimates for a few more (e.g., Chimney Swift, Yellow-breasted Chat, Saltmarsh Sharp-tailed Sparrow and Seaside Sparrow). For most bird species, however, there are only informed guesses as to population size.

For monitoring purposes, however, it is often not necessary to know population sizes, as long as we can track changes in abundance. The best known programs that are used for monitoring are the Breeding Bird Survey (U.S. Geological Survey) and the Christmas Bird Count (National Audubon Society).

No single approach, however, will provide high-quality information on all species. Breeding bird atlases, with their simple and flexible field methods, probably do as good a job of capturing distributional information on the full range of bird species as any type of survey, but they still have limitations. Nocturnal and secretive species, in particular, are often under represented unless there have been dedicated searches devoted specifically to these species, and most bird atlases come with warnings that the maps for owls, nightjars, rails and the like should be viewed as incomplete. An even greater shortcoming is that, with a few exceptions, atlases provide information only on distribution. Whether a site had one pair of nesting Common Terns or a thousand cannot be determined from a typical atlas map. With data collected at the fairly coarse resolution of approximately 25 km² blocks, relating occurrence to specific locations also can be difficult when using traditional bird atlasing methods. Ideally, an inventory of the state’s birds would tell both precisely where each species occurs, and how abundant it is at each location.

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For monitoring purposes, however, it is often not necessary to know population sizes, as long as we can track changes in abundance. The best known programs that are used for monitoring are the Breeding Bird Survey, administered by the United States Geological Survey (http://www.mbr-pwrc.usgs.gov/bbs/bbs.html) and the National Audubon Society’s Christmas Bird Count (http://www.audubon.org/bird/cbc). Neither of these surveys provides complete counts, but both provide an indication of how populations may change over time. The Breeding Bird Surveys take place along 16 survey routes in Connecticut, and...
Christmas Bird Counts are conducted in 17 count circles in the state. In neither case is the level of sampling ideal for state-level assessments; nor were these programs designed to track populations at the scale of individual states. A third source of information on large-scale changes in bird populations comes from the Summer Bird Counts, coordinated by the Connecticut Ornithological Association. Like the two continental programs, this survey has the advantage of including all species. Summer Bird Counts, however, suffer from the many limitations that apply to Christmas Bird Counts when used for monitoring (Enhancing the Scientific Value of the Christmas Bird Count, The Auk, Dunn et al. 2005, 122: 338-346).

Despite their limitations, these three surveys provide the best information available on long-term population changes for most of the state’s birds, and provide the only logical starting point for the current assessment. Supplementing these general surveys there are limited inventory and monitoring data from three (overlapping) classes of survey: those that focus on (a) particular species, (b) particular habitats, and (c) particular sites. Most such surveys are coordinated by the DEP, often with the extensive help of volunteer birders (http://dep.state.ct.us/burnatr/wildlife/geninfo/volunteer.htm).

What Information Do We Still Need?

Although we do have a general sense of where species are most likely to be found in the state, and about how the numbers of many species are changing, this knowledge is incomplete and is often biased by the propensity for both birders and researchers to spend more time in some areas than in others. Collectively, for example, Connecticut birders spend far more time birding along the coast, than in inland areas. And when they venture inland it is largely to the same few places. To really tell how species are faring it is necessary to monitor their numbers not only in the best places, but in all the places where they occur. This is why the Breeding Bird Survey is widely considered to be a superior scheme for monitoring than is the Christmas Bird Count. Breeding Bird Survey routes are selected (with a few constraints) randomly, and survey points are dictated based on a standard protocol. Because of this careful design, the surveys tell something about the fate of bird populations in almost all of the places where they occur.

This is not to say that the Breeding Bird Survey is perfect. No program is. For example, since all routes occur along roads the Survey may produce biased information about species that either avoid or gravitate towards roads. It is also acknowledged to be relatively poor at monitoring waterbirds, especially those that are secretive or colonial, and it does not provide very good information about species that occur in habitats through which roads rarely pass – such as tidal marshes. Conversely, although Christmas Bird Count data have their limitations, it is certainly not the case that they have no monitoring value. On the contrary, the count’s long history, impressive level of participation, and seasonal focus on mid-winter when few monitoring efforts occur, makes them an important part of the existing body of knowledge.

But it is also important to say that we can do better, and that effective monitoring of our state’s bird populations will require us to build on existing efforts. Attempting to emulate the goals of the Breeding Bird Survey – by choosing monitoring sites that will yield information representative of the entire state’s avifauna, irrespective of their apparent attractiveness – should be an important goal in any such planning. More generally, it is critical to plan monitoring with an eye to how the data will be analyzed, this means consulting those who have expertise in statistical analysis and experimental design before actually starting to collect data.
First there is a clear need to coordinate inventory and monitoring efforts and the use of the data that are collected. Ideally coordination would occur at several levels. First and foremost, the various organizations involved in bird conservation in the state must cooperate to develop a joint strategy for collecting data that will meet everyone’s needs. This means explicitly identifying and prioritizing goals so that they can be addressed systematically. Without such coordination, data collection will be piecemeal and we will fail to efficiently use the abundant skills, but limited time, of the state’s birders, to whom the job of data collection will inevitably fall.

Second, it is important not to succumb to the myopic view that our interests end at the state’s borders. Political boundaries are certainly relevant to our actions and our obligations, but not to the birds. By ignoring what is going on in neighboring states we will fail to meet our responsibilities to the state in which we live. Fortunately achieving such coordination is already happening through the actions of Partners in Flight’s (PIF) Northeast Working Group. Supporting these efforts should be high priority.

Third, there is a need to coordinate the way in which data are collated and analyzed. In an ideal world there would be a single location where all of the data on Connecticut’s bird populations could be gathered and made available for analyses. Currently, however, data are scattered across various locations and within various organizations. In many cases data are not being analyzed at all. If we are to be serious about monitoring, then we need to take database development and data analysis as seriously as we take data collection, because without careful analysis the hard work of field workers will be wasted.

Again, there is a solution. The Cornell Laboratory of Ornithology has developed web-based methods for archiving data so that they are available both to the organizations that collect them, and (where appropriate) to others. Taking advantage of these methods, and the considerable expertise at Cornell, should be a high priority for organizations interested in managing bird populations in Connecticut. Again, working together to provide a joint solution to this problem will, ultimately, be far more useful and less costly than if each organization attempts to do this on their own. Working together also reduces the chances that data will simply end up in dusty file cabinets where no one pays attention to their existence.

The Future of Bird Monitoring in Connecticut

To move forward, organizations interested in bird conservation, whether from a regulatory, scientific, or advocacy stance, need to collaborate to refine their monitoring goals and then systematically implement programs to meet them. In some cases existing programs are adequate – on-going beach-nesting bird surveys are a good example. In other cases there will be a need to design new studies – breeding night-birds and saltmarsh birds fall into this category. And for yet others, it may be necessary to expand or modify current efforts to improve the degree to which surveys represent conditions across the entire state, this might be the case for shrubland-nesting birds.

It is not for one person to determine what changes should occur in order to better monitor the state of Connecticut’s birds in the future, but I will end with three specific suggestions that I think should be considered.
First, there has been much interest in conducting a second breeding bird atlas project in order to assess how distributions of birds have changed since the previous atlas. Now is the time to consider doing such a project to use as a baseline for future assessments of the state’s bird populations.

Second, whether an atlas project comes to pass or not, it would be extremely valuable to develop a statewide inventory of which birds actually occur on the state’s protected lands. Any decision about what conservation actions should be taken in the future should be grounded in a careful assessment of what we have already protected. Connecticut has a long history of land protection, and many different organizations contribute resources to protecting open space and creating conservation lands (according to the Land Trust Alliance there are over 90 land trusts alone in Connecticut). Currently, however, we have only very limited information about what species occur in these protected areas. Development of an easy-to-implement survey that land trusts, birding groups and other interested individuals can use to inventory their properties, and a centralized database where the resulting information can be stored and accessed would allow us to focus limited conservation resources on those species that are least well served by our existing system of protection.

Third, I believe there is a need to develop a coordinated effort to improve our monitoring of the most important sites for bird conservation in the state. Audubon Connecticut has begun the task of coordinating efforts to identify sites that meet internationally agreed upon criteria for what constitutes an “Important Bird Area”. This program represents an opportunity to prioritize bird conservation activities so that resources can be used in areas where they will have the greatest impact. If these sites are to remain important over the long term, we need to ensure that they continue to exhibit those criteria originally recognized as critical. Developing a statewide system for monitoring these sites – focusing at each site on the things that caused it to be identified as an Important Bird Area – has, therefore, great potential to improve the long term protection of Connecticut’s birds.

Finally, I should note that these ideas are not necessarily discrete projects. If we are careful, many of our monitoring goals could be achieved as part of a coordinated strategy to better understand the state of Connecticut’s bird populations. Moreover, data collected for one purpose (e.g., a night bird survey or Important Bird Area monitoring) could easily be used for other purposes (e.g., a new bird atlas). Such efficiencies, however, will only be possible if the many organizations dedicated to protecting bird populations in the state coordinate their actions and work together to meet the goals that we collectively share.

There is always a need for more data but it should not be used as an excuse for inaction even as we work to improve bird population monitoring. As outlined...
Many neotropical migrants need large, unfragmented forest to breed productively.

above, the Breeding Bird Surveys, the Christmas Census and the Summer Bird Count are the best data currently available. In the following section, Patrick Comins describes what is happening to Connecticut bird populations primarily based on these data.

**DEP Surveys:**
- Waterfowl
- Wetland Birds
- Raptors
- Individual Species and Habitats

*The Scarlet Tanager is an important woodland species.*
Three of the bird species that regularly breed in Connecticut in significant numbers are considered of global conservation concern, Saltmarsh Sharp-tailed Sparrow, Cerulean Warbler, and Piping Plover. Golden-winged Warbler and Red-headed Woodpecker, although nesting in low numbers in Connecticut, are also of global conservation concern as are three species that formerly nested here, Black Rail, Henslow’s Sparrow and Northern Bobwhite, and three migrant species, Buff-breasted Sandpiper, Olive-sided Flycatcher and Bicknell’s Thrush.

Twenty-eight species of birds that nest in Connecticut are considered of continental concern, including two Federally Threatened species, Piping Plover and Bald Eagle and one Federally Endangered species, Roseate Tern. The Connecticut DEP lists 21 as Endangered, nine as Threatened and 20 as Special Concern (http://dep.state.ct.us/cgnhs/nddb/birds.htm).

Connecticut’s bird populations are dynamic with trends that are as diverse as the species that occur here. Some species have increased over time, while others have declined, including some birds that have gone from being only occasional visitors to among the most common of our backyard birds, such as Northern Cardinal and Tufted Titmouse. Others, such as Yellow-breasted Chat and Eastern Meadowlark have declined dramatically over the decades.

To put bird population dynamics into perspective, this article uses examples of species with population trends that have significant conservation implications or indicate broad-scale changes to the state’s bird life. These changes can be categorized by grouping spe-
cies that rely on similar habitats. An analysis of The Breeding Bird Survey Data for Connecticut (Sauer, et al, 2005) provides some of the best insight into the population trends of the state’s breeding birds. Their analysis indicates that 23 species of breeding birds have suffered significant declining trends in Connecticut compared with 18 species with significant increasing trends from 1966 to 2004. Over the shorter period from 1980 to 2004, 19 species show declining trends compared to 14 that are increasing. Although statistically significant, these trends do not tell the entire story, as there is little information about birds that were already rare by 1966 or those not well covered by Breeding Bird Survey routes.

At this time we know little about the effects of West Nile virus on bird populations. Certainly there has been some effect on bird populations, particularly American Crows, which have a good capacity to recover from temporary population declines. The real worry would be affecting species with a lesser capacity to handle increased mortality rates, i.e. species that are already of conservation concern.

There are several indirect effects from West Nile virus and other avian diseases that can also infect humans that could have a negative effect on bird populations in general, including:
- Increased use of pesticides to control mosquito populations.
- Change in attitude about birds and wild habitats if birds are viewed as potential vectors for disease, thus limiting support for bird conservation and protection.
- A change in attitude about wetlands that reduces support for the protection of wetlands.

Shrubland Species Show Significant Declines

Shrubland (early successional) species have undergone some of the most dramatic declines of any group of birds in Connecticut. The Breeding Bird Survey (BBS) indicates that seven species show significant declines whereas five have increased since 1966. The situation for shrubland birds is, however, understated by only looking at the proportion of increasing to decreasing species. The vast majority of shrubland specialist species appear to be declining, whereas the five species that show increasing trends are more generalized in their habitat needs, well adapted to the human landscape and include several species that have expanded their range into our area from the south. Included within the declining species are Brown Thrashers, which have undergone one of the most significant declines of any species in Connecticut. Once common in the 1960s, today Brown Thrashers are listed as a species of Special Concern by the state.

At least six other shrubland birds show declining annual trends since 1966, House Wren, Song Sparrow, Field Sparrow, Prairie Warbler, Blue-winged Warbler and Eastern Towhee. The decline of Prairie and Blue-winged Warblers are of special concern because they are included on the National Audubon

Three Connecticut Birds Are of Global Conservation Concern:
- Saltmarsh Sharp-tailed Sparrow
- Cerulean Warbler
- Piping Plover
Society’s National WatchList, declining throughout their entire continental range. The population declines of Blue-winged Warblers is especially important because Connecticut supports a significant percentage of the entire global population.

Shrubland habitat also supports two of Connecticut’s most endangered species, Yellow-breasted Chat and Golden-winged Warbler, once fairly common, but now found nesting at less than a handful of Connecticut locations.

As mentioned, there are some exceptions to these declines, but they are species that are not totally dependent on shrubland habitat. Carolina Wren, a species that has colonized Connecticut from the south has shown a dramatic increase since 1966. It is also well-adapted to the human landscape, often nesting in even the most urban of yards. Northern Cardinal is another of the species that has colonized the state from the south and is well-adapted, perhaps even dependent on a human-influenced landscape. Yellow Warbler and Gray Catbird round out the list of increasing shrubland species, both are well-suited to nesting in a suburbanized landscape.

**Grassland Species Have Declined and Now Have Low Populations**

Determining population trends for grassland birds in Connecticut is complicated by the small population sizes of most species. That grassland birds have declined to this point, however, is significant and a sign of trouble for these birds. There are no species of grassland specialists that are increasing in Connecticut.

Nine species of grassland birds are native breeders and all are listed by the Connecticut DEP as Threatened, Endangered, or of Special Concern. At least two species have been extirpated within the last century. Additionally, each of the four raptors that nest in grassland habitats are also listed. Most of these birds were common nesters in the state prior to the mid-twentieth century.

Eastern Meadowlarks are the one species for which we have sufficient BBS data to determine abundance trends. This species has declined at an alarming annual rate of over 9% annually from 1966 to 2004. Observations indicate that grassland species continue to decline in Connecticut, reflecting similar regional and national trends. Additional information on grassland birds is found in Protecting Connecticut’s Grassland Heritage, Comins et al, 2003.

**The Trends for Forest Birds Are Mixed**

The population trends of woodland nesting species in Connecticut are fairly evenly matched, with six species showing declining trends and five showing increasing trends. Overall, birds dependent upon forests in the state appear to be stable. Increased forest fragmentation may however take its toll on forest species over the coming decades, as we have now reached a point where forest development is outpacing reforestation of farmland.

Two very notable exceptions are Black-billed and Yellow-billed Cuckoos. These birds have declined over 8% annually since 1966, and are among the fastest
declining of any bird species in the state. They are a special case, as both cuckoos are dependent upon a very specialized forest type, a young forest with adjacent brushy edge habitats. Thus, while classified as forest birds, they are also dependent upon shrubland patches within the woodland landscape. Other declining woodland birds include Purple Finch and Least Flycatcher.

An additional five woodland nesting birds (Wood Thrush, Black-and-white Warbler, Scarlet Tanager, Eastern Wood-Pewee and Veery) have not shown significant declines in Connecticut thus far, but are declining significantly throughout other portions of the northeast, suggesting that they may soon show declines here as well.

Three species of woodland nesting birds are increasing significantly due to northward expansion of their ranges, Red-bellied Woodpecker, Blue-gray Gnatcatcher and Tufted Titmouse. Each of these birds was considered rare prior to the 1940s but is reasonably common and widespread today. Downy Woodpeckers (a favorite backyard feeder bird) and American Redstarts have also been increasing.

The Summer Bird Count indicates that most of our woodpeckers, with the exception of Northern Flicker and perhaps Hairy Woodpecker, appear to be increasing. Two woodland hawks, Cooper’s Hawk and Red-shouldered Hawk, formerly listed as Threatened and Special Concern species in Connecticut, have increased dramatically and have been removed from the list.

Of special interest is the woodland nesting Cerulean Warbler, a bird that has shown a recent increase but is of long-term concern as it is declining severely throughout the heart of its breeding range. Connecticut may become more important to the overall population of this bird if current trends continue. A globally vulnerable species, this bird is highly sensitive to fragmentation of our forests and efforts should be made to identify and protect key habitats.

Most Shoreline Birds Are Declining

Coastal habitats support the largest number of State-listed species with no less than 15 species exclusively confined to nesting here. Additionally, two out of three of the Federally-listed species and two that are of global conservation concern occur exclusively in coastal habitats. All of this means that high-quality coastal habitats (tidal marshes, islands, beach strand and mud flats) are in limited supply and/or under pressure from competing uses and many of the birds that depend on them are in danger of being extirpated from the state.

Among our greatest concern are Least Terns. These birds, nesting in loose colonies, are Threatened in the state and highly susceptible to habitat degradation, predation and human disturbance. These birds have declined from about 1000 pairs in the mid 1980s to about 216 pairs in 2005. Roseate Terns are Connecticut’s only Federally Endangered species, nesting exclusively at the Falkner Island Unit of the Stewart B. McKinney National Wildlife Refuge in Guilford. These birds have declined from a peak of 235 pairs in 1985 to a low of 37 pairs in 2004, a serious cause for concern.

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Current State of Connecticut’s Birds
Sample Bird Population Trends

Source:
Connecticut Ornithological Association Summer Bird Count 2005; Zeranski and Comins.
Scarlet Tanagers are found in forest habitat such as in Litchfield.

**Shrublands**

Gray Catbirds breed in shrubland habitat as in Groton.

**Inland Wetlands**

American Coots use inland wetlands such as in Burlington.
Grasslands

Savannah Sparrows need grassland such as in Windsor Locks.

Coastal

American Oystercatchers are found along the shoreline.

Tidal Marshes

Willets use tidal marsh habitat such as this in Milford.

KEY

Habitats of Connecticut

4% Inland Wetland
0.3% Shrubland
0.1% Shoreline

All data are approximate and derived in part from the University of Connecticut's Center for Land Use Education & Research. Mapping data currently being revised.
Although most of our coastal birds are declining, a few species have shown remarkable increases in recent years. Ospreys are among Connecticut’s greatest success stories. Nearly wiped out by the 1960s, these birds have shown a remarkable comeback due, largely, to the federal ban on DDT as well as a tremendous effort to erect nesting platforms all across our coast. American Oystercatchers and Willets

A saltmarsh in the town of Madison is used by many birds for both nesting and feeding.

Long Island Sound provides critical wintering habitat for such species as Common Loon, shown here in winter plumage.

About 30% of Connecticut Tidal Marshes Have Been Filled in for Development
have also come back from over hunting in the nineteenth century. However, these comebacks are a result of human intervention, not improved habitat.

Piping Plovers are listed as Threatened both by Federal and State governments, but have increased a bit since the late 1980s due to a considerable expenditure of effort and resources by regulatory agencies and volunteers. Future population declines are likely without a continuing commitment to conservation of this species.

**Long Island Sound Is an Important Habitat for Birds**

Long Island Sound is not a separate habitat for breeding birds so it receives less coverage in this report. Therefore there are no breeding bird populations to use as an indicator of habitat health.

Long Island Sound itself, however, provides habitat for migrating water birds and critical winter habitat for Common Loon and Greater Scaup. It also provides necessary isolation for island nesting terns, herons, egrets and other wading birds. The health of the Sound is important because its fish and invertebrate stocks are a critical food source for many shoreline and saltmarsh birds.

*The Common Nighthawk has adapted to cities by nesting on flat roofs but is now in serious decline.*

**In Connecticut, the DEP Lists:**

- **Endangered** - 21 species
- **Threatened** - 9 species
- **Special Concern** - 20 species

**Only One Urban/Suburban Bird Is Threatened**

This is the most evenly matched classification for population trends, with three species each showing declining or increasing trends. Blue Jays, European Starlings and Common Grackles all have declining trends. Perhaps recent Starling declines are representative of the landscape reaching an equilibrium after supporting nearly a century of increases of this introduced species. All three species remain common. Common Nighthawks, now nearly extirpated from the state, nest exclusively on flat gravel rooftops in urban and suburban areas.

Three species found primarily in urban and suburban landscapes have shown increasing trends. House Finches (introduced from the western U.S.), Mourning Doves and Chipping Sparrows are all well-adapted to nesting in a suburban landscape. Monk Parakeets, introduced into the Connecticut landscape prior to the 1980s have exhibited nearly exponential growth along our coastline towns.

For a list of Connecticut bird trends by species, visit www.ctaudubon.org.
Most of the bird species on the Connecticut list of Endangered, Threatened and Special Concern species have relatively specialized habitat requirements. They depend on a particular habitat, such as tidal marsh, mature forest, or open grassland. More generalized species that live in a broad range of habitats typically have adjusted well as people have modified the landscape. Generalists such as American Robins, Black-capped Chickadees and Northern Cardinals thrive in wooded residential areas and even in urban neighborhoods. In contrast, species that require extensive areas of natural habitat for feeding and nesting are more likely to suffer population declines and the threat of extirpation (local extinction) in the state.

Some of these species have declined because much of their habitat has been converted into farmland, suburbs, marinas or urban areas. About 30% of the tidal marshes in Connecticut have been filled in for development, resulting in a major loss of habitat for species such as the Saltmarsh Sharp-tailed Sparrow and the Seaside Sparrow, both of which nest exclusively in salt meadows. Sandy beaches and dunes have been extensively developed and are heavily used by people during the summer when most birds nest, so it is not surprising that some of the most endangered species of birds in the state need sandy coastal habitats for nesting. Piping Plover, Least Tern, and Roseate Tern are not only listed for Connecticut, but are also listed as Threatened or Endangered for the United States.

Other species have declined even though the total area of suitable habitat appears to be stable or even increasing. This is true, for example, of some species that need mature forests for nesting. Although a large proportion of the state is forested, these birds are threatened by a decline in the quality of their habitat. Degradation of habitat can result from habitat fragmentation (when a large, continuous expanse of habitat is broken up into small, isolated patches) or from the loss of natural disturbances such as wild fires and beaver dams that create habitat diversity. Ecologists began to appreciate the importance of these more subtle changes in the natural landscape in the 1970s.
Forest Birds

After farming was abandoned in most parts of Connecticut, much of the landscape reverted to forest. Consequently, one would expect birds that require mature forests to be doing well, and in fact Breeding Bird Surveys indicate that regional populations of many species of forest birds have increased or remained stable since the mid-1960s. There is legitimate concern about the future of these species, however, because of growing evidence that many forest preserves do not provide adequate nesting habitat. Even when the vegetation looks ideal, nest success may be too low to sustain the population. An overall decline in songbird populations could directly affect the health and stability of the state’s forests. Insectivorous songbirds are important predators of caterpillars, and experimental studies indicate that severe outbreaks of caterpillars would occur more frequently in the absence of these birds, resulting in massive defoliation and heavy tree mortality.

Concern about forest songbirds arose during the 1970s after it became apparent that forest birds were decreasing at many sites in eastern North America. Long-term censuses showed that severe population declines had occurred in nature reserves, wildlife areas, and parks, and some bird species had completely disappeared from particular localities. Typically these sites were carefully protected to preserve natural forest habitats, but they were losing some of their most distinctive and conspicuous species. The first alarm was sounded for three wooded parks in the Washington DC area where the number and diversity of forest specialists (birds that require mature forest) declined precipitously between the early 1950s and mid 1970s. Long-term censuses at sites in New Jersey, New York and Wisconsin also revealed declines in forest specialists. A similar pattern was documented for the Connecticut College Arboretum, where faculty and students have tracked bird populations since 1953. Even though the vegetation in this mature-forest study area showed little change, populations of many forest specialists declined steeply by the mid 1970s. Black-throated Green Warbler, American Redstart, Canada Warbler and Eastern Wood-Pewee disappeared, and some previously common species (Red-eyed Vireo, Ovenbird and Hooded Warbler) had greatly reduced numbers. The habitat had not been destroyed or obviously degraded, so these catastrophic declines were perplexing to researchers.
An initial explanation was that these species had declined not because of problems in their carefully protected nesting areas, but because of the rapid destruction of tropical forests. Most forest specialists (and virtually all of the species that showed major declines) migrate thousands of miles south to spend the winter in tropical habitats. Extensive destruction of their winter habitats could decimate their populations.

Forest specialists primarily declined in small forest reserves and parks, however, not in the heart of heavily forested regions. Long-term studies in such places as Great Smoky Mountains National Park in North Carolina and Tennessee, and White Mountain National Forest in New Hampshire revealed that populations of specialized forest birds were doing fine, with a few species declining but just as many species increasing. In general large forests retained a high diversity and density of forest birds. If destruction of tropical wintering habitat were the main problem, then breeding populations in both large and small forests should be affected.

Comparisons of small, isolated forests and the interior of large forests in the same region confirmed that the problem is associated with forest area. This was demonstrated in a study of 46 forests in southeastern Connecticut that ranged in size from four acres to 6422 acres. The number of species of forest specialists increased steadily with an increase in forest area (Figure 1, p.33). The density of forest birds was also higher in larger forests.

The smallest forests had few or no forest specialists, and were primarily inhabited by generalized birds that one could find in a suburban garden. Studies of large numbers of forests of different sizes in Maryland and New Jersey revealed the same basic pattern. Forest specialists tend to be infrequent or even absent in small forests.

Since the 1970s numerous studies showed that forest birds avoid or abandon small forests because they cannot reproduce successfully at these sites. Forest songbirds may have appropriate vegetation and plenty of food in small forests, but they have a difficult time protecting their eggs and young. Both predators and parasites (Brown-headed Cowbirds) are exceptionally abundant along the forest edge and in the zone of forest close to the edge. Predators such as raccoons and cats take the eggs and nestlings of songbirds (many of which nest on the ground or in low shrubs). Cowbirds are brood parasites that never construct their own nests, but instead lay their eggs in the nests of a host species. Cowbird nestlings typically take most of the food brought by the host parents, and they frequently push the host young out of the nest. Consequently, the host parents raise few of their own young. Both predators and cowbirds are less common in the interior of large forests, where forest songbirds

Nesting on the forest floor, the **Ovenbird** is threatened by deer overbrowsing.

A forest nesting hawk with short wings and a long tail, the **Sharp-shinned Hawk** is well adapted for maneuvering through the thick woods.
are able to produce enough young to sustain their populations.

The insight that small forests don’t provide good habitat for some forest specialists has already molded the policies of state agencies and non-profit conservation groups. The Connecticut DEP gives higher priority for open-space purchases that supplement the area of current state conservation land. After identifying the largest remaining blocks of unbroken forest in Connecticut, The Nature Conservancy targeted these areas for special conservation efforts (including cooperative efforts with private landowners).

Another emerging concern is the impact of white-tailed deer on forest bird populations. By today’s standards the white-tailed deer would have been considered an endangered species in Connecticut during the early twentieth century. After hunting regulations were adopted, deer populations soared. Large predators, such as mountain lions and gray wolves were extirpated from Connecticut after European settlement, so the deer no longer have effective natural predators. Consequently, deer have achieved such high densities in many parts of the state that they are changing the structure of forest vegetation, eliminating forest wildflowers, tree seedlings and much of the shrub layer. Heavy deer browse may delay the regeneration of trees in canopy gaps caused by the death of old trees. Birds that depend on the shrub layer or vegetation in canopy gaps are especially affected by heavy deer browse. Studies in Ohio, Pennsylvania and Massachusetts showed that forests with heavy deer browse have lower densities of such species as Wood Thrush, Hooded Warbler, Eastern Wood-Pewee and Eastern Towhee.

Destruction of tropical habitats remains a concern for some species of migratory birds that have specialized habitat requirements in the winter. This is true for Wood Thrushes, which are concentrated in tropical moist forests and rainforests in Mexico and Central America, and for Cerulean Warblers, which are restricted to tropical cloud forests in the Andes. Thirty years of intensive research on the ecology of migratory birds showed, however, that many species use a wide range of habitats during the winter and that they are not immediately threatened by destruction of their winter habitat. The future of these migratory forest birds largely depends on how we manage their northern breeding habitats.

Grassland Birds

Just as some bird species depend on mature forest, there are other bird species that are found exclusively in open grassland. Although some ecologists argue that grassland bird conservation should be delegated to the prairie states, where there are extensive areas of native grassland, grassland birds were historically an important component of biological diversity in Connecticut. This was particularly true in the eighteenth and nineteenth centuries when hay meadows and pastures supported dense populations of Eastern Meadowlarks, Bobolinks and other grassland birds. Before English settlement, grassland birds were undoubtedly less common than during the peak period of farming in the 1800s, but historical accounts indicate that coastal New England had open grasslands that were large enough to support populations of grassland birds. In sandy coastal areas, grasslands and savannas were sustained by grass fires, while beaver activity and seasonal flooding along rivers and streams were probably the most important sources of grassland farther inland. Abandoned beaver ponds drain to become grassy or shrubby “beaver meadows” that are frequently inhabited by Bobolinks and other grassland birds.

As most of the farms in Connecticut were abandoned in the 1800s, the forest grew over open
landscapes and grassland became increasingly scarce. The natural disturbances that originally generated grassland (fire, seasonal flooding of rivers, and unrestrained beaver activity) became rare, so grassland birds declined as their habitat was taken over by trees. Many species of grassland birds are now represented by only a few relict populations in places like airports and military air fields where open grass is maintained by mowing. Recent efforts to change mowing schedules to avoid the nesting season have been successful in protecting and increasing these populations.

Like forest specialists, many grassland specialists require large, unbroken expanses of their preferred habitat. The reasons that these two groups are sensitive to the fragmentation of their habitats appear to be similar. Grassland birds suffer greater loss of eggs and nestlings close to the edge of a grassland (where it abuts cropland or residential areas) than in the interior of the grassland. Consequently, even small grassland birds such as the Grasshopper Sparrow nest most successfully where there are hundreds of acres of continuous open grassland with extensive habitat far from the edge. Large grasslands are also better for maintaining a diverse set of grassland species because different sections of a large grassland can be mowed or burned on different schedules. The result is a mosaic of different types of grassland, each with a distinctive set of bird species.

Compared to old-growth forests or freshwater marshes, some grassland habitats are relatively easy to create. This has even happened (somewhat inadvertently) when strip mines in West Virginia and Ohio were seeded with grass to reduce erosion and hasten restoration. Many of these restored strip mines now have diverse assemblages of grassland birds. Hence, a knowledgeable wildlife manager should be able to plant native grasses and create extensive areas of appropriate habitat for grassland birds.

**Saltmarsh Birds**

Some of the most highly specialized species of birds in Connecticut are associated with the narrow band of tidal marshes along the coast. These species are further restricted to particular habitat types (such as expanses of short grass meadow) within tidal marsh complexes. These specialized birds declined as many
marshes were filled and developed, and as the remaining marshes were severely altered by construction of ditches and restriction of natural tidal flow.

The birds that require short grass meadows include Willet, Saltmarsh Sharp-tailed Sparrow and Seaside Sparrow. These species are ecologically similar to grassland specialists; their habitat is basically an open grassland that is periodically flooded by tides. Two studies of bird distributions in Connecticut coastal marshes showed that these species have higher densities in larger marshes, and that they are infrequent or absent in small marshes. Thus, major goals for conserving populations of these species should be the protection of large expanses of continuous short grass meadow and restoring marshes where short grass meadow has been broken up into small, remnant patches.

Tidal marsh restoration has become a major priority for the Connecticut DEP and non-profit conservation groups such as The Nature Conservancy. Short grass meadow vegetation sometimes recovers quickly when tidal flow is restored by removing barriers or installing larger culverts in dikes. At Barn Island Wildlife Management Area, for example, short grass vegetation and the bird species associated with this habitat returned to tidally restricted marshes within 15 years of the restoration of tidal flow.

Recovery of some tidal marshes requires more than restoration of tidal flow, however. Marshes that have been disturbed by ditching or tidal restriction are often invaded by common reed or *Phragmites*. Although common reed is a native species, a problem develops when tall reedbeds spread across a marsh and rapidly replace the short grass species that typify saltmeadows. Recently it was determined that the common reed that invades other types of marshes in Connecticut is genetically similar to populations in Europe, indicating that an invasive genetic strain of reed was introduced into this country. Its spread is favored by drying of the marsh and distur-
marsh sparrows would benefit from the restoration of more of these tidal pools.

**Shrubland Birds**

Shrubland specialists require low, woody vegetation such as shrub thickets or regenerating young trees. Like grassland species, many shrubland birds declined after tall trees replaced low vegetation in abandoned farm fields. These species must have reached exceptionally high densities during the 1800s after many farms were abandoned, but their numbers declined as old fields became young forests. Before English settlement, shrubland birds were probably restricted to openings caused by natural disturbances such as fires, beaver activity, wind storms strong enough to blow down trees, and flooding of low-lying river floodplains. Because of the decline in agriculture and the suppression of most natural disturbances, these species have declined, and some are now in danger of disappearing from the state.

Like grasslands, shrublands require some sort of active management unless natural disturbances (such as wild fires, seasonal flooding and beaver activity) can be reintroduced. Most of Connecticut is too heavily settled to allow unregulated wild fires or flooding, so expensive vegetation management is needed to prevent the natural succession from low, shrubby vegetation to tall trees. This has been done on a small scale with “wildlife openings” in state forests and wildlife management areas, and managed shrublands in a few nature preserves. The small clearcuts generated by logging in state forests also provide habitat for some shrubland bird species, but this habitat is ephemeral. Within a decade clearcuts typically become young forests that are colonized by forest species; shrubland birds quickly disappear from these sites.

The most important source of habitat for shrubland specialists are the open corridors (rights-of-way) maintained along powerlines. Trees must be removed from these corridors to protect the lines and facilitate maintenance of the line. Thus, there is an economic incentive to maintain low vegetation and in most parts of New England, this is accomplished by selectively removing trees and tall shrubs to favor low shrubs. The low shrubs form a relatively stable shrubland that have a greater diversity of plants and animals compared to corridors maintained by broadcast herbicide spraying or mowing.

Recent studies in Connecticut, Massachusetts and New York show that the strips of shrubland along powerlines support a rich diversity of shrubland birds, including species that have suffered substantial popu-
lations is not well known. In some habitats birds are able to shift to using introduced plants as long as the overall structure of the vegetation does not change greatly. In some cases, however, songbirds nesting in introduced shrubs have lower nest success than those nesting in native shrubs. Introduced plants also may support fewer caterpillars than native plants because many species of caterpillars feed only on particular species of native plants. Native plants therefore may well provide more food for insect-eating birds.

Another important environmental factor that may be important for conservation of shrubland birds is the invasion of sites by introduced shrubs and vines. Although the spread of invasive plants is potentially important in many habitats (including salt meadows that are threatened by the invasion of an introduced type of common reed), it may be particularly important for shrubland habitats because so many rapidly spreading exotic plants grow well in open, early successional areas. Reductions in plant diversity following the spread of invasive species such as Oriental bittersweet, Japanese knotweed, and multiflora rose are well documented, but the effect of invasive plants on bird popu-
Creating a Diverse Natural Landscape

An overriding conservation goal for Connecticut is to restore the general types of habitats found across the state before English settlement in the 1600s. The current natural landscape is dominated by mature (but still relatively young) deciduous forest, and many of the original habitats of the state are rare or missing. Under represented habitats include both early successional habitats (such as beaver ponds, grasslands and shrublands) and late successional habitat (old-growth forests). Although some sites should be maintained in early successional stages, it is equally important to permit other sites to mature with the goal of eventually achieving old-growth conditions. We have so few examples of bottomland, old-growth forests in New England that it is difficult to know how they would enhance biological diversity, but they would help sustain Barred Owls, Wood Ducks, Pileated Woodpeckers and other species that use nest cavities in large, dead trees.

A range of different habitats is most easily maintained in extensive, continuous natural areas rather than in numerous, small nature reserves. A single disaster can destroy the vegetation in a small preserve, as happened when most of the 200 to 300 year old white pine forest at Cathedral Pines Preserve was knocked down in a single day by three tornados. In a large preserve such events are more likely to increase habitat diversity without completely eliminating any single habitat, resulting in a habitat mosaic with high overall species diversity. Large preserves can also sustain populations of species with large territories or home ranges (such as Goshawk and black bear) as well as forest songbirds that have low nesting success in small forests.

Even if we protect large complexes of natural habitats, it will be important to coordinate conservation efforts across the state. Many sites will not be appropriate for managing particular habitats such as grassland or freshwater marsh, so it is important to coordinate efforts so that an adequate amount of habitat is maintained across

The Black-throated Green Warbler is an old-growth coniferous forest specialist.
the state for each of the major types of vegetation. This requires close coordination between federal agencies (such as the U.S. Fish and Wildlife Service), state agencies (especially the divisions of Wildlife, Parks and Forestry within the DEP), and non-profit conservation organizations. This type of cooperation has already been initiated through such programs as Partners in Flight (an international effort to protect migratory bird populations) and the Silvio O. Conte National Fish and Wildlife Refuge. Also, more research on ecological requirements of birds is needed. Some of the basic ecological concepts that underlie current conservation efforts are the product of field research during the past 20 to 30 years, and we are just beginning to understand some of the natural systems we are trying to protect.

**Figure 1**

*Forest Specialists Increase with Plot Size*

Relationship between the average number of species of forest specialists and the area of continuous forest for survey points in 46 forests in Southeastern Connecticut. See [www.ctaudubon.org](http://www.ctaudubon.org) for suggested references.
The Department of Environmental Protection (DEP), through its Bureau of Natural Resources (BNR) has a long, successful record in wildlife management. This is credited to a dedicated professional staff and the science-based wildlife management that has been implemented with the help of many conservation partners. Most of the success to date has involved the restoration of game species including birds, fish and mammals, such as the Wild Turkey, the Striped Bass and the Fisher. These and other efforts were made possible by the revenue derived from both the sale of hunting and fishing licenses, and the payment, by hunters and anglers, of federal excise taxes on hunting and fishing equipment through programs known today as Pittman-Robertson and Dingell-Johnson Acts. These laws were enacted many decades ago because Congress recognized that stable, long-term funding was needed to reverse the decline in wildlife populations nationwide.

Historically, funding for “nongame” wildlife programs has been minimal in most states and at the federal level. Despite limited resources, Connecticut has had several success stories including the recovery of the Osprey, Eastern Bluebird and Bald Eagle. However, a broad array of wildlife — songbirds, small mammals, reptiles, amphibians and invertebrates — have received little or no attention and have lacked conservation funding. Work needs to be undertaken, locally and nationally, to address the long-term conservation needs of these species.

Recognizing the need to conserve all of America’s wildlife, Congress initiated annual appropriations in 2001 through the Wildlife Conservation and Restoration Program and, subsequently, the State Wildlife Grants Program. These annual appropriations were the culmination of nearly two decades of work by all of the states working through the International Association of Fish and Wildlife Agencies (IAFWA) and with thousands of governmental, non-governmental and corporate conservation partners to demonstrate the need for additional funding to address the full array of wildlife species. As a requirement of this funding, all states and territories had to prepare and submit by October 1, 2005 a Comprehensive Wildlife Conserva-
tion Strategy (CWCS) to the U.S. Fish and Wildlife Service for review and approval.

Congress further required that these conservation strategies address the following eight elements:

- Distribution and abundance of wildlife species
- Location and relative condition of key habitats and community types
- Problems (threats) that may adversely affect wildlife species
- Conservation actions necessary to conserve species of Greatest Conservation Need (GCN) and priorities for implementing such actions
- Monitoring plans for species and habitats to measure the effectiveness of conservation actions and to adapt to changes as needed
- Procedures for review and development of subsequent versions of the strategy
- Plans for coordinating the development, implementation, review and revision of the strategy with federal, state and local agencies, as well as Indian tribes
- Public participation

Connecticut’s CWCS represents an historic opportunity to help reverse the decline of wildlife populations and the loss of key habitats with the goal of keeping common species common and minimizing the need to list additional species as endangered or threatened. It outlines a strategy for the conservation of wildlife in the state for the next decade. In the context of this strategy, wildlife includes: amphibians, birds, fish (freshwater, anadromous and marine), invertebrates (principally insects, mollusks and crustaceans), mammals, and reptiles.

The CWCS was developed after an exhaustive two-year planning and coordination process that included the compilation and review of an extensive inventory of natural resource information and conservation programs, in consultation with a diversity of stakeholders in the state, region and nation. Information on the full array of wildlife and wildlife conservation efforts in Connecticut was solicited, researched and compiled. From these data, DEP-BNR staff, the Endangered Species Scientific Advisory Committee (ESSAC), and conservation partners identified those species of greatest conservation need (GCN). The CWCS addresses each of the eight required elements and highlights these GCN species, their key habitats, conservation challenges, research needs and conservation actions. It also addresses how the DEP will monitor effectiveness, coordinate with conservation partners, periodically review and update the strategy, and foster public participation.

Connecticut’s wildlife is remarkably diverse for a small state. There are 84 species of mammals, 290 species of regularly occurring birds, 49 species of reptiles and amphibians, 168 species of fish and an estimated 20,000 species of invertebrates. This diversity is due to the state’s wide range of landscapes, waterscapes and habitat diversity, from the coastal plain and Long Island Sound in the south to the north-

The American Woodcock is an important game species in Connecticut.
CONNECTICUT STATE OF THE BIRDS 2006

The Department of Environmental Protection has initiated a special study to assess the status of **Whip-poor-wills**, a declining species in Connecticut.

The DEP Wildlife Division, in partnership with the U.S. Fish and Wildlife Service Region 5 Office, compiled an exhaustive list of all existing bird conservation plans relevant to Connecticut. This information detailed the status of migratory birds on state, regional, and national levels, as well as threats to these birds and their habitats, and the conservation actions required to address these threats. Monitoring recommendations were also compiled from these existing plans. A complete listing of all the sources referenced in the development of the CWCS is contained in the CWCS Appendix. They ranged from reports or assessments on individual species to regional reports such as Partners in Flight Physiographic Area and Bird Conservation Region Plans, the North American Waterfowl Management Plan, and Waterbird and Shorebird Conservation Plans to plans, for avian conservation developed by partners such as The Nature Conservancy and Audubon Connecticut, to formal Endangered Species Recovery Plans.

An iterative review process was then implemented with the help of the ESSAC to review lists of priority species and conservation actions and to rank them for their importance in Connecticut. To make the final list of conservation actions both comprehensive and realistically achievable, actions were broadened to include suites of species or removed if they duplicated actions that would yield the same conservation result. The focal species lists were reviewed and revised in an effort to concentrate on species that regularly occur in our state or for which Connecticut possesses a global responsibility or could make a significant contribution toward their conservation. Many migrant species were not listed individually if another resident species utilized the same habitat and had conservation needs that would also address the needs of the seasonal visitors.

At the heart of Connecticut’s CWCS are conservation actions. Implementing these actions over the next decade will yield quality of life and ecosystem diversity benefits statewide and will significantly advance bird conservation efforts at local, state, regional and national levels. Additionally, the likelihood of new
species being listed as endangered or threatened will be minimized, helping to keep today's common species common in the future.

The conservation actions vary greatly in form. Many are overarching, applying to all wildlife species in all habitats. Some examples include:

- Determine the distribution, abundance, condition and limiting factors (threats) for all GCN species and key habitats
- Evaluate the impact of invasive plants and animals on GCN species and their habitats and develop/implement applicable management strategies
- Develop statewide guidelines to minimize the impacts of residential/industrial development on GCN species
- Implement all existing recovery and management plans for GCN species in Connecticut
- Enhance efforts to provide current information and guidance on GCN species and key habitats to land use planners, decision makers and the public at local, region and statewide levels

Some address suites of species or species that share similar habitat types. The following are a few examples:

- Conserve and increase breeding populations of GCN colonial or beach nesting birds
- Monitor population trends of grassland birds within Connecticut and as part of regional efforts among other northeastern states
- Monitor population trends of GCN forest interior bird species (e.g., Worm-eating Warbler, Cerulean Warbler) that are not well covered by Breeding Bird Survey efforts

Other conservation actions focus on individual species that may have unique conservation needs or on species for which Connecticut has a global responsibility for their conservation, such as the following:

- Conserve and increase breeding populations of GCN grassland birds, especially the Upland Sandpiper
- Determine the status and distribution of breeding populations of Saltmarsh Sharp-tailed Sparrows

Piping Plovers, a Federally and State Threatened species, require special protection of their beach nesting habitat.
The CWCS provides a framework for bird conservation. The conservation actions are broad-based and allow great flexibility in the ways they can be accomplished as part of the State Wildlife Grants program. Some components of these action items are better suited to implementation by one specific conservation partner; others will require all partners to work together if meaningful progress is to be made. An example of how these conservation actions can best be accomplished by all partners working together can be readily illustrated in the case of the Piping Plover.

As a state and federally listed species, the Piping Plover has a formal species recovery plan that is required to be implemented. The implementation of that plan has been delegated by the federal government to the DEP. Conservation partners such as Connecticut Audubon Society and the Connecticut Ornithological Association help recruit volunteers to monitor nesting areas. Citizen volunteers and DEP staff work to fence nesting areas to protect them from disturbance. This fencing also protects other beach nesting species such as Least and Common Terns and Black Skimmers. Academic partners such as the University of Connecticut implement research projects to assess the impacts of limiting factors (e.g., nighttime lighting) on plover nesting success. The DEP also works with local municipalities and private landowners to protect nesting areas during the breeding season. The conservation importance of some of these locations may be highlighted through their designation and inclusion in Audubon Connecticut’s Important Bird Area Program.

The conservation of breeding populations of Piping Plover through habitat protection, restoration and enhancement was identified as a priority conservation action in the CWCS. By monitoring the implementation and degree of success of this conservation action,
the DEP and its partners will be able to quantify the performance measure, the number of known breeding pairs of Piping Plovers. The monitoring results will provide information on whether the conservation actions are increasing the number of Piping Plover nests or enhancing nest productivity each year. If the Piping Plover population shows no significant improvement, conservation actions can then be appropriately modified (adaptive management) to better address the limiting factors. The DEP may, for example, intensify habitat protection measures. Alternatively, the DEP may focus efforts on a few key sites or promote cooperative projects with partners if a lack of funds limits the intensification of the conservation efforts. By applying this adaptive management approach, a feedback loop between monitoring, conservation actions and management objectives will be established.

The exciting challenge of the CWCS involves implementing this cooperative and layered approach to proactively manage wildlife resources. It will serve as a guidance document to reach the conservation goals outlined. Researchers will be able to identify species and habitats in need of closer study. Land managers and local landowners will gain information on key habitats for wildlife. Conservation organizations will know
the areas where education and outreach efforts will make a significant contribution and will be able to help fill knowledge gaps through citizen-science projects. The details of implementation – how, where, when, and by whom – will be addressed annually. Progress will be measured and conservation actions and the steps involved in implementation of those actions will be adjusted as needed.

Approaching conservation in this proactive, coordinated way will help prevent duplication of effort, ensure that key components of conservation actions are not overlooked and increase our ability to make informed decisions on issues that affect birds and their habitats in Connecticut. The list of Connecticut Birds of Greatest Conservation Need as well as the references for the literature cited for this article can be found at www.ctaudubon.org.

Funding Conservation
Since 2001 Congress has appropriated approximately $400 million nationwide to the states to work on comprehensive wildlife management in the form of State Wildlife Grants. Since 2001, Connecticut has been awarded $3.5 million in wildlife grants that have been used to support various wildlife projects throughout Connecticut. These grants require a 50% match on behalf of the state to form a State/Federal partnership. The grants are competitive with other states and each grant is awarded individually, not as part of a larger block grant. In order to place all states on an equal footing, the Federal government requires each state to develop a strategic plan that must then be approved before grants may be submitted. This CWCS documents the need and sets a road map for future Federal funding of key wildlife conservation projects in Connecticut.
As described in this report, a significant number of bird species in Connecticut are declining due to loss of suitable habitat. This loss of habitat also affects other wildlife, including mammals, reptiles, amphibians and invertebrates. This section outlines the principal conservation issues facing the state’s birds and habitats and makes recommendations for action.

Three of the six major habitat types in the state, shoreline, tidal marsh and inland wetlands have been considerably reduced from their historical size and, while they now are legally protected, the possibility of expanding these three habitats is slight. Therefore the birds that use them will require special conservation attention species by species.

Two of the remaining three habitats - grasslands and shrublands - are shrinking. If this trend continues, these habitats and the bird species they support will be greatly diminished. In this situation, habitat conservation and restoration is needed to assist all grassland and shrubland birds.

As grasslands grow into shrublands, they then become forests. Thus the resulting woodlands, our largest habitat type, are expanding across undeveloped sections of the state. Therefore, many birds that use woodlands exhibit growing or stable population trends. However, a significant number of woodland species that need large tracts of mature forests to be productive are declining because of forest fragmentation. Large forest blocks fragmented by highways and development result in the reduced ability of many forest birds to breed productively due to the influx of suburban predators and nest parasites such as house cats, raccoons and Brown-headed Cowbirds. Thus, we need a strong effort to conserve large forest parcels and discourage fragmentation.

There has been widespread public opinion that many migratory songbirds are declining due to deforestation of their tropical wintering grounds, including rainforests. This is certainly a long-term conservation concern. However, as Dr. Robert Askins points out in his article, birds that require specialized habitat to breed in Connecticut seem to be able to use much more generalized habitat in their Central and South American wintering grounds. Therefore, the principal responsibility for the state’s birds, habitats and biodiversity rests with us.

There will always be conflicts between habitat conservation and development, and as our population grows there will be a continuing need for healthy, attractive places to live, work, shop and recreate. It is not practical nor is it suggested that we stop development. The challenge before us is to make the land that we do conserve the highest quality habitat that supports the largest and most diverse wildlife populations.

Conservation organizations have sometimes been criticized for impractical, broad recommendations that need large amounts of public money or require new regulations that create bureaucratic burdens. The authors are sensitive to the need for practical solutions that will provide short-term progress and lead in the right long-term direction. All the recommendations stem from the findings in the articles in this report.
Any program must start with an inventory of the land in these habitats. It is recommended that the Legislature fund and encourage the state to inventory and map the critical habitats outlined in this report in cooperation with the state’s major non-governmental conservation organizations.

The second recommendation is to better use the land resources we currently have. There are large amounts of state, town and private lands owned by conservation organizations, private lands with conservation easements and private lands containing needed habitat. These lands should be actively managed to provide more and improved grassland and shrubland habit. For example, the state and its partners should expand ongoing efforts to restore and develop early successional habitats. The incentives contained in the 2007 Farm Bill reauthorization and the U.S. Fish and Wildlife Service Landowner Incentive Program should be maintained.

Farmland is a great potential source of grassland and power line corridors (see Askins, page 30) are a major potential source of shrublands. Private landowners who own or buy farms can be encouraged to maintain or create grasslands. A good way to do this is through direct incentives to ensure necessary management that interferes as little as possible with private use.

The third recommendation is for the DEP, in conjunction with its partners and stakeholders, to further prioritize the GCN (Greatest Conservation Need) species including national and regional goals. Then, based on this integrated list, prioritize those habitats and identify areas for acquisition and management. Facilitation of these actions may be hastened if the DEP considers expanded representation on the Endangered Species Advisory Committees and these Committees meet more regularly.

Next it is recommended that the Legislature work with DEP and other partners to recommend modification of the state’s 21% open space goal to be sure it includes the identified key prioritized habitats (e.g. grasslands, large forest blocks, shrublands, etc.). Finally, there is a need for better information on bird populations (see Elphick, page 8). Most bird population information gathering, with the exception of a few surveys done by DEP staff, is conducted by volunteers with an interest in and knowledge of birds. These volunteers come from local bird clubs, conservation organizations and statewide bird groups such as the Connecticut Ornithological Association. It is recommended that the University of Connecticut, in cooperation with the DEP, lead and convene a conference/workshop of the interested organizations including the U.S. Fish and Wildlife Service, to determine the best approach and the costs of improving bird information. This conference may include discussion on conducting the next Connecticut Breeding Bird Atlas, as well as developing protocol for local land use groups to use to census birds on their respective properties.

It is hoped that the proposed conference will be a step toward energizing the state’s potential conservation-oriented public and enhance cooperation between the various organizations with their diverse interests.

The Connecticut Audubon Society is committed to working cooperatively with the Legislature, DEP and our fellow conservation organizations. We will work with all interested parties to develop the specifics of our recommendations and progress toward our common goal of preserving and enhancing Connecticut’s habitats and the wildlife they support.

**Five Key Recommendations**

1. **Inventory and Map Key Habitats**
2. **Better Use of Current Land Resources**
3. **Prioritize Species of Greatest Conservation Need (GCN)**
4. **Review 21% Connecticut Open Space Goal to Be Sure It Includes Key Prioritized Habitats**
5. **UCONN, in Cooperation with DEP Hold a Conference of Stakeholders to Determine Best Approach to Improve Bird Information**
CONNECTICUT AUDUBON SOCIETY

Founded in 1898, Connecticut Audubon Society conserves Connecticut’s environment through science-based education and advocacy focused on the state’s bird populations and their habitats. Connecticut Audubon Society operates nature facilities in Fairfield, Milford, Glastonbury and Pomfret as well as an EcoTravel office in Essex and an Environmental Advocacy office in Hartford. Connecticut Audubon Society manages 19 wildlife sanctuaries around the state, preserves over 2,600 acres of open space in Connecticut and educates over 200,000 children and adults annually. Working exclusively in the state of Connecticut for over 100 years, Connecticut Audubon Society is an independent organization, not affiliated with any national or governmental group. For membership and other information, please visit www.ctaudubon.org.

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Birds Need Our Protection

“The most significant threats to Connecticut’s land and waterscapes include habitat loss, degradation and fragmentation from development; changes from land use; and competition from non-native, invasive species. Other threats include insufficient knowledge regarding wildlife and their habitats (distribution, abundance and condition); the lack of landscape-level conservation; insufficient resources to maintain or enhance wildlife habitat; and public indifference toward conservation.”

- Connecticut Comprehensive Wildlife Conservation Strategy (Connecticut Department of Environmental Protection - 2006)